Latin American

International Conference on Natural and Applied Sciences-II Colombia, Bogotá

Universidad Nacional Abierta y a Distancia
April 5-7, 2022



PROCEEDING BOOK

EDITORS
Dr. Germán Martínez Prats
Dr. Francisca Silva Hernández
Dr. Rafael Ricardo Renteria Ramos
Dr. María Cruz Cuevas Álvarez

ISBN:978-625-8377-41-5

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CONFERENCE ID

LATIN AMERICAN INTERNATIONAL CONFERENCE ON NATURAL AND APPLIED SCIENCES-II

DATE - PLACE

April 5-7, 2022
Universidad Abierta y a Distancia UNAD, Colombia

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Universidad Juárez Autónoma de Tabasco, México
Institute of Economic Development And Social Research
Violence and Abuse Studies Platform

LANGUAGES

English, Spanish, Turkish, Russian

EVALUATION PROCESS

All applications have undergone a double-blind peer review process

TOTAL NUMBER OF PAPER: 118

The number of paper from Turkey: 47

Other Countries:71

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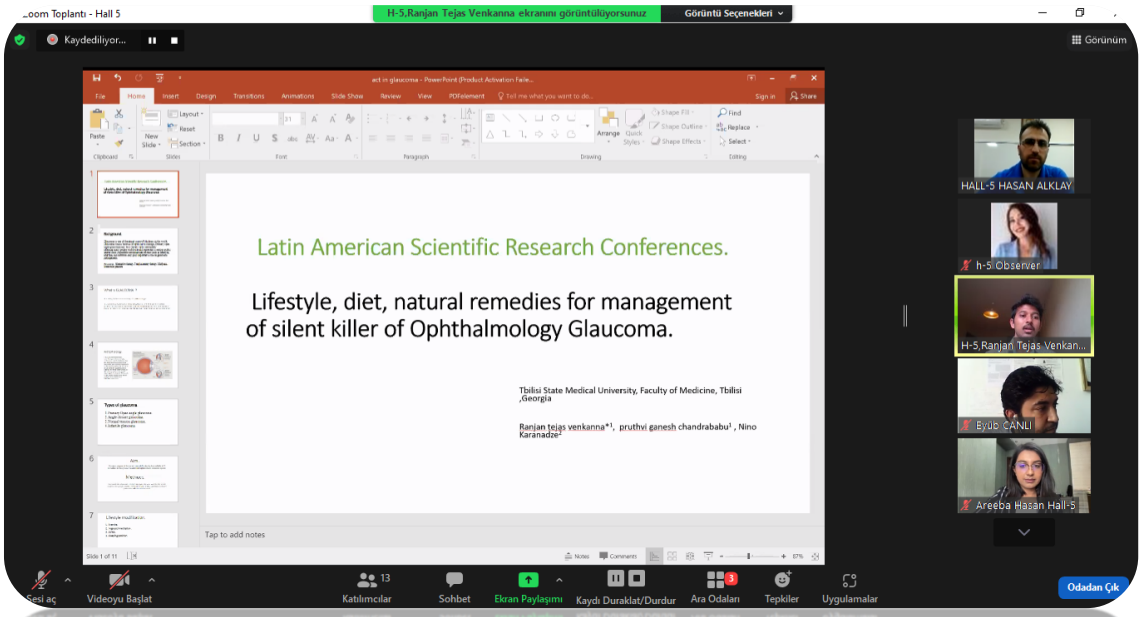


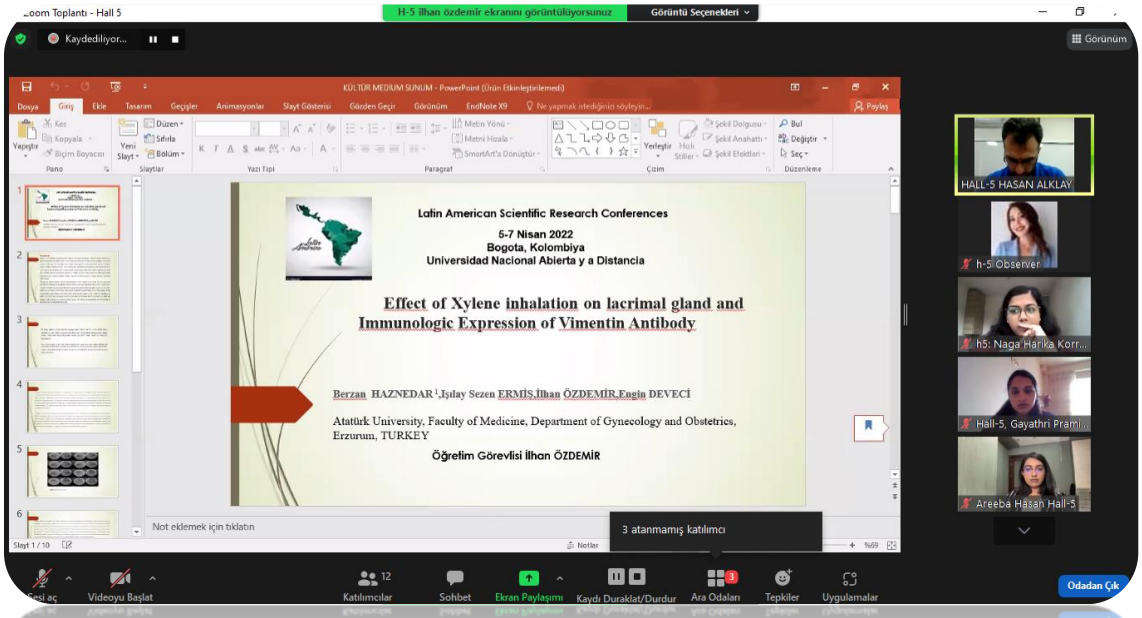

DE COLOMBIA

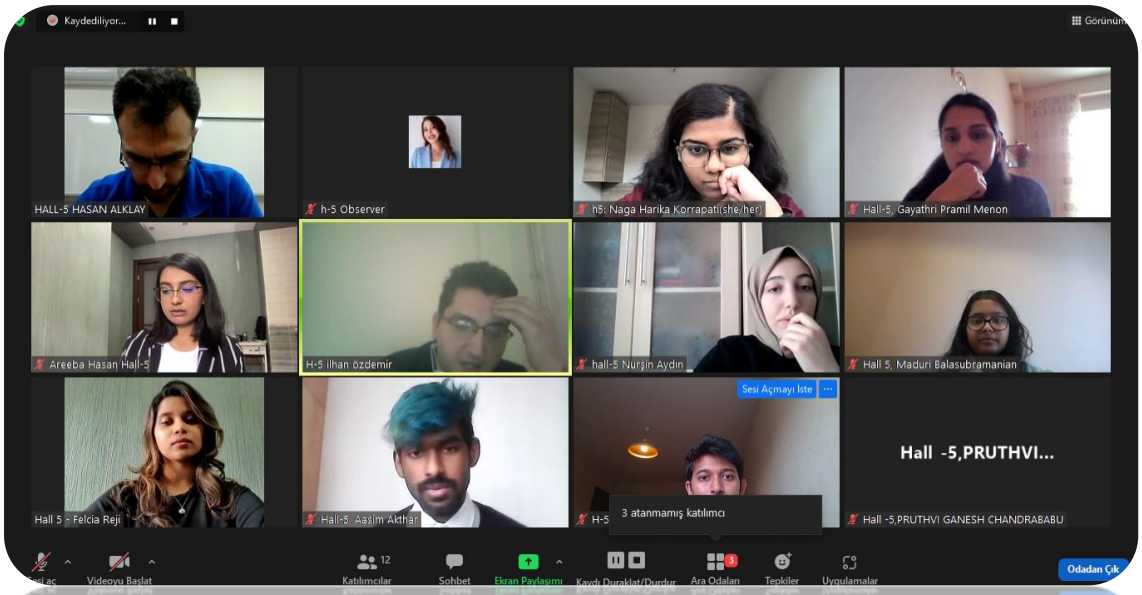

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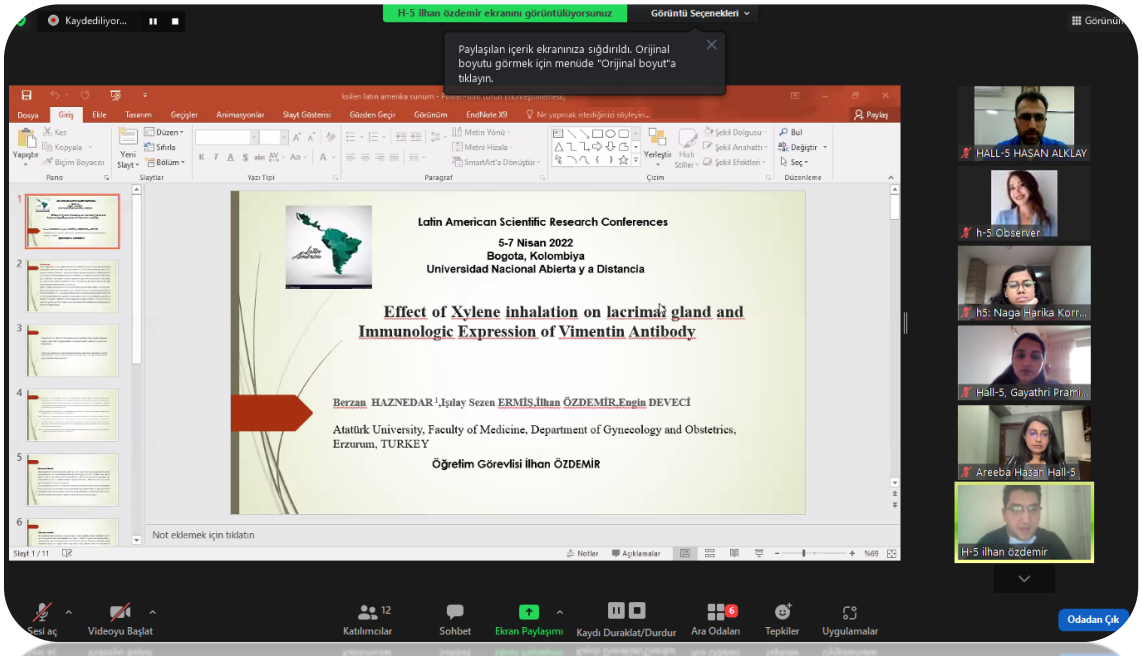

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Nacional a Distancia
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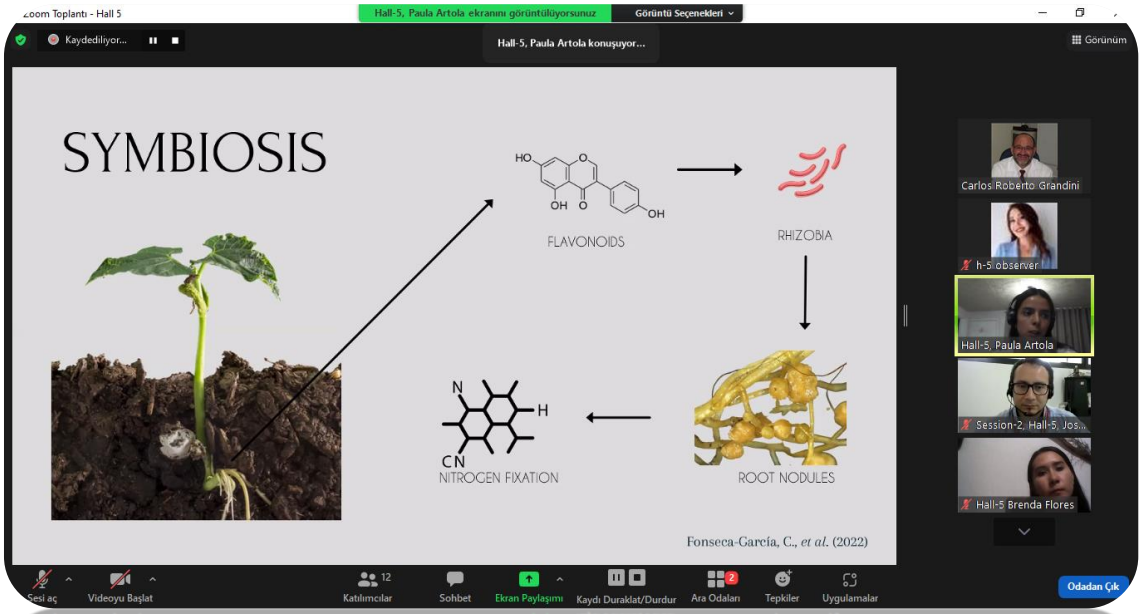

UNAD


H-5,Ranjan Tejas Venkanna ekranını görüntülüyorsunuz
Görüntü Seçenekleri
Kaydediliyor...
Görünüm
Latin American Scientific Research Conferences.
Lifestyle, diet, natural remedies for management of silent killer of Ophthalmology Glaucoma.
Tbilisi State Medical University, Faculty of Medicine, Tbilisi ,Georgia
Ranjan tejas venkanna*1, pruthvi ganesh chandrababu1 , Nino Karanadze2
Tap to add notes
HALL-5 HASAN ALKLAY
h-5 Observer
H-5,Ranjan Tejas Venkan...
Büşra ÇANLI
Areeba Hasan Hall-5
Sesi aç
Videoyu Başlat
Katılımcılar
Sohbet
Ekran Paylaşımı
Kaydı Duraklat/Durdur
Ara Odaları
Tepkiler
Uygulamalar
Odadan Çık

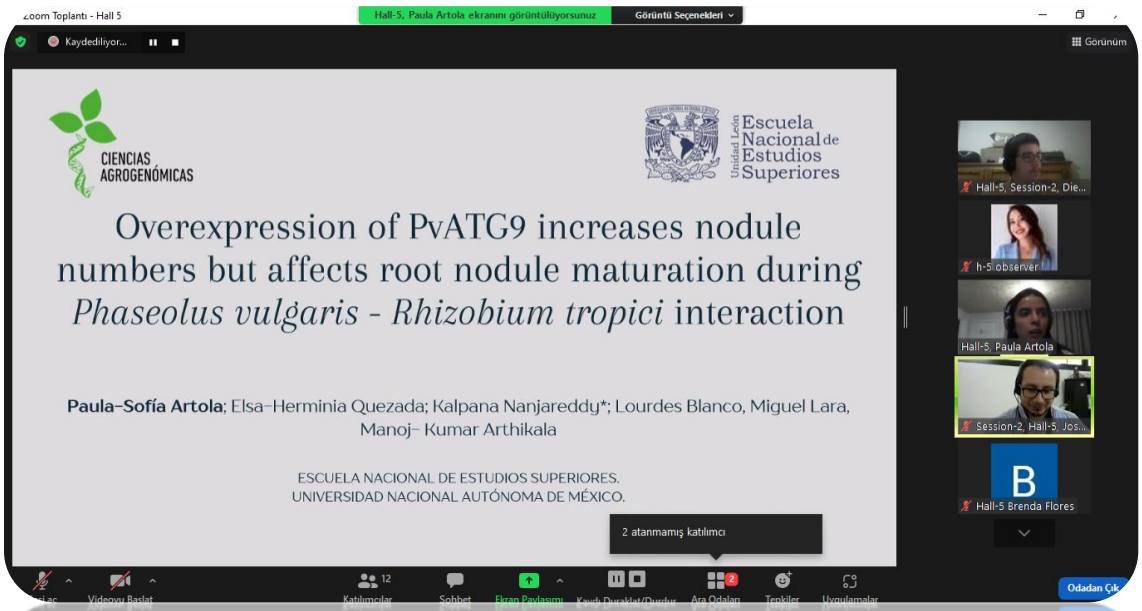

H-5 İlhan özdemir ekranını görüntülüyorsunuz
Görüntü Seçenekleri
Kaydediliyor...
Görünüm
Latin American Scientific Research Conferences
5-7 Nisan 2022
Bogota, Kolombiya
Universidad Nacional Abierta y a Distancia
Effect of Xylene inhalation on lacrimal gland and Immunologic Expression of Vimentin Antibody
Berzan HAZNEDAR1,Işılay Sezen ERMİŞ,İlhan ÖZDEMİR,Engin DEVECİ
Atatürk University, Faculty of Medicine, Department of Gynecology and Obstetrics, Erzurum, TURKEY
Öğretim Görevlisi İlhan ÖZDEMİR
Not eklemek için tıklatın
3 atanmamış katılımcı
HALL-5 HASAN ALKLAY
h-5 Observer
h5: Naga Harika Korr...
Hall-5, Gayathri Prami...
Areeba Hasan Hall-5
Sesi aç
Videoyu Başlat
Katılımcılar
Sohbet
Ekran Paylaşımı
Kaydı Duraklat/Durdur
Ara Odaları
Tepkiler
Uygulamalar
Odadan Çık

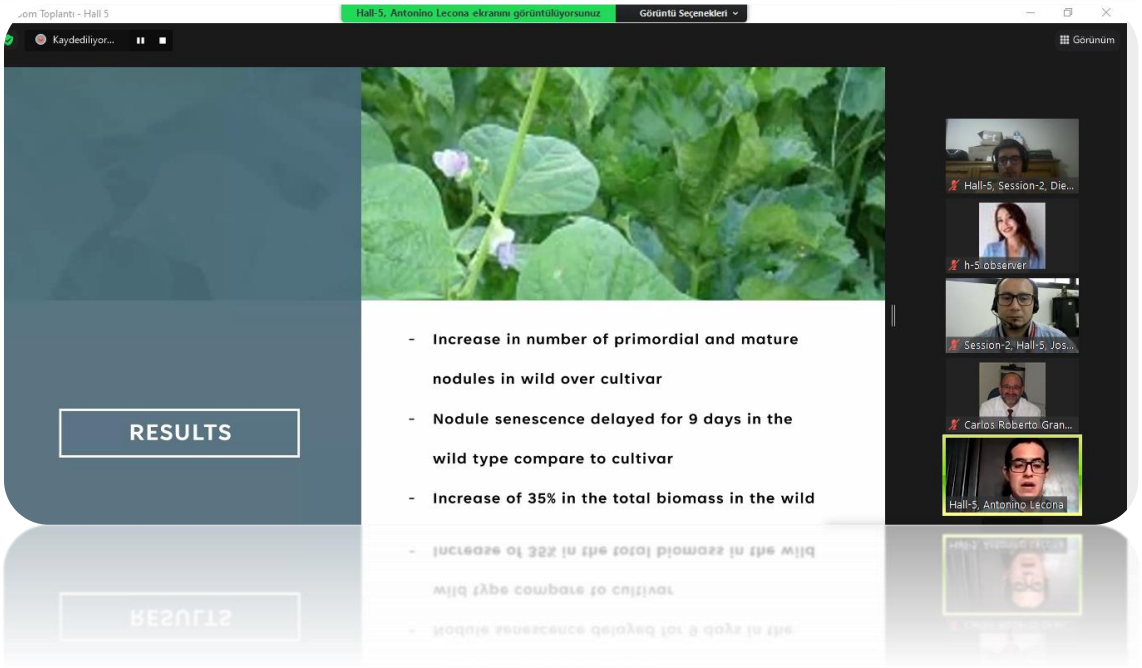

Kaydediliyor...
Görünüm
HALL-5 HASAN ALKLAY
h-5 Observer
h5: Naga Harika Korrapati(she/her)
Hall-5, Gayathri Pramil Menon
Areeba Hasan Hall-5
H-5 ilhan özdemir
hall-5 Nurşin Aydın
Hall 5, Maduri Balasubramanian
Hall 5 - Felcia Reji
Hall-5, Aasim Akthar
H-5
Sesi Açmayı İste
3 atanmamış katılımcı
Hall -5,PRUTHVI...
Hall -5,PRUTHVI GANESH CHANDRABABU
Sesi aç
Videoyu Başlat
Katılımcılar
Sohbet
Ekran Paylaşımı
Kaydı Duraklat/Durdur
Ara Odaları
Tepkiler
Uygulamalar
Odadan Çık

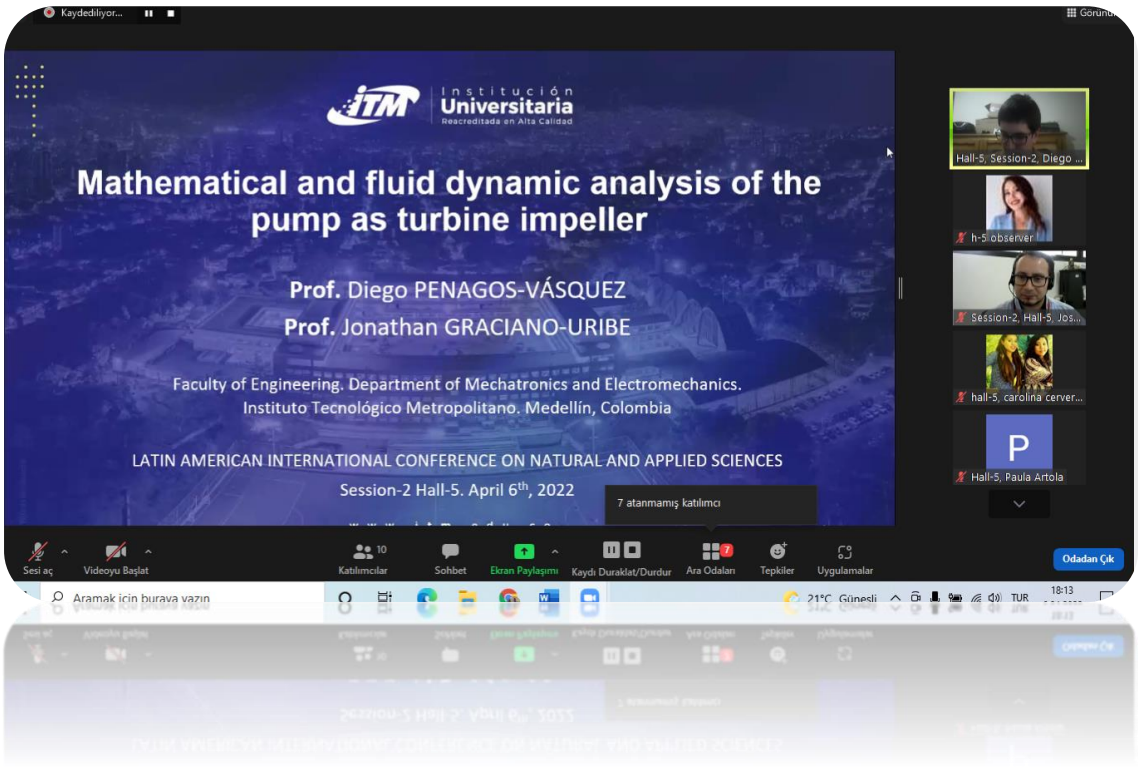

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H-5 ilhan özdemir ekranını görüntülüyorsunuz
Görüntü Seçenekleri
Paylaşılan içerik ekranınıza sığdırıldı. Orijinal boyutu görmek için menüde "Orijinal boyut"a tıklayın.
Latin American Scientific Research Conferences
5-7 Nisan 2022
Bogota, Kolombiya
Universidad Nacional Abierta y a Distancia
Effect of Xylene inhalation on lacrimal gland and Immunologic Expression of Vimentin Antibody
Berzan HAZNEDAR[1],Işılay Sezen ERMİŞ,İlhan ÖZDEMİR,Engin DEVECİ
Atatürk University, Faculty of Medicine, Department of Gynecology and Obstetrics, Erzurum, TURKEY
Öğretim Görevlisi İlhan ÖZDEMİR
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h-5 Observer
h5: Naga Harika Korr...
Hall-5, Gayathri Pramil...
Areeba Hasan Hall-5
H-5 ilhan özdemir
Sesi aç
Videoyu Başlat
Katılımcılar
Sohbet
Ekran Paylaşımı
Kaydı Duraklat/Durdur
Ara Odaları
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Uygulamalar
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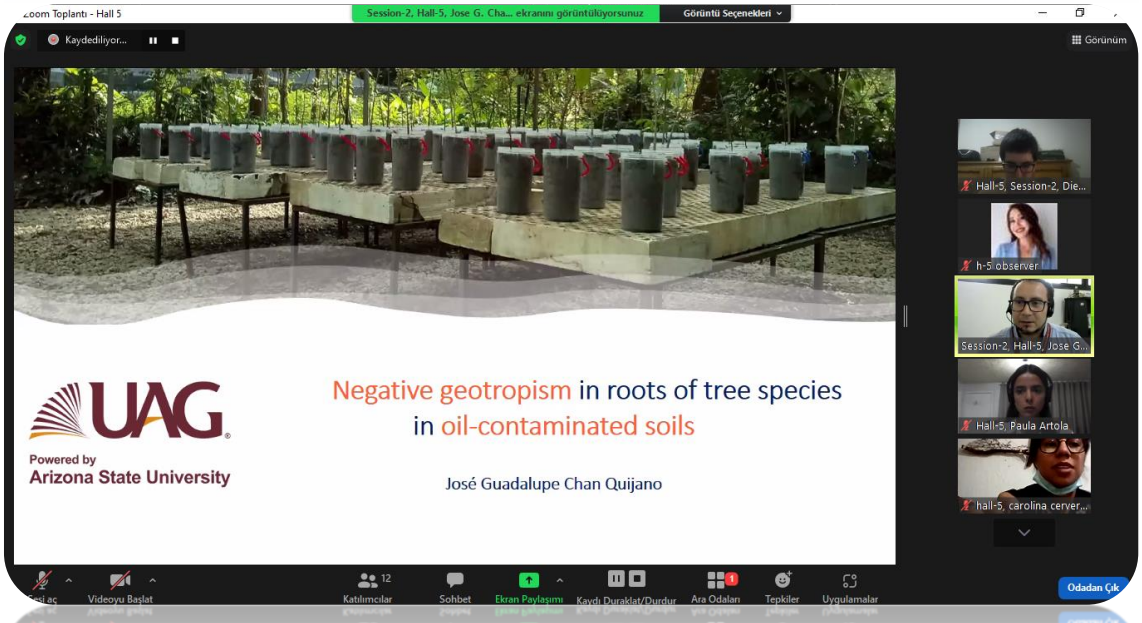

Hall-5, Paula Artola ekranını görüntülüyorsunuz
Görüntü Seçenekleri
Kaydediliyor...
Hall-5, Paula Artola konuşuyor...
Görünüm
SYMBIOSIS
FLAVONOIDS
RHIZOBIA
NITROGEN FIXATION
ROOT NODULES
Fonseca-García, C., et al. (2022)
Carlos Roberto Grandini
h-5 observer
Hall-5, Paula Artola
Session-2, Hall-5, Jos...
Hall-5 Brenda Flores
Sesi aç
Videoyu Başlat
Katılımcılar
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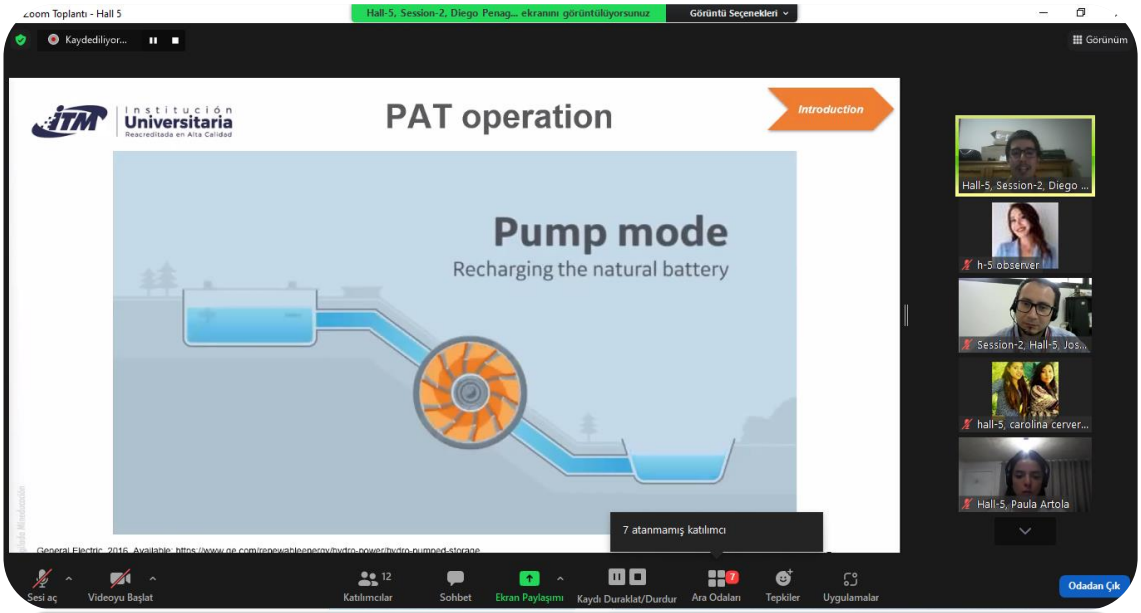

Carlos Roberto Grandini ekranını görüntülüyorsunuz
Görüntü Seçenekleri
Kaydediliyor...
Görünüm
Development, Structural, Microstructural, Mechanical and Biological Characterization of the Zr-25Ta-5Ti Alloy
Latin American
Edriely de Oliveira Saraiva; Pedro Akira Bazaglia Kuroda;
Carlos Roberto Grandini, FBSE
UNESP – Univ Estadual Paulista, Laboratório de Anelasticidade e Biomateriais,
17.033-360, Bauru, SP, Brazil
e-mail: carlos.r.grandini@unesp.br
3 atanmamış katılımcı
Hall-5, Session-2, Die...
h-5 observer
Session-2, Hall-5, Jos...
Carlos Roberto Grandini
Hall-5 Brenda Flores
Sesi aç
Videoyu Başlat
Katılımcılar
Sohbet
Ekran Paylaşımı
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Tepkiler
Uygulamalar
Odadan Çık

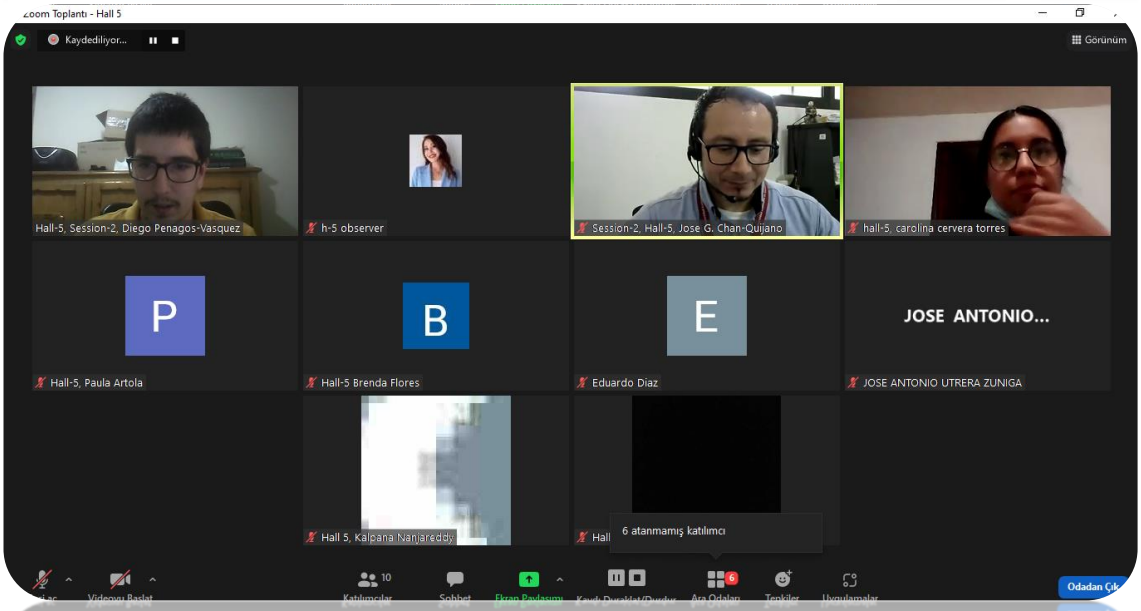

Hall-5, Paula Artola ekranını görüntülüyorsunuz
Görüntü Seçenekleri
Kaydediliyor...
Görünüm
CIENCIAS AGROGENÓMICAS
Escuela Nacional de Estudios Superiores
Unidad León
Overexpression of PvATG9 increases nodule numbers but affects root nodule maturation during Phaseolus vulgaris - Rhizobium tropici interaction
Paula-Sofía Artola; Elsa-Herminia Quezada; Kalpana Nanjareddy*; Lourdes Blanco, Miguel Lara, Manoj- Kumar Arthikala
ESCUELA NACIONAL DE ESTUDIOS SUPERIORES.
UNIVERSIDAD NACIONAL AUTÓNOMA DE MÉXICO.
2 atanmamış katılımcı
Hall-5, Session-2, Die...
h-5 observer
Hall-5, Paula Artola
Session-2, Hall-5, Jos...
B
Hall-5 Brenda Flores
Videoyu Başlat
Katılımcılar
Sohbet
Ekran Paylaşımı
Ara Odaları
Tepkiler
Uygulamalar
Odadan Çık

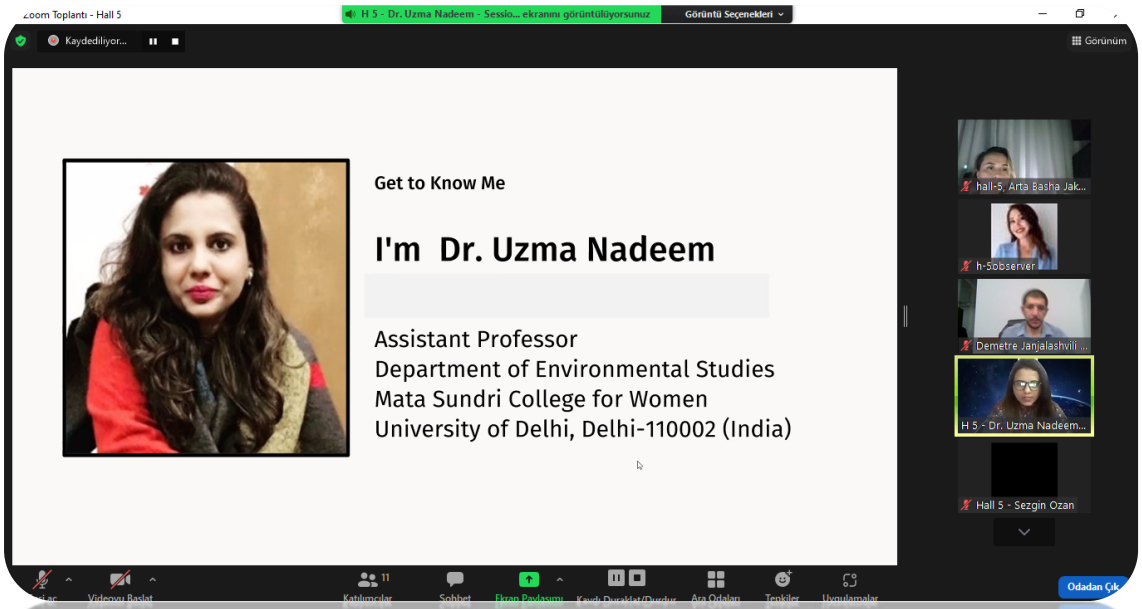

Hall-5, Antonino Lecona ekranını görüntülüyorsunuz
Görüntü Seçenekleri
Kaydediliyor...
Görünüm
RESULTS
- Increase in number of primordial and mature nodules in wild over cultivar
- Nodule senescence delayed for 9 days in the wild type compare to cultivar
- Increase of 35% in the total biomass in the wild
Hall-5, Session-2, Die...
h-5 observer
Session-2, Hall-5, Jos...
Carlos Roberto Gran...
Hall-5, Antonino Lecona

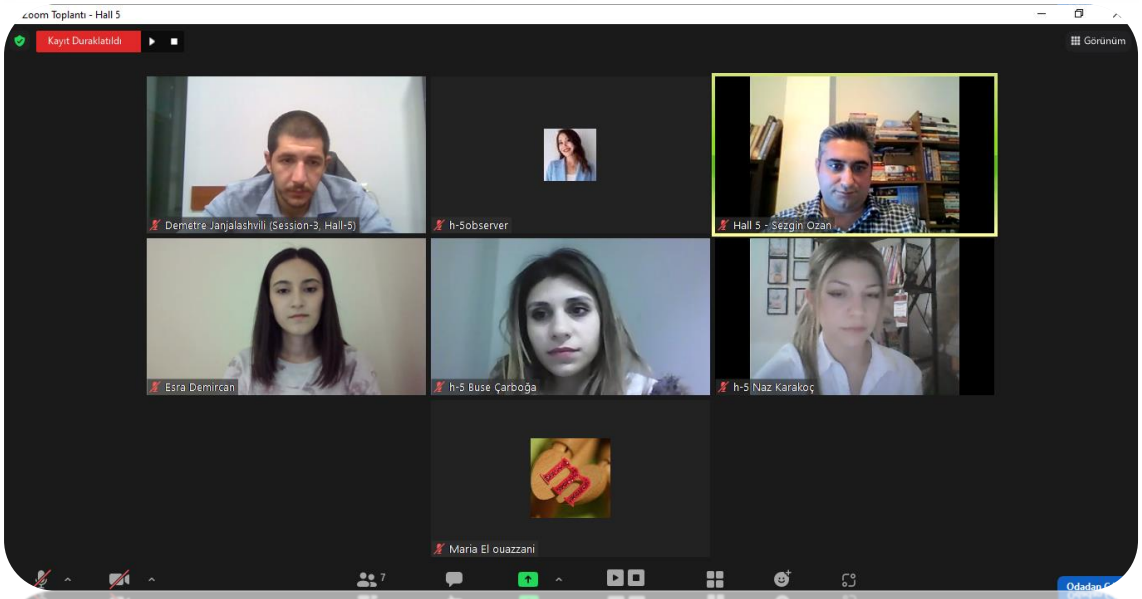

Kaydediliyor...
Görünüm
Institución Universitaria
Reacreditada en Alta Calidad
Mathematical and fluid dynamic analysis of the pump as turbine impeller
Prof. Diego PENAGOS-VÁSQUEZ
Prof. Jonathan GRACIANO-URIBE
Faculty of Engineering. Department of Mechatronics and Electromechanics.
Instituto Tecnológico Metropolitano. Medellín, Colombia
LATIN AMERICAN INTERNATIONAL CONFERENCE ON NATURAL AND APPLIED SCIENCES
Session-2 Hall-5. April 6th, 2022
7 atanmamış katılımcı
Hall-5, Session-2, Diego ...
h-5 observer
Session-2, Hall-5, Jos...
hall-5, carolina cerver...
P
Hall-5, Paula Artola
Sesi aç
Videoyu Başlat
Katılımcılar
Sohbet
Ekran Paylaşımı
Kaydı Duraklat/Durdur
Ara Odaları
Tepkiler
Uygulamalar
Odadan Çık
Aramak için buraya yazın
21°C Güneşli
TUR
18:13


Zoom Toplantı - Hall 5
Session-2, Hall-5, Jose G. Cha... ekranını görüntülüyorsunuz
Görüntü Seçenekleri
Kaydediliyor...
Görünüm
UAG
Powered by
Arizona State University
Negative geotropism in roots of tree species in oil-contaminated soils
José Guadalupe Chan Quijano
Hall-5, Session-2, Die...
h-5 observer
Session-2, Hall-5, Jose G...
Hall-5, Paula Artola
hall-5, carolina cerver...
Sesi aç
Videoyu Başlat
Katılımcılar
Sohbet
Ekran Paylaşımı
Kaydı Duraklat/Durdur
Ara Odaları
Tepkiler
Uygulamalar
Odadan Çık

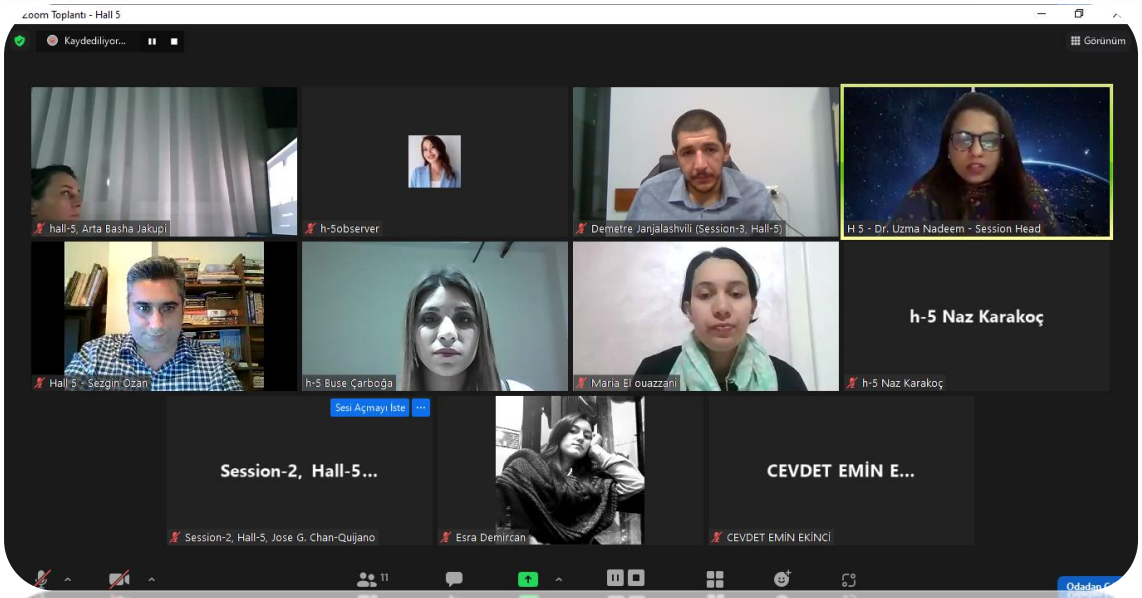

Zoom Toplantı - Hall 5
Hall-5, Session-2, Diego Penag... ekranını görüntülüyorsunuz
Görüntü Seçenekleri
Kaydediliyor...
Görünüm
Institución Universitaria
Reacreditada en Alta Calidad
PAT operation
Introduction
Pump mode
Recharging the natural battery
General Electric. 2016. Available: https://www.ge.com/renewableenergy/hydro-power/hydro-pumped-storage
Hall-5, Session-2, Diego ...
h-5 observer
Session-2, Hall-5, Jos...
hall-5, carolina cerver...
Hall-5, Paula Artola
7 atanmamış katılımcı
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Ekran Paylaşımı
Kaydı Duraklat/Durdur
Ara Odaları
7
Tepkiler
Uygulamalar
Odadan Çık


Zoom Toplantı - Hall 5
Kaydediliyor...
Görünüm
Hall-5, Session-2, Diego Penagos-Vasquez
h-5 observer
Session-2, Hall-5, Jose G. Chan-Quijano
hall-5, carolina cervera torres
P
Hall-5, Paula Artola
B
Hall-5 Brenda Flores
E
Eduardo Diaz
JOSE ANTONIO...
JOSE ANTONIO UTRERA ZUNIGA
Hall 5, Kalpana Nanjareddy
Hall
6 atanmamış katılımcı
Katılımcılar
10
Sohbet
Ekran Paylaşımı
Ara Odaları
6
Tepkiler
Uygulamalar
Odadan Çık

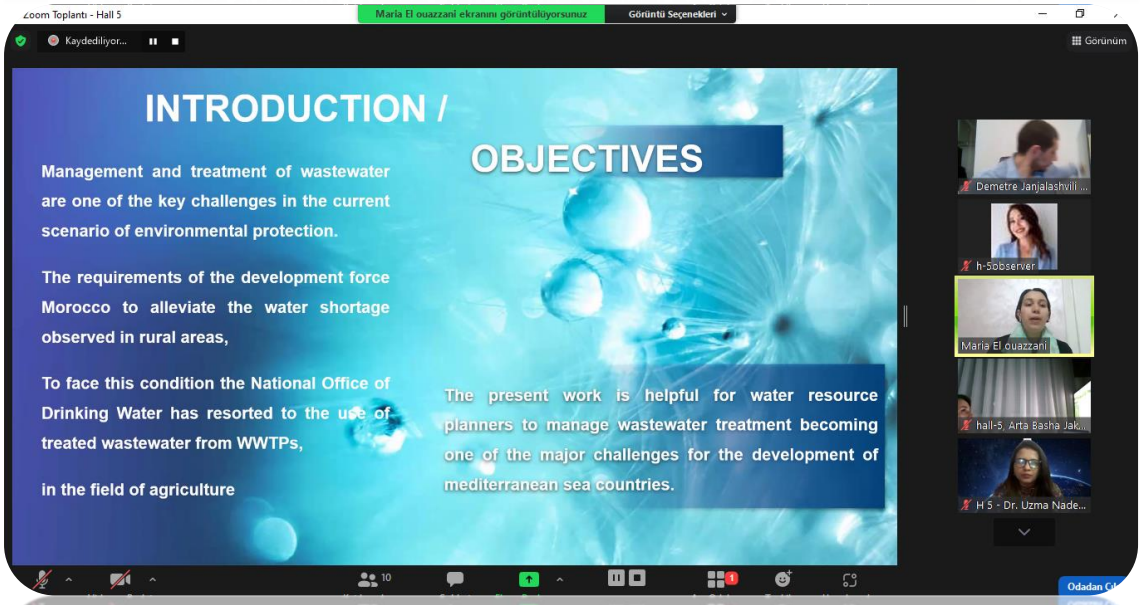

Zoom Toplantı - Hall 5
H 5 - Dr. Uzma Nadeem - Sessio... ekranını görüntülüyorsunuz
Görüntü Seçenekleri
Kaydediliyor...
Görünüm
Get to Know Me
I'm Dr. Uzma Nadeem
Assistant Professor
Department of Environmental Studies
Mata Sundri College for Women
University of Delhi, Delhi-110002 (India)
hall-5, Arta Basha Jak...
h-5observer
Demetre Janjalashvili ...
H 5 - Dr. Uzma Nadeem...
Hall 5 - Sezgin Ozan
Katılımcılar
Sohbet
Ekran Paylaşımı
Ara Odalar
Tepkiler
Uygulamalar
Odadan Çık

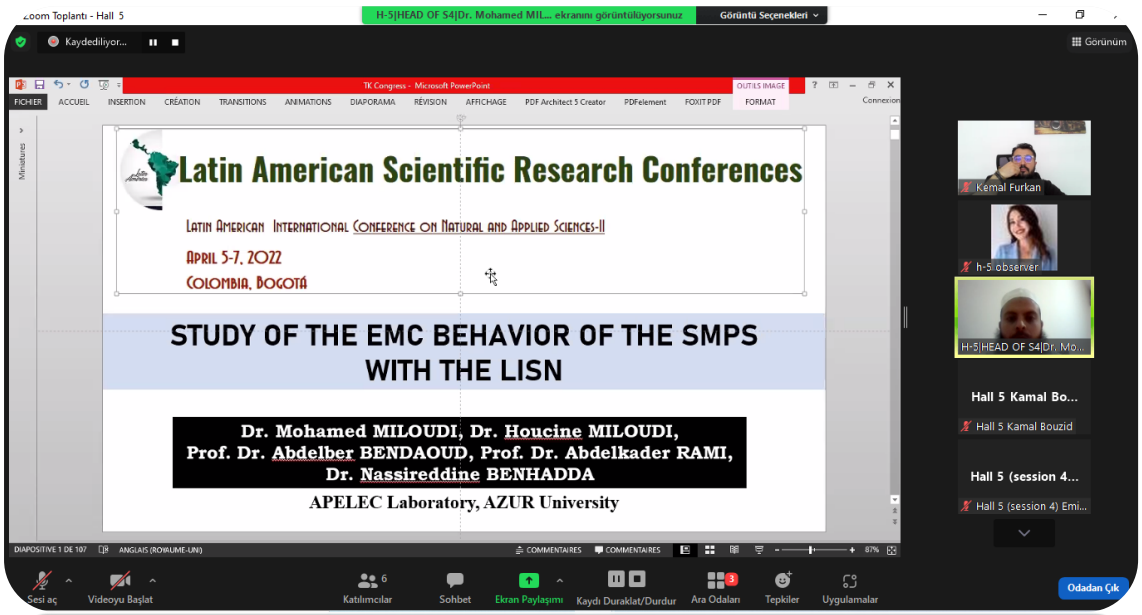

Zoom Toplantı - Hall 5
Kayıt Duraklatıldı
Görünüm
Demetre Janjalashvili (Session-3, Hall-5)
h-5observer
Hall 5 - Sezgin Ozan
Esra Demircan
h-5 Buse Çarboğa
h-5 Naz Karakoç
Maria El ouazzani
Odadan Çık

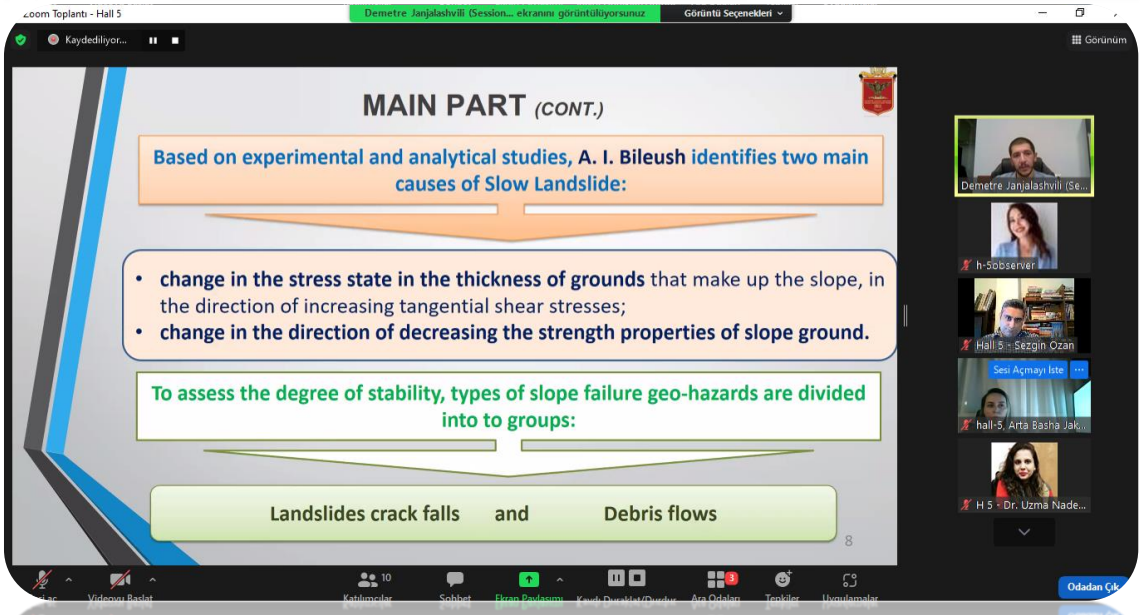

Zoom Toplantı - Hall 5
hall-5, Arta Basha Jakupi ekranını görüntülüyorsunuz
Görüntü Seçenekleri
Kaydediliyor...
Görünüm
ECOTOURISM VALUE DEFINED THROUGH THE ECO-LODGES DESIGN – KOSOVO
Hall-5 Arta BASHA JAKUPI
Valdron VESELI
Florim GRAJCEVCI
LATIN AMERICAN INTERNATIONAL CONFERENCE ON NATURAL AND APPLIED SCIENCES
April 5-7, 2022
Colombia, Bogotá
Next slide
Kosovo has excellent potential for developing regular four-season nature-based tourism as a form of a more responsive and sustainable relaxation or recreation in a natural environment. However, it lacks a genuine offer of accommodation premises in almost all tourist hotspots, which affects the number of visitors compared to similar destinations in developed countries. A well-thought design approach and interventions are necessary to increase and strengthen tourism in these destinations. It is necessary to create a network of accommodation premises, respectively the architectural design of eco-lodges prototypes for use by visitors, which in addition to the function would further enrich the landscape, and over time would become the reference and identifying elements of these areas. The research is based on identifying tourism potentials throughout Kosovo to create a viable offer of accommodation based entirely on ecotourism. The aim is to increase visitors' interest and awareness and strengthen ecotourism development. All interventions
Slide 1 of 23
hall-5, Arta Basha Jakupi
h-5observer
Demetre Janjalashvili ...
H 5 - Dr. Uzma Nadeem...
Hall 5 - Sezgin Ozan
Videoyu Başlat
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Sohbet
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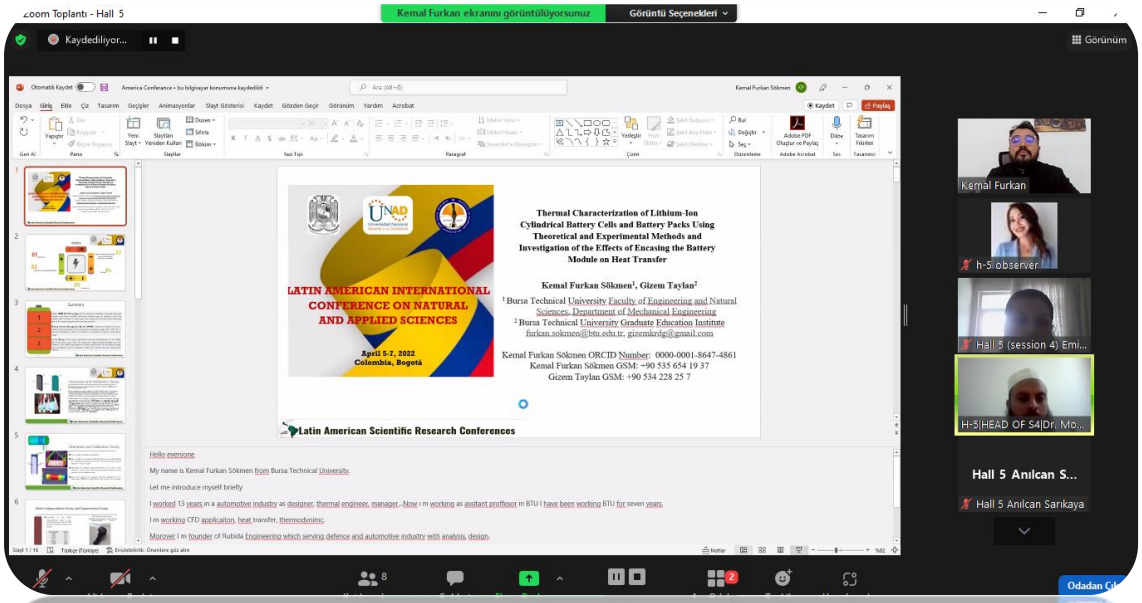

Zoom Toplantı - Hall 5
Kaydediliyor...
Görünüm
hall-5, Arta Basha Jakupi
h-5observer
Demetre Janjalashvili (Session-3, Hall-5)
H 5 - Dr. Uzma Nadeem - Session Head
Hall-5 - Sezgin Ozan
h-5 Buse Çarboğa
Maria El ouazzani
h-5 Naz Karakoç
h-5 Naz Karakoç
Sesi Açmayı İste
Session-2, Hall-5...
Session-2, Hall-5, Jose G. Chan-Quijano
Esra Demircan
CEVDET EMİN E...
CEVDET EMİN EKİNCİ
Odadan Ç

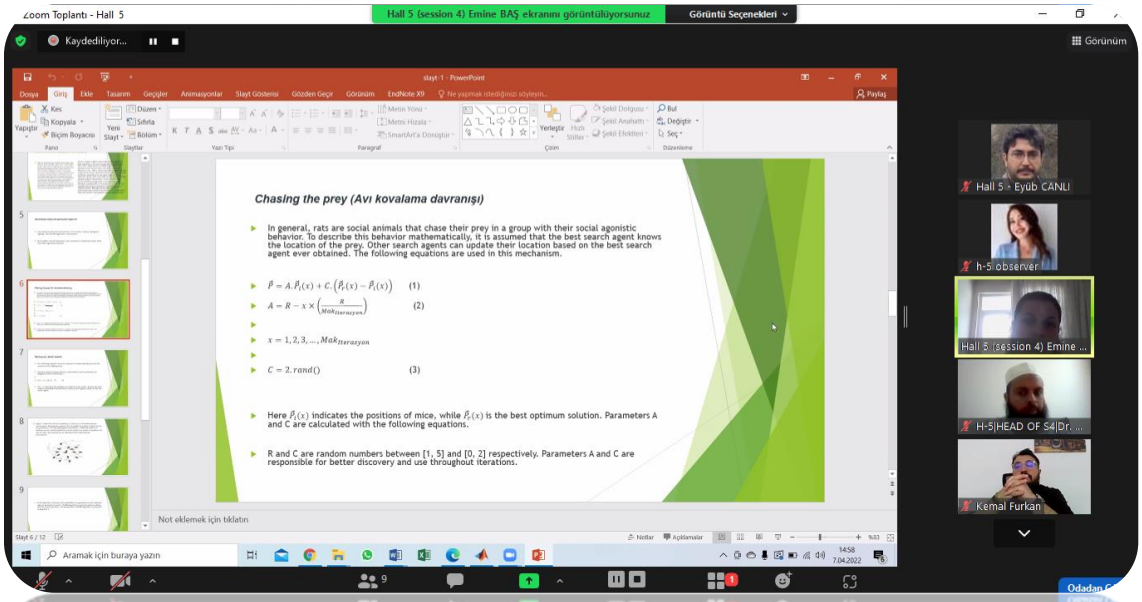

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2nd İNTERNATİONAL
Latin American Scientific Research Conferences
Latin American International Conference on Natural and Applied Science - II
Universidad Nacional Abietrta y a Distancia
April 5-7, 2022
Colombia, Bogotá
HAVA KİRLİLİĞİ KAYNAKLI AFETLER VE SAĞLIK ÜZERİNE ETKİLERİ
(AİR POLLUTİON DİSASTERS AND ITS EFFECTS ON HEALTH)
Buse ÇARBOĞA[2], Assoc. Prof. Dr. Ayşe Handan DÖKMECİ [1*]
[1]Assoc. Dr., Tekirdag Namık Kemal University, School of Health, Department of Emergency Aid and Disaster Management, Tekirdag/TURKEY
[2]Tekirdag Namık Kemal University, Institute of Health Sciences, CBRN and Toxicological Disasters Master's Program, Tekirdag/TURKEY
h-5 Buse Çarboğa
h-Sobserver
Demetre Janjalashvili ...
H 5 - Dr. Uzma Nade...
Hall 5 - Sezgin Ozan

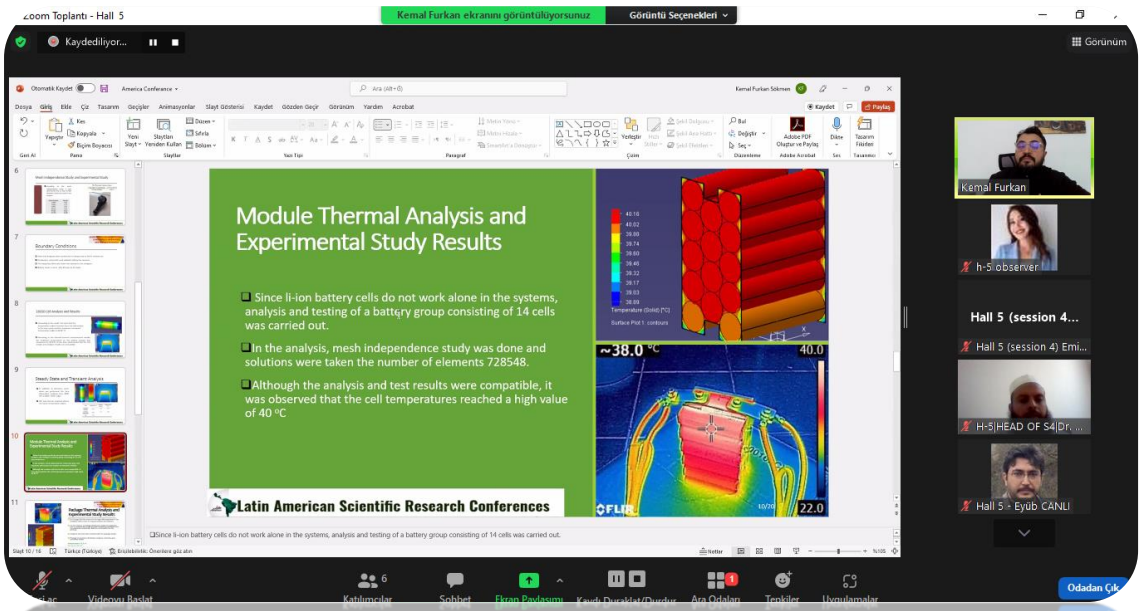

Zoom Toplantı - Hall 5
Maria El ouazzani ekranını görüntülüyorsunuz
Görüntü Seçenekleri
Kaydediliyor...
Görünüm
INTRODUCTION /
OBJECTIVES
Management and treatment of wastewater are one of the key challenges in the current scenario of environmental protection.
The requirements of the development force Morocco to alleviate the water shortage observed in rural areas,
To face this condition the National Office of Drinking Water has resorted to the use of treated wastewater from WWTPs,
in the field of agriculture
The present work is helpful for water resource planners to manage wastewater treatment becoming one of the major challenges for the development of mediterranean sea countries.
Demetre Janjalashvili ...
h-Sobserver
Maria El ouazzani
hall-5, Arta Basha Jak...
H 5 - Dr. Uzma Nade...


Zoom Toplantı - Hall 5
H-5|HEAD OF S4|Dr. Mohamed MIL... ekranını görüntülüyorsunuz
Görüntü Seçenekleri
Kaydediliyor...
Görünüm
Latin American Scientific Research Conferences
Latin American International Conference on Natural and Applied Sciences-II
April 5-7, 2022
Colombia, Bogotá
STUDY OF THE EMC BEHAVIOR OF THE SMPS WITH THE LISN
Dr. Mohamed MILOUDI, Dr. Houcine MILOUDI,
Prof. Dr. Abdelber BENDAOUD, Prof. Dr. Abdelkader RAMI,
Dr. Nassireddine BENHADDA
APELEC Laboratory, AZUR University
Kemal Furkan
h-5 observer
H-5|HEAD OF S4|Dr. Mo...
Hall 5 Kamal Bo...
Hall 5 Kamal Bouzid
Hall 5 (session 4...
Hall 5 (session 4) Emi...
Sesi aç
Videoyu Başlat
Katılımcılar
Sohbet
Ekran Paylaşımı
Kaydı Duraklat/Durdur
Ara Odaları
Tepkiler
Uygulamalar
Odadan Çık

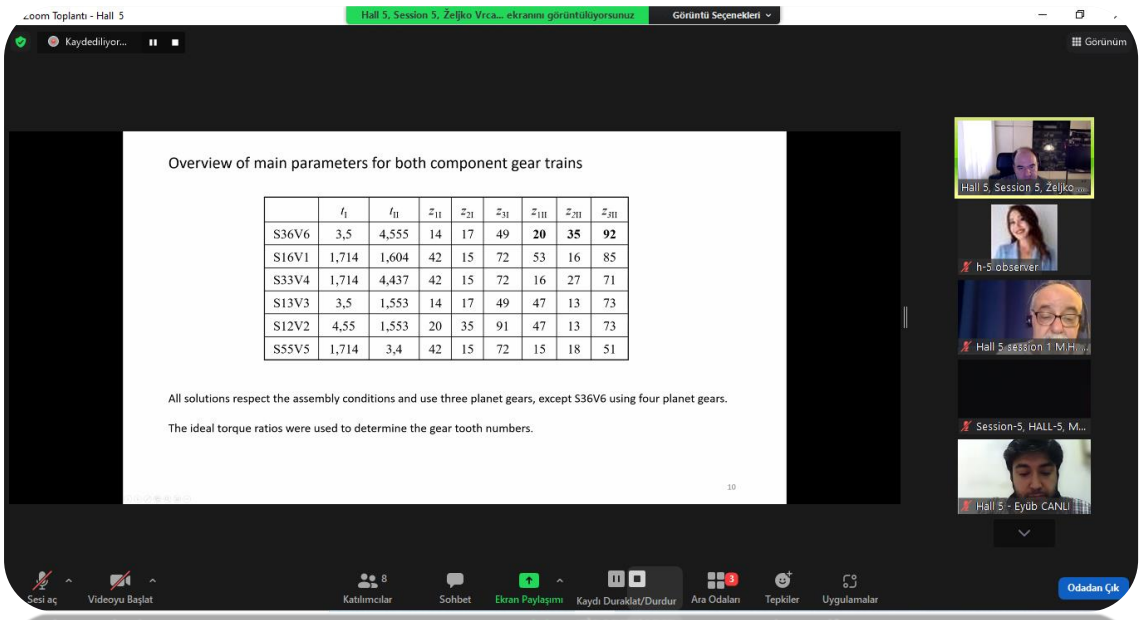

Zoom Toplantı - Hall 5
Demetre Janjalashvili (Session... ekranını görüntülüyorsunuz
Görüntü Seçenekleri
Kaydediliyor...
Görünüm
MAIN PART (CONT.)
Based on experimental and analytical studies, A. I. Bileush identifies two main causes of Slow Landslide:
change in the stress state in the thickness of grounds that make up the slope, in the direction of increasing tangential shear stresses;
change in the direction of decreasing the strength properties of slope ground.
To assess the degree of stability, types of slope failure geo-hazards are divided into to groups:
Landslides crack falls and Debris flows
8
Demetre Janjalashvili (Se...
h-5observer
Hall 5 - Sezgin Ozan
Sesi Açmayı İste
hall-5, Arta Basha Jak...
H 5 - Dr. Uzma Nade...
Sesi aç
Videoyu Başlat
Katılımcılar
Sohbet
Ekran Paylaşımı
Kaydı Duraklat/Durdur
Ara Odaları
Tepkiler
Uygulamalar
Odadan Çık


Zoom Toplantı - Hall 5
Kemal Furkan ekranını görüntülüyorsunuz
Görüntü Seçenekleri
Kaydediliyor...
Görünüm
Thermal Characterization of Lithium-Ion Cylindrical Battery Cells and Battery Packs Using Theoretical and Experimental Methods and Investigation of the Effects of Encasing the Battery Module on Heat Transfer
Kemal Furkan Sökmen[1], Gizem Taylan[2]
LATIN AMERICAN INTERNATIONAL CONFERENCE ON NATURAL AND APPLIED SCIENCES
April 5-7, 2022
Colombia, Bogotá
Latin American Scientific Research Conferences
Hello everyone
My name is Kemal Furkan Sökmen from Bursa Technical University.
Let me introduce myself briefly.
I worked 13 years in a automotive industry as designer, thermal engineer, manager.. Now i m working as assitant proffesor in BTU I have been working BTU for seven years.
I m working CFD applicaiton, heat transfer, thermodynimic.
Morover I m founder of Rubida Engineering which serving defence and automotive industry with analysis, design.
Kemal Furkan
h-5|observer
Hall 5 (session 4) Emi...
H-5|HEAD OF S4|Dr. Mo...
Hall 5 Anılcan S...
Hall 5 Anılcan Sarıkaya

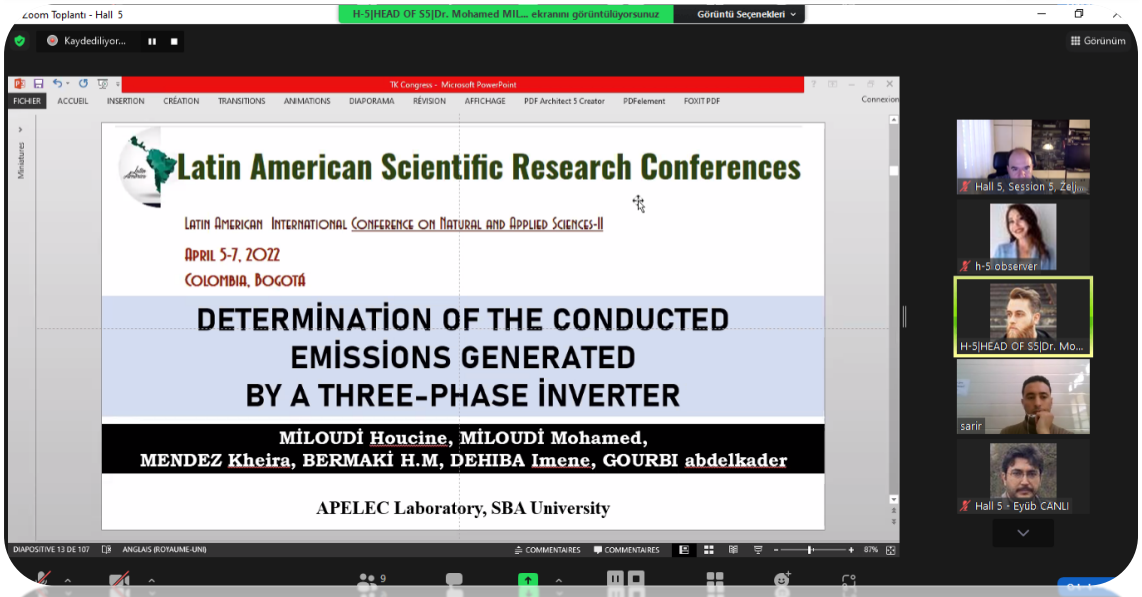

Zoom Toplantı - Hall 5
Hall 5 (session 4) Emine BAŞ ekranını görüntülüyorsunuz
Görüntü Seçenekleri
Kaydediliyor...
Görünüm
Chasing the prey (Avı kovalama davranışı)
In general, rats are social animals that chase their prey in a group with their social agonistic behavior. To describe this behavior mathematically, it is assumed that the best search agent knows the location of the prey. Other search agents can update their location based on the best search agent ever obtained. The following equations are used in this mechanism.
$\vec{P} = A.\vec{P}_i(x) + C.\left(\vec{P}_i(x) - \vec{P}_i(x)\right)$ (1)
$A = R - x \times \left(\frac{R}{Mak_{Iterasyon}}\right)$ (2)
$x = 1, 2, 3, \ldots, Mak_{Iterasyon}$
$C = 2.rand()$ (3)
Here $\vec{P}_i(x)$ indicates the positions of mice, while $\vec{P}_i(x)$ is the best optimum solution. Parameters A and C are calculated with the following equations.
R and C are random numbers between [1, 5] and [0, 2] respectively. Parameters A and C are responsible for better discovery and use throughout iterations.
Not eklemek için tıklatın
Hall 5 - Eyüb CANLI
h-5|observer
Hall 5 (session 4) Emine ...
H-5|HEAD OF S4|Dr. ...
Kemal Furkan


Zoom Toplantı - Hall 5
Kemal Furkan ekranını görüntülüyorsunuz
Görüntü Seçenekleri
Kaydediliyor...
Görünüm
Module Thermal Analysis and Experimental Study Results
Since li-ion battery cells do not work alone in the systems, analysis and testing of a battery group consisting of 14 cells was carried out.
In the analysis, mesh independence study was done and solutions were taken the number of elements 728548.
Although the analysis and test results were compatible, it was observed that the cell temperatures reached a high value of 40 °C
Latin American Scientific Research Conferences
~38.0 °C
40.0
22.0
Kemal Furkan
h-5|observer
Hall 5 (session 4...
Hall 5 (session 4) Emi...
H-5|HEAD OF S4|Dr. ...
Hall 5 - Eyüb CANLI
Katılımcılar
Sohbet
Ekran Paylaşımı
Ara Odaları
Tepkiler
Uygulamalar
Odadan Çık


Zoom Toplantı - Hall 5
Hall 5 - Eyüb CANLI ekranını görüntülüyorsunuz
Görüntü Seçenekleri
Kaydediliyor...
Görünüm
SELÇUK ÜNİVERSİTESİ
Latin American Scientific Research Conferences
Thermal conductivity of grinded almond shell particle boards
Anilcan Sarikaya, Ahmet Ali Sertkaya, Eyub Canli, Cengiz Guler
Colombia, Bogotá – April 2022
UNIVERSIDAD JUÁREZ AUTÓNOMA DE TABASCO
"ESTUDIO EN LA DUDA. ACCIÓN EN LA FE"
UNAD
Universidad Nacional Abierta y a Distancia
MArket SOciety REVi
5 atanmamış katılımcı
h-5|observer
Hall 5 Anilcan Sarikaya
Hall 5 - Eyüb CANLI
Hall 5 Kamal Bo...
Hall 5 Kamal Bouzid
H-5|HEAD OF S4|Dr. ...
Katılımcılar
Sohbet
Ekran Paylaşımı
Ara Odaları
Tepkiler
Uygulamalar

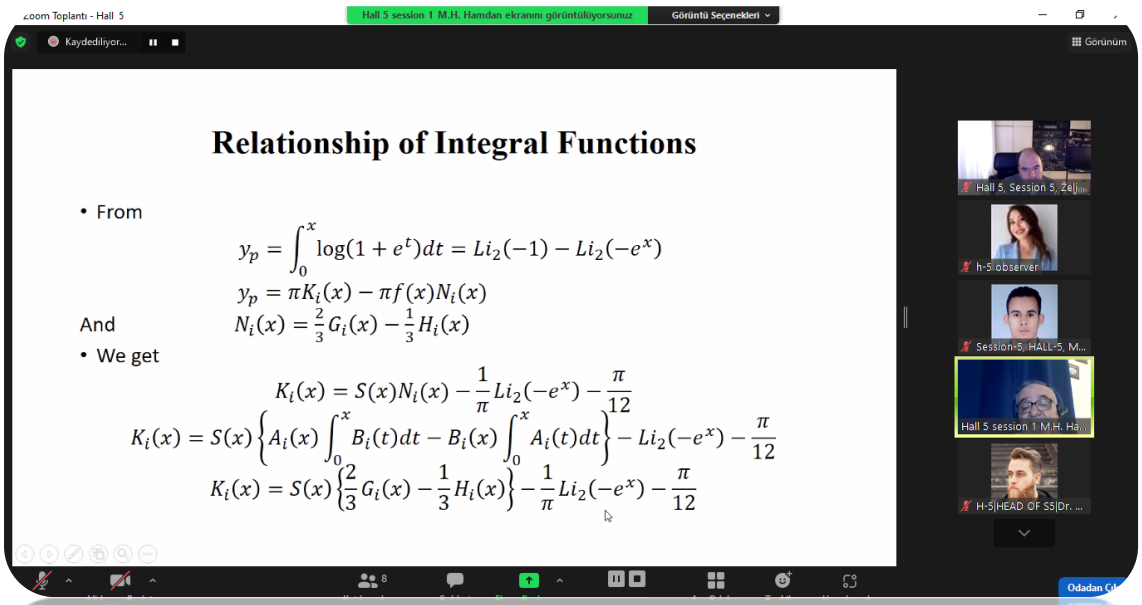


	l_I	l_{II}	z_{1I}	z_{2I}	z_{3I}	z_{1II}	z_{2II}	z_{3II}
S36V6	3,5	4,555	14	17	49	**20**	**35**	**92**
S16V1	1,714	1,604	42	15	72	53	16	85
S33V4	1,714	4,437	42	15	72	16	27	71
S13V3	3,5	1,553	14	17	49	47	13	73
S12V2	4,55	1,553	20	35	91	47	13	73
S55V5	1,714	3,4	42	15	72	15	18	51

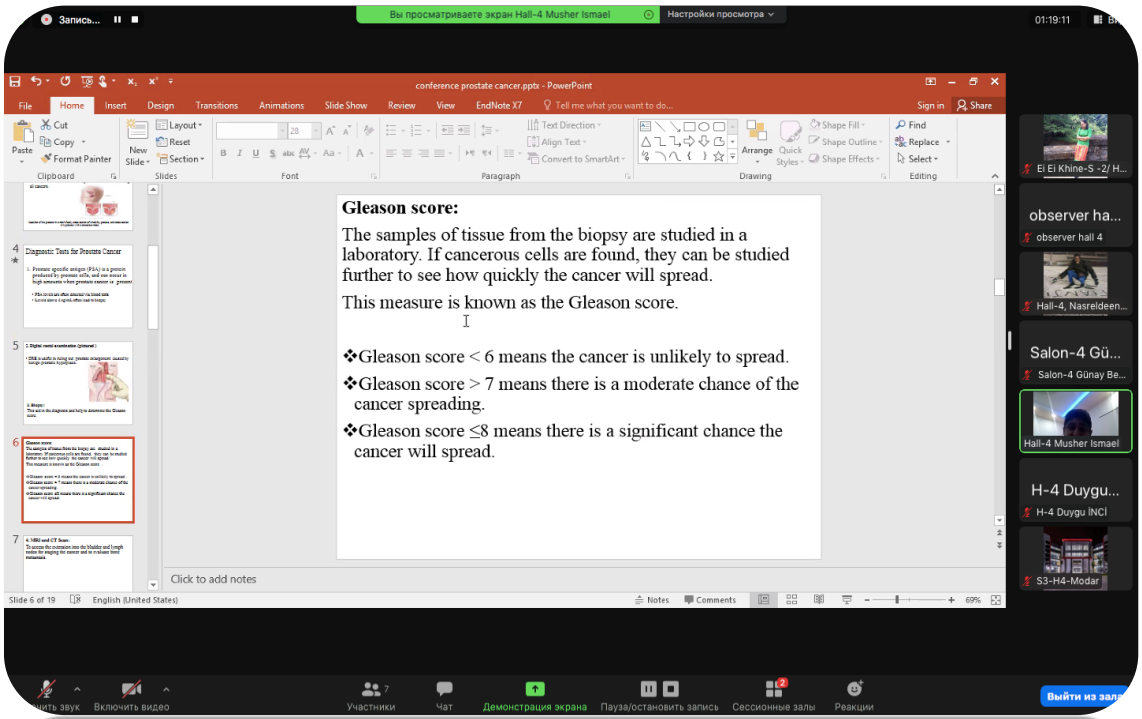


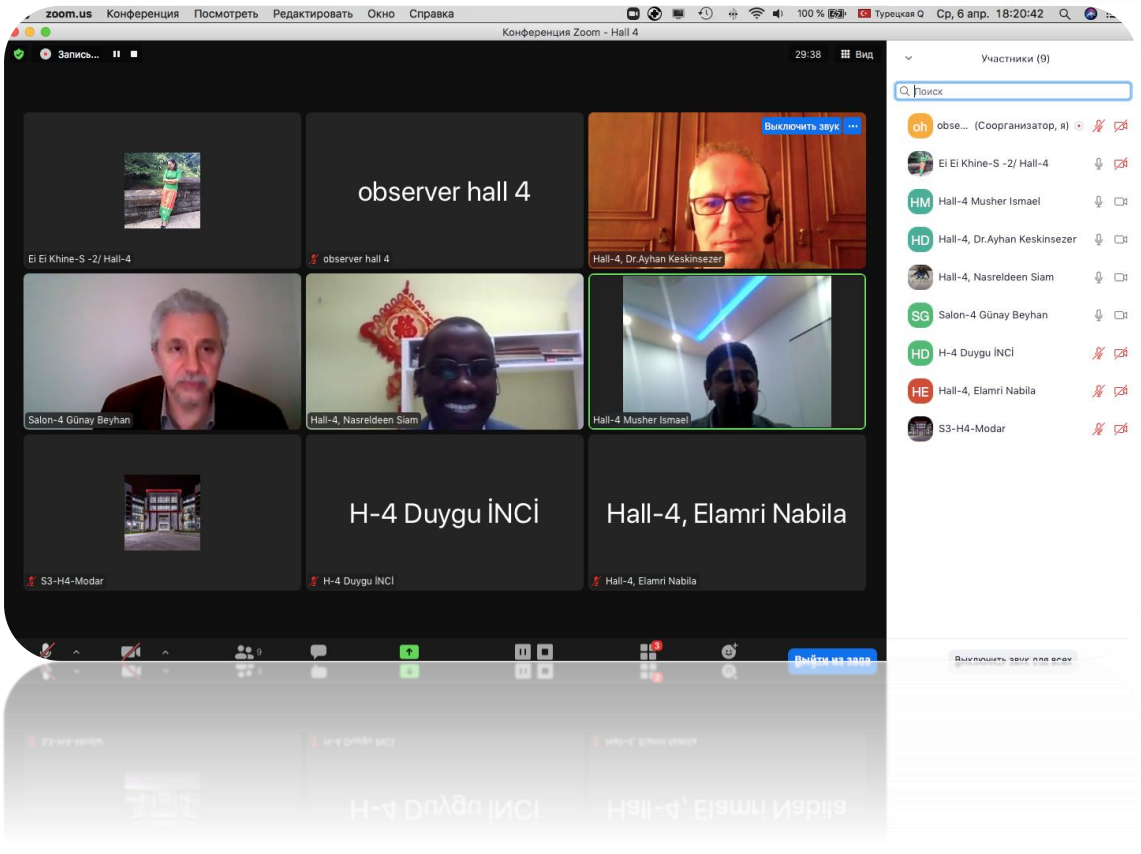

Mohammed ekranını görüntülüyorsunuz
Görüntü Seçenekleri
Kaydediliyor...
LATIN AMERICAN INTERNATIONAL CONFERENCE ON NATURAL AND APPLIED SCIENCES
April 5-7, 2022
Colombia, Bogotá
ADAPTIVE FUZZY-PI CONTROL OF GRID-CONNECTED SOLAR PHOTOVOLTAIC INVERTER
L2GEGI Laboratory, University of Tiaret, Algeria
Mohamed LATTOUI
Morsli SEBAA
Tayeb ALLAOUI
Noureddine SARIR
Aoued Walid MECHETOUNE
Hall 5, Session 5, Želj...
h-5 observer
H-5|HEAD OF S5|Dr. Mo...
Hall 5 session 1 M.H. ...
Hall 5 - Eyüb CANLI
Mohammed
Mohammed
Sesi aç
Videoyu Başlat
Katılımcılar
Sohbet
Ekran Paylaşımı
Kaydı Duraklat/Durdur
Ara Odaları
Tepkiler
Uygulamalar
Odadan Çık

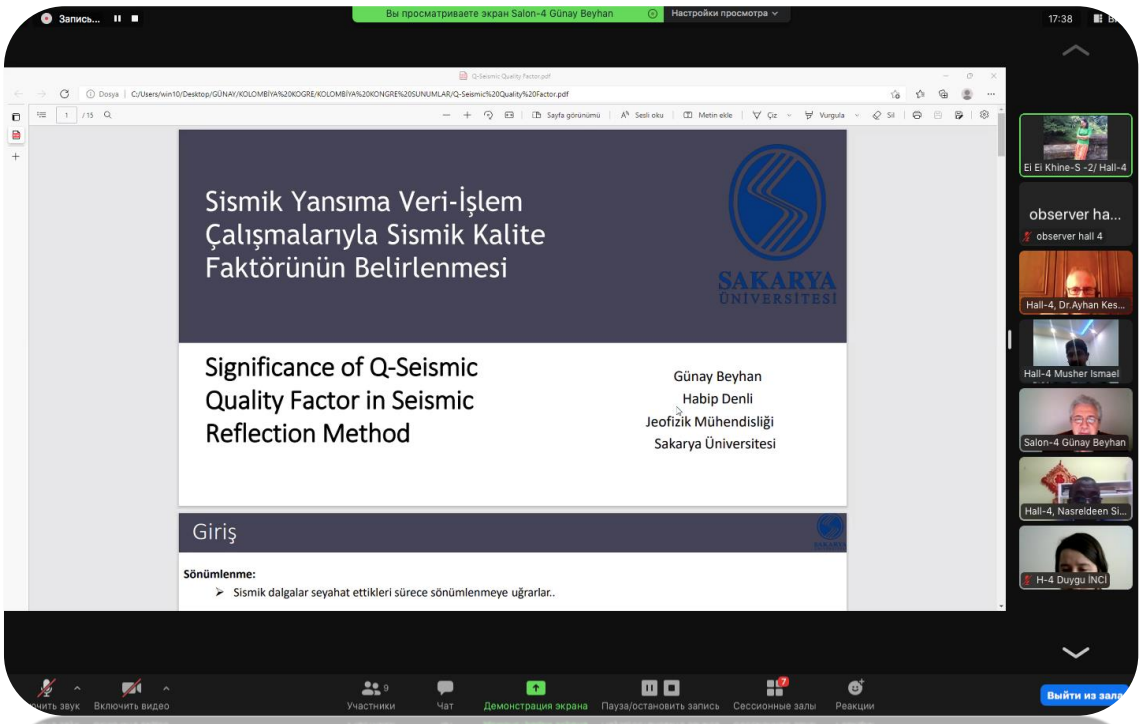

Zoom Toplantı - Hall 5
Hall 5, Session 5, Željko Vrca... ekranını görüntülüyorsunuz
Görüntü Seçenekleri
Kaydediliyor...
Latin American International Conference on Natural and Applied Sciences
April 5-7, 2022 Colombia, Bogotá
Session 5, Hall 5; April 7, 2022
Opportunities for the Application of Reversing Planetary Transmissions
Željko VRCAN[a], Sanjin TROHA[a], Jelena STEFANOVIĆ-MARINOVIĆ[b], Kristina MARKOVIĆ[a],
[a] University of Rijeka, Faculty of Engineering
[b] University of Niš, Faculty of Mechanical Engineering
Hall 5, Session 5, Željko ...
h-5 observer
Hall 5 session 1 M.H. ...
Hall 5 - Eyüb CANLI
Session-5, HALL-5, M...
Videoyu Başlat
Katılımcılar
Sohbet
Ekran Paylaşımı
Ara Odaları
Tepkiler
Uygulamalar
Odadan Çık

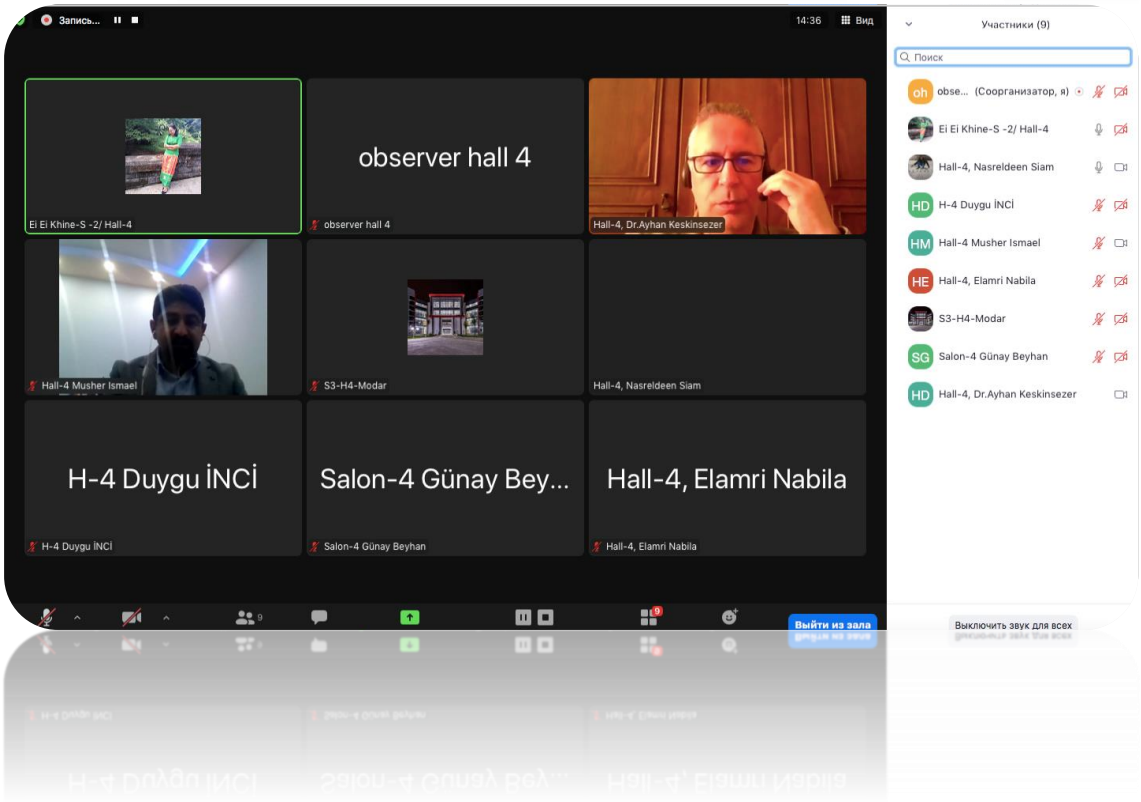

Zoom Toplantı - Hall 5
Hall 5 session 1 M.H. Hamdan ekranını görüntülüyorsunuz
Görüntü Seçenekleri
Kaydediliyor...
Görünüm
Relationship of Integral Functions
• From
$y_p = \int_0^x \log(1+e^t)dt = Li_2(-1) - Li_2(-e^x)$
$y_p = \pi K_i(x) - \pi f(x) N_i(x)$
And $N_i(x) = \frac{2}{3}G_i(x) - \frac{1}{3}H_i(x)$
• We get
$K_i(x) = S(x)N_i(x) - \frac{1}{\pi}Li_2(-e^x) - \frac{\pi}{12}$
$K_i(x) = S(x)\left\{A_i(x)\int_0^x B_i(t)dt - B_i(x)\int_0^x A_i(t)dt\right\} - Li_2(-e^x) - \frac{\pi}{12}$
$K_i(x) = S(x)\left\{\frac{2}{3}G_i(x) - \frac{1}{3}H_i(x)\right\} - \frac{1}{\pi}Li_2(-e^x) - \frac{\pi}{12}$
Hall 5, Session 5, Zelj...
h-5 observer
Session-5, HALL-5, M...
Hall 5 session 1 M.H. Ha...
H-5|HEAD OF S5|Dr. ...
Odadan Çık


Kaydediliyor...
Session-5, HALL-5, Mostapha Ka... ekranını görüntülüyorsunuz
Görüntü Seçenekleri
Görünüm
جامعة مولاي إسماعيل
UNIVERSITÉ MOULAY ISMAÏL
المدرسة الوطنية العليا للفنون و المهن
ÉCOLE NATIONALE SUPÉRIEURE DES ARTS ET MÉTIERS
Latin American Scientific Research Conferences
Laboratory of sciences and engineering professions
Team of Innovative Materials and Mechanical Manufacturing Processes
Session-5, Hall-5 HEAD OF SESSION: M.H. Hamdan and Mohamed MİLOUDİ
Mechanical, Morphological, and Viscosimetric proprieties of Polystyrene composites with thermally treated Snail Shells Nanoparticle (SSP).
❖ Presented by:
KARAOUI Mostapha
4 atanmamış katılımcı
Ses aç
Videoyu Başlat
Katılımcılar
Sohbet
Ekran Paylaşımı
Kaydı Duraklat/Durdur
Ara Odaları
Tepkiler
Uygulamalar
Odadan Çık
Hall 5, Session 5, Zelj...
h-5 observer
Session-5, HALL-5, Most...
Hall 5 session 1 M.H. Ha...
H-5|HEAD OF S5|Dr. Mo...
Hall 5 - Eyüb CANLI

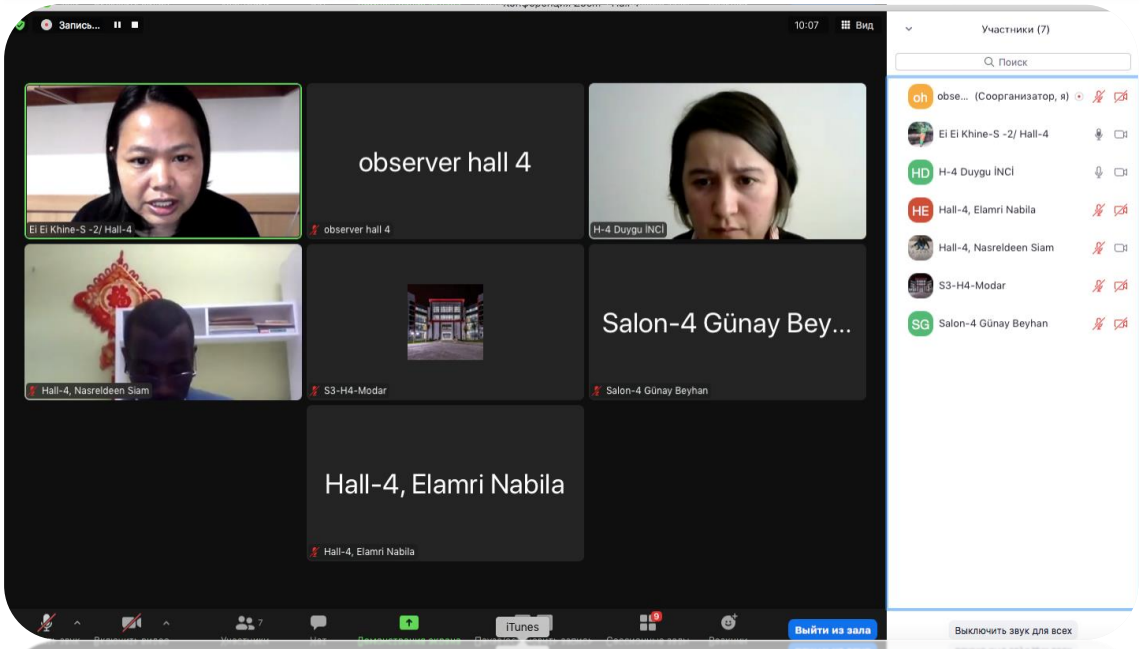

Вы просматриваете экран Hall-4 Musher Ismael
Настройки просмотра
conference prostate cancer.pptx - PowerPoint
Gleason score:
The samples of tissue from the biopsy are studied in a laboratory. If cancerous cells are found, they can be studied further to see how quickly the cancer will spread.
This measure is known as the Gleason score.
❖Gleason score < 6 means the cancer is unlikely to spread.
❖Gleason score > 7 means there is a moderate chance of the cancer spreading.
❖Gleason score ≤8 means there is a significant chance the cancer will spread.
Click to add notes
Ei Ei Khine-S -2/ H...
observer ha...
observer hall 4
Hall-4, Nasreldeen...
Salon-4 Gü...
Salon-4 Günay Be...
Hall-4 Musher Ismael
H-4 Duygu...
H-4 Duygu İNCİ
S3-H4-Modar
Включить звук
Включить видео
Участники
Чат
Демонстрация экрана
Пауза/остановить запись
Сессионные залы
Реакции
Выйти из зала

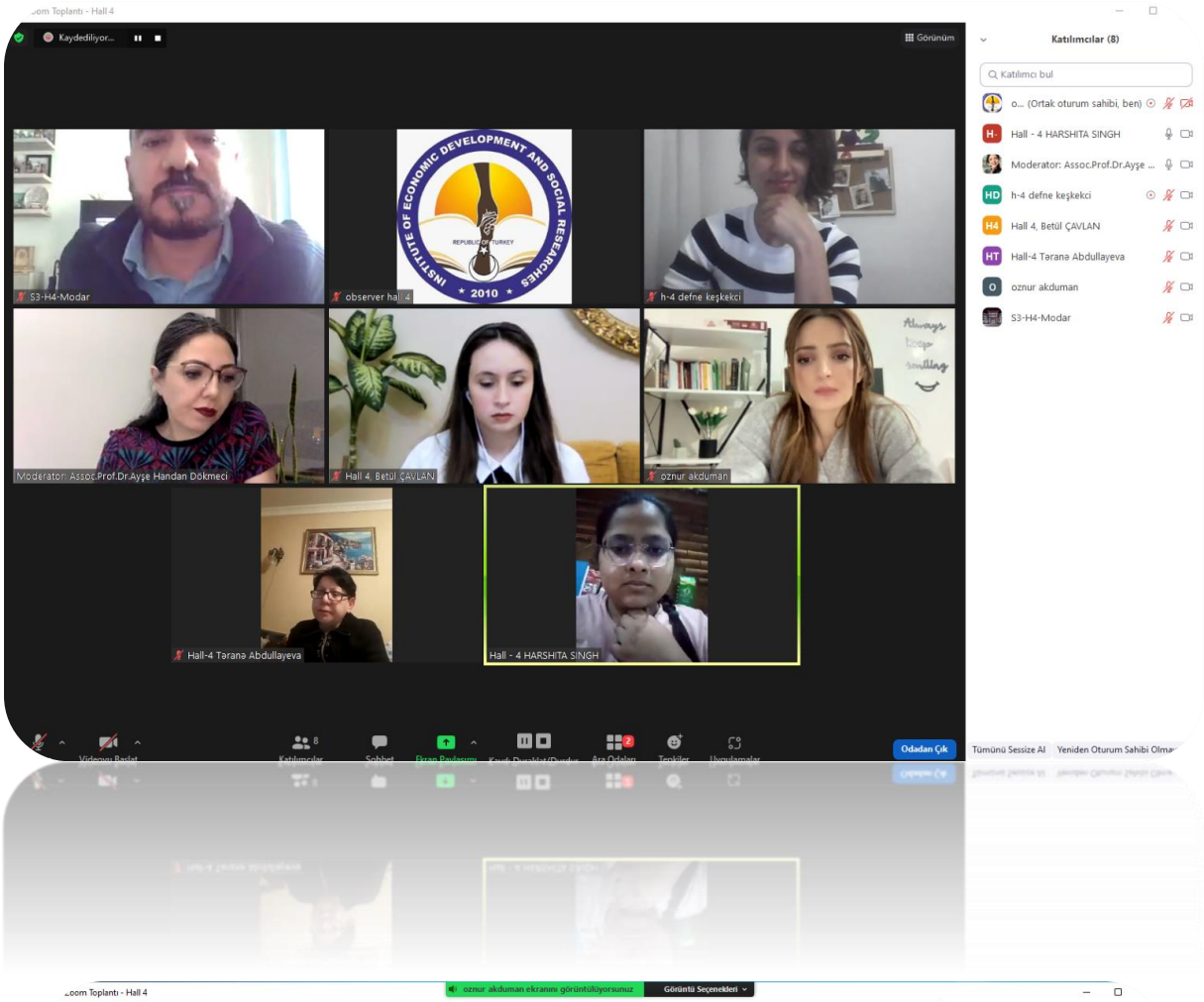

zoom.us Конференция Посмотреть Редактировать Окно Справка
Конференция Zoom - Hall 4
Участники (9)
observer hall 4
H-4 Duygu İNCİ
Hall-4, Elamri Nabila
Выключить звук
Ei Ei Khine-S -2/ Hall-4
Hall-4, Dr.Ayhan Keskinsezer
Salon-4 Günay Beyhan
Hall-4, Nasreldeen Siam
Hall-4 Musher Ismael
S3-H4-Modar
Выйти из зала

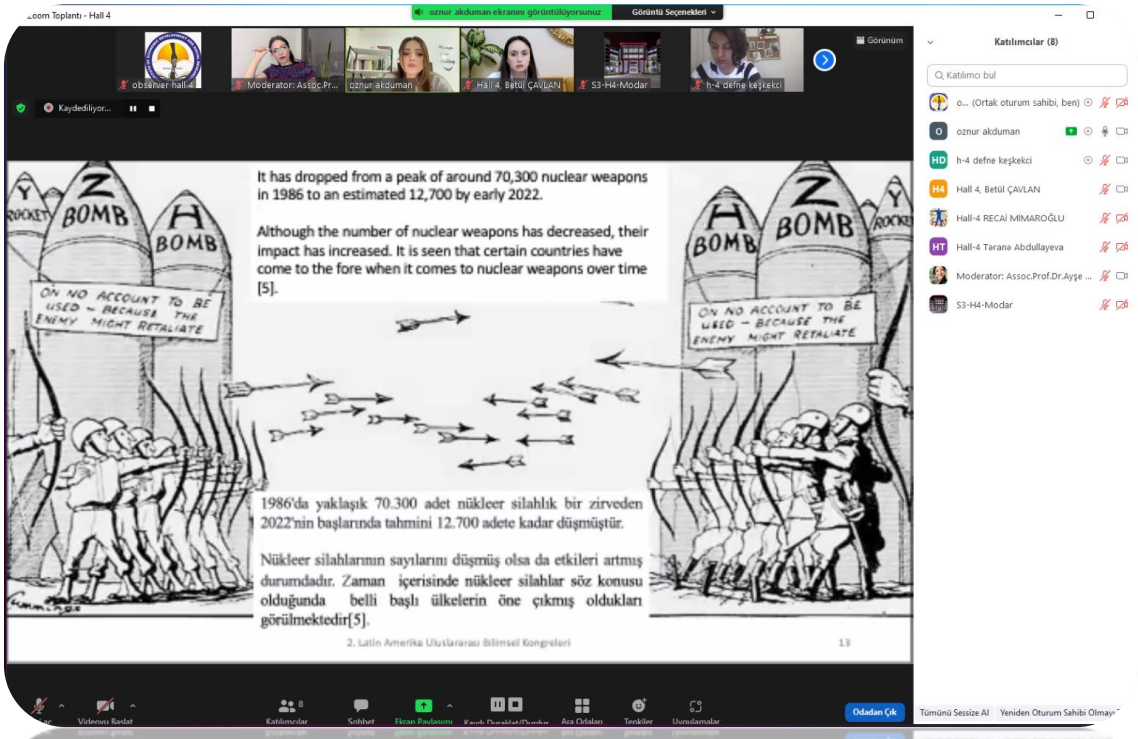

Запись...
Вы просматриваете экран Salon-4 Günay Beyhan
Настройки просмотра
17:38
Sismik Yansıma Veri-İşlem Çalışmalarıyla Sismik Kalite Faktörünün Belirlenmesi
SAKARYA ÜNİVERSİTESİ
Significance of Q-Seismic Quality Factor in Seismic Reflection Method
Günay Beyhan
Habip Denli
Jeofizik Mühendisliği
Sakarya Üniversitesi
Giriş
Sönümlenme:
Sismik dalgalar seyahat ettikleri sürece sönümlenmeye uğrarlar..
Ei Ei Khine-S -2/ Hall-4
observer ha...
observer hall 4
Hall-4, Dr.Ayhan Kes...
Hall-4 Musher Ismael
Salon-4 Günay Beyhan
Hall-4, Nasreldeen Si...
H-4 Duygu İNCİ
Включить звук
Включить видео
Участники
Чат
Демонстрация экрана
Пауза/остановить запись
Сессионные залы
Реакции
Выйти из зала


Запись...
14:36
Вид
observer hall 4
Ei Ei Khine-S -2/ Hall-4
observer hall 4
Hall-4, Dr.Ayhan Keskinsezer
Hall-4 Musher Ismael
S3-H4-Modar
Hall-4, Nasreldeen Siam
H-4 Duygu İNCİ
Salon-4 Günay Bey...
Hall-4, Elamri Nabila
H-4 Duygu İNCİ
Salon-4 Günay Beyhan
Hall-4, Elamri Nabila
Участники (9)
Поиск
obse... (Соорганизатор, я)
Ei Ei Khine-S -2/ Hall-4
Hall-4, Nasreldeen Siam
H-4 Duygu İNCİ
Hall-4 Musher Ismael
Hall-4, Elamri Nabila
S3-H4-Modar
Salon-4 Günay Beyhan
Hall-4, Dr.Ayhan Keskinsezer
Выйти из зала
Выключить звук для всех


Highly porous 3D Mn_xO_y/Al_2O_3 wood-derived sorbent for hot coal gas desulfurization
Bogota, Colombia, April 5-7, 2022
Latin Americ
ciences-II
Mute
Stop Video
Participants
Chat
New Share
Pause Share
Apps
More
You are screen sharing
Stop Share
Ei Ei Khine-S -2/ H...
observer ha...
observer hall 4
Hall-4, Nasreldeen Si...
Hall-4, Dr.Ayhan Kes...
S3-H4-Modar
H-4 Duygu...
H-4 Duygu İNCİ
Salon-4 Gü...
Salon-4 Günay Be...
Включить видео
Участники
Чат
Демонстрация экрана
Пауза/остановить запись
Сессионные залы
Реакции


Участники (7)
Поиск
obse... (Соорганизатор, я)
Ei Ei Khine-S -2/ Hall-4
H-4 Duygu İNCİ
Hall-4, Elamri Nabila
Hall-4, Nasreldeen Siam
S3-H4-Modar
Salon-4 Günay Beyhan
observer hall 4
Ei Ei Khine-S -2/ Hall-4
H-4 Duygu İNCİ
Hall-4, Nasreldeen Siam
S3-H4-Modar
Salon-4 Günay Bey...
Hall-4, Elamri Nabila
Выйти из зала
Выключить звук для всех


Zoom Toplantı - Hall 4
Kaydediliyor...
Görünüm
S3-H4-Modar
observer hall 4
h-4 defne keşkekci
Moderator: Assoc.Prof.Dr.Ayşe Handan Dökmeci
Hall 4, Betül ÇAVLAN
oznur akduman
Hall-4 Təranə Abdullayeva
Hall - 4 HARSHITA SINGH
Katılımcılar (8)
Katılımcı bul
o... (Ortak oturum sahibi, ben)
Hall - 4 HARSHITA SINGH
Moderator: Assoc.Prof.Dr.Ayşe ...
h-4 defne keşkekci
Hall 4, Betül ÇAVLAN
Hall-4 Təranə Abdullayeva
oznur akduman
S3-H4-Modar
Odadan Çık
Tümünü Sessize Al
Yeniden Oturum Sahibi Olma


Zoom Toplantı - Hall 4
oznur akduman ekranını görüntülüyorsunuz
Görüntü Seçenekleri
Kaydediliyor...
Görünüm
Katılımcılar (8)
Katılımcı bul
o... (Ortak oturum sahibi, ben)
oznur akduman
h-4 defne keşkekci
Hall 4, Betül ÇAVLAN
Hall-4 RECAİ MİMAROĞLU
Hall-4 Təranə Abdullayeva
Moderator: Assoc.Prof.Dr.Ayşe ...
S3-H4-Modar
Y ROCKET
Z BOMB
H BOMB
ON NO ACCOUNT TO BE USED – BECAUSE THE ENEMY MIGHT RETALIATE
It has dropped from a peak of around 70,300 nuclear weapons in 1986 to an estimated 12,700 by early 2022.
Although the number of nuclear weapons has decreased, their impact has increased. It is seen that certain countries have come to the fore when it comes to nuclear weapons over time [5].
1986'da yaklaşık 70.300 adet nükleer silahlık bir zirveden 2022'nin başlarında tahmini 12.700 adete kadar düşmüştür.
Nükleer silahlarının sayılarını düşmüş olsa da etkileri artmış durumdadır. Zaman içerisinde nükleer silahlar söz konusu olduğunda belli başlı ülkelerin öne çıkmış oldukları görülmektedir[5].
2. Latin Amerika Uluslararası Bilimsel Kongresi
13
Odadan Çık
Tümünü Sessize Al
Yeniden Oturum Sahibi Olmay

LATIN AMERICAN INTERNATIONAL CONFERENCE ON NATURAL AND APPLIED SCIENCES

April 5-7, 2022
Colombia, Bogotá

CONFERENCE PROGRAM

Online (with ZOOM Conference)

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LATIN AMERICAN INTERNATIONAL CONFERENCE ON NATURAL AND APPLIED SCIENCES
April 5-7, 2022 Colombia, Bogotá

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- Moderator is responsible for the presentation and scientific discussion (question-answer) section of the session.

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Zoom'a giriş yaparken önce lütfen adınızı, soyadınızı ve SALON numaranızı yazınız
Örnek: Salon-1, Shahla Tahirgizi

-Opening Ceremony-

06.04.2022

Bogota and México Local Time: 09^{30}-10^{00}
Ankara Local Time: 17^{30}-18^{00}

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Dr. Mustafa Latif EMEK
President of IKSAD Institute

Dr. Rafael Renteria Ramos
Universidad Nacional Abierta y a Distancia, Colombia

Dra. Felipa Sánchez Pérez
Universidad Juárez Autónoma de Tabasco, México
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Dra. Francisca Silva Hernandez
Universidad Juárez Autónoma de Tabasco, México

Dr. Germán Martínez Prats
Universidad Juárez Autónoma de Tabasco, México

Dra. Lily Lara Romero
Director of CCYTET- Consejo de Ciencia y Tecnologia del Estado de Tabasco

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06.04.2022	Session-1, Hall-5
Bogotá Time: 06^{30}-09^{00}	**Ankara Time: 14^{30}-17^{00}**

HEAD OF SESSION: Gemma DC Santos and Hasan Alklay

TOPIC TITLE	AUTHORS	AFFILIATION
OBEZİTE HASTALARINA CERRAHİ VE GİRİŞİMSEL ALTERNATİF YAKLAŞIMLAR	Hasan ALKLAY	Dicle University Diyarbakır, Turkey
ACCEPTANCE OF TYPE 2 DIABETES PATIENTS IN VEITCHIA MERRILLII FRUITS (BUNGA DE TSINA) AS AN ALTERNATIVE MEDICINE IN LOWERING BLOOD SUGAR LEVEL	Gemma DC Santos,	Nueva Ecija University, Nueva Ecija, Philippines
LIFESTYLE, DIET, NATURAL REMEDIES FOR MANAGEMENT OF SILENT KILLER OF OPHTHALMOLOGY GLAUCOMA	Ranjan Tejas Venkanna, Pruthvi Ganesh Chandrababu, Nino Karanadze	Tbilisi State Medical University, Tbilisi, Georgia.
THE GROWING INCIDENCE OF HAND DERMATITIS AMONG HEALTHCARE WORKERS DURING THE COVID-19 PANDEMIC ERA	Gayathri Pramil Menon, Maduri Balasubramanian, Aasim Akthar Ahmed, Naga Harika Korrapati	Tbilisi State Medical University Tbilisi, Georgia
HIPPOCAMPAL CHANGES IN ADOLESCENTS WITH COVID-19: A LITERATURE REVIEW	Areeba Hasan, Felcia Reji	Tbilisi State Medical University, Tbilisi, Georgia.
ROLE OF OXYTOCIN IN ALCOHOL ADDICTION: A LITERATURE REVIEW	Felcia Reji, Areeba Hasan	Tbilisi State Medical University, Tbilisi, Georgia.
EVALUATION OF THE EFFECT OF STEM CELL THERAPY ON INFERTILITY	Işılay Sezen ERMİŞ, Engin DEVECİ, İlhan ÖZDEMİR	Harran University, Şanlıurfa, Turkey. Dicle University, Diyarbakır, Turkey. Atatürk University, Erzurum, Turkey.
EFFECT OF FORMALDEHYDE INHALATION ON LACRIMAL GLAND AND EXPRESSION OF KI67	Berzan HAZNEDAR, Işılay Sezen ERMİŞ, İlhan ÖZDEMİR, Engin DEVECİ	Harran University, Şanlıurfa, Turkey. Dicle University, Diyarbakır, Turkey. Atatürk University, Erzurum, Turkey.
EFFECT OF XYLENE INHALATION ON LACRIMAL GLAND AND IMMUNOLOGIC EXPRESSION OF VIMENTIN ANTIBODY	Berzan HAZNEDAR, Işılay Sezen ERMİŞ, İlhan ÖZDEMİR, Engin DEVECİ,	Harran University, Şanlıurfa, Turkey. Dicle University, Diyarbakır, Turkey. Atatürk University, Erzurum, Turkey.
DIFFERENCES BETWEEN LACTATE DEHYDROGENASE LEVELS IN HOSPITALIZED PATIENTS WITH DELTA AND OMICRON VARIANT OF SARS-CoV-2 IN CLINICAL HOSPITAL BITOLA, MACEDONIA	Biljana Ilkovska, Bisera Kotevska Trifunova	Clinical hospital ''Dr. Trifun Panovski'' – Bitola, North Macedonia, ''Tokuda Hospital'' – Sofia, Bulgaria.
MORPHOLOGICAL CHANGES ON THE APICAL SURFACE OF THE CELL AND THE FUNCTIONAL IMPORTANCE OF THESE CHANGES	Nurşin AYDIN Uğur TOPALOĞLU	Dicle University Diyarbakır, Turkey

06.04.2022	Session-1, Hall-6
Bogotá Time: 06^{30}-09^{00}	**Ankara Time: 14^{30}-17^{00}**

HEAD OF SESSION: Mourad RATTAL and Suzan YALÇIN

TOPIC TITLE	AUTHORS	AFFILIATION
EFFECTS OF PHYTOGENIC ADDITIVES ON EGG QUALITY IN LAYING HENS	Suzan YALÇIN, Sakine YALÇIN	Selçuk University, Konya, Turkey. Ankara University, Ankara, Turkey.
EFFECTS OF DIETARY WALNUT LEAVES ON THE ANTIOXIDANT PROPERTIES OF EGGS IN LAYING HENS	Suzan YALÇIN, Sakine YALÇIN	Selçuk University, Konya, Turkey. Ankara University, Ankara, Turkey.
GUT DYSBIOSIS IN DOGS WITH SPINAL CORD INJURY: IMPACT OF POLENOPLASMIN	Giurgiu Gheorghe, Cojocaru Manole	Deniplant-Aide Sante Medical Center, Bucharest, Romania, Titu Maiorescu University, Bucharest, Romania
ANALYSIS OF COMMON PARROT VIRUS CASES IN TAIWAN DURING 2018-2019	Chen-Wei Wang, Chia-Ying Lin, Tzu-Chieh Lin, Ching-Dong Chang, Ching-Wen Wu Cheng-Han Li, Hung-Yi Wu	National Pingtung University Pingtung, Taiwan
MORPHOMETRIC EVALUATION OF THE SPLEEN IN THE FETAL PERIOD IN BOVINES BEFORE AND AFTER SILICONE PLASTINATION	Asuman ARKAŞ ALKLAY, Saime Betül BAYGELDİ, Yeşim ASLAN KANMAZ, Mehmet KILINÇ, Ömer ATALAR,	Dicle Üniversitesi Veteriner Diyarbakır, Türkiye; yFırat Üniversitesi Elazığ, Türkiye
EFFICACY OF ALOE VERA SUPPLEMENTED CANOLA MEAL BASED DIETS ON GROWTH PERFORMANCE, NUTRIENT DIGESTIBILITY AND CARCASS COMPOSITION OF CATLA CATLA FINGERLINGS	Zeeshan Yousaf Muhammad Faisal	Fish Nutrition Laboratory, Government College University, Faisalabad, Pakistan
ACACIA JACQUEMONTII ETHYL ACETATE EXTRACT DOWNREGULATED THE HYPERGLYCEMIA THROUGH ITS MODULATORY EFFECTS ON ENDOGENOUS ANTIOXIDANT AND ANTI-INFLAMMATORY STATUS IN ALLOXAN INDUCED DIABETIC RATS.	Ambreen Mehmood Awan, Wafa Majeed Maryam Ehsan Muhammad Saad Tariq	University of Agriculture, Faisalabad, Pakistan
MODELISATION 2D OF RADIATIVE EXCHANGE IN POLAR BEAR FUR	Mourad RATTAL Lamiaa RCHIDA	Hassan 1st University, Morocco
ROLE OF DIETARY ZEOLITE SUPPLEMENTATION ON OVERALL PERFORMANCE OF TILAPIA FINGERLINGS FED PLANT BY-PRODUCT BASED DIET	Syed Makhdoom Hussain	Fish Nutrition Laboratory, Government College University, Faisalabad, Pakistan

06.04.2022	Session-2, Hall-4
Bogotá Time: 10^{00}-12^{30}	Ankara Time: 18^{00}-20^{30}

HEAD OF SESSION: Musher Ismael SALIH and Ei Ei Khine

TOPIC TITLE	AUTHORS	AFFILIATION
HIGHLY POROUS 3D MN X O Y /AL 2 O 3 WOOD-DERIVED SORBENT FOR HOT COAL GAS DESULFURIZATION	Nasreldeen M. J. Siam	Tianjin University, China
SIGNIFICANCE OF Q-SEISMIC QUALITY FACTOR IN SEISMIC REFLECTION METHOD	Habip DENLİ, Günay BEYHAN	Sakarya Üniversitesi, Turkey
APPLICATION OF MULTIPLE ELECTRODE ARRAY IN ANCIENT CITY LAUBRANDA	Günay BEYHAN, Ayhan Keskinsezer	Sakarya Üniversitesi, Turkey
POTENTIOMETRIC INVESTIGATION OF Cu(II)-5-METHYL-1,10-PHENANTHROLINE COMPLEXES CONTAINING SOME AMINO ACIDS	Duygu İNCİ , Rahmiye AYDIN	Kocaeli University, Bursa Uludag University,
THE INVESTIGATION OF CRYSTAL STRUCTURE, ELASTIC AND OPTOELECTRONIC PROPERTIES OF Y X IN 1-X N SYSTEM	Nidhal Drissi, Abdelaziz Gassoumi	University Tunis ElManar, Tunis, Tunisia.
REMOVAL OF PONCEAU S BY UV/H 2 O 2 AND UV/PROCESSES: EFFECT OF MATRIX, OF OPERATING FACTORS, OF SCAVENGING SPECIES AND COD REMOVAL	LAFTANI Yasmine, CHATIB Baylassane, BOUSSAOUD Abdelghani, HACHKAR Mohsine	Cadi Ayyad University, Morocco
SYNTHESIS AND CHARACTERIZATION OF HETEROCYCLIC COMPOUNDS: BASED ON PYRAZOLE AND TRIAZOLE	Oussama RIOUCHI1, Rachid TOUZANI , Adyl OUSSAID, Nassima RIOUCHI	OLMAN-RL, Mohamed 1st University, Morocco.
INVESTIGATIONS OF PSA, EPCA2, PSCA AND PSMA AS SPECIFIC DIAGNOSTIC MARKERS FOR PROSTATE CANCER	Musher Ismael SALIH Mustafa KARATEPE	Firat University, Turkey
DECOLORIZATION KINETICS OF PONCEAU S DYE BY CHEMICAL CHLORINATION: A COMPARISON WITH SUNLIGHT/ CHLORINE AND UV/CHLORINE PROCESSES	Baylassane Chatib, Yasmine Laftani, Abdelghani Boussaoud	Cadi Ayyad University, Dar Si-Aïssa Road, Safi, Morocco
CHARACTERIZATIONS OF IRON (III) OXIDE DOPED CALCIUM OXIDE NANOPARTICLES	Ei Ei Khine, Peter Baumli, Georgy Kaptay	University of Miskolc, Hungary.

06.04.2022	Session-2, Hall-5
Bogotá Time: 10^{00}-12^{30}	**Ankara Time: 18^{00}-20^{30}**

HEAD OF SESSION: José G. Chan-Quijano

TOPIC TITLE	AUTHORS	AFFILIATION
UNDERSTAND THE ROLE OF SNRK1 IN THE SYMBIOTIC ASSOCIATION IN PHASEOLUS VULGARIS	Carolina Cervera, Manoj-Kumar Arthikala, Kalpana Nanjareddy	Universidad Nacional Autónoma de México
MATHEMATICAL AND FLUID DYNAMIC ANALYSIS OF THE PUMP AS TURBINE IMPELLER	Diego PENAGOS-VÁSQUEZ Jonathan GRACIANO-URIBE	Faculty of Engineering, Department of Mechatronics and Electromechanics, Instituto Tecnológico Metropolitano, Robledo Campus, Vía al Volador, Medellín, Colombia.
EFFECT OF OIL ON THE DEVELOPMENT OF THE ROOTS OF TWO TREE SPECIES	José G. Chan-Quijano	Universidad Autónoma de Guadalajara, Campus Tabasco
CHARACTERIZATION OF THE SPATIAL AND TEMPORAL EXPRESSION OF NLP GENE AS A NOVEL REGULATOR OF PHASEOLUS NODULATION	Brenda-Azucena Flores Kalpana Nanjareddy Manoj-Kumar Arthikhala	Ciencias Agrogenómicas, Escuela Nacional de Estudios Superiores Unidad León, Universidad Nacional Autónoma de México (UNAM), Guanajuato, México
OVEREXPRESSION OF PVATG9 INCREASES NODULE NUMBERS BUT AFFECTS ROOT NODULE MATURATION DURING PHASEOLUS VULGARIS - RHIZOBIUM TROPICI INTERACTION	Paula-Sofía Artola Manoj-Kumar Arthikhala Elsa-Herminia Quezada Miguel Lara Flores Lourdes Blanco Kalpana Nanjareddy	Universidad Nacional Autónoma de México (UNAM),
DEVELOPMENT, STRUCTURAL, MICROSTRUCTURAL, MECHANICAL AND BIOLOGICAL CHEMICAL, MECHANICAL AND BIOLOGICAL CHARACTERIZATION OF THE ZR-25TA-5TI ALLOY	Edriely de Oliveira Saraiva, Pedro Akira Bazaglia Kuroda Carlos Roberto Grandini	UNESP – Univ. Estadual Paulista, Laboratório de Anelasticidade e Biomateriais, Brazil
LATE SENESCENCE OF RHIZOBIAL NODULES CAUSES AN INCREASE OF BIOMASS IN WILD PHASEOLUS VULGARIS	Antonino M. Lecona Kalpana Nanjareddy Manoj-Kumar Arthikala	Escuela Nacional de Estudios Superiores, Unidad León, Universidad Nacional Autónoma de México (UNAM), Guanajuato, México

06.04.2022	Session-2, Hall-6
Bogotá Time: 10^{00}-12^{30}	**Ankara Time: 18^{00}-20^{30}**

HEAD OF SESSION: Manuel Vergel Escamilla

TOPIC TITLE	AUTHORS	AFFILIATION
EVALUACIÓN DE UN SISTEMA DE PANELES SOLARES FOTOVOLTAICO EN CASA HABITACIÓN EN LA CIUDAD DE VILLAHERMOSA, TABASCO	Jesús Manuel Vergel Rodríguez, Manuel Vergel Escamilla, José Roman Islas Rodríguez, Sergio Díaz Contreras, Fidelio Castillo Romero, Brissa Roxana de León de los Santos, Dra. Kristal de María de Jesús de la Cruz	TecNM Campus Villahermosa, Tabasco, México.
FACTORES QUE AFECTAN EL DESEMPEÑO DE LOS EQUIPOS DE CÓMPUTO Y ESTRATEGIAS DE SOLUCIÓN	Francisco Antonio Alcocer Luna, Jorge Luis Mazariego Montejo, Luis Alfredo Pérez Osorio, Jesús Ángel Solano Pérez, Manuel Vergel Escamilla, José Roman Islas Rodríguez, Sergio Díaz Contreras, Fidelio Castillo Romero, Brissa Roxana de León de los Santos	TecNM Campus Villahermosa, Tabasco, México.
EVALUACIÓN DEL EFECTO DE LA 6-BENCIL-AMINOPURINA (BAP) EN EL DESARROLLO IN VITRO DE CYMBIDIUM SPP	Leonardo Díaz Cordero, Jaime Alberto Corona Calleja, Kristal de María Jesús de la Cruz, Elías de la Cruz Luna, Manuel Vergel Escamilla, Sergio Díaz Contreras, Fidelio Castillo Romero	Universidad Politécnica del Centro (UPC), Villahermosa, Tabasco México.TecNM Campus Villahermosa, Tabasco México.
PROTOTIPO DE MEDICIÓN DE CONSUMO DE ENERGÍA ELÉCTRICA DOMÉSTICA	Sergio Díaz Contreras, Manuel Vergel Escamilla, Fidelio Castillo Romero	Tiempo Completo del TecNM Campus Villahermosa, Tabasco México.
TECNOLOGÍAS EMERGENTES PARA LA VIRTUALIZACIÓN DE ESCRITORIOS REMOTOS	Manuel Vergel Escamilla, Raul Ake Ovando, Sergio Díaz Contreras, Brissa Roxana de León de los Santos, Fidelio Castillo Romero	Tiempo Completo del TecNM Campus Villahermosa, Tabasco México.
DROUGHT STRESS ENHANCES RHIZOBIUM NODULE NUMBERS AND YIELD IN THE MESOAMERICAN WILD OVER CULTIVAR COMMON BEAN	Laura-Lizeth Tovar, Dra. Kalpana Nanjareddy, Manoj-Kumar Arthikhala	Universidad Nacional Autónoma de México (UNAM)

06.04.2022	Session-3, Hall-4
Bogotá Time: 13^{00}-15^{30}	**Ankara Time: 21^{00}-23^{30}**

HEAD OF SESSION: Harshita Singh and Ayşe Handan DÖKMECİ

TOPIC TITLE	AUTHORS	AFFILIATION
NATURAL SCIENCE	Harshita Singh	Banasthali Vidyapeeth University,Rajasthan,India.
AUTOMATIC RECOGNITION OF CONTROL CHART PATTERNS (CCP'S) IN THE CONTEXT OF ARTIFICIAL INTELLIGENCE (AI)	Modar Mohammed, Omar El Farissi	IBN ZOHR University- MOROCCO
THE ROLE OF SCENARIOS IN DISASTER AND EMERGENCY	Betül ÇAVLAN, Ayşe Handan DÖKMECİ	Tekirdağ Namık Kemal Üniversitesi,
EFFECT OF TEMPERATURE ON STATIC DAMAGE OF CPVC	Abderrahim Khtibari, Abderrazak En-Naji , Achraf Wahid1, Abdelkrim Kartouni, Mohamed El Ghourba	Hassan II University, Casablanca, Morocco. –Morocco Moulay Ismail University, Meknes, MOROCCO –Morocco
TRANSBOUNDARY EFFECTS OF A POSSIBLE NUCLEAR WAR	Öznur AKDUMAN, Ayşe Handan DÖKMECİ	Tekirdag Namık Kemal University, Tekirdag, Turkey.
THE ROLE OF PLAY IN THE BIOLOGICAL AND ENVIRONMENTAL EDUCATION OF SCHOOLCHILDREN	Abdullaeva Tarana Ibragimova Khoshgedem	Azerbaijan State University
KNOWLEDGE, ATTITUDES AND BEHAVIORS OF GENERATION Z ON FOOD SAFETY: KUTAHYA PROVINCE EXAMPLE	Defne Keşkekci Zeynep Şimşek	Kütahya Dumlupınar Üniversitesi
ATTITUDES OF ATHLETES PARTICIPATING IN TURKISH UNIVERSITY SPORTS COMPETITIONS TOWARDS THE COVID-19 VACCINE	Yusuf GÖZAÇIK Recai MİMAROĞLU Savaş AYHAN	Dicle University, Dilekpınar Canaydın Secondary School, Diyarbakır, Turkey.

06.04.2022	Session-3, Hall-5
Bogotá Time: 13^{00}-15^{30}	**Ankara Time: 21^{00}-23^{30}**

HEAD OF SESSION: Dr.Uzma Nadeem

TOPIC TITLE	AUTHORS	AFFILIATION
FACTORS DETERMINING THE DEVELOPMENT OF THE LANDSLIDE PROCESS	Konstantine Bziava Demetre Janjalashvili	Georgian Technical University, Tbilisi, Georgia,
EVALUATION OF THE PURIFYING PERFORMANCE OF THE WASTEWATER TREATMENT PLANT BY NATURAL LAGOON IN ARID CLIMATE: A CASE STUDY	Maria EL OUAZZANI, Abdelmajid HADDOUI, Naïla Ouazzani, Mustapha AFDALI	Sultan Moulay Slimane University, Beni Mellal, Morocco.
ENVIRONMENTAL HEALTH PROBLEM CAUSED BY DISASTERS; WATER POLLUTION AND SAFE WATER USE	Naz KARAKOÇ , Ayşe Handan DÖKMECİ	Tekirdag Namik Kemal University, Tekirdag, Turkey.
APPLICATION OF GREEN CHEMISTRY FOR ENVIRONMENTAL CONSERVATION AND SUSTAINABLE DEVELOPMENT	Uzma Nadeem, Harpreet Kaur	Mata Sundri College for Women, University of Delhi, Delhi- India
AIR POLLUTION DISASTERS AND ITS EFFECTS ON HEALTH	Buse ÇARBOĞA, Ayşe Handan DÖKMECİ,	Tekirdağ Namık Kemal University,
DEVIATING FUNDAMENTAL NATURAL PERIODS OF LOW-RISE REINFORCED CONCRETE BUILDINGS UTILIZING COMPRESSIBLE INCLUSION AROUND THE FOUNDATIONS	Mohammed Alhegres, Mansour Alturki, Sherif Elkholy, Ahmed Elragi,	Qassim University, Buraydah, Saudi Arabia,
STRUCTURAL STUDY OF MODIFIED CLAYS APPLIED TO THE ADSORPTION OF POLLUTANTS	Nassima RIOUCHI Mohamed ABOU -SALAMA Oussama RIOUCHI Mohamed LOUTOU	Nador, Mohamed 1st University,Morocco
DISTRIBUTION OF THE DIATOM GENUS CHAETOCEROS IN THE LAGOON OF NADOR, MOROCCO	Ouassila Riouchi, Ali Skalli, Mustapha Akodad, AbdelDefne Moumen, Ghizlane Azizi, Hanane Ait Hmeid ,Mourad Baghour.	Nador, Mohammed 1st University, Morocco.
ECOTOURISM IN KOSOVO, DESIGN OF ECO-LODGES PROTOTYPES	Arta Basha Jakupi, Valdron Veseli, Florim Grajcevci	University Hasan Prishtina, Kosovo
INTERPRETATION OF THE ARCHITECTURAL FEATURES OF THE CLASSICAL PERIOD TURKISH-ISLAMIC RELIGIOUS BUILDINGS FROM A BIOHARMOLOGICAL PERSPECTIVE	Sadık Sezgin OZAN, Cevdet Emin EKİNCİ	Fırat Üniversitesi Elazığ-Türkiye
ON THE COVERING RADII OF CYCLIC CODES OVER BINARY FINITE FIELDS	Seher Tutdere	Balıkesir University, Balıkesir, Turkey

06.04.2022	Session-3, Hall-6
Bogotá Time: 13^{00}-15^{30}	**Ankara Time: 21^{00}-23^{30}**

HEAD OF SESSION: Dr. Pelin SERTYEŞİLIŞIK and Amenah Emad Mohammed Redha

TOPIC TITLE	AUTHORS	AFFILIATION
THE EFFECT OF OAK ASH ON THE STABILITY OF ASPHALT PAVEMENTS	Tacettin GEÇKİL Zülfükar AKSAĞAN Ceren Beyza İNCE	İnönü Üniversitesi, Munzur Üniversitesi
QUICK REPAIR OF CONCRETE ROAD SURFACE DAMAGES	Tayfun UYGUNOĞLU, Eray GÜL	Afyon Kocatepe Üniversitesi, Afyonkarahisar/Türkiye
EFFECT OF CARBON FIBERS ON 3D PRINTER EXTRUDED MORTARS	Tayfun UYGUNOĞLU	Afyon Kocatepe Üniversitesi, Afyonkarahisar/Türkiye
EFFECT OF USAGE OF POROUS AGGREGATE ON WATER HOLDING CAPACITY OF GREEN ROOF	Tayfun Uygunoğlu, Pelin Sertyesilisik,	Afyon Kocatepe Üniversitesi, Afyonkarahisar/Türkiye
USE OF INTEGRATED IRON STEEL BY-PRODUCT STEEL SLAG AS ROAD CONSTRUCTION MATERIAL	Ömer Saltuk BÖLÜKBAŞI	Iskenderun Technical University, Hatay, TURKEY.
LICHENS' EFFECTS ON HISTORICAL STONE STRUCTURES	Ayşe DOLAR , Murat DAL	Hatay Mustafa Kemal Üniversity-Hatay/Turkey, Munzur University- Tunceli/Turkey
ROAD NETWORK DEVELOPED ASSIGNMENT TO IMPROVE TRAFFIC FLOW	Pires Abdullah, Tibor Sipos,	Budapest University
OCCUPATIONAL HEALTH AND SAFETY IN THE TRANSPORTATION SECTOR	Ömer Saltuk BÖLÜKBAŞI	Iskenderun Technical University, Hatay, TURKEY.
EFFECT OF WASTE PET ON MARSHALL STABILITY OF HOT MIXES	Tacettin GEÇKİL Zülfükar AKSAĞAN Ceren Beyza İNCE	İnönü Üniversitesi, Munzur Üniversitesi,
GREEN CONCRETE PRODUCTION BASED ON THERMAL BEHAVIORAL DEVELOPMENT FROM RECYCLED AGGREGATE	Amenah Emad Mohammed Redha	Dijlah University College
PERFORMANCE OF SATELLITE-DERIVED DATASET OF SOLAR IRRADIANCE IN MOROCCO	Halima YAKOUBI, Youness El Mghouchi, Abdeljabar KHELLOUKI	Moulay Ismail University, Meknes, Morocco
INVESTIGATION OF MECHANICAL PROPERTIES OF DRAW HOOK EQUIPMENT USED IN RAIL SYSTEMS	Bahadır Furkan KINACI Hüseyin BOTSALI Cevat ÖZARPA İsmail ESEN Hayrettin AHLATÇI	Karabuk University Marmara University
IMPROVEMENT OF FLAME RETARDANT PROPERTY OF ACRYLIC BASED COATINGS BY PHOSPHATE-BASED FLAME RETARDANTS	Naci ÖZCAN Ayşe AYTAÇ	Kocaeli University, Türkiye
PROPOSED OF BALANCING AND LEAK MONITORING SYSTEM IN SMART WATER DISTRIBUTION NETWORKS	Bahadır Furkan KINACI İsa AVCI Cevat ÖZARPA	Karabuk University
SOLIDWORKS BASED DESIGN OF CYCLOIDAL CURVE FORM GEAR WITH PARAMETRIC EQUATIONS	Mehmet Sinan ÇETİN, Mahir UZUN	İnönü University, Malatya, TURKEY

07.04.2022	Session-4, Hall-4
Bogotá Time: 06^{30}-09^{00}	**Ankara Time: 14^{30}-17^{00}**

HEAD OF SESSION: Meliha KOLDEMIR and Debismita Nayak

TOPIC TITLE	AUTHORS	AFFILIATION
THE COMPLEX TREATMENT OF NON-SPECIFIC ULCERATIVE COLITS	P.H. Najafgulieva	Azerbaijan Medical University, Baku, Azerbaijan
Cytotoxicity Analysis of One Pre-Hydrated versus One Dried Acellular Porcine Dermal Matrix: an in vitro study	Rodolfo Reda , Alessio Zanza, Dario Di Nardo, Maurilio D'Angelo, Luca Testarelli	Department of Oral and Maxillo Facial Sciences, University of Rome La Sapienza, 00161 Rome, Italy;
TYPES AND USAGE AREAS OF CULTURE MEDIA IN IVF APPLICATIONS	Cenap EKİNCİ, Serap Mutlu OTÇU, İlhan Özdemir, Şamil ÖZTÜRK,	Dicle University, Diyarbakır, Turkey. Atatürk University Erzurum,Turkey. Çanakkale Onsekiz Mart University, Çanakkale, Turkey.
MOLECULAR and GENETIC DIAGNOSIS of DUCHENNE MUSCULAR DYSTROPHY in AZERBAIJAN POPULATION	Aghayeva Saltanat Arshad, Mammadov Ayaz Mammad	Azerbaijan State Pedagogical University, Western Caspian University, Baku, Azerbaijan
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Survey on knowledge and practice of palliative care in Hassan II Provincial Hospital in Settat-Morocco	Mrs Nabila Elamri, Mrs Ibtissam Atif , Pr Mourad Rattal, Pr Abedellah Gantare	Hassan First University, Settat, Morocco
Pipeline Network Model for Arterial Blood Flow Analysis	Debismita Nayak, T S L Radhika	BITS Pilani, Hyderabad Campus, Telangana, India

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Bogotá Time: 06^{30}-09^{00}	**Ankara Time: 14^{30}-17^{00}**

HEAD OF SESSION: Mohamed MİLOUDİ and Emine BAŞ

TOPIC TITLE	AUTHORS	AFFILIATION
INTRODUCING A NEW HEURISTIC ALGORITHM-1	Emine BAŞ	Kulu Vocational School, Selçuk University
INTRODUCING A NEW HEURISTIC ALGORITHM-2	Emine BAŞ	Kulu Vocational School, Selçuk University
THERMAL CONDUCTIVITY OF GRINDED ALMOND SHELL PARTICLE BOARDS	Anilcan Sarikaya Ahmet Ali Sertkaya Eyub Canli Cengiz Guler	Selcuk University, Konya, Turkey Duzce University, Duzce, Turkey
HOW TO INCREASE THE EFFICIENCY OF HYDROGEN CHARGING SETUP	M. Furkan Baltacıoğlu Burak Bal	Abdullah Gül University, Kayseri, Turkey
THERMAL CHARACTERIZATION OF LITHIUM-ION CYLINDRICAL BATTERY CELL AND BATTERY PACK WITH THEORETICAL AND EXPERIMENTAL METHODS AND INVESTIGATION OF THE EFFECT OF BATTERY MODULE COATING ON HEAT TRANSFER	Kemal Furkan Sökmen, Gizem Taylan,	Bursa Technical University
MIXED CONVECTION FLOW SIMULATION INSIDE 2D CAVITY PARTIALLY HEATED FILLED WITH HYBRID NANOFLUID	Kamal BOUZID, Lahoucine BELARCHE, Btissam ABOURIDA, Ali SIADI	Ibn Zohr University, Morocco Cadi Ayyad University, Morocco
EXPLOITING RENEWABLE ENERGY IN IRAQ TO CONQUER THE PROBLEM OF ELECTRICITY SHORTAGE AND MITIGATE GREENHOUSE GAS EMISSIONS	Muthanna M. Al-Hadeethi, Abdulmuttalib A. Muhsen, Mohd Wazir Bin Mustafa	University Teknologi Malaysia, Skudai, Johor Bahru, Malaysia Ministry of Electricity, Haditha, Iraq Warsaw University of Technology, Warsaw
EFFECT OF HYDROGEN ON MICRO AND MACRO HARDNESS OF AL 7075	Burak Bal M. Furkan Baltacıoğlu Barış Çetin	Abdullah Gül University, Kayseri, Turkey FNSS Savunma Sistemleri A.Ş., R&D Center, Ankara, Turkey
STUDY OF THE EMC BEHAVIOR OF THE SMPS WITH THE LISN	Mohamed MİLOUDİ Houcine MİLOUDİ Abdelkader GOURBİ Abdelber BENDAOUD, Abdelkader RAMİ, Nassireddine BENHADDA	APELEC Laboratory, UDL University ICEPS Laboratory, ABB University

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HEAD OF SESSION: Tulay OZCAN

TOPIC TITLE	AUTHORS	AFFILIATION
CARBON CAPTURE TECHNOLOGY BY Spirulina	Dr.N.Venu Madhav, Dr.Sree Sai Vyshnavi, Binte Jalal Jaheera	Satavahana University Campus College,MaIkapur Road, Karimnagar, INDIA, Dr BRKR Ayurvedic Medical College,Hyderabad
THE EFFECTS OF SODIUM OMADINE ON FRESHWATER MUSSELS	Göktuğ GÜL, Pınar ARSLAN, Aysel Çağlan GÜNAL,	Gazi University, Ankara, Turkey Çankırı Karatekin University, Çankırı, Turkey
CREATING A NEW VARIANT OF PASTA WITH SWEET POTATO AND SPINACH	Jenny Anne Jaibin	Keningau Vocational College, Culinart Art Department, Keningau, Malaysia
DETERMINATION of POMOLOGICAL CHARACTERISTICS of SOME GRAPE CULTIVARS (Vitis Vinifera L.) in MANISA REGION	Zeynep BASCAM Tulay OZCAN	Bursa Uludag University, Bursa, Turkey,
REMOVAL OF AN ORANGE G AZO DYE ON GRANULAR ACTIVATED CARBON BASED ON OLIVE STONES	Benzekri Benallou Moktar Douara. Nadia Mekibes Zohra, Termoul Mourad, Chemrak Mohammed Amine, Benderdouche Nouredine, Bestani Benaouda	Université de Mostaganem, Mostaganem-Algeria
DETERMINATION OF THE RATIONAL PARAMETERS OF PRESSING PUMPKIN SEEDS BY METHODS OF EXPERIMENT PLANNING	A.E. Kairbayeva 1 , L.N. Frolova, V.N. Vasilenko, S.S. Dzhingilbayev	Almaty Technological University, Almaty, Republic of Kazakhstan
EFFECTS OF NATURAL DISASTERS ON AGRICULTURE AND FOOD SECURITY AND SOLUTION SUGGESTIONS	Esra DEMIRCAN, Ayse Handan DOKMECI	Tekirdag Namik Kemal University

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HEAD OF SESSION: Nurinisa ESENBUGA and Muhammad Zubair Ul Hassan Arsalan

TOPIC TITLE	AUTHORS	AFFILIATION
ESTIMATION OF GROWTH CURVES WITH NONLINEAR MODELS IN AWASSI LAMBS	Ramazan ÇETİN, Nurinisa ESENBUGA	Directorate of Caucasian Bee Breeding, Education ND Gene Center, Ardahan/Turkey University of Ataturk, Erzurum, Turkey
THE EFFECT OF EXTERNAL ENVIRONMENTAL CONDITIONS ON INTERNAL ENVIRONMENTAL CONDITIONS IN POULTRY HOUSE	Nurinisa Esenbuga, Bahar Kocaman	Ataturk University, Erzurum, Turkey
EFFECT OF PHYTASE AND CITRIC ACID SUPPLEMENTATION IN PLANT MEAL BASED DIET (CANOLA MEAL) IMPROVING MINERAL UTILIZATION IN CIRRHINUS MRIGALA FINGERLINGS	Muhammad Zubair Ul Hassan Arsalan	Fish Nutrition Laboratory, Government College University, Faisalabad, Pakistan
INTRODUCTION TO AN ETHNOBOTANICAL STUDY OF THE OUARZAZAT REGION IN MOROCCO	Younesse EL-OUAZZANI, Fouad MSANDA, Khalil CHERIFI	Laboratory of Microbial Biotechnology and Plant Protection, Faculty of Sciences, Agadir, Morocco.
INVESTIGATION OF SOME ANATOMICAL FEATURES OF PUNICA GRANATUM L. IN TERMS OF PHARMACEUTICAL BOTANY	Safa GÜMÜŞOK Muhammed Mesud HÜRKUL	Ankara University, Turkey
STUDIES ON THE CHARACTERIZATION OF BIOSOOT OF VITEX NEGUNDO, AN AROMATIC PLANT	R. Sanjeev Kumar, L. Tharani Kumar, R. Ramya, S. Bhuvaneswari, N.K. Udaya Prakash	Vels Institute of Science, Technology and Advanced Studies (VISTAS), Chennai, India Marina Labs, Nerkundram, Chennai, India Bharathi Women's College, Broadway, Chennai, India.
POTENTIAL OF ACTINOPYGA LECANORA HYDROLYSATES-BASED NANOEMULSION FOR TOPICAL APPLICATION	Aqilah Noor Bahari, Norazlinaliza Salim, Siti Efliza Ashari, Nazamid Saari	Universiti Putra Malaysia,

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HEAD OF SESSION: M.H. Hamdan and Mohamed MİLOUDİ

TOPIC TITLE	AUTHORS	AFFILIATION
MECHANICAL, MORPHOLOGICAL, AND VISCOSIMETRIC PROPRIETIES OF POLYSTYRENE COMPOSITES WITH THERMALLY TREATED SNAIL SHELLS NANOPARTICLE (SSP).	M. Karaoui1, M. Alami, M. Assouag	1Team of Innovative Materials and Mechanical Manufacturing Processes, ENSAM, University Moulay Ismail, B.P. 15290, Al Mansour, Meknes, Morocco.
AIRY'S INHOMOGENEOUS EQUATION WITH SIGMOID FORCING FUNCTION	M.H. Hamdan D.C. Roach	Department of Mathematics and Statistics, University of New Brunswick 100 Tucker Park Road, Saint John, New Brunswick Canada E2L 4L5
VALORIZATION OF PALM SOLID WASTE FOR ENERGY PRODUCTION IN OUARGLA REGION	Mohamed Cherif Benzid, Boubekeur Dokkar, Naoui Khenfer, Soufiane Benoumhani, Nadia Saifi	Department of mechanical engineering, University of Kasdi Merbah Ouargla, Algeria,
OPPORTUNITIES FOR THE APPLICATION OF REVERSING PLANETARY TRANSMISSIONS	Željko Vrcan Troha Jelena Stefanović-Marinović Kristina Marković	University of Rijeka, University of Niš, Serbia,
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ADVANCED COOLING SYSTEM FOR HYDROPOWER PLANT	Abdulmuttalib A. MUHSEN, Bashar Attiya	Warsaw University of Technology, Warsaw Haditha Hydropower Station, Ministry of Electricity, Haditha, Iraq
IMPROVEMENT THE PERFORMANCE OF MPPT TECHNIQUE BASED A WIND ENERGY SYSTEM USING A HEURISTIC METHOD	Sarir Noureddine Morsli SEBAA Allaoui Tayeb Mohamed LATTOUI	University of Tiaret
ADAPTIVE FUZZY PI CONTROL OF GRID-CONNECTED SOLAR PHOTOVOLTAIC INVERTER	Mohamed LATTOUI Morsli SEBAA Allaoui Tayeb Sarir Noureddine Aoued Walid Nour El Islam MECHETOUNE	University of Tiaret

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OBEZİTE HASTALARINA CERRAHİ VE GİRİŞİMSEL ALTERNATİF YAKLAŞIMLAR

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ÖZET

Obezite; tıpta vücut yağının normalden fazla olması anlamına gelmektedir. Obezitenin ölçüsü olarak ise BIM - body mass index (VKI- vücut kitle indeksi) ile ifade edilir. Obezite insanlarda ölüm riski, hiper tansiyon, kan yağlarında yani kolesterol ve trigliseritlerde yükselme, tip II diyabet, koroner arter hastalıkları ve kalp krizi, safra kesesi hastalıkları, osteoartrit, bazı kanser türleri, karaciğer yağlanması veya siroz ve kısırlık gibi riskleri arttırır ve bunlar kendi içlerinde obezitenin komplikasyonları olarak değerlendirilir. Obezitenin bir çok nedeni vardır. Bunların bir kısmı genetik faktörler olup bir kısmıda çevresel faktörlerdir. Bu faktörler obezitenin tedavisinde oldukça önem arz etmektedir. Obezite diyeti, ilaçlar veya obezitede kullanılan bitki çayları bu tedavilerin içinde yer alır. Ancak bütün bunlara ek olarak birde cerrahi yöntemler mevcuttur. Obezite cerrahisi ise bariatrik cerrahi ya da metabolik cerrahi, mide ve ince bağırsaklarda yapılan cerrahi değişikliklerdir. Böylece kişinin yeme isteğini sınırlayan, gıdaların emilimini azaltan ve devamında kilo kaybını sağlayan ameliyatlardır. Her obezite hastası obezite cerrahi endikasyonu taşımayabilir. Bir obezite hastasının obezite ameliyatı olabilmesi için gerekli endikasyonları olması gerekmektedir. Obezite cerrahisinin yapılması için altın standart BMI değerinin 40 kg/m ^{2} ' den yüksek olması veya BMI'nın 35 kg/m^2'den yüksek olması ve obezitenin sebep olduğu seconder hastalıkların bulunması (diyabet, hiper tansiyon, hiper lipidemi) ve hastanın diyet ve egzersiz ile kilo verememiş olması gerekmektedir. Obezite ameliyatı için hastanın genel durumu, başka hastalıklarının olup olmadığı ve olası komplikasyonları göz önüne bulundurulmalıdır. Obezite cerrahisi 3 tipte incelenir; restriktif, malabsortif, mikst. Restriktif ameliyatlar, gıda alımını kısıtlayıcı yani mide küçültücü ameliyatlardır. Malabsortif ameliyatlar, ince bağırsakta yapılan değişikliklerle gıda emilimini bozan veya engelleyen ameliyatlardır. Mikst ameliyatlar ise hem restriktif hem de malabsorstif ameliyatları içeren bir obezite ameliyatı çeşididir. Obezite cerrahisinde sık kullanılan bir çok ameliyat vardır. Bunlar; Gastrik bypass, Sleeve gastrektomi, Ayarlanabilir gastrik band (mide kelepçesi), Biliopankreatik deversion+duodenal switch (BPD + DS) gibi bir çok ameliyat çeşidi bulunmaktadır. Bu ameliyatların ise kendi içinde bir çok avantaj ve dezavantajları bulunmaktadır. Ve şu an güncel olarak obezite cerrahisi üzerine bir çok yeni çalışmalar ve araştırmalar yapılmaktadır. Biz bu çalışmamızda günümüzde sıkça kullanılan obezite cerrahisinde kullanılan yöntemleri ve girişimsel alternatifleri detaylı bir şekilde incelemeyi amaçladık.

Anathar Kelimeler: Obezite, obezite cerrahi, obezite ameliyatları

ACCEPTANCE OF TYPE 2 DIABETES PATIENTS IN VEITCHIA MERRILLII FRUITS (BUNGA DE TSINA) AS AN ALTERNATIVE MEDICINE IN LOWERING BLOOD SUGAR LEVEL

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ABSTRACT

The study is all about the Veitchia fruit, also known as "Bunga De China" in the Philippines. The people living in Aduas Sur, Nueva Ecija, Philippines believe that Veitchia fruit can lower the blood sugar level of an individual who is suffering from Type 2 Diabetes. The researcher became interested in finding out if there is a scientific basis for the claim that Veitchia fruit can lower high blood sugar levels. Based on the phytochemical test result, Veitchia fruit contains alkaloids, saponins, reducing sugar, and cardiac glycosides, which are good for the body of an individual with Type 2 Diabetes. The study also found out that the people with type 2 diabetes in Aduas Sur, Nueva Ecija, Philippines, highly believed in the effectiveness of the fruit. The researcher recommends a further study of the fruit by isolation of individual phytochemical constituents and subjecting it to drug design, which will definitely give fruitful results in phytopharmaceutical.

Keywords: Veitchiamerrillii, Alkaloid, Saponins, Reducing Sugar, Cardiac Glycosides, T2D

LIFESTYLE, DIET, NATURAL REMEDIES FOR MANAGEMENT OF SILENT KILLER OF OPHTHALMOLOGY GLAUCOMA

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ABSTRACT

Glaucoma is one of dominant cause of blindness in the world. Glaucoma causes because of optic nerve damage. Primary open angle glaucoma may be a chronic optic neuropathy affecting many people worldwide and represents a serious public health issue. Adjustable environmental factors such as lifestyle, exercise, and nutrition may play a role in glaucoma pathogenesis. Although glaucoma IOP levels are treated with many options like laser therapy, eye drops or any pharmacological drugs, our main goal is to give information about the non-pharmacological treatment that includes like (ACT) lifestyle adjustment and alternative and complementary therapy this at least 5% glaucoma population uses ACT. There is various lifestyle, exercise, diet that decreases the IOP up to 1.00 to 3.00 mm hg but that would make difference in glaucoma. Psychological stress can also increase the IOP. Few studies show that alcohol, marijuana are also remedy for glaucoma but we must have to remember side effects of the medications before promoting the remedy for glaucoma. Although the ACT is not last minute treatment for the glaucoma, it cannot be the substitute for the regular method of lowering the IOP.

Keywords: Alternative therapy, Complementary therapy, Glaucoma, Marijuana, Intraocular pressure.

THE GROWING INCIDENCE OF HAND DERMATITIS AMONG HEALTHCARE WORKERS DURING THE COVID-19 PANDEMIC ERA

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ABSTRACT

Background: Hand dermatitis is a highly prevalent cutaneous manifestation in the occupational setting, particularly among healthcare professionals. Repetitive hand washing procedures using alcohol gels and soaps as well as irritants from PPE kits and gloves can cause adverse effects on the hand's skin integrity.
Methods: Keywords like contact dermatitis, hand dermatitis, healthcare workers, and covid-19 were used for literature search databases like Google Scholar and PubMed. Articles published in the last 2 years were taken for review.
Discussion: Contact dermatitis is a common occupational hazard in the healthcare setting in many developed countries. The hands are the primary site of involvement in 80% of cases of contact dermatitis, followed by the wrists and forearms. Contact dermatitis can further aggravate and lead to atopic dermatitis or other secondary infections. Certain protective gear such as latex gloves with chemicals is a few causes of contact dermatitis in the workplace. There have been cases of pigmentation formation in people with contact dermatitis bordering from mild to severe. Acute hand dermatitis presents with red macules/papules, plaques, swelling, blistering, crusting, and fissuring. Since the outbreak of coronavirus in 2020 there has been a 31.5% increase in contact dermatitis, 97% increase in dermatitis, more than 60% increase in hand dermatitis among healthcare workers. Overall, there has been an 84.6% increase in occupational contact dermatitis among healthcare workers.
Conclusion: In recent years, there has been a growing need for awareness about the increasing number of cases of contact dermatitis in the healthcare setting and as the pandemic continues there might be more incidence of contact dermatitis in hands. It is critical to protect healthcare professionals from any occupational hazards, hence proper prevention techniques are essential. Using certain barrier creams and lipid-rich moisturizers, are a few recommendations to prevent and manage hand dermatitis.

Keywords: Contact dermatitis, hand dermatitis, and health care workers.

HIPPOCAMPAL CHANGES IN ADOLESCENTS WITH COVID-19: A LITERATURE REVIEW

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ABSTRACT

The hippocampus plays an important role in the regulation of emotions, cognitive functions, and long-term potentiation. Some viral infections induce hippocampal atrophy or neuroinflammation resulting in neurocognitive impairments. It has been demonstrated that the human coronavirus HCoV-OC43 affects many brain areas and induces neurodegeneration in the hippocampus. The noticeable hippocampal pathology in COVID-19 survivors is also illustrated by autopsy studies showing neuronal damage associated with Covid 19 in brain regions most vulnerable to hypoxia, including the neocortex, hippocampus, and cerebellum. The COVID-19 pandemic has increased stress levels, especially in adolescents who experience unique stressors like changes in socialization and limitations to education. Additionally, a significant portion of COVID-19 patients and survivors display marked clinical signs of stress, depression, anxiety, endocrine disruption, and neurodegenerative disorders. These stressors are known to cause alterations in volume, microstructure, and function in systems that are undergoing significant maturation across adolescence, such as the hippocampus, amygdala, and their connectivity to prefrontal cortex (PFC) regions. It was also suggested that the pandemic might increase depression among adolescents, leading to increased alcohol and substance use, constituting an epidemic hidden in the pandemic. The impact of the COVID-19 pandemic puts adolescents at particularly high risk for substance misuse. As adolescence is marked by progressive hippocampal development, this brain region may be particularly susceptible to the adverse effects of adolescent alcohol use disorders and such patients are found to have significantly smaller left and right hippocampal volumes. Moreover, unmanaged mental health issues also lead to increased levels of stress hormones that could alter the hypothalamic-pituitary–adrenal axis and exacerbate neuroinflammation and deteriorate neuroplasticity of the brain. It is therefore crucial especially for adolescents to maintain a healthy mindset and avoid stressors during the pandemic or an active infection with COVID-19.

Keywords: Hippocampal atrophy, COVID-19, Adolescence.

ROLE OF OXYTOCIN IN ALCOHOL ADDICTION: A LITERATURE REVIEW

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ABSTRACT

Oxytocin (OXT) plays an important role in several neuropsychiatric disorders, including alcohol and drug addiction. There is growing interest in the oxytocin system as a potential therapeutic target for the treatment of alcohol and substance use disorders because oxytocin plays a key role in mediating several addiction-related behavioral and neurochemical processes. Oxytocin is intricately linked to neurotransmitters such as dopamine, GABA, and glutamate, as well as other central and peripheral signaling systems (such as noradrenaline, CRF, and corticosterone) in the development and maintenance of an addiction. Oxytocin signaling has been shown to interact with a variety of drugs, including alcohol, throughout the cycle of use disorders: it is a component of the brain signaling cascade that generates and modulates reward and pleasure in response to drugs, as well as having the ability to change the course of drug withdrawal. Additionally, oxytocin interacts with brain stress systems to modulate common triggers for relapses such as emotionality, anxiety, and stress reactivity. One of the crucial goals of treating alcohol-dependent patients is to enhance their ability to stay abstinent after detoxification therapy. Oxytocin is also known to exert substantial anxiolytic effects and facilitate prosocial behavior. It acts by inhibiting the effects of the corticotropin-releasing factor on GABAergic interneurons in the amygdala and paraventricular nucleus of the hypothalamus. Intranasal oxytocin decreased neural cue-reactivity in brain networks of alcohol-dependent rats and humans with increased oxytocin receptor expression. The application of oxytocin is now thought to be a beneficial influence on the mechanisms of relapse and craving by reduction of anxiety, stress vulnerability, and social withdrawal in abstinent alcohol-dependent patients. Therefore oxytocin could be utilized as a potential treatment option for alcohol addiction. Additionally, more studies can be conducted to analyze the genetic link between oxytocin expression and alcohol dependency.

Keywords: Oxytocin, Alcohol addiction, Substance use disorder.

THE ROLE OF STEM CELLS IN THE TREATMENT OF PATIENTS DIAGNOSED WITH INFERTILITY

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ABSTRACT
Adult stem cells, which have the ability to differentiate into more than one cell type, are used in many regenerative medicine research areas. There is a wide range of case reports on the use of bone marrow-derived mesenchymal stem cells in treatment. Stem cells, which have clinical applications in gynecological oncology, perinatology and infertility sub-branches of obstetrics and gynecology, can be used as an alternative treatment method in the treatment of gynecological solid tumors, prenatal transplantation and gene therapy in the uterus. Fetal stem cells passed from fetus to mother by microchimerism can help prevent tissue damage in the mother. When we look at the experimental research and the stem cell studies carried out for the purpose of treatment in general, many bone marrow-derived MSCs benefit from the importance of bone, cartilage, bone marrow stroma, muscle, fat, tendon regeneration, vascular support, neuronal environment, and fulfilling the deteriorated functions of tissues and organs. appears to be the result of a large number of studies.

Keywords: infertility, stem cells, treatment methods.

INTRODUCTION
Adult stem cells originating from blood and bone marrow, stem cells obtained by cell separation from embryos, umbilical cord blood stem cells are undifferentiated cells that have plasticity in accordance with the tissue or organ characteristics to which they are applied. It is possible to reproduce adult stem cells by separating them from peripheral blood, periosteum, muscle tissue, liver, fatty aspiration materials, cord blood, cord stroma, placenta, amniotic fluid, synovial fluid, dental pulp and maxillofacial tissues, as well as bone marrow (1). Mesenchymal stem cell (MSC) obtained from bone marrow aspirate taken from the superior iliac wing in humans has multiple clinical uses. Specific migration capacities to sites of bone fracture, myocardial infarction, and ischemic cerebral injury have been reported after intravenous infusion of bone marrow-derived MSCs (2). Human embryonic stem cells are cells that are obtained as a result of the separation of cells that make up the inner cell mass of embryos by mechanical or immunological methods, and that show continuous proliferation without differentiation under special

culture media and conditions. As a result of embryonic stem cell studies initiated with experimental research for the first time in the world and in our country, human embryonic stem cell lines with the potential for therapeutic use have been obtained, but it is thought that ethical and legal regulations should be fulfilled regarding the obtaining of human embryos as a stem cell source and clinical use (3).

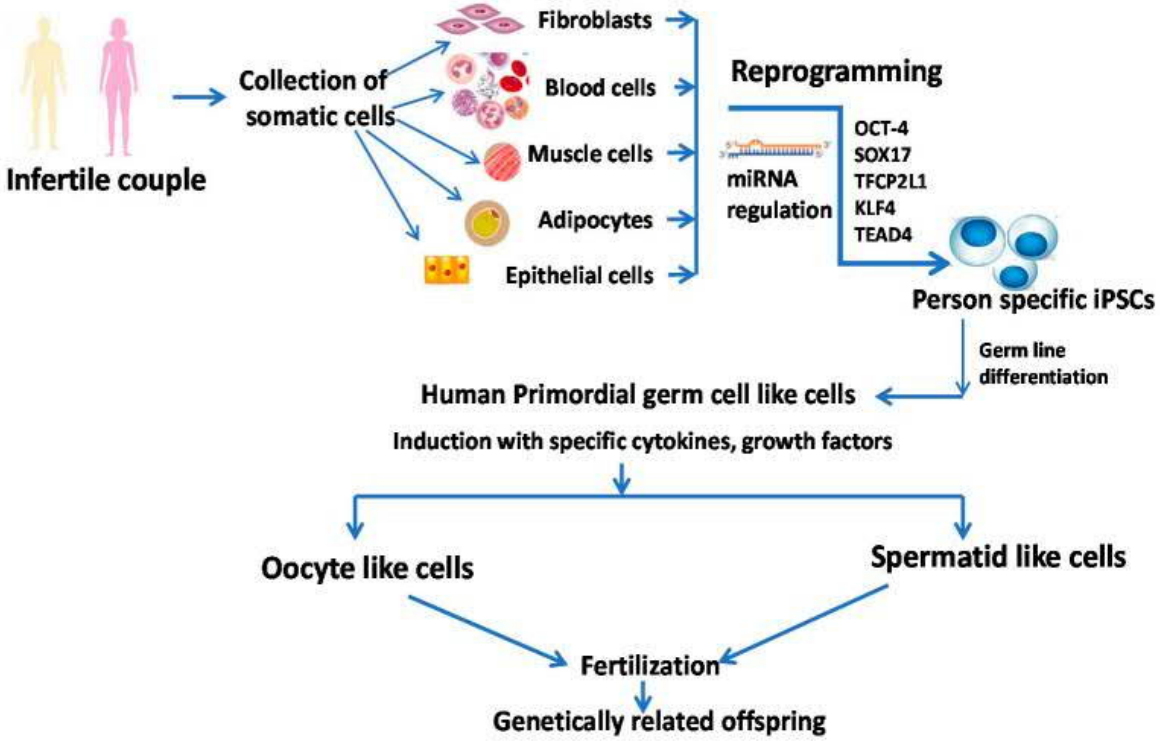


Figure 1. The role of stem cells in the generation of patient-specific gamete cells. (4)

The fact that SSCs have gained fertilization capacity in vivo increases the prospects for future treatment of patients with NOA. The most recent example of treatments that provide clinical pregnancy in humans with the use of early-stage germ cells is the birth of healthy children with the application of ROSI using spermatids determined to be haploid in character by sperm FISH staining. Indeed, 14 healthy births have been reported in this way (5).

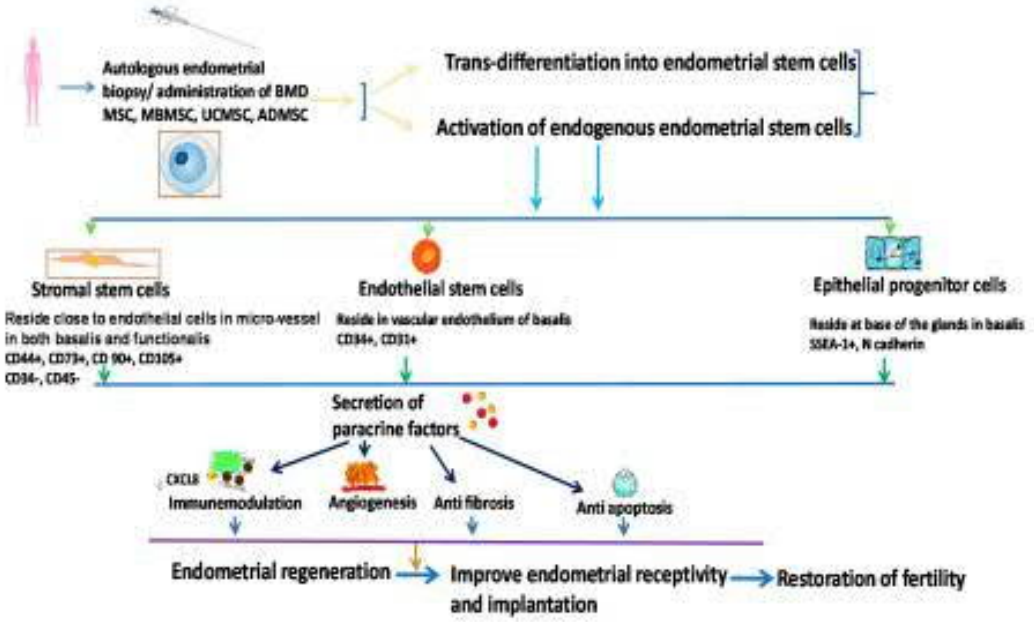


Figure 2. The mechanistic explanation of stem cell therapy for restoration of fertility via endometrial regeneration; BMDMSC: Bone-marrow-derived mesenchymal stem cell; MB MSC: menstrual blood mesenchymal stem cell; UC MSC: umbilical cord mesenchymal stem cell; ADMSC: adipose-tissue-derived mesenchymal stem cell; CXCL: C-X-C motif chemokine ligand; SSEA-1: Stage-specific embryonic antigen-1; CD: Cluster of differentiation (6).

Stem cells, which have clinical applications in gynecological oncology, perinatology and infertility sub-branches of obstetrics and gynecology, can be used as an alternative treatment method in the treatment of gynecological solid tumors, prenatal transplantation and gene therapy in the uterus. It has been reported that intrauterine treatment of fetal metabolic diseases with stem cells may be possible in infertility and in vitro fertilization research and treatment (7). Fetal stem cells transferred from fetus to mother by microchimerism can help prevent tissue damage in the mother.

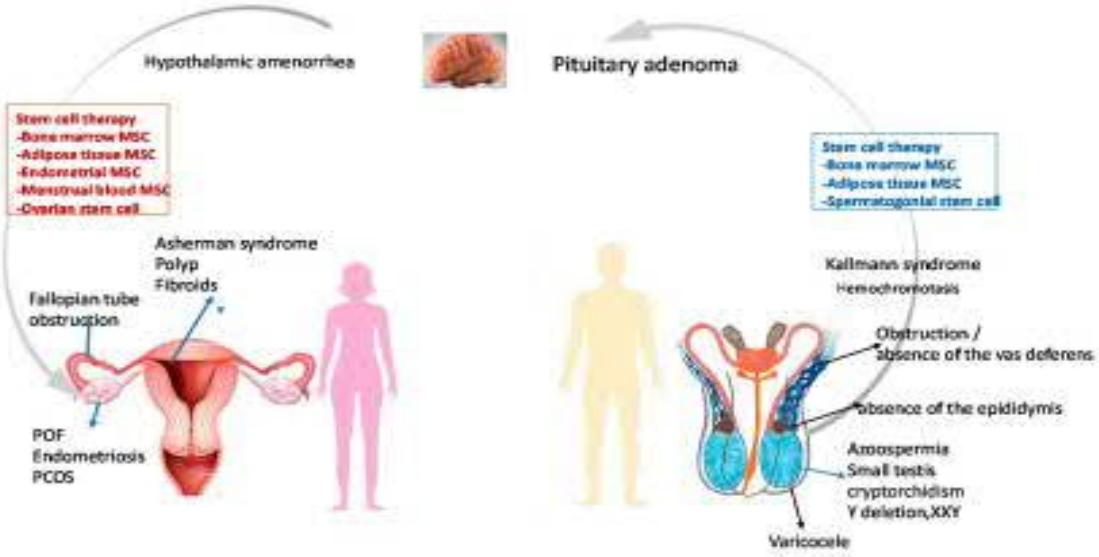


Figure 3: Some probable causes of infertility in male and female POF: premature ovarian failure, PCOS: Polycystic ovarian syndrome, XXY: Klinefelter syndrome, MSC: Mesenchymal stem cell.

Generally, pure spermatogonium type A recovery rates are between 0.3% and 30% when different techniques and working conditions are taken into account. Transplantation of testicular tissue or tissue samples treated in culture media may be more promising instead of SSC transplantation. Because in this way, support cells in which sperm cells develop can also be used. When testicular tissue samples obtained from newborn mice, pigs and goats are transferred under the skin, spermatogenesis can be completed and even healthy offspring can be born (8). I wonder if the testicular tissue in humans was transplanted into the testicles of other animals, could similar spermatogenesis stages be achieved? In this way, xenograft transplants of prepubertal male testicular tissues suggest that spermatogenesis can continue for 4–12 months (9).

CONCLUSION

Although infertility continues to be very common around the world, it creates a very serious emotional stress for couples who want to be parents. Therefore, early intervention to eliminate this serious situation will be very beneficial for couples. With the developing technology, very successful results have been obtained in IVF treatment. Stem cell therapy is widely used in medicine and has an important place in infertility treatment. It has an important place in spermatogonia and egg cells, thanks to the ability of the stem cell to renew itself and to transform into many cells. In line with the studies, it has been emphasized that the stem cell contributes significantly to infertility and will have a great importance with the developing technology.

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EFFECT OF FORMALDEHYDE INHALATION ON LACRIMAL GLAND AND EXPRESSION OF KI67

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ABSRACT
Formaldehyde inhalation in the follow-up of tissues in the laboratory environment significantly affects organs such as nasal mucosa and eyes. It is known to have an irritating feature on the nasal mucosa. In this study, the histopathological and KI67 immunological effects of formaldehyde inhalation on the lacrimal gland were investigated.

In this study, 16 adult wistar albino (230-260gr weight) rats were used. There were 8 rats in the control group and 8 rats in the experimental group. Experimental group was exposed to 10 ppm formdide for 8 hours/day, 5 days/week for 8 weeks.Under anesthesia, the eye was completely removed from the orbital region and placed in 10% formalin. After routine histological follow-ups, the sections were stained with Hematoxylin-Eosin and KI67. Degenerative changes and hyperplasia in the cells of the lacrimal gland, thickening of the basement membrane, mononuclear cell infiltrations between the glands were observed in the animals exposed to formaldehyde.

Positive expression was observed in epithelial cells and inflammatory cells with KI67.

It was thought that formaldehyde inhalation impairs the secretory function in lacrimal gland cells and may cause obstruction in the ducts of the lacrimal glands by increasing apoptosis.

Keywords: KI67, Hematoxylin-Eosin, formaldehyde.

INTRODUCTION
Formaldehyde is an important toxic substance that can irritate tissues through direct contact with various routes of contamination, most of which are dissolved in water and organically. Formaldehyde causes cytotoxicity in cells through the formation of strong DNA-protein crosslinks (1). Formaldehyde is widely consumed in household products, adhesives, and as an industrial fungicide, germicidal and disinfectant.

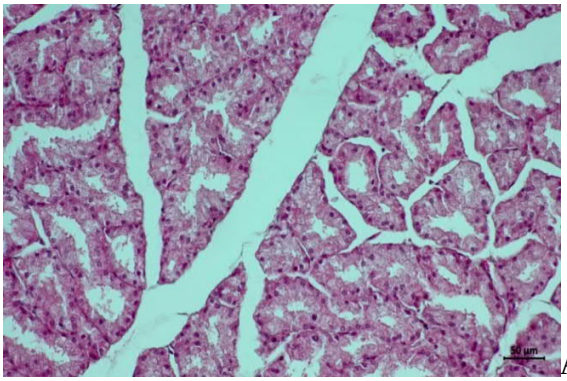
Fixation process in forensic medicine as a preservative in tissue preservation in morgues and for tissue detection in medical laboratories is widely preferred. It is a highly endogenous chemical to which workers from different occupations are frequently exposed in a broad perspective and can be absorbed exogenously.
The amount of inhalation, dermal and oral exposure and absorption is related to the uptake of formaldehyde.The overall uptake of inhaled formaldehyde by inhalation from the nasal mucosa per minute at rest has been estimated at 90% in rats, 67% in monkeys, and 76% in humans (2). Ki-67, which is seen in the nucleus during cell proliferation, is defined as a marker of proliferation. Ki-67 correlates well with the mitotic cell number. Macrophage activity, also defined as antigen identified by monoclonal antibody, is used as a marker for cell mitotic index and tumor grading (3).
In this study, the histopathological and KI67 immunological effects of formaldehyde inhalation on the lacrimal gland were investigated.

Material and Method

In this study, 16 adult wistar albino rats were used. There were 8 rats in the control group and 8 rats in the experimental group. The animals were maintained under 12 hour light and 12 hour dark cycle at 20 ± 2°C and 55%-60% humidity conditions. Animals were fed a pellet diet and water ad-libitum. Experimental group was exposed to 10 ppm formdide for 8 hours/day, 5 days/week for 8 weeks (4). At the end of the experiment, all animals were anesthetized by intraperitoneal injection of 5 mg / kg xylazine HCl (Rompum) the eye was completely removed from the orbital region and placed in 10% formalin Formaldehyde-fixed tissue was embedded in paraffin wax for further histopathologic examination. Sections were deparaffinized in %70,80,90 and 96 alcohols. They were placed in paraffin inclusion melted at 58°C after treatment with xylole, the 4–6 µm sections were taken by rotary microtome (Rotatory Microtome, Leica, RM 2265, Germany) and the sections were stained with Hematoxylene-Eosin stain

The antigen retrieval process was performed twice in citrate buffer solution (pH 6.0), first for 10 min, and second for 7 min, boiled in a microwave oven at 700 W. They were allowed to cool to room temperature for 15 min and washed twice in distilled water for 5 min. Endogenous peroxidase activity was blocked in 0.1% hydrogen peroxide for 20 min. Ultra V block (was applied for 10 min prior to the application of primary antibodies, which were left on overnight Kİ67 antibody (1:100 dilution) The sections were washed 3 times for 5 min in PBS and then were incubated with biotinylated secondary antibody for 25 min. After washing with PBS, streptavidin peroxidase was applied to the sections for 25 min. The sections were washed 3 times for 5 min in PBS. Diaminobenzidine was applied to the sections for up to 15 min as a chromogen. The control slides were prepared using the same procedure, without primary antibodies. Counterstaining was done using Harris's haematoxylin for 45 s, dehydrated through ascending alcohol and cleared in xylene **(**Product Number: HHS32 Sigma, hematoxylin solution, Harris modified, Sigma-Aldrich, 3050 Spruce Street, Saint Louis, MO, 63103, USA)**.** The slides were mounted with Entellan and examined under a light microscope (Olympus, Germany) (13).

RESULT


A

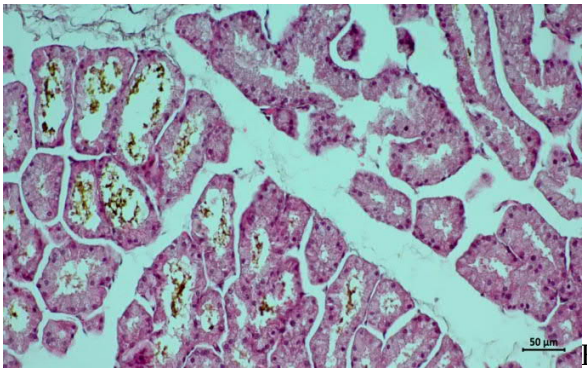
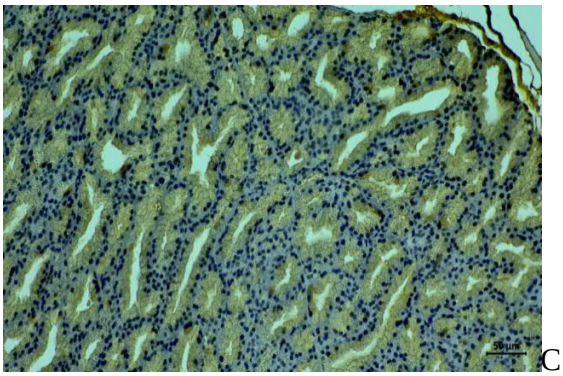

B

Figure 1AControl group- In the histopathological examination of the sections of the control group, it was observed that in the transversal section of lobular lacrimal gland cells, glandular epithelial cells had an oval appearance with chromatin-rich nuclei and light papillary structures towards the lumen.Prominent extracellular matrix density was observed in the interlobular area with a regular basement membrane structure.

Figure 1B In the formaldehyde group, it was observed that there was a significant irregularity in the lobular structure of the lacrimal gland, examination in the basement membrane of the gland, degeneration in the epithelial cells, impaired secretion towards the lumen, and an appearance that would cause the obstruction of the gland ducts where the secretion consisted of hyaline structures.It was observed that the integrity of the glands was lost, the cell apoptosis increased, and the dilatation and congestion in the blood vessels increased with inflammation.


C

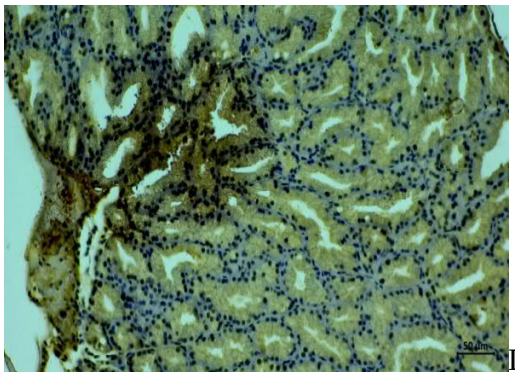

D

Figure 1C Control group:When KI67 immunoactivity was examined in the control group sections, negative KI67 expression was observed in regular intralobular gland cells, while KI67 expression was positive in some macrophage cells and blood vessel endothelial cells in the capsular region.

Figure 1D-In the formaldehyde group, an increase in KI67 expression was observed in necrotic cells in some intralobular areas with gland cells, inflammatory cells in the interlobular area and also in blood vessel endothelial cells.

Since KI67 is a marker of nuclear proliferation and an important marker of inflammation activity, it was found to be an important marker in terms of understanding intra and interlobular structure.

DISCUSSION

Formaldehyde has irritating effects. It is an important environmental toxic substance that has both genotoxic and clastogenic effects, induces DNA insertions, and causes nasopharyngeal cancer and

leukemia (5). The effect of formaldehyde on the ocular surface was investigated (6). Reported that even short-term exposure (6 weeks) to concentrated formaldehyde vapors (40% solution) caused an irritating effect in the respiratory tract and changed the functional activity of the cell.

Yorgancılar et al. reported that 10 ppm formaldehyde application completely disrupted the structure of the mucosa histopathologically for 8 weeks and was effective in squamous cell metaplasia formaldehyde (7). Salem et al. evaluated the results on the ocular surface of rats exposed to gaseous FA released from a cotton swab 5 days a week, 2 weeks, 2 h/day, soaked with 10% Formaldehyde and placed 15 cm away from the rats (8). This in vivo model induced corneal damage with marked necrosis of epithelial cells.

In our study, degeneration of lacrimal gland epithelial cells, pycnosis in the nuclei, apoptotic changes together with an increase in inflammatory cells and dilatation and congestion in blood vessels were observed in formaldehyde inhalation.

It was observed that it caused necrotic formation in the lacrimal gland and significantly impaired the secretory function.

Ki-67, a marker for cells undergoing DNA synthesis before mitosis, has been reported to be associated with cellular proliferation. Recognizes a nuclear protein involved in the active premitotic phases of the cell cycle (G1, S, G2 and M). This protein can be used as a measure of growth fraction by dividing the number of positive cells by all cells present. It has been predicted that it is sufficient to explain the necrotic and carcinoma of the salivary gland (9).

In our study, the increase in KI67 expression in necrotic cells in some intralobular areas with gland cells, inflammatory cells in the interlobular area as well as in blood vessel endothelial cells explains the toxicity of formaldehyde to a large extent.

Formaldehyde's formation of hyalinized structures in the lumen together with the rapid discharge of tear secretion into the lumen by increasing cell hyperplasia, causes disruption of myoepithelial function, obstruction of the secretory ducts, and affecting the nasolacrimal canal, causing negativities in the respiratory tract.

It was thought that KI67 could be the precursor of this signaling as a marker of nuclear proliferation and an important marker in inflammation activity.

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EFFECT OF XYLENE INHALATION ON LACRIMAL GLAND AND IMMUNOLOGIC EXPRESSION OF VIMENTIN ANTIBODY

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ABSRACT
Xylene is a substance used in tissue monitoring with toxic effects. In contact with inhalation, it significantly affects the respiratory tract, eye and nervous system. In this study, it was aimed to show the changes caused by the effect of xylene inhalation on the lacrimal gland and the development of Vimentin activity in rats. Adult wistar albino rats were used in this study. There were 8 rats in the control group and 8 rats in the experimental group. The experimental group was exposed to 300 ppm xylene for 3-5 minutes a day, 5 days a week for 8 weeks. Under anesthesia, the eye was completely removed from the orbital region and placed in 10% formalin. Sections were stained with Hematoxylin-Eosin and Vimentin after routine histological follow-ups. As a result of oxidative stress caused by the effect of Xylene, shedding and degeneration of epithelial cells in the lacrimal gland, deterioration in the basement membrane structure, and narrowing in the duct structures were observed. It was concluded that by affecting the cell membrane structure and basement membrane structure, Xylene disrupts the secretory function of the gland and may cause changes in vision.

Keywords: Vimentin Antibody, lacrimal gland, Hematoxylin-Eosin.

INTRODUCTION
Xylene is found in small amounts as a solvent in the rubber, paint and leather industries, in aviation fuel, gasoline and cigarette smoke. In dentistry, xylene is used for tissue processing, staining and polishing in histological laboratories. It is an important substance that allows maximum displacement of alcohol and increases paraffin infiltration by making the tissue transparent. It has been reported that the main effect of inhaling xylene vapor is headache, dizziness, nausea and vomiting. Exposure to xylene can occur via

inhalation, ingestion, eye or skin contact. Xylene causes health effects from both acute (<14 days) and also chronic (>365 days) exposure (1).

The lacrimal glands are in two pairs and the lacrimal ducts are their main components. an excretory system that carries tear secretions is poured into the nasal cavity. The nasolacrimal ducts are significantly affected during inhalation.

Vimentin is an intermediate filament protein and a mesenchymal marker that indicates the loss of cell-cell adhesions during Extracellular matrix development. Vimentin It is an intermediate protein that affects the secretory function in cell adhesion in determining the basement membrane function. Vimentin activity is important in determining the function of the lacrimal gland through the nasolacrimal duct in the affected nasal mucosa during inhalation.

In this study,histopathological and immunohistochemical techniques dueto the impact of the changes in Xylene and examined the distribution of vimentin

MATERIAL AND METHOD

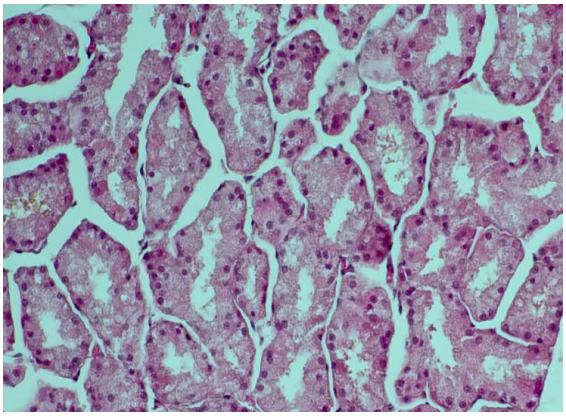
Adult wistar albino rats were used in this study. There were 8 rats in the control group and 8 rats in the experimental group. The experimental group was exposed to 300 ppm xylene for 3-5 minutes a day, 5 days a week for 8 weeks (2). All the animals were individually housed in stainless steel cages at room temperature. The animals had free access to standard laboratory rat pellet and water. 100x65x100 in the sizes of the experimental group were taken into a glass vase

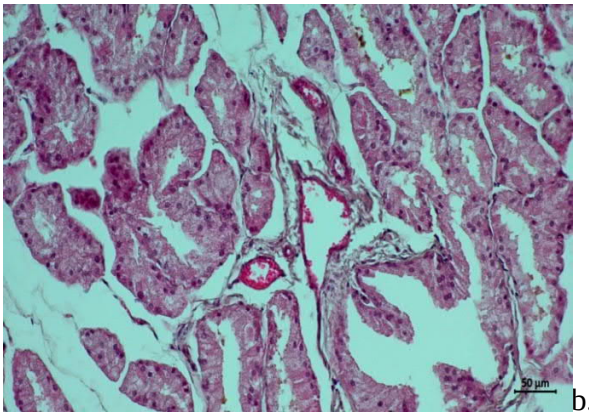
. The lacrimal glands were dissected under ketamine hidrochloride anesthesia and placedin 10% formaldehide solution. They were placed in parafineinclusion melted at 58ºC after treatment with xylol, the 4-6µm sections were taken by rotary microtome and the sectionswere stained with Hematoxylene-Eosin (H-E) and Trichrom-masson dyes and then observed under light microscopy to determine histological changes (3).

IMMUNOHISTOCHEMISTRY STAIN

Antigen retrieval was done in microwave (Bosch®, 700 watt) for 3min x90ºC. They were subjected to a heating process in a microwave oven at 700 watts in a citrate buffer (pH 6) solution for proteolysis. Phosphate-buffered solution (PBS, pH 7.2) were washed 3x5 minutes. Citrate buffer, tissue sections were antigenically masked for the abolition of the environment and 2x5 minutes in a microwave oven,waited outside for 10 minutes. The slides were washed in PBS, and marked the boundaries of tissue on the hydrophobic pen. Three percent hydrogen peroxide were dropped on the tissue and allowed to stand for 15 minutes. Sections were washed in PBS at room temperature and humid 80 min were stained with antibodies to vimentin in the primary. Washed with PBS. Secondary antibodies and streptavidin-peroxidase complex, 30 minutes, stained. Diaminobenzidine as the chromogen (DAB) were stained for 3-5 minutes. One minute with Harris hematoxylin staining was the opposite (4).

RESULT

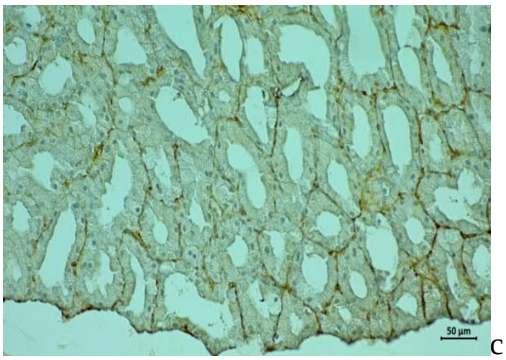

a



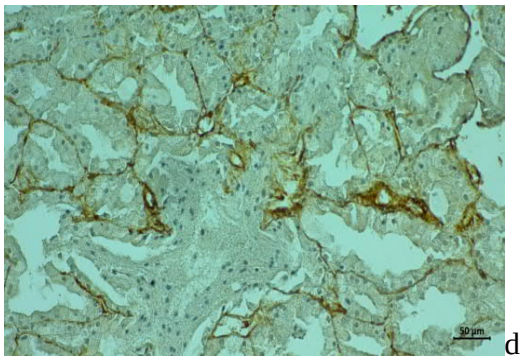
b.

Figure1a- In the histopathological examination of the control group section, the nuclei of the lacrimal gland and lacrimal duct cells were round in appearance, the chromatin density was high, the basement membrane structure was regular, the connective tissue cells were few in the interlobular area, and they showed a solitary distribution around the small capillary structure.

Figure 1b-Xylene applied group showed elongation and thinning of the lacrimal gland structures, degeneration and apoptotic changes in cells, an increase in cells spilling into the lumen. Thinning and dilatation of the wall structure of blood vessels were observed in the interlobular area, while an increase in inflammatory cell infiltration was observed around the vessel.



c



d

Figure 1c- Control group: Mild expression of vimentin in the basement membrane of the lacrimal gland and lacrimal duct cells, and positive expression of vimentin in myoepithelial cells and some fibroblast cells in the interlobular area.

Figure1d- Xylene group: An increase in vimentin expression was observed in degenerative basement membranes and capillary vessel wall, myoepithelial cells.

DISCUSSION

Xylene is a hydrocarbon known for its wide usage in tissue processing, staining in the histology and pathology laboratory.Exposure occurs primarily by inhalation. The common side effect of inhaled xylene is depression of the central nervous system causing dizziness, headache, nausea and vomiting. Irritation of the nose and throat may also occur with low-level inhalation of xylene (2).

In the use of 200 ppm xylene, irritation in the nose and throat occurs after 3-5 minutes. It has been observed that in the central nervous system neuronal membrane, the membrane proteins in which xylene

binds to lipo-solubility are functional and directly affects the proteins in the membranes by disrupting the lipid environment.(5). It has been stated that accidental splashing in the eye causes damage to the surface of the eye and increases the tear significantly (6). In one study, male Wistar rats exposed to 6 hours/day formaldehyde for 3 days experienced itching, nasal stiffness, and even nosebleeds afterward. Significant necrosis and thickening of the respiratory epithelium and significant degenerations in the lacrimal ducts were observed in high-dose (3 ppm) toxic substance application. In our study, degeneration and apoptotic changes in the lacrimal gland and lacrimal ducts were detected in xylene application, with examination and dilatation and increased inflammation in blood vessels, and congestion.

Vimentin is an intermediate filament protein found in mesenchymal and skeletal muscle cells.9 Vimentin filaments are found in many tissues. The extracellular matrix protein collagen is synthesized by fibroblasts, chondroblasts, osteoblasts and other cells (7). Xylene was thought that vimentin may be the correct signaling protein in monitoring the changes in the structure of the lacrimal duct, due to the deterioration of the basement membrane structure with xylene application, the deterioration of the filamentous structure, the circulation disorder in the blood vessel, and the fibroblastic secretion caused the collagen structure to be affected.

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DIFFERENCES BETWEEN LACTATE DEHYDROGENASE LEVELS IN HOSPITALIZED PATIENTS WITH DELTA AND OMICRON VARIANT OF SARS-CoV-2 IN CLINICAL HOSPITAL BITOLA, MACEDONIA

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ABSTRACT

Introduction:
Corona virus disease 2019 infection has now reached a pandemic state, affecting more than a million patients worldwide. Predictors of disease outcomes in these patients need to be urgently assessed to decrease morbidity and societal burden.
Lactate dehydrogenase (LDH) has been associated with worse outcomes in patients with viral infections. We analyzed the difference of LDH levels in patients with Delta and Omicron variant of SARS-CoV-2.
Materials and methods: Our study includes 60 adult patients, 20 females and 40 males with Covid 19 infection. They were hospitalized and treated in PHO Clinical Hospital Dr. Trifun Panovski Bitola, Macedonia in the period January 2021 to February 2022.
We separated patients in two groups – 30 patients (7 females, 23 males) with Delta variant of SARS-CoV-2 and 30 patients (13 females and 17 males) with Omicron variant of SARS-CoV-2.
Patients with Delta variant of SARS-CoV-2 were at age 33 – 87 (66,4±14), and patients with Omicron variant of SARS-CoV-2 were in age 17-88 (62,3 ±17,5).
Results: We measured levels of LDH in patients with Delta and Omicron variant of SARS-CoV-2with Abbot Architect CI4100 analyzer.
Mean values of LDH was 309.5 ± 116 in patients with Delta variant of SARS-CoV-2 and 320.41± 159.9 in patients with Omicron variant of SARS-CoV-2 , p=0.763.
Females with Delta variant of SARS-CoV-2 have mean values of LDH 327 ±129, and females with Omicron variant of SARS-CoV-2 have mean values of LDH 314.15±195, p=0.87.
Males with Delta variant of SARS-CoV-2 have mean values of LDH 303 ±111.9, and males with Omicron variant of SARS-CoV-2 have mean values of LDH 319.17±126, p=0.67.
Conclusion: We can conclude that patients with Omicron and Delta variant of SARS-CoV-2 have increased values of LDH. We did not find the statistical significant differences of LDH in booth groups of patients with Delta variant of SARS-CoV-2 and patients with Omicron variant of SARS-CoV-2, also we did not find difference between females and males with Delta and Omicron variant of SARS-CoV-2.

Keywords: LDH, Omicron variant of SARS-CoV-2 , Delta variant of SARS-CoV-2 , Macedonia

HÜCRE APIKAL YÜZEYININ UĞRADIĞI MORFOLOJIK DEĞIŞIMLER VE BU DEĞIŞIMLERIN FONKSIYONEL ÖNEMI

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ÖZET

Canlıların en küçük birimi olan hücreler, yüzey alanlarını kullanarak fizyolojik fonksiyonlarını yerine getirmektedir. Hücrelerin bu yüzey alanları apikal, lateral ve bazal yüz olarak adlandırılmaktadır. Bu yüzey alanlarında, hücrenin canlılığını devam ettirmek açısından önemli olan kalıcı veya geçici değişimler gerçekleşir. Bu değişimler; madde alış-verişini gerçekleştirmek ve hücreye hareket yeteneği kazandırmak amacı ile hücrenin apikal yüzeyinde meydana gelir. Bu yüzeyde meydana gelen değişimler fonksiyonlarına göre; mikrovillus ve stereosilya madde alış-verişini, kinosilya (silya), pseudopodyum ve flagella ise hücre hareketliliğini sağlayan değişimler şeklinde sınıflandırılır. Mikrovilluslar genel bir ifadeyle madde alış-verişi için özelleşmiş yapılar olup temel fonksiyonları, emilim yüzeyini arttırmaktır. Böylece hücre yüzeyini yaklaşık olarak yüz kat oranında arttırarak bağırsak epitel hücrelerinde besinlerin, böbreklerde su ve iyonların emiliminde rol oynarlar. Madde-alış verişinde rol aldıkları düşünülen diğer bir oluşum olan stereosilyalar; ductus epididimis ve iç kulakta bulunan uzun ve hareketsiz uzantılardır. Hücrelere hareket yeteneğinin kazandırılmasında işlev gören silyalar; solunum yollarında (mukusun akciğerden dış ortama atılması), tuba uterinalarda (yumurta hücresinin uterusa ulaşmasına yardımcı olmak) ve ductus efferenteslerde (spermlerin epididiymis kanalına taşınmasına yardımcı olmak) farklı roller üstlenerek bulunurlar. Flagellum, yapısı kinosilyum ile aynı olup hareketli ve kalıcı stoplazmik oluşumlardır. Memelilerde erkek üreme hücresi olan spermiumlarda bulunur ve spermiumların hareketinden sorumludurlar. Bir diğer oluşum olan pseudopodlar ise geçici olarak şekillenen stoplazmik uzantılardır. Hücreler bu uzantılarla hareket etme ve besin alma işlemini gerçekleştirmektedirler. Elde edilen bu güncel bilgiler doğrultusunda hücre yüzey değişimlerinin; tanımı, sınıflandırılması, meydana gelme amacı ve fizyolojik öneminin daha iyi anlaşılması ile bu güncel bilgilerin yeni yapılacak araştırmalara ışık tutması amaçlanmıştır.

Anahtar kelimeler: Apikal yüz; Flagella; Hücre; Kinosilya; Mikrovillus; Stereosilya.

MORPHOLOGICAL CHANGES ON THE APICAL SURFACE OF THE CELL AND THE FUNCTIONAL IMPORTANCE OF THESE CHANGES

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ABSTRACT

Cells, the smallest unit of living things, perform their physiological functions by using their surface areas. These surface areas of cells are called the apical, lateral, and basal face. Permanent or temporary changes occur in these surface areas, which are important for the survival of the cell. These changes occur on the apical surface of the cell in order to exchange substances and give the cell the ability to move. The changes that occur on this surface are classified according to their functions, as microvilli and stereocilia for material exchange, kinocilia (cilia), pseudopodium and flagella as changes that provide cell motility. Microvilli are specialized structures for substance exchange in general terms, and their main function is to increase the absorption surface. Thus, they play a role in the absorption of nutrients in the intestinal epithelial cells, of water and ions in the kidneys by increasing approximately a hundredfold the cell surfice. Stereocilia, that another formations are thought to play a role in substance exchange, are long and immobile extensions found in the ductus epididymis and inner ear. Cilia, which function as giving the cells the move ability, are found by assuming different roles in the respiratory tract (expulsion of mucus from the lung to the external environment), tuba uterina (helping the egg cell reach the uterus) and ductus efferentes (helping the sperm to be transported to the epididymis canal). Flagellum has the same structure as kinocilium and is mobile and permanent cytoplasmic formation. They are found in spermia, which are male reproductive cells in mammals, and are responsible for the movement of spermium. Pseudopods, another formation, are temporarily shaped cytoplasmic extensions. Cells carry out the process of movement and intake nutrients with these extensions. In line with the current information, it is aimed to that the definition, classification, purpose of occurrence and understand the physiological importance of cell surface changes better shed light on new researches**.**

Keywords: Apikal face; Cell; Flagella, Kinocilia; Microvilli; Stereocilia.

EFFECTS OF PHYTOGENIC ADDITIVES ON EGG QUALITY IN LAYING HENS

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ABSTRACT
A rapid increase in the usage of phytogenic feed additives has occurred mainly due to the EU ban on the use of antimicrobial substances as growth stimulators in 2006. Phytogenic feed additives are also used to improve the quality of animal products. They are herbs, spices, plant-fruit extracts, essential oils, flavoring substances, and mixtures of bioactive ingredients such as anise, caraway, cinnamon, citrus, clove, fennel, garlic, ginger, melissa, onion, oregano, peppermint, rosemary, sage, thyme. They contain biologically active substances such as berberine, resveratrol, curcumin, carvacrol, thymol, isoflavones, and hydrolyzed fibers. Many experiments were done to understand their effects on animal performance and product quality. Some phytogenic supplements improve egg yolk color, some increase egg weight, egg Haugh unit or eggshell quality, and some decrease egg yolk cholesterol. The beneficial effects of dietary supplementation with phytogenic additives on egg quality traits are mainly attributed to the antioxidative properties of phytogenic compounds. Poultry farmers may use phytogenic substances to produce high-quality eggs.

Keywords: Phytogenic feed additives, egg quality, nutrition, laying hen

INTRODUCTION
The increased awareness of the consumers and the ban on the use of antibiotics triggered a need for natural and safe feed additives to achieve better and healthy production results of animals. Natural products such as herbs, spices and plant extracts are used as feed additives called as phytogenics, phytobiotics or botanicals (Kuralkar and Kuralkar, 2021). Phytobiotic feed additives are classified as sensory and flavoring compounds according to the European Union Legislation (EC 1831/2003). They are herbal plants, spices, plant-fruit extracts, essential oils, colouring substances, flavouring substances and single or mixture of bioactive substances. Some herbs such as anise seeds, caraway seeds, cinnamon bark, chamomile flawors, citrus peel, clove buds, fennel seeds, garlic bulbs, ginger rhizome, melissa leaves, onion bulbs, oregano leaves, peppermint leaves, rosemary leaves, sage leaves, thyme leaves and valerian root/rhizome are generally used in commercial products. They contain biologically active substances such as berberine, resveratrol, curcumin, carvacrol, thymol, fisetin, quercetin, piperlongumine, piperine, isoflavones and hydrolyzed fibers (Shehata et al., 2022). They are the conventional alternatives of antibiotic growth promoters in the poultry production sector after the prohibition of antibiotic growth promoters from the European Union markets. They have antibacterial, antioxidant, anti-inflammatory, digestive stimulant and hepatoprotective functions. Different type of herbs, their active constituents and properties are given in Table 1.

Table 1. Different type of herbs, their active constituents and properties (Kuralkar and Kuralkar, 2021)

Name of plants	Common name	Parts used	Bioactive compound	Properties	References
Agaricus sp.	Mushroom	Whole plant	Phenolic compounds	Antimicrobial, antioxidant, anti-allergenic, immunmodulatory properties	Chauhan, 2010
Allium cepa L.	Onion	Bulb	Methly-n-propyl disulphide, Allin, Allicin, Allyl sulfide	Antibacterial	Kumar and Kumar, 2013
Allium sativum L.	Garlic	Bulb	Allicin, diallyl disulphide	Antibacterial	Bunglavan et al., 2010
Armoracia rusticana P.Gaertn.	HorsRadish	Root	Allylisothuicyanate	Anti-inflammatory, antibacterial, anti fungal	Aghsaghali, 2012; Kumar et al., 2014
Brassica Nigra (L.) K. Koch	White mustard	Seed	Allyllisothiocyanate	Antioxidant, anti-inflammatory	Aghsaghali, 2012
Brassica juncea (L.) Czern.	Black mustard	Seed, root	Isothiocyanates, Glucosinolates, Flavanoids	Antimicrobial, Antioxidant, Anti-tumor	Kumar and Kumar, 2013
Capsicum annuum L.	Capsicum	Fruit	Capsaicin	Antioxidant, anti-inflammatory, anti-carcinogenic	Alloui et al., 2014
Cinnamomum zeylanicum Blume	Cinnamon	Stem bark	Cinnamaldehyde, eugenol	Antimicrobial, antioxidant	Aghsaghali, 2012
Curcuma longa L.	Turmeric	Rhizome	Curcumin (diferuloylmethane)	Antimicrobial, anti-inflammatory, immunomodulatory	Chaturvedi et al., 2015
Echinacea purpurea (L.) Moench	Coneflower	Flowers	Flavonoid echinolone chicoric acid	Immunmodulatory, anti-inflammatory	Laudato and Capasso, 2013
Juglans regia L.	Walnut	Leaves and	naphthoquinone	Anti-inflammatory, antioxidant	Viegi et al., 2003;

		peels			Abo-El-Sooud, 2018
Mentha piperita L.	Mint	Leaf	Menthol	Antioxidant	Aghsaghali, 2012; Kumar et al., 2014
Nigella sativa L.	Kala jira (Kalonji)	Fruits	Thymoquinone, triterpenoid, flavonoids, phenolic acids	Antimicrobial, antifungal, antiparasite	Perumal et al.,2013
Ocimum sanctum L.	Tulsi	Leaves	Eugenol, Urosolic acid	Anti-inflammatory, immunomodulatory	Chauhan, 2010; Chaturvedi et al., 2015
Origanum vulgare L.	Oregano	Leaf	Carvacrol, Thymol	Antimicrobial, antifungal, antimicrobial, antioxidant	Zeng et al., 2015
Petroselinum crispum (Mill.) Fuss	Parsley	Leaves	Apiol	Antimicrobial, antioxidant	Aghsaghali, 2012; Kumar et al., 2014
Pimpinella anisum L.	Anise	Fruit	Anethol	Antioxidant, antimicrobial, anti-inflammatory	Aghsaghali, 2012; Kumar et al., 2014

Antibiotic growth promoters have three primary effects: increased growth, improved feed efficiency, lower incidence of certain diseases. Herbal additives are effective growth promoters as the antibiotics.

USAGE OF PHYTOGENIC SUBSTANCES TO PRODUCE HIGH QUALITY EGGS

Quercetin is the most common flavonoid in nature and can be found in fruits and vegetables including onions, kale and apples (Shehata et al., 2022). Dietary quercetin improved egg yolk oxidative stability (Ting et al., 2011). Simitzis et al. (2018) reported that quercetin inclusion increased egg yolk protein and reduced egg yolk cholesterol without negative impacts on performance and egg quality. These positive effects may be due to the ability of quercetin to alter caecal microflora and improve antioxidant status (Liu et al., 2014) and may be due to the estrogen-like effect of quercetin that leads to elevate releasing of hormones and improve reproductive organ growth (Yang et al., 2018).

Olive trees are rich in phenolic compounds having many beneficial effects due to their antioxidant, anti-inflammatory and antimicrobial activity on egg quality characteristics. Olive pulp (Olea europaea L.) is one of the residues remained from the olive oil extraction after the removal of the seed fractions. Fat content in the pulps can vary depending on oil extraction method. It is a source of α-linolenic acid with high free radicals scavenging activity because of its phenolic components such as oleuropein and its derivatives, the main alcohols 3,4-dihydroxyphenyl ethanol, known as hydroxytyrosol and p-hydroxyphenyl ethanol or tyrosol (Bulotta et al., 2014). Abd El-Moneim and Sabic (2019) reported that dietary olive pulp at the levels of 5% and 10% reduced total lipid and total cholesterol in egg yolk in Japanese quails. Egg weight, yolk percentages, yolk:albumen ratio and Haugh unit values were increased with olive pulp inclusion. These beneficial effects may be due to the antioxidant properties of phenolic compounds (Abd El-Moneim and Sabic, 2019).

Turmeric (*Curcuma longa*) is a rhizomatous herbaceous perennial plant of the ginger family, *Zingiberaceae*. Turmeric extract is a yellow-orange poly-phenol and it is a dry yellow powder. Curcumin (diferuloylmethane) is the active ingredient, the natural yellow pigment in the roots of Turmeric, is a polyphenolic compound that is isolated from the rhizomes of *Curcuma longa*. Curcumin exerts protective effects against oxidation, being capable of eliminating free radicals and thus, protecting the cells against lipid peroxidation (Khan et al., 2012). Galli et al. (2018) demonstrated that dietary curcumin improved egg quality. This may be associated with enhanced vitellogenin synthesis. Curcumin supplementation at the level of 50 mg/kg indicated a greater intensity of yellow coloration. Dietary curcumin reduced lipid peroxidation in fresh and stored eggs. The mechanism of this result can be associated with the presence of phenolic compounds that avoid or minimize the formation of hydrogen peroxide (Farag et al., 1989). According to the study of Radwan et al. (2008), egg weight and egg mass were increased significantly in laying hens fed 0.5% turmeric, yolk weight and yolk index were significantly higher in the group fed with 1% turmeric. Turmeric supplementation increased egg shell weight and shell thickness due to the improvement in the environment in the uterus (specifically the site of calcium deposition) with turmeric. Marchiori et al. (2019) revealed that usage of curcumin in the diet of heat stressed quails increased the antioxidant effect, reduced lipid peroxidation, enhanced egg yolk color, reduced saturated fatty acids and increased unsaturated fatty acids.

Resveratrol (trans-3,5,4’-trihydroxystilbene) is a naturally occuring polyphenolic compound, stilbene-type aromatic phytoalexin predominantly found in grapes, peanuts, berries, and turmeric. Resveratrol has numerous biological effects including antioxidant, antiinflammatory, immunomodulatory, anticancer

and metabolic modifier activities (Şahin et al., 2010; Fremont, 2000). Resveratrol is highly hydrophilic and lipophilic and therefore it is more effective than some other antioxidants, such as vitamin E and vitamin C (Murcia and Martinez-Tome, 2001; Şahin et al., 2010). Şahin et al. (2010) showed that supplemental resveratrol at the levels of 0.2 and 0.4 g/kg increased Haugh unit and the antioxidant status of eggs in Japanese quails.

Oregano and thyme are members of the *Lamiaceae* family, an aromatic herb used extensively in food to add a distinctive aroma and flavor (Shehata et al., 2022). Yalçın et al. (2020) reported that supplementation of dried and ground thyme (*Thymus vulgaris* L.) leaves at 2% to the diets of laying hens resulted in beneficial effects in laying hens due to the lowering of yolk cholesterol and total saturated fatty acids concentration while increasing omega-3 fatty acids. These beneficial effects may be due to active ingredients such as thymol, its phenolic isomer carvacrol, caffeic acid, p-cymene-2,3-diol and some biphenyls and flavonoid compounds.

The active components of black cumin seed are thymoquinone, anethole, carvacrol and 4-terpinol (Abou-Elkhair et al., 2018). Yalçın et al. (2009) indicated that dietary black cumin seed decreased egg yolk cholesterol, saturated fatty acids (% of total fatty acid methyl esters) and the ratio of saturated to unsaturated fatty acids in laying hens. Black cumin seed at the levels of 10 and 15 g/kg increased egg weight. However the inclusion of black cumin seeds in the diets had no significant effect on egg shape index, shell breaking strength, shell thickness, yolk index, albumen index, Haugh unit and the weight percentages of egg shell, yolk weight and albumen weight.

Garlic contains a variety of organosulfur compounds such as allicin, ajoene, S-allylcysteine, diallyl disulfide, S-methylcysteine sulfoxide and S-allylcysteine sulfoxide (Chi et al., 1982). Yalçın et al. (2006) demonstrated that 5 and 10 g/kg garlic powder inclusion increased egg weight in laying hens. Inclusion of 10 g/kg garlic powder decreased egg yolk concentration by 10.3% compared with the control group. Garlic powder had no effect on egg shell index, egg breaking strength, egg yolk index, egg albumen index and Haugh unit.

Red pepper (*Capsicum annuum* L.) is a rich source of carotenoids such as vitamin C, E and provitamin A with well-known antioxidant functions (Krinsky, 2001). Red pepper active compounds are capsaicin, capsisin and capsantine. Red pepper is effective in darkening the yolk color. Red pepper also increased egg Haugh unit (Abou-Elkhair et al., 2018).

CONCLUSION

As conclusion, phytogenic supplementation has potential commercial applications for the production of high-quality eggs. The use of these additives will make a significant contribution to the feed sector and animal husbandry.

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EFFECTS OF DIETARY WALNUT LEAVES ON THE ANTIOXIDANT PROPERTIES OF EGGS IN LAYING HENS

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ABSTRACT
Since the ban of antibiotic growth promoters in the European Union in 2006, phytogenic feed additives received attention as alternatives to prebiotics, probiotics, and antibiotics in laying hen nutrition. Some herbal feed additives were shown to improve health status, performance, antioxidant status, immunity, and egg quality in laying hens. As a herbal plant, walnut leaves are widely used by folk medicine as antiseptic, antibacterial, anti-inflammatory, antidiabetic, antihelmintic, hepatoprotective, neuroprotective, and antioxidant properties. The secondary metabolites of walnut leaves are phenolic acids, flavonoids, tocopherols, organic acids, triterpenic acids, terpenes, terpenoids, tetralone derivatives and hydroxy-1,4-naphthoquinone (juglone) derivatives. Phenolic compounds are naturally occurring antioxidants because of their health benefits due to their radical scavenging activity, reducing oxidative stress, which is the main cause of several disorders. Dietary walnut leaves supplementation did not significantly affect feed intake, egg production and feed efficiency in laying hens. Walnut leaves increased total phenols, lutein and zeaxanthin, and zinc levels in egg yolk. Supplementation of walnut leaves enhanced the oxidative stability of egg yolks and retarded the lipid peroxidation process during storage.

Keywords: Walnut leaves, phenolic compounds, egg antioxidant properties, nutrition, laying hen

INTRODUCTION
Some herbal feed additives were shown to improve health status, performance, antioxidant status, immunity and egg quality in laying hens (Abou-Elkhair et al., 2018; Alagawany and El-Hack, 2015; Popescu et al., 2020; Untea et al., 2020). The beneficial impact of herbal additives could be due to the polyphenolic composition (Popescu et al., 2020; Pyner et al., 2017).
Walnut (*Juglans regia* L.) is considered a priority plant by the Food and Agriculture Organization (FAO), have been considered as a beneficial source of health and is a strategic species for human nutrition (Jahanban-Esfahlan et al., 2019). Walnut by-products produced in agricultural industries, are rich in phenolic compounds, have high content in flavonoids, alkaloids, saponins, steroids, and tannins. and they are valuable sources of antioxidants for animal nutrition. Walnut leaves are responsible for some of the therapeutic properties like anti-allergic, anti-inflammatory, antiviral, antiproliferative, antidiarrheal,

anthelmintic, antifungal, hypoglycemic, antioxidant and anticarcinogenic properties due to being rich source of phenolic compounds (Nour et al., 2016; Untea et al., 2020; Popescu et al., 2020). Walnut leaves have free-radical scavenging properties, and are an important exogenous antioxidant source with a role in oxidative stress balance (Vieira et al., 2019).

Popescu et al. (2020) demonstrated the antioxidant potential of the extract of the walnut leaves. Total polyphenolic content is an average of 192.03 µg GAE/g dry weight, 2,2-diphenyl-1-picrylhydrazyl (DPPH) free-radical scavenging activity is 57.59 %, oxygen radical absorbance capacity value (ORAC) is 175.7 µmol Trolox/g dry weight in walnut leaves.

EFFECTS OF WALNUT LEAVES SUPPLEMENTATION ON LAYING HEN

Walnut leaves powder has 12.83% crude protein, 2.21% crude fat and 17.41% crude fiber. Walnut leaves had a total antioxidant capacity (TAC) of 254.29 mM equivalent ascorbic acid or 141.15 mM eqivalent vitamin E, 56.75 mg/g total polyphenols,157.54 mg/kg vitamin E, 264.09 mg/kg lutein and zeaxanthin and 32.64 mg/kg zinc. Therefore addition of walnut leaves to the diets had a positive effect on the levels of total phenols, vitamin E, lutein and zeaxanthin in the diets (Untea et al., 2020).

In the study of Popescu et al. (2020), dietary walnut leaves powder supplementation have exerted beneficial effects in the duodenum and the jejunum morphology by showing significant increases in villus height, increased nutrient absorption and activities of intestinal enzymes in laying hens. Villi height and crypt depth ratio in the small intestine has a direct influence on the absorptive function (Wu et al., 2013).

In poultry, the activity of digestive enzymes located in the brush border membrane of enterocytes plays a significant role in the physiological processes in the digestive tract that depend on nutritional feeding and diet characteristics (Ramirez-Otarola and Sabat, 2011). Activities of digestive enzymes are affected by food intake and diet composition (Duke, 1986). Activities of proteases in the intestinal juice depend on the amount of dietary protein, while the activities of amylase and lipase depend on dietary carbohydrates and lipids as substrates for their activity (Ren et al., 2012).

In the study of Popescu et al. (2020), supplementation of 1% walnut leaves numerically increased maltase activity, numerically decreased alpha-amylase activity and significantly decreased trypsin activity in duodenum and jejunum. A strong negative correlation was observed between the total polyphenol content and a decreased alpha-amylase and trypsin activities both in duodenum and jejunum. The alpha-amylase catalyzes hydrolysis of the internal α-1, 4-glycosidic linkages in starch, producing glucose and maltose. Oligosaccharides escape digestion from the small intestine and reached the cecum due to the decreasing amylase activity. Oligosaccharides in cecum were fermented by microbiota producing short chain fatty acids (Lambertz et al., 2017) and aminated compounds with providing beneficial impact on hens. Acetate, propionate and butyrate are the main short chain fatty acids showing signaling molecules with epigenetic impact (Houghton et al., 2016). Trypsin is an enzyme responsible for protein and peptides degradation into amino acids. The peptides hydrolysis stage is important in protein absorption. Trypsin activities in duodenum and jejunum in the walnut leaves group were found to be numerically lower than the control group. This result may be due to the covalent attachment of the phenolic compounds of walnut leaves to the reactive nucleophilic sites of the trypsin enzyme, affecting its active site. Because of this reason, the rate of the catalyzed reaction decreased significantly (Rohn et al., 2002).

Invertase enzyme activity was significantly increased in duodenum and decreased in jejunum by the 1%

walnut leaves addition (Popescu et al., 2020). Reduction of invertase enzyme activity in jejunum may be due to the lower amount of sucrose present in jejunum because of the increased activity of invertase in duodenum. Group supplemented walnut leaves has a 5-fold increase in the level of lactobacilli and a significant reduction in *Enterobacteriaceae* in cecum compared to the control group due to the highest probiotic potential of walnut leaves. Probably higher concentrations of short chain fatty acids produced in the small intestine decreased the *Enterobacteriaceae* population (Heinritz et al., 2016), which is negatively correlated with the *Lactobacilli* population (Popescu et al., 2020). Popescu et al. (2020) concluded that walnut leaves powder supplementation might change positively the microbiota of hens by modulating several digestive enzymes that favor the development of *Lactobacilli* and decrease *Enterobacteriaceae*.

EFFECTS OF WALNUT LEAVES SUPPLEMENTATION ON ANTIOXIDANT PROPERTIES OF EGGS

Untea et al. (2020) examined the effects of dietary walnut leaves as a source of natural antioxidant on the enrichment of antioxidant nutrients in the egg yolk and on the susceptibility of the yolk to lipid peroxidation during storage with 32 week old laying hens. Walnut leaves addition did not significantly affect the productive parameters in laying hens. Supplementation of walnut leaves powder significantly increased the total polyphenol content, and the zinc, lutein and zeaxanthin concentrations in the egg yolks. A significant reduction in the concentrations of primary oxidation products formed in the egg yolk of group fed diet supplemented with walnut. This result demonstrated that walnut leaves had an efficient inhibition effect on peroxyl radical formation. A significant correlation was observed between primary oxidation products and total polyphenolic content of the egg yolks, where zinc, lutein and zeaxanthin are the bioactive compounds that inhibit the formation of secondary oxidation products.

Dietary walnut leaves supplementation did not significantly affect feed intake, egg production and feed conversion ratio in laying hens. However walnut leaves supplementation led to a significant decrease in average egg weight (Untea et al., 2020).

Walnut leaves supplementation did not affect the levels of total antioxidant capacity, vitamin A and vitamin E in egg yolks. However dietary walnut leaves supplementation increased total phenols, lutein and zeaxanthin and zinc levels in egg yolk (Untea et al., 2020).

Walnut leaves supplementation decreased the palmitic acid in egg yolk fatty acids. The oxidative stability parameters of the eggs showed significantly decreased concentrations of primary oxidation products (peroxide value, conjugated dienes, conjugated trienes) formed in the egg yolks of the groups supplemented walnut leaves, showing the efficient inhibition effect of walnut leaves on peroxyl radical formation. Secondary oxidation products (para anisidine, thiobarbituric acid reactive substances) are decreased by the addition of walnut leaves (Untea et al., 2020).

Lutein and zeaxanthin cannot be synthetised by hens, so the carotenoids stored in the yolk are related to the diet (Meynier et al., 2014). Lutein and zeaxanthin exhibit antioxidant properties and were found to be important compounds in the prevention of age-related macular degeneration (Meynier et al., 2014).

In the study of Untea et al. (2020), dietary walnut supplementation significantly increased concentrations of xanthophyll in the egg yolks reflecting the concentration of carotenoids in the diet. Lutein is transferred from the feed to the egg yolk with high efficiency depending on the carotenoid composition and content of the diet (Karadas et al., 2006).

Zinc does not directly interact with reactive oxygen species. It plays an important role in antioxidant defense by activation of antioxidant enzymes, inhibiting some important pro-oxidant enzymes, competing with redox-active transition metals such as iron and copper for certain binding sites, protecting the sulfhydryl groups of proteins from oxidation, or forming metallothionein, which is a scavenger of radicals (Koekkoek and van Zanten, 2016). The increasing zinc concentrations in yolks with walnut leaves supplements is an important parameter of antioxidant system for eggs.

Atherogenicity index and thrombogenicity index are the main parameters of animal fat used to assess the nutritional value and the impact on consumer health (Attia et al., 2015, Criste et al., 2018). Saturated fatty acids are considered to be pro-atherogenic and pro-thrombogenic lipids and unsaturated fatty acids are considered to be anti-atherogenic and anti-thrombogenic lipids (Attia et al., 2015, Senso et al., 2007). Atherogenicity index was not influenced by walnut leaves supplementation while thrombogenicity index was significantly decreased with dietary walnut supplementation showing a beneficial effect on human health.

Inclusion of walnut leaves in the diet promotes the enrichment of antioxidant compounds in egg yolks. The antioxidant compounds of eggs (polyphenols, vitamins, minerals) probably act synergistically with each other, providing a protective effect against lipid peroxidation and increasing the oxidative stability of yolk lipids. The indicators of the initial stage of oxidation (peroxide value, conjugated dienes, conjugated trienes) decreased for the walnut leaves supplemented group compared with the control group, as did the amount of alkenals, alcadienals and aldehides generated during decomposition of hydroperoxides, measured as para-anisidine and TBARS values. Lutein, zeaxanthin and zinc were significantly correlated with para-anisidine and TBARS, being the bioactive compounds that inhibit the formation of secondary oxidation products (Untea et al., 2020)

CONCLUSION

As conclusion, walnut leaves in laying hen diets enhanced the oxidative stability of egg yolks and retarded the lipid peroxidation process during storage. The use of walnut leaves will make a significant contribution to the feed sector and animal husbandry.

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GUT DYSBIOSIS IN DOGS WITH SPINAL CORD INJURY: IMPACT OF POLENOPLASMIN

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ABSTRACT

Background Studies have demonstrated the presence of gut dysbiosis (alterations in gut bacterial homeostasis) secondary to spinal cord injury in dogs. The dysbiosis is thought to impair recovery by decreasing the production of short-chain fatty acids which play a role in suppressing inflammation within the central nervous system.

Obiective Therefore, targeting gut dysbiosis could have significant therapeutic value in the management of spinal cord injury. The purpose of this study is to determine if gut dysbiosis occurs in dogs with spinal cord injury. Another area of potential intervention interest is in situations of spinal injury where there is an urgent need to generate new neurons. To arrive at these observations, the authors examined how Polenoplasmin and diet solve paralysis in dogs.

Materials and methods The most common cause of spinal problems in dogs is trauma. We are currently assessing whether indoles can also stimulate formation of neurons in dogs with paralysis.

Results We found that gut microbes that metabolize tryptophan-an essential amino acid-secrete small molecules called indoles, which stimulate the development of new brain cells in dogs, also demonstrated that the indole-mediated signals elicit key regulatory factors known to be important for the formation of new neurons.

Conclusion This study is another intriguing piece of the puzzle highlighting the importance of lifestyle factors and diet.

In conclusion, the link between the health of the microbiome and the health of the brain shows how microorganisms in the gut solve paralysis. Gut microbe secreted molecule linked to formation of new nerve cells in paralysed dogs.

Keywords: intestinal dysbiosis, indoles, paralysed dog, Polenoplasmin.

ANALYSIS OF COMMON PARROT VIRUS CASES IN TAIWAN DURING 2018-2019

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ABSTRACT
Problem: For the avian polyomavirus (APV), psittacine beak and feather disease virus (PBFDV) and avian bornavirus (ABV), did temperature difference were effect on the death or morbidity caused by viral infection on parrot?

Objectives: We were collation 201 parrots case on 2018-2019 in Taiwan. Moreover, according to the analysis of collected information, the common viral infections of parrots and temperature difference effect parrot viral infection.

Research methods: In this study, we were collected 201 samples of parrots from January 2018 to December 2019 in Taiwan. In addition, we diagnosed by PCR and RT-PCR. Finally, the sample APV, PBFDV, ABV and other test results are aggregated, analyzed, and counted according to climate and other related factors.

Results: According to the analysis of collected information, the common viral infections of parrots are usually single infections, totaling 79 cases (79/132), including 38 cases of APV, 21 cases of PBFDV, and 20 cases of ABV. In this statistic, there were 21 mixed infections of two viruses (21/132), and 5 cases of three virus infections (5/132). There were 30 cases of APV and PBFDV mixed infections, followed by 11 cases of APV+ABV and 7 cases of ABV+PBFDV infections. The temperature difference has a direct significant effect on the death or morbidity caused by viral infection. When the temperature difference exceeds 8 degrees in a single day, there will be cases of viral infection within the next 5 days.

Conclusions: In this study, we were inferred that the drastic temperature change in a single day causes urgency to the infected parrot and, therefore, death. Based on the research results, it will provide a reference for disease prevention and clinical diagnosis and treatment in the future, and provide a basis for assisting the owners to improve feeding and care.

Keywords: Avian polyomavirus, Psittacine beak and feather disease virus, avian bornavirus, temperature difference

MORPHOMETRIC EVALUATION OF THE SPLEEN IN THE FETAL PERIOD IN BOVINES BEFORE AND AFTER SILICONE PLASTINATION

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ÖZET:

Dalak, immunolojik ve hemotopoetik fonksiyonları olan en büyük lenfoid organdır. İntrauterin dönemde eritrosit üretiminden sorumludur. Embriyonal dönemde yaklaşık 5. haftada dorsal mezogastrium yaprağı ile dorsal mezenterin kolelomik epitel hücreleri arasındaki mezenkimal hücreleri dalağın ilk halini oluşturmaktadır. Dalağın tüm gelişimi sol üst kadranda şekillenmektedir.

Fetuslar gebelik haftasına göre Grup 1 (1.trimester), Grup 2 (2.trimester) ve Grup 3 (3.trimester) olmak üzere gruplandırıldı. 1. Grup (0-12 hafta), 2. Grup (12-26 hafta) ve 3. Grup (27-40 hafta) baş-kuyruk uzunluğu, bi-parietal çap, baş çevresi, femur uzunluğu ve ayak uzunluğuna göre belirlendi. Alınan fötüsların prosedüre uygun şekilde diseksiyon işlemlerinden sonra dalakları çıkarıldı. Dijital kumpasla yatay ve dikey olarak boyutları ölçüldü. Daha sonra hassas terazide ağırlık ölçümleri alındı. Dalakların kolorimetre cihazı ile renk ölçümleri yapıldı. Silikon plastinasyon işlemi öncesi dalakların orijinal görünümünü korumak için çelik bir düzeneğe sabitlendi. Bu aşamalarından sonra plastine edilmiş fötal dalaklarda 2. kez uzunluk ve ağırlık ölçümleri yapılarak kolorimetre cihazi ile renk skalasındaki değişimler değerlendi. Bu çalışma ile fötal dönemde önemli rolü olan dalağın plastinasyonunu ve morfolojisini ilk defa incelenerek literatürlere katkı sağlayacağı kanaatindeyiz.

Plastine dalakların plastinasyon öncesi ve sonrasındaki anatomik görünümlerini dışbakıdan korudukları ancak plastinasyon öncesi ölçümleri, ağırlıkları ve renk skalasındaki değeri, plastinasyon

sonrasına göre azaldığı tespit edildi. Ayrıca 3 grupta da yaptığımız tüm ölçümler dalakların gelişimlerine göre doğru orantılıydı. Bu sebeple silikon plastinasyonu sonrası tüm değerlerdeki azalmalar da aynı orantıda gerçekleşti.

Bu çalışma sığırlarda fötal dönemde gelişim haftasına göre dalakların plastinasyon öncesi ve sonrası morfometrisi ile renk değişiklikleri ilk defa ortaya konulmuştur. Elde etmiş olduğumuz bu veriler kapsamında araştırmanın bu alandaki bilgi birikimine ve sonrasında yapılabilecek çalışmalara katkı sağlayacağı düşünülmektedir.

Anahtar Kelimeler: Dalak, Plastination, Fötal Dönem

ABSTRACT

The spleen is the largest lymphoid organ, immunological and hematopoietic. In the intrauterine period, erythrocyte is your main responsibility. In the embryonic period, at about the 5th week, the mesenchymal cells between the dorsal mesogastrium leaf and the dorsal mesentery form the initial state of the spleen. The entire development of the spleen is formed in the left upper abdomen.

Fetuses were grouped according to gestational week as Group 1 (1st trimester), Group 2 (2nd trimester), and Group 3 (3rd trimester). Group 1 (0-12), Group 2 (12-26) and Group 3 (27-40) are determined according to head-tail length, bi-parietal diameter, head circumference, femur long and long week week. The spleens of the retrieved fetuses are removed after dissection in accordance with procedural rules. Dimensions were measured horizontally and vertically with a digital caliper. Then the weights were taken on precision scales. Color measurements of the spleens were made with a colorimeter device. Before the silicone plastination process, the spleens were fixed to a steel assembly for the original image. After these stages, length and weight measurements were made for the second time in plastinated fetal spleens, and the changes in the color scale were evaluated with a colorimeter device. With this study, we are the first to contribute to those by examining the plastination and morphology of the spleen, which has a fetal role.

It was determined that the plastination spleens preserved their anatomical appearance before plastination, but their pre-plastination measurements, weights and color scale values were compared to post-plastination. In addition, all the measurements we made in the 3 groups were directly proportional to the development of the spleens. For this reason, the decreases in all values after silicone plastination took place in the same proportion.

In these leaks, the color appearance of the fetuses was revealed for the first time by morphometry before and after plastination in the studies. Within the scope of the data we have obtained, it is thought that the research will contribute to the knowledge in this field and to the studies that can be done later.

Keywords: Spleen, Plastination, Fetal Period

GİRİŞ

Dalak vücuttaki en büyük lenfoid organı ve lenfoid doku agregasyonudur (1). Dalak; hem immunolojik hem de hematopoetik fonksiyonları olan lenfoid bir organdır. Dalak, hematopoietik hücrelerin ekstramedüller üretimi, anormal kan hücrelerinin, bakterilerin ve parazitlerin tanınması ve çıkarılması ve birçok septisemik hastalıkta lenfositlerin ve spesifik antikorların üretimi dahil olmak üzere

bir dizi fonksiyona sahiptir (2).

Büyük ruminant'larda dalak, diyafragma'nın gerisinde, regio hypocondriaca sinistra'da, 7.-12. inter costal aralıkta bulunur. Ruminant'lar hariç evcil memelilerde tamamı periton içine yerleşmiştir. Ruminant'larda ise dalağın yarısı, diyafragma ve rumen'in dorsal kesesi arasındaki retroperitoneal bağlantı bölgesine ve aynı zamanda reticulum'un cranial yüzeyine dikey olarak uzanmış şekilde bulunur (2-3).

Fetal dönemde eritrositlerin üretildiği yer olması bakımından dalağın fötal dönemde önemi ve rolü çok büyüktür. Fetusların gebelik yaşına göre dalağın gelişimi farklılık göstermektedir. Çünkü gebelik sürecinin ilerlemesiyle beraber büyüyen fetusların eritrosit üretimi artar. Bu da dalağın gelişimini hızlandırmaktadır. Bu sebeple dalağın fötal dönemde gelişimi büyük önem arz etmektedir.

Bu farklılığın olası nedenlerinin dalaktan kan drenajı, portal basıncın düşmesi, kapsüler düz kas kasılması ve otolitik değişiklikler ile ilişkili olduğu iddia edilmiştir. Bu fark göz önüne alındığında, fetüslerin dalaklarından ölçümlerin önemli olabileceğini düşünmekteyiz. Bu nedenle fötal dalağın anatomik ve biyometrik gelişimini incelemeye karar verdik (4). Bütün bunlara ek olarak fötal dalak materyallerimize plastinasyon işlemini uyguladık. Plastinasyon öncesi ve sonrası ağırlık, uzunluk ve genişlik ölçülerinin hangi oranda değiştiğini inceledik. Plastine edilmiş dalakların kolorimetre cihazi ile renk skalasındaki değişimler değerlendirildi.

Dalak Embriyolojisi

Embriyonal dönemde dalağın gelişiminden mezoderm sorumludur. Gebeliğin ortalama 5. ve 6. haftasında dorsal mezogastrium'un yaprağı ile dorsal mezenter'in koelomik hücreleri arasında bulunan mezenkimal hücreler dalağın ilk halini oluşturur. Aynı süreçte gelişimi devam eden midenin oluşumunu destekleyen dorsal mezogastrium, ortalama 5-6. haftalarda omentum majus'u oluşturmak için genişleme göstermektedir. Dalak bu mezenterik genişleme içerinde kalır. Dalağın bütün gelişimi bu genişleme içinde sol regio hypocondriaca'da devam eder. Dalağın ligament'lerini dorsal mezogastrium oluşturur. Midenin rotasyonu sonucunda mezogastrium'un sol yüzü sol böbreğin üst kısımları üzerinde periton'a yapışır. Dorsal mesenterium'un mide ve dalak arasında kalan kısmı lig. gastrolienale'yi, sol böbrek ve dalak arasında kalan kısmı ise lig.splenolieanle'yi oluşturur. (5)

Plastinasyon nedir?

Son yıllarda plastinasyon, temel olarak makro anatomi öğretimine ek olarak Anatomi Bölümlerine girmiştir. Gunther von Hagens'in Heidelberg Üniversitesi'ndeki çığır açan çalışmasından (5) kaynaklanan teknik, insan vücudunun öğrencilere sunulma biçiminde devrim yaratmaya başladı. 1977'de piyasaya sürülmesinden ve potansiyelinin erken gösterilmesinden bu yana (6,7), dünya çapında geniş bir kabul görmüştür.

Standart plastinasyon teknikleri ile hazırlanan plastine dokular, organlar ve vücut bölümleri için birçok uygulamadan bahsedilmiştir. Ayrıca, öğrencilere öğretmek gibi doğrudan veya dolaylı öğretim amaçları için mükemmel araçlar olarak kabul edilmiştir. Numuneleri hazırlamak için kullanılan malzemeler, S10 silikon, S6 gaz kürü ve S3 katalizörü gibi güvenli ve tehlikesizdir (5,8).

Plastinasyon yöntemine bağlı olarak kısmen boyutunda küçülme veya doğal renk ve dokuda değişiklik gibi dezavantajlar da gözlenebilir. Çeşitli plastine örneklerde renk değişikliklerinin önlenmesi hala önemli bir konu olmasına rağmen, plastine dokuların kolorimetrik değişikliklerine odaklanan tatmin

edici bir çalışma henüz yayınlanmamıştır (9,10).

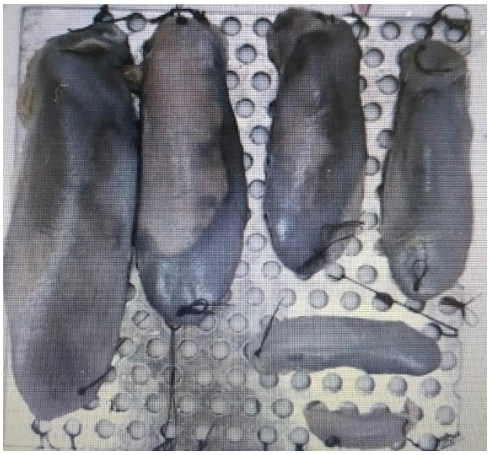
MATERYAL - METHOD

Mezbahanelerden temin edilen fetuslar gebelik haftasına göre Grup 1 (1.trimester), Grup 2 (2.trimester) ve Grup 3 (3.trimester) olmak üzere gruplandırıldı. 1. Grup (0-12 hafta), 2. Grup (12-26 hafta) ve 3. Grup (27-40 hafta) baş-kuyruk uzunluğu, bi-parietal çap, baş çevresi, femur uzunluğu ve ayak uzunluğuna göre belirlendi.

Alınan fetusların prosedüre uygun şekilde diseksiyon işlemlerinden sonra dalakları çıkarıldı. Dijital kumpasla yatay ve dikey olarak boyutları ölçüldü. Daha sonra hassas terazide ağırlık ölçümleri alındı. Dalakların kolorimetre cihazı ile renk ölçümleri yapıldı.

Silikon plastinasyon 5 aşamada gerçekleştirildi. Bu aşamalardan ilki örneklerin hazırlanmasıdır. Diseksiyon işlemleri tamamlanan dalaklar orijinal görünümünü korumak için çelik bir düzeneğe sabitlendi (şekil 1). İkinci aşama ise dehidrasyon aşamasıdır. Dalaklar -25°C'de aseton banyolarına maruz bırakıldı. Dehidrasyon işlemini takiben dalaklar asetonun içerisinde oda sıcaklığında bırakılarak yağdan arındırma işlemi gerçekleştirilir.

İmpregnasyon aşamasında ise vakum tankında BIODUR S10/S3 karışımında oda sıcaklığında vakum pompası çalıştırılarak tankta negatif basınç oluşturuldu. En son aşama olarak gaz kürleme ünitesine alınarak BIODUR S6 buharına tabii tutuldu. Bu aşamalarından sonra plastine edilmiş fötal dalaklarda 2. kez uzunluk ve ağırlık ölçümleri yapılarak kolorimetre cihazı ile renk skalasındaki değişimler değerlendirildi.



Şekil 1. Dalakların çelik düzeneğe sabitlenmesi

BULGULAR VE SONUÇ

Literatür taraması, fetal dönemde dalağın lokalizasyonu ve komşuluğu ile ilgili herhangi bir çalışma olmadığını düşündürmektedir.

Yapılan disseksiyonda dalağın diyafragma'nın gerisinde, regio hypocondriaca sinistra'da, 7.-12. inter costal aralıkta bulunduğu gözlemlenmiştir. Ruminant'larda dalağın tamamı periton içine

yerleşmediği fetal dönemde de buna uyumu olduğu görülmüştür. Dalağın yarısı, diaphragma ve rumen'in dorsal kesesi arasındaki retroperitoneal bağlantı bölgesine ve aynı zamanda reticulum'un cranial yüzeyine dikey olarak uzanmış şekilde bulunmuştur. Dalak ile mide ve diyafram komşuluğu erişkinlerle uyumluydu. Tüm olgularda gastrosplenik ve splenorenal bağlar mevcuttu.

Silikon plastinasyon işlemi total 31 gün sürmüştür. Plastine dalakların plastinasyon öncesi ve sonrasındaki anatomik görünümlerini dışbakıdan korudukları gözlemlendi (şekil 2). Ancak plastinasyon öncesi ölçümleri, ağırlıkları ve renk skalasındaki değeri, plastinasyon sonrasına göre azaldığı tespit edildi (tablo1 ve tablo 2). Ayrıca 3 grupta da yaptığımız tüm ölçümler dalakların gelişimlerine göre doğru orantılıydı. Bu sebeple silikon plastinasyonu sonrası tüm değerlerdeki azalmalar da aynı orantıda gerçekleşti.



Şekil 2.

Tablo 1. Plastinasyon öncesi ölçümler

		Ağırlık(gr)	En(mm)	Boy(mm)
Grup 1 1.trimester	1.fetus	0.31 gr	7.79 mm	21.66 mm
	2.fetus	1.12 gr	10.56mm	42.52mm
Grup 2 2.trimester	1.fetus	2.92 gr	18.44 mm	57.71 mm
	2.fetus	3.86 gr	21.73 mm	61.99 mm
Grup 3 3.trimester	1.fetus	6.82 gr	22.33 mm	69.89 mm
	2.fetus	11.59 gr	24.18 mm	92.5 mm

Tablo 2. Plastinasyon sonrası ölçümler

		Ağırlık(gr)	En(mm)	Boy(mm)
Grup 1 1.trimester	1.fetus	0.06 gr	4.41 mm	13.33 mm
	2.fetus	0.25 gr	6.14 mm	26.95mm
Grup 2 2.trimester	1.fetus	0.63 gr	10.53 mm	38.91 mm
	2.fetus	1.06 gr	21.73 mm	61.99 mm
Grup 3 3.trimester	1.fetus	4.36 gr	17.28 mm	51.62 mm
	2.fetus	7.73 gr	14.22 mm	58.72 mm

Kolorimetrik olarak dokulardaki parlaklık oranı L* olarak, renk değişimlerinin derecesi a* olarak yeşilden kırmızıya ve maviden sarıya b* olarak değişim derecesi, çalışmada kullanılan kolorimetre cihazı ile X-Y koordinatlarında gösterilmiş ve değer aralığında istatistiksel verilere dönüştürülmüştür. CIE tarafından L*a*b* standartlarında belirlenir. Bu verilerin kendi aralarında kolaylıkla karşılaştırılabilir olduğu çalışmada ortaya konmuştur. Kolorimetrik yöntemin, son ürünlerin renk kalitesinin değerlendirilmesinde olduğu kadar, anatomik numune hazırlama tekniği olarak da kullanılabileceği kanıtlanmıştır. Böylece özellikle anatomi alanında eğitim materyali olarak kullanılan plastinatların dokuların doğal rengine benzer anatomik örnekler olduğunu ortaya koymuştur.

Bu çalışma sığırlarda fetal dönemde gelişim haftasına göre dalakların plastinasyon öncesi ve sonrası morfometrisi ile renk değişiklikleri ilk defa ortaya konulmuştur. Elde etmiş olduğumuz bu veriler kapsamında araştırmanın bu alandaki bilgi birikimine ve sonrasında yapılabilecek çalışmalara katkı sağlayacağı düşünülmektedir.

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EFFICACY OF *ALOE VERA* SUPPLEMENTED CANOLA MEAL BASED DIETS ON GROWTH PERFORMANCE, NUTRIENT DIGESTIBILITY AND CARCASS COMPOSITION OF *CATLA CATLA* FINGERLINGS

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ABSTRACT

A feeding trial of 70 days was conducted to evaluate the effect of Aloe vera supplemented canola meal based diet on growth performance, nutrient digestibility and body composition of Catla catla fingerlings. For this purpose, six canola meal based diets were prepared including one control diet (without out A. vera supplementation) and five other diets containing 1%, 2%, 3%, 4% and 5% A. vera supplementation. The chromic oxide was added at the rate of 1% as an indigestible marker in feed. Fish were be acclimatized for two weeks in V-shaped tanks, which are specifically designed for feces collection Fingerlings were fed at the rate of 5% of their live wet weight. Analysis revealed that fish fed with 3% A. vera supplemented diet significantly ($p<0.05$) enhance weight gain (13.46g), weight gain % (206.14%) and feed conversion ratio (1.23). Highest apparent digestibility coefficient of nutrient in terms of gross energy (68.23%), crude protein (75.51%) and crude fat (81.46%) were also noted on the same supplementation level. Carcass analysis showed that maximum crude protein (19.57%) and fat content (3.95%) were also found at 3% supplementation of A. vera. It was concluded that A. vera has significant effect on overall performance of C. catla fingerlings particularly at the level of 3% supplementation in the diet.

Keywords: Aloe vera, body composition, growth performance

ACACIA JACQUEMONTII ETHYL ACETATE EXTRACT DOWNREGULATED THE HYPERGLYCEMIA THROUGH ITS MODULATORY EFFECTS ON ENDOGENOUS ANTIOXIDANT AND ANTI-INFLAMMATORY STATUS IN ALLOXAN INDUCED DIABETIC RATS

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ABSTRACT

Objectives*: Acacia jacquemontii* have many traditional therapeutic uses. Current study was designed to examine the role *of Acacia jacquemontii* ethyl acetate extract (AJEAE) in alloxan induced diabetes in rat model. **Methods**: In-vitro analysis performed that include characterization (HPLC), assessment of total phenolic and flavonoid content and antioxidant (DPPH) activity of the plant extract. In vivo study, animals were allocated into five groups NC, DC, GL, AJEAE 250mg/kg and AJEAE 500mg/kg. The effects of plant extract on fasting plasma glucose, plasma insulin and HOMA-IR were evaluated. Lipid profile, inflammatory cytokines and oxidative stress markers were also evaluated. **Results**: Our results confirmed the presence of certain phenols and flavonoids. Significant inhibition of DPPH was exhibited by AJEAE. After alloxan injection rats showed marked hyperglycemia, augmented inflammatory markers levels and elevated levels of lipid profile, oxidative stress markers were observed. Plant extract improved the above-mentioned parameters. Histopathological results also confirmed the hypoglycemic properties of AJEAE through regeneration of pancreatic β cells. **Conclusion**: Our findings verified the antihyperglycemic property of AJEAE.

Keywords: Diabetes mellitus, *Acacia jacquemontii,* α-amylase, superoxide dismutase, TNF-α, HDL

MODELISATION 2D OF RADIATIVE EXCHANGE IN POLAR BEAR FUR

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ABSTRACT

Animal life in the Arctic requires an ideal thermal insulation capacity to withstand strong winds and polar cold. Therefore, understanding the radiative exchanges in the fur of arctic mammals like polar bears, a powerful symbol of strength and endurance, will ease mastery of the mechanisms responsible for their good radiative insulation. For this purpose, a mathematical model was realized by assimilating the hairs composing the bear's coat to thin layers. Then a computer simulation under MATLAB was accomplished to quantify the temperature variation, as well as the energy flow between the external environment and the polar bear body, which are respectively at temperatures of -40°C and 37°C, through the hair.

In this study, two-dimensional structure, and arrangement of a set of (500 × 500) hairs, will be the idea of thermal protection for polar bear. By a significant number of simulated hairs, the polar bear developed an amazing heat retention capacity. The previous study succeeded in imitating this natural 2-scale microstructure. After an average number of thin layers, we minimized the radiative exchanges and canceled the heat losses. This developed model, with such thermal properties, will present a good insulation capacity, which allows reproducing the structure of polar bear's hair and to integrate it in real applications, to function as a thermal insulator adapted to maintain the heat, during the winter in a home

Keywords: Thermal insulation; Polar Bear; Modelization.

ROLE OF DIETARY ZEOLITE SUPPLEMENTATION ON OVERALL PERFORMANCE OF TILAPIA FINGERLINGS FED PLANT BY-PRODUCT BASED DIET

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ABSTRACT

This study was aimed to determine the effects of zeolite supplemented guar meal based test diets on growth parameters, nutrient digestibility and body composition of *Oreochromis niloticus* fingerlings. A total of 270 fingerlings (7.04±0.01 $gfish^{-1}$) were randomly distributed in six dietary groups in triplicates and fed on respective diets containing equal amount of guar meal and graded levels of zeolite *viz*. 0%, 1%, 1.5%, 2%, 2.5% and 3%. Fingerlings were fed at the rate of 4% of their live wet weight for the period of 60 days. Diet containing zeolite at 1.5% level showed statistically (P<0.05) significant improvement in weight gain (19 g), weight gain% (271%), feed conversion ratio (1.21), standard growth rate (1.40), improved protein (51.61%) and fat contents (16.3%) of body compared with the control and other test diets. Highest apparent digestibility coefficient of nutrients i.e., crude protein (CP) (69%), ether extract (EE) (77%) and gross energy (GE) (61%) was observed in fish fed on test diet having 1.5% zeolite level. These findings provide evidence of improved growth, nutrient digestibility and body composition of Nile tilapia fingerlings fed guar meal based diet.

Keywords: Natural zeolite, Nile tilapia, plant meal.

HIGHLY POROUS 3D Mn_xO_y/Al_2O_3 WOOD-DERIVED SORBENT for HOT COAL GAS DESULFURIZATION

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ABSTRACT
H_2S is a highly corrosive gas found in many situations, including hot coal gases. To ensure a clean environment and preserve the life of industrial equipment and metallic sorbents, this gas must be removed or reduced to sub-parts per million before usage. In order to achieve this, porous 3D Mn_xO_y/Al_2O_3 wood-derived sorbent prepared by the self-assembly in the treated persimmon wood channel sol-gel vacuum-assisted method and calcination at 700 °C. The performance tests were carried out in a fixed-bed reactor at 600-700 °C. The experimental results show the high breakthrough sulfur capacity (286.23 mg g^{-1}) and effective utilization (92.33%) at 700 °C reported as the best results on manganese-based sorbents recently. Fresh and used sorbents were characterized using H_2-TPR, BET, XRD, FT-IR, TG/DSC, UV-vis and SEM-EDS techniques. This study will provide a novel idea for using low-cost and environmentally friendly materials to fabricate favorable 3D Mn_xO_y/Al_2O_3 sorbents to remove H_2S from coal-derived gas at a high temperature.

Keywords: 3D Mn_xO_y/Al_2O_3 wood-derived sorbent; self-assembly; high sulfur capacity; porous; hydrogen sulfide.

1. Introduction
Hydrogen sulfide (H_2S) is a highly poisonous and corrosive gas that not only corrodes metallic equipment but also poses a threat to the environment and human health [1–3]. Meanwhile, environmental regulation has been implemented to minimize the sulfur content of fossil fuel-derived gas. It is critical to keep H_2S emissions below 100 ppmv in an integrated coal gasification combined cycle (IGCC) system [4–6]. The IGCC is one of the most promising methods for the advanced electric power generation via coal gasification, as it requires a critical clean stage for the treatment of H_2S and organic sulfides to avoid equipment corrosion and catalyst poisoning during the operation [7]. The low desulfurization process is a well-established method for removing H_2S from industrial processes [8]. However, the wet desulfurization process requires reducing the gas temperature before H_2S removal and then raising it again after H_2S removal, which reduces the overall operation's energy efficiency and results in the squandering of water resources [9]. When compared to the removal of H_2S at low temperatures, the high-

temperature desulfurization has drawn the attention of many researchers because it can effectively utilize all thermal efficiency [10,11].

Many resources have been committed to the development of metal oxides that can be utilized as sorbents to remove hydrogen sulfide at high temperatures, such as an oxide of (Zn, Cu, Fe, Mn, Mo, Co, Ca, etc.) [12,13]. With respect to these sorbents, Mn-based sorbents are given more consideration, owing to the high sulfur potential of manganese oxide and the highest initial reaction rate for hydrogen sulfide removal in the temperature range of 400-1000 °C [14]. The manganese sulfide produced can be fully recovered at 700 °C using a low concentrated N_2/O_2 mixture or steam [15].

A variety of support materials, including activated carbon, zeolites, mesoporous silica, Al_2O_3, TiO_2, and other oxides of metals [16,17], were used to prepare the manganese-based sorbents in order to improve desulfurization efficiency and stability. Alumina-supported manganese sorbent is the most effective of these support materials for sorbent performance [18].

Wood is an inexpensive natural tree resource that provides a wide range of well-oriented microfibers and water transport tracheids [19]. As previously stated, desulfurization is directly linked to the micro perspective and mesoporous channels where quick O/S exchange occurs in the desulfurization process after H_2S rapid diffusion velocity [20].

In the present work, we prepared a highly porous 3D Mn_xO_y/Al_2O_3 wood-derived sorbent for desulfurization using the sol-gel process and calcination at high temperature, an important sorbent component produced by the carbonized wood support. Nonetheless, the novelty of our work has properly proved the cooperation of micro-mesoporous and hierarchical micron channels of sorbent inherited wood for quick gas diffusion during hot coal gas desulfurization. The performance of these sorbents in desulfurization was examined using hot coal gas at 600-700 °C in a fixed-bed reactor. Brunauer Emmett and Teller (BET), Hydrogen temperature-programmed reduction (H_2-TPR), Environmental scanning electron microscopy (ESEM), Fourier-transform infrared spectroscopy (FT-IR), X-ray diffraction (XRD) and ultra-violet and visible spectroscopy (UV-vis) techniques used to the characterization of fresh, used sorbents. This work was intended to produce low-cost sorbents for extracting H_2S from hot coal gas with a potential strategy, outstanding activity, and good stability.

2. Experimental

2.1. Reagents

Ammonia solution (NH_3, 25%), manganese nitrate solution ($Mn(NO_3)_2$), and polyacrylic acid (PAA, M.W ~ 1000) were purchased. All chemical reagents were used without further purification.

2.2. Pretreatment of wood pieces

Dried waste persimmon wood was collected from nature and cut into pieces with suitable size 6 mm of thickness using a folding saw. Firstly, the clean pieces of wood were boiled in a suitable ammonia solution (4 wt%) for 5 h to extract lignin. In the following step, the handled pieces of wood were cleaned three times with distilled water and then with ethanol before being dried at 100 °C.

2.3. Preparation of sorbents

Mn_xO_y/Al_2O_3 sorbent is synthesized according to a report in the literature [20]. Briefly, $Mn(NO_3)_2$ solution (15.14 g), $Al(NO_3)_3 \cdot 9H_2O$ (5.6 g), and PAA (1.5 g) are dissolved in DW (20 mL). After adding

a few drops of HNO_3 (5 mol L^{-1}) to prepare the sol-gel, the mixture is continuously stirred for 1h. Next, the pretreated wood slices are immersed in the sol mentioned above and moved to a vacuum dry oven (100 °C) for 3 d for water evaporation. PAA chelators with active Mn ions are self-assembled in the wood multi-channels. Finally, after removing leftover precursors from the wood surface, the 3D Mn_xO_y/Al_2O_3 sorbent successfully replicated the hierarchical porous structure of wood during two hours of calcination in the air at 700 °C (0.5 °C min^{-1}).

2.4. Characterization

The N_2 adsorption isotherms of fresh and used 3D Mn_xO_y/Al_2O_3 sorbents were measured at 77 K using homemade equipment [21]. Prior to measurements, the sorbents were subjected to a 0.5-hour vacuum treatment at 150 °C. In order to calculate the specific surface area and pore volume, the adsorption isotherms were used along with the average pore diameter. Barrett, Joyner, and Halenda's approaches were used to compute the distribution curves of the pore size of the sorbents. The temperature-programmed reduction (H_2-TPR) of hydrogen in a household system was investigated utilizing gas chromatography (GC) in conjunction with a thermal conductivity detector (TCD) to measure the amount of hydrogen used during the process [4]. It was necessary to charge around 50 mg of sorbent into the U-shaped quartz tube reactor, which first cleaned the sorbents' surface at 150 °C for 30 minutes before cooling to ambient temperature. Afterward, the sorbent was heated at 10 °C min^{-1} in 5 vol% H_2/Ar(50 mL min^{-1}) a mixture to 850 °C, and the H_2 consumption signals were recorded. Wide-angle X-ray diffraction (XRD) patterns were obtained using a PANalytical Automatic Diffractometer with Ni-filtered Cu Ka radiation (k = 0.15406 nm) at 50 mA and 40 kV settings. The XRD data were collected for 2θ values ranging from 10° to 80° at a scan rate of 10° min^{-1}. Environmental scanning electron microscopy (ESEM) analysis was carried out on the cross section of sorbent particles using (FSM-5600LV) equipped with energy dispersive X-ray (EDS) technique. The Fourier transform infrared (FT-IR) absorption spectroscopy (with a BIO-RAD FTS 3000 spectrophotometer) was used to obtain information about surface groups at room temperature in the 400 to 4000 cm^{-1} range. After dispersing the sorbents in KBr pellets, they were examined. UV-vis spectroscopy was performed using $BaSO_4$ as reference material on a TU-1901 twin-beam ultraviolet-visible spectrophotometer in the wavelength range of 200-800 nm.

2.5. Desulfurization performance

The performance of 3D Mn_xO_y/Al_2O_3 sorbents for desulfurization of hot coal gas was investigated at atmospheric pressure and temperatures ranging from 600 to 700 °C in a fixed-bed reactor with an internal diameter of 8 mm and a length of 300 mm (Fig. 1). On the input stream gases, mass flow controllers (D08-4E, Beijing Sevenstar Flow Co., Ltd., China) were used to regulate the flow rates, which were 166.7 mL min^{-1}. The inlet stream gases were composed of 10.5 % H_2, 0.33 % H_2S, 18% CO and 71% N_2 (balance). During each experiment, a 0.25 g sample was loaded into a quartz reactor, and the reaction temperature was controlled by a k-type thermocouple. Initially, the sorbents were heated to the desired temperature at a rate of 10 °C min^{-1} in N_2, and then, for desulfurization, a simulated coal gas was fed into the reactor at a weight hourly space velocity (WHSV) of 40 × 10^3 mL h^{-1} g^{-1} was introduced into the reactor. The H_2S content in the inlet/outlet gas was determined by the iodometry titration method to obtain the H_2S breakthrough curve (limit concentration can be detected by this procedure is 50 mg m^{-3}).

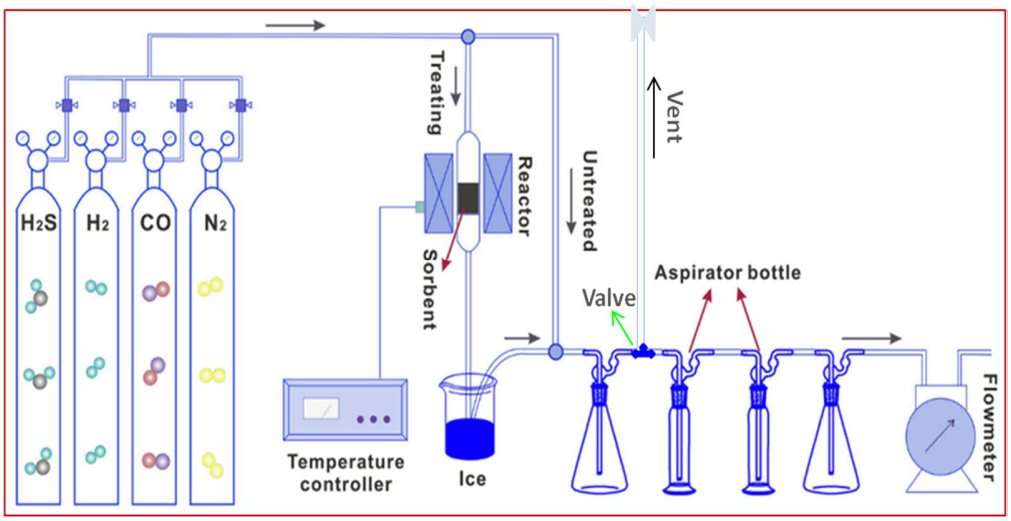


Figure. 1 Schematic diagram of hot coal gas desulfurization apparatus.

The breakthrough time was defined as the point at which the H_2S concentration in the outflow reached 50 mg m^{-3}, according to the study. The breakthrough sulfur capacity (*BSC*) is the amount of sulfur captured by the sorbent before the breakthrough time, which was determined using the equation. (1):

$$SC\left(\frac{mg\ of\ Sulfur}{g\ of\ sorbent}\right) = WHSV \times \frac{M_S}{V_m} \times \frac{22.4}{M_{H2S}} \left[\int_0^t (C_{in} - C_{out})dt\right] \times 10^{-4} \quad (1)$$

Where SC denotes the effective sulfur capacity of the sorbent (mg Sulfur/g sorbent), WHSV denotes the weight hour space velocity (L $h^{-1}g^{-1}$), Ms and M_{H2S} denote the molar weights of sulfur (32.06 $g^{-1}mol^{-1}$) and H_2S (34.06 $g^{-1}mol^{-1}$), respectively; Vm denotes the molar volume of H_2S at 1 atm pressure and 25 °C (24.5 $L^{-1}mol^{-1}$); Cin and Cout denote the input and outlet concentrations of H_2S (mg m^{-3}), respectively, while t (h) denotes the desulfurization reaction time.

The effective utilization (*EU*) of the sorbent is described as a ratio of breakthrough sulfur capacity (*BSC*) to theoretical sulfur capacity (*TSC*).

$$EU = \left(\frac{BSC}{TSC}\right) \times 100\% \quad (2)$$

3. Results and discussion:

3.1. Preparation of sorbents

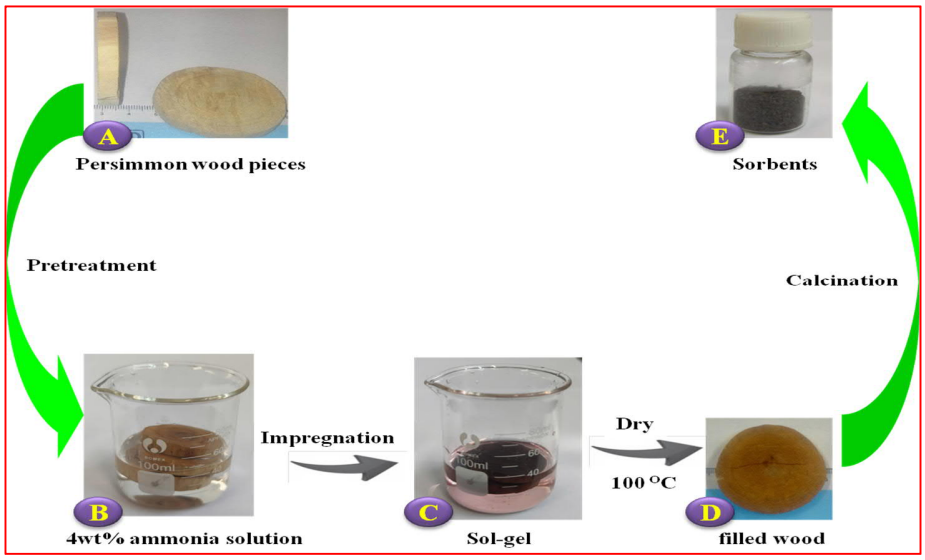


Figure. 2 The preparation process of persimmon wood-derived 3D Mn_xO_y/Al_2O_3 sorbents; natural persimmon wood piece (A) sawed-off, (B) NH_3-treated, (C) impregnation with Mn/Al sol as well as (D) filled wood and (E) final calcined sorbents.

The synthesis procedure of the 3D Mn_xO_y/Al_2O_3 sorbents is illustrated in Fig. 2. First, prepared the natural persimmon wood with a suitable size (cylindrical pieces 45-50mm in diameter, 5-6mm in the thickness along the growth direction (Fig. 2A); and then treated the pieces in the boiling 4%NH_3 solution to extract lignin inside (Fig. 2B). Fig. 2C and 2D show the impregnation step and filled wood pieces with Mn/Al sol-gel. Fig. 2E shows the final 3D Mn_xO_y/Al_2O_3 sorbents after being calcined at 700 °C.

3.2. Characterization of sorbents

3.2.1. N_2 adsorption isotherms of sorbents

Fig. 3 depicts the nitrogen (N_2) adsorption isotherms and pore size distribution over 3D $MnxOy/Al_2O_3$ sorbents that were both freshly prepared and used. The findings demonstrate that both fresh and used sorbents display the isotherm features of Type-II macroporous materials, as defined by the International Union of Pure and Applied Chemistry classification [22].

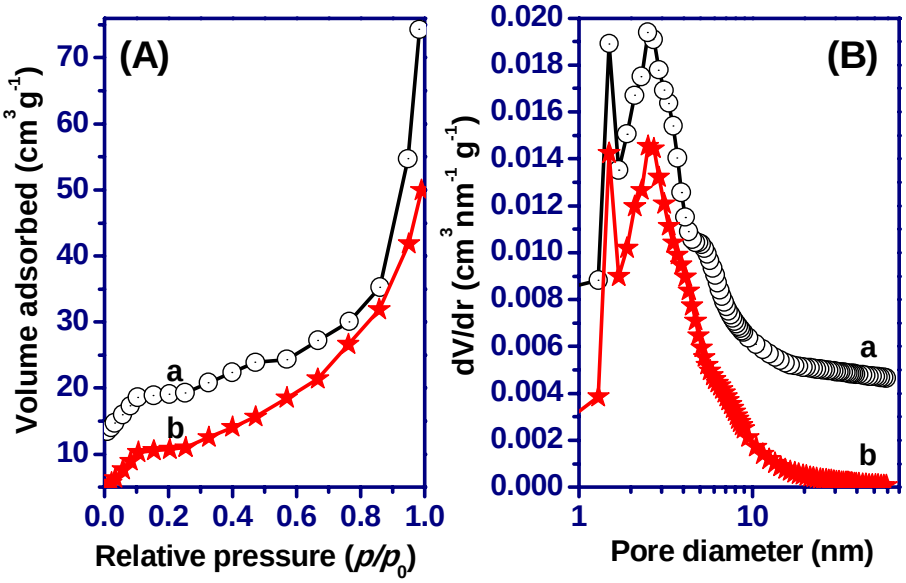


Figure. 3 (A) Nitrogen adsorption isotherms and (B) pore size distributions of the skeleton in (a) fresh 3D Mn_xO_y/Al_2O_3 and (b) used 3D Mn_xO_y/Al_2O_3 at 700 °C.

According to Fig. 3A, a steep inflection in the relative pressure (p/p_o) range (0.85-0.95) indicates the presence of a largely built micron channel in 3D Mn_xO_y/Al_2O_3 sorbents derived from persimmon wood. Fresh and used sorbents have similar hierarchical mesoporous pore size distributions of about 2 nm and 4 nm. The calculated values of the specific surface area (S_{BET}), total pore volume (V_T), average pore diameter (D_a), microporous volume (V_{mic}), and mesoporous volume (V_{meso}) of fresh and used 3D Mn_xO_y/Al_2O_3 sorbents content in Table 1. For the used sorbents, after desulfurization at (600 - 700 °C), the S_{BET} slightly decreased with a slight change in pore construction due to metals sulfides formation on the channel and surface of sorbents during oxygen/sulfur exchange.

Table 1 *Specific surface area (S_{BET}), total pore volumes (V_T), average pore diameter (D_a), mesoporous (V_{meso}) and microporous (V_{mic}) volumes of fresh and used 3D Mn_xO_y/Al_2O_3 sorbents.*

Samples	S_{BET} (m^2/g)	V_T (mm^3/g)	V_{mic} (mm^3/g)	V_{meso} (mm^3/g)	D_a (nm)
Fresh Mn_xO_y/Al_2O_3	38	60	13	47	6.3
Used Mn_xO_y/Al_2O_3 (600 °C)	31	50	10	40	6.4
Used Mn_xO_y/Al_2O_3 (650 °C)	33	51	7	44	6.1
Used Mn_xO_y/Al_2O_3 (700 °C)	32	51	7	44	6.2

3.2.2. H_2-TPR and Wide-angle X-ray diffraction (XRD) of sorbents

TPR is used to investigate the resistance-reduction efficiency of fresh sorbents in the presence of hydrogen gas (H_2), so it was necessary to understand the reduction behaviors of manganese oxides. The H_2-TPR profiles of fresh 3D Mn_xO_y/Al_2O_3 sorbents in Fig. 4A. It is shown that there were two reduction peaks, the weak reduction peak at about 342 °C was ascribed to reducing Mn_2O_3 to Mn_3O_4 ($3Mn_2O_3 + H_2 = 2Mn_3O_4 + H_2O$). While the strong reduction peak at around 567 °C was ascribed to the reduction of Mn_3O_4 to MnO ($Mn_3O_4 + H_2 = 3MnO + H_2O$), MnO cannot be reduced to elemental manganese in the reduced atmosphere at a temperature less than 1200 °C [23].

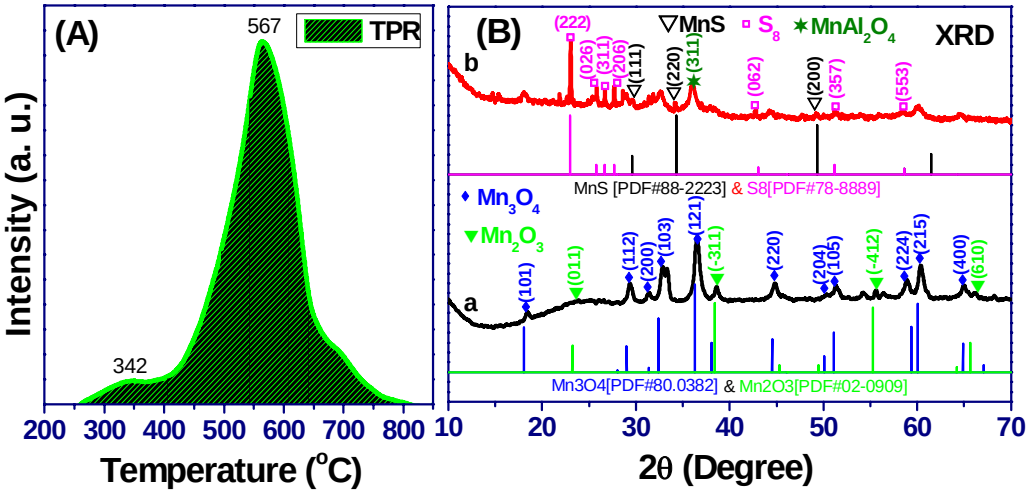


Figure. 4 (A) H_2-TPR and (B) Wide-angle XRD patterns profiles of (a) fresh 3D Mn_xO_y/Al_2O_3, (b) used 3D Mn_xO_y/Al_2O_3 sorbents.

Fig. 4B presented the wide-angle XRD patterns of fresh and used 3D Mn_xO_y/Al_2O_3 sorbents. For the fresh sorbents, the manganese oxides existed in the form of Mn_3O_4 [PDF#80.0382] and Mn_2O_3 [PDF#02-0909] phases. The diffraction peaks of Mn_3O_4 (2θ = 18°, 29°, 31°, 32°, 36°, 44°, 50°, 51°, 59°, 60°, 65°) and Mn_2O_3 (2θ = 23°, 38°, 55°, 66°) Fig. $4B_{(a)}$. After the desulfurization in hot coal gas at 700 °C, the diffraction peaks of Mn_3O_4 and Mn_2O_3 disappeared Fig. $4B_{(b)}$, in used 3D Mn_xO_y/Al_2O_3, which showed that the active manganese oxides phases completely reacted with H_2S and were converted into manganese sulfides and elemental sulfur. The used sorbents observed weak peaks at 2θ = 29.7°, 34.4°, and 49.2° were ascribed to the diffraction of MnS [PDF#88-2223], and peaks at 2θ = 23.1°, 25.8°, 26.8°, 27.7°, 42.8°, 51.3°, and 58.5° assigned to S_8 [PDF#78-8889], indicating that active manganese oxides react with H_2S to convert into manganese sulfides, as well as Mn_2O_3, react with H_2S to form S_8, in addition to $MnAl_2O_3$ peak appear at 36° [PDF#10.0310].

3.2.3. Environmental scanning electron microscopy (ESEM) and EDS of sorbents

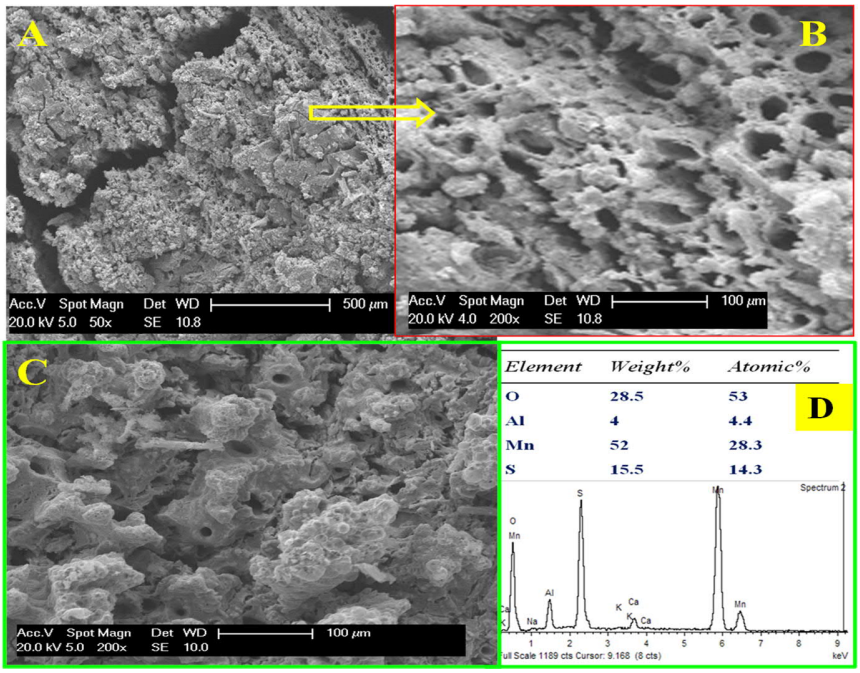


Figure. 5 Cross-section ESEM images of (A, B) fresh 3D Mn_xO_y/Al_2O_3, (C) used 3D Mn_xO_y/Al_2O_3, and (D) EDS spectrum analysis.

The cross-section ESEM images and EDS analysis of the fresh and used 3D Mn_xO_y/Al_2O_3 sorbents are shown in Fig. 5. It can be seen that the cross-section of fresh sorbents shows a large number of micro, meso-and macroporous (Fig. 5A and B). The morphology of used sorbent appeared a little different from the fresh sorbents, to indicate the formation of sulfides and elemental sulfur on the surface lead to part of micro and mesoporous covered by sulfur, but most macroporous still appeared overused images (Fig. 5C), indicating the high stability of persimmon wood-derived macroporous sorbent. The spectrum analysis of used 3D Mn_xO_y/Al_2O_3 sorbents demonstrated that the atomic percentages of O, Al, Mn, and S were 53, 4.4, 28.3, and 14.3%, respectively (Fig. 5D). The analysis results show a significant amount of sulfur, confirming the transformation of all manganese oxides to manganese sulfide and elemental sulfur through the S/O exchange process in hot coal gas and well agreement with XRD analysis (Fig. $4B_{(b)}$).

3.2.4. FT-IR and UV–vis diffuse reflectance spectra of samples

The FT-IR spectrum of fresh and used 3D Mn_xO_y/Al_2O_3 sorbent as well as Al_2O_3 was shown in Fig. 6A. The significant absorption peaks at 3438 cm^{-1} and 1630 cm^{-1} seen in all samples were caused by the stretching vibration of the hydroxyl groups (-OH) [24–26]. The weak peaks at 2928 cm^{-1} and 2848 cm-1 were attributed to the vibration of the C-H bond being stretched [27]. The peaks at 1418 cm^{-1} and 1130 cm^{-1} associated with Mn-O-Al groups shift slightly into a high vibration and become more intense in the used 3D Mn_xO_y/Al_2O_3, indicating the formation of $MnAl_2O_3$, which is corroborated by the XRD pattern of $MnAl_2O_3$ (Fig. 4B). The peak at 818 cm^{-1} due to the MnS phase in used 3D Mn_xO_y/Al_2O_3, while two significant peaks observed at 624 cm^{-1} and 522 cm^{-1}can be attributed to the asymmetry, blending, and

symmetry stretching vibrations of Mn-O bonds in the Mn_3O_4 and Mn_2O_3 phases, comparable to the earlier research [20,28]. In the meantime, the abroad beak in the range of (600-900 cm^{-1}) correlated to the Al-O vibration in Al_2O_3 (Fig. $6A_{(a)}$).

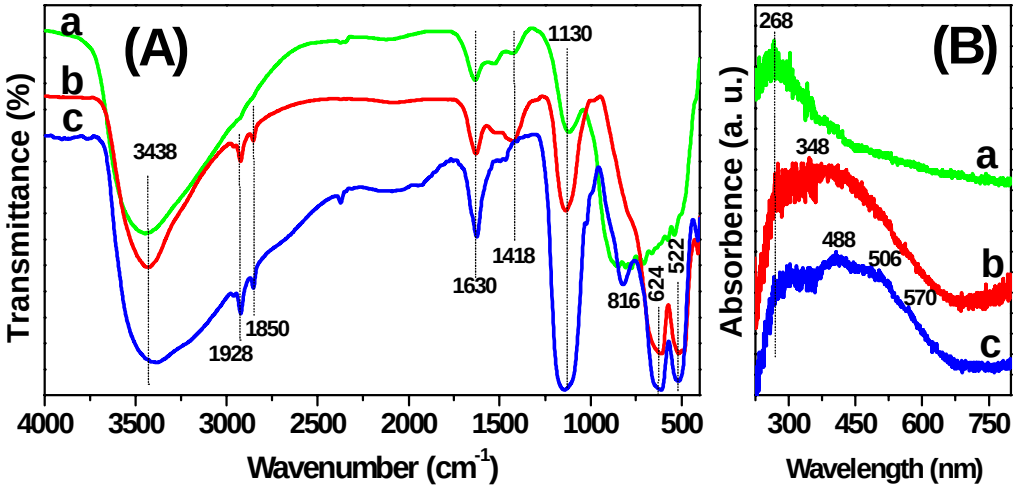


Figure. 6 (A) FT-IR and (B) UV-visible diffuse reflectance spectra profiles of (a) Al_2O_3; (b) fresh 3D Mn_xO_y/Al_2O_3; and (c) used 3D Mn_xO_y/Al_2O_3.

The characterization of the UV-vis spectrum was utilized to explore the valence states and chemical surroundings of active particles. As seen in Fig. 6B, all the samples absorbed main absorption bands at 268 nm is related to the charge transfers of $O^{2-}\rightarrow Mn^{2+}$ and $O^{2-}\rightarrow Mn^{3+}$ (or Al^{3+}) in Mn_3O_4/Al_2O_3. In the fresh 3D Mn_xO_y/Al_2O_3, a band of 348 nm was related with crystal field d-d transitions. After desulfurization (Fig $6B_{(c)}$), the absorption bands are assigned with 488 nm 506 nm and 570 nm ($^6A_{1g}\rightarrow{}^4T_{2g}$) in d-d transitions of Mn^{2+} (d^5) of octahedral or tetrahedral MnS crystal field [20].

3.3. Investigation on performance of sorbents

Fig. 7A illustrated the desulfurization performance of 3D Mn_xO_y/Al_2O_3 sorbent at different temperatures of 600 °C, 650 °C and 700 °C. The results indicate that the reaction temperature plays a critical role in the performance of sorbents.

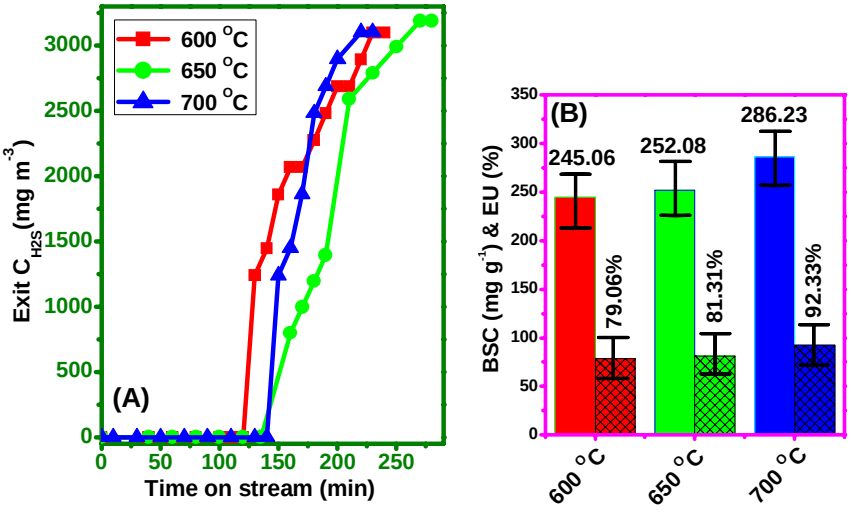
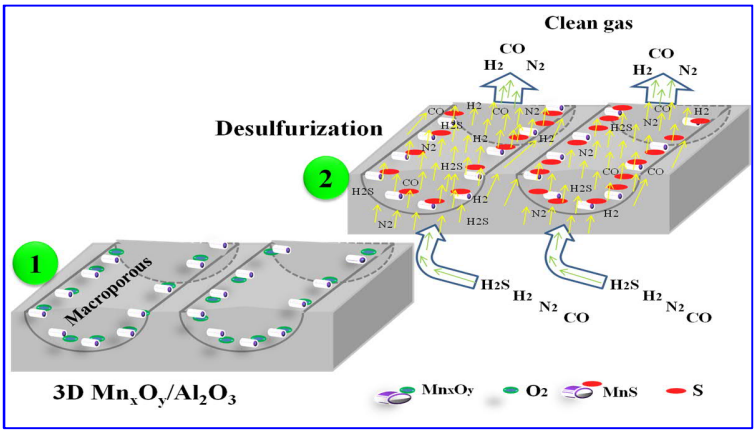


Figure. 7 *(A) Desulfurization behaviors over 3D Mn_xO_y/Al_2O_3 sorbent at different temperatures (600-700 °C), (B) Breakthrough sulfur capacity & Effective utilization (feed composition: 0.33% H_2S, 10.5% H_2, 18% CO, and N_2 balance gas).*

The deactivation rate after the breakthrough period is highly steep in all temperature ranges studied over 3D Mn_xO_y/Al_2O_3 sorbent. It is concluded that manganese oxide nanoparticles do not relatively affect the strong macroporous 3D structure of sorbent. The best efficiency for desulfurization was obtained at 700 °C with a maximum breakthrough sulfur capacity (*BSC*, 286.23 mg g^{-1}) and effective utilization (*EU*, 92.33%) reported as the best result on manganese-based sorbents recently (Fig. 7B). Because of the large porosity channels inherited from persimmon wood and the thin mesoporous manganese oxide wall, more active components are accessible on the outer surface, which is advantageous for loadings of additional species. Meanwhile, the hydrogen sulfide (H_2S) in the hot coal gas diffused swiftly and caused surface reaction not only in a porous channel but also on the outside of the pore (Scheme 1). When the reaction temperature decreases to 650 °C and 600 °C, the corresponding *BSC* decreased slightly (252.08 mg g^{-1}, 245.06 mg g^{-1}) compared to the *BSC* at 700 °C (286.23 mg g^{-1}) (Fig. 7B), which is significantly higher than those the *BSC* (52 mg g^{-1}) over 10%Zn-Mn/γ-Al_2O_3 [29] at 600 °C, and *BSC* (120 mg g^{-1}) over Ce-Mn_xO_y/Al_2O_3-La [30] at 850 °C. As a result, 700 °C was determined as the optimum reaction temperature in this study over 3D Mn_xO_y/Al_2O_3 sorbent for hot coal gas desulfurization.



Scheme 1. *Desulfurization mechanism over persimmon wood-derived porous 3D Mn_xO_y/Al_2O_3 sorbent.*

4. Conclusion

In this research work, highly porous sorbent proposed for hot gas desulfurization, 3D Mn_xO_y/Al_2O_3 wood-derived sorbent prepared by the self-assembly in the pretreated persimmon wood channel sol-gel vacuum-assisted method, and experimentally evaluated in a fixed-bed reactor at the temperature ranges of 600-700 °C. This wood-derived self-assembly architecture facilitates successful interaction between H_2S on Mn_3O_4 and the accelerated exchange rate of S/O. The H_2-TPR, XRD, BET, FT-IR, UV-vis, and ESEM-EDS techniques were employed to characterize the physical and chemical properties and find the detailed structure of sorbents, which provided a novel idea for using low-cost and environmentally friendly materials to fabricate favorable 3D Mn_xO_y/Al_2O_3 sorbents for H_2S removal from hot coal gas.

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THE IMPORTANCE OF (Q) SEISMIC QUALITY PARAMETER IN SEISMIC REFLECTION DATA-PROCESSING APPLICATIONS

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ABSTRACT

As seismic waves travel through the ground, they suffer energy losses. Measuring seismic energy losses is very important in terms of data quality. Therefore, improving data quality is the main goal. Various methods have been developed to estimate the damping (Q-Seismic Quality Factor) value in seismic reflection studies. These methods; time-distance (t-x) and zero-offset time-slowness (τ-p) environments. This situation increases the importance of the subject.

A lot of research has been done on seismic absorption at the ground surface and in the laboratory environment. In these studies, very important information has been obtained about the behavior and mechanism of seismic absorption in the ground. Estimation of seismic damping and quality factor is very important especially in oil and other hydrocarbon exploration. During these searches, it provides important information about the petrophysical parameters used in reservoir classification such as gas saturation and hydrocarbon viscosity (Winkler ve Nur, 1982; Behura ve ark., 2007; Reine ve ark., 2012b). As it is known, the damping factor is affected by the cracks of the rocks, the compressibility of these cracks, the friction of the grain boundaries, the type of fluid in the pores and the fluid saturation (Dvorkin et al., 1995; Pride et al., 2004; Quintal et al., 2012). Therefore, high absorption (Q) anomaly values show a quality spread. But limestone and igneous rock (non-porous medium) also mean low energy loss. On the other hand, in porous media with low damping (Q) anomaly value, waves lose high energy while propagating (O'Connell and Budiansky, 1978; Toverud and Ursin, 2005, Wilkie and Gibson, 1995). As it is known, although the square root of the seismic wave energy propagating in a medium is directly proportional to its amplitude, it is inversely proportional to the square of the radius of the dissemination sphere (Yilmaz, 2001; Liner, 2004).

In this case, the simplest representation of the absorption coefficient (α) for a plane wave with a single frequency value is expressed by the following formula.

$$A(x) = A_0 e^{-\alpha x} \qquad (1)$$

In this formula, absorption can be expressed as damping and dispersion for frequency- independent Q (Futterman, 1962). Where x is the travel distance; A is the final amplitude measured; A_0 is the initial amplitude; α is the absorption coefficient. Filtering data is very important in seismic data-processing work. Geophone intervals and seismic source distance should be well determined in the field study. In this case, very thin layers may not be seen in the velocity analysis. Usually, this thin layer merges with

the other layer. If there are many velocity-depth models in the velocity analysis study, the most appropriate model should be determined. Geological knowledge of the land is needed for the selection of the most suitable model. Because only the data-processing phase is relevant to the model. It is known that different models vary for Q measurement. Therefore, the layer should not be too thin in the measurement of Q due to the relationship of Q to travel time. Ray tracing method is used to obtain velocity models (Jacob, 1970; Julian, 1970). Since angle of incidence and offset are used as functions of depth / time with this method, it is necessary to know which layer the signal passed through during its travel and by which receiver it was recorded.

After the velocity model is obtained by the seismic reflection data-processing study, the Seismic Quality Factor (Q) can be measured from the offset-pair determined by the ray-tracing method, employing the spectral ratio method. When there is more than one velocity model, that is, the Fresnel Zone can be calculated to decide the effect on the offset-pair selection for the uncertainties arising from the velocity models. In the case of the measurement of Q values is negative, it can be said that this may be due to the 'tuning effect.' Because thin layers cause such an effect, it is understood that high-frequency sources should be used. The fact that the seismic quality factor is minimal is another evidence of high attenuation. This case may be that the layer is fractured and soft cracked. On the other hand, in the case of the Q value being high, it is understood that the attenuation in the media is low, and it has a high velocity. In this paper, the difference between Q measurements made in the t-x and the t-p domain was investigated theoretically. Accordingly, since the velocity model is needed in case the Q value is measured in the t-x domain, the ray-tracing method, which is an angle-dependent method, is used when determining the offset pair. However, when the t-p transform is applied, it is seen that this angular effect disappears, and the offset-pair required to measure Q from the direct velocity values (slowness) seen in the seismic image is fallen the same p (slowness) trace. In this study, it is stated that by making a theoretical approach to determine the Q parameter, the Q value on the seismic data can assist in making robust seismic interpretations.

Keywords: Seismic Reflection, Seismic Data-Processing, Seismic Quality Factor

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SİSMİK YANSIMA YÖNTEMİNDE Q-SİSMİK KALİTE FAKTÖRÜNÜN ÖNEMİ

ÖZET

Sismik dalgaların seyahatleri sırasında ki enerji kayıplarının ölçülmesi, verinin kalitesinin artırılması açısından oldukça önemlidir. Bu nedende sismik yansıma çalışmalarında sönümleme (Q-Sismik Kalite Faktörü) değerinin tahmin edilmesine yönelik t-x ve τ-p ortamlarında yapılan yaklaşımlar konunun önemini daha da artırmaktadır. Öte yandan yer yüzeyinden veya laboratuvar ortamında yapılan çalışmalardan, soğurmanın yer içindeki davranışı ve mekanizması hakkında önemli ipuçları elde edilmektedir. Sismik yansıma veri-işlem çalışması ile elde edilen hız modeli sonrası ışın izleme metodu ile belirlenen ofset çiftinden spektral oran yöntemi kullanılarak "Q" ölçülebilmektedir. Birden fazla hız modeli olduğunda bu modellerin offset çifti seçimi üzerindeki etkisine karar vermek için Fresnel Zonu hesaplanabilmektedir. Ölçülen Q değerinin negatif çıkması durumunda ise bunun tuning etkisinden olabileceği söylenebilir. Çünkü ince tabakalar böyle bir etkiye neden olacağından her zaman yüksek frekanslı kaynakların kullanılması gerektiği anlaşılmaktadır. Sismik kalite faktörünün çok küçük çıkması da sönümlenmenin fazla olduğunun bir başka delilidir. Buna neden olarak da tabakanın çatlaklı ya da

çok yumuşak oluşu gösterilebilir. Öte yandan Q değerinin büyük olması durumunda ise, tabakadaki sönümlenmenin az olduğu ve yüksek hıza sahip olduğu anlaşılmaktadır. Bu çalışmada, t-x ve $\tau - \rho$ ortamlarında yapılan Q ölçümleri arasındaki farklar teorik olarak incelenmiştir. Buna göre Q değeri ölçümünün t-x ortamında yapılması durumunda hız modeline ihtiyaç olduğundan, ofset çifti belirlenirken açıya bağlı bir yöntem olan ışın izleme metodu kullanılmaktadır. Oysa, $\tau - \rho$ dönüşümü yapıldığında, bu açısal etkinin ortadan kalktığı ve sismik kesitte görülen direkt hız değerlerinden Q' yu ölçmek için gerekli olan ofset çiftinin bu ortamda alt alta yer aldığı görülmektedir. Bu çalışmada Q parametresinin tespit edilmesine yönelik teorik bir yaklaşım yapılarak sismik veri üzerinde Q değerinin daha sağlıklı sismik yorumlamalar yapılmasına yardımcı olduğu ifade edilmektedir.

Anahtar Kelimeler: Sismik Yansıma, Sismik Veri-İşlem, Sismik Kalite Faktörü

ABSTRACT

Measuring the energy decays during the propagation of seismic energy waves is highly important in increasing the data quality. For this reason, the approaches applied in t-x and t-p domains to estimate the attenuation (Q- Seismic Quality Factor) value in seismic reflection studies increase the importance of the study further. On the other hand, critical clues about the behavior and mechanism of absorption in the ground are obtained from the previous studies carried out on the subsurface survey or in the laboratory experiment. After the velocity model is obtained by the seismic reflection data-processing study, the Seismic Quality Factor (Q) can be measured from the offset-pair determined by the ray-tracing method, employing the spectral ratio method. When there is more than one velocity model, that is, the Fresnel Zone can be calculated to decide the effect on the offset-pair selection for the uncertainties arising from the velocity models. In the case of the measurement of Q values is negative, it can be said that this may be due to the 'tuning effect.' Because thin layers cause such an effect, it is understood that high-frequency sources should be used. The fact that the seismic quality factor is minimal is another evidence of high attenuation. This case may be that the layer is fractured and soft cracked. On the other hand, in the case of the Q value being high, it is understood that the attenuation in the media is low, and it has a high velocity. In this paper, the difference between Q measurements made in the t-x and the t-p domain was investigated theoretically. Accordingly, since the velocity model is needed in case the Q value is measured in the t-x domain, the ray-tracing method, which is an angle-dependent method, is used when determining the offset pair. However, when the t-p transform is applied, it is seen that this angular effect disappears, and the offset-pair required to measure Q from the direct velocity values (slowness) seen in the seismic image is fallen the same p (slowness) trace. In this study, it is stated that by making a theoretical approach to determine the Q parameter, the Q value on the seismic data can assist in making robust seismic interpretations.

Keywords: Seismic Reflection, Seismic Data-Processing, Seismic Quality Factor

GİRİŞ

Jeofizik arama yöntemleri arasında önemli bir yere sahip olan sismik prospeksiyon çalışmaları sırasında sismik dalgalarda meydana gelen enerji kayıplarının ölçülmesi veri kalitesi açısından çok önemlidir (Wang, 2002, Castagna ve ark., 2003). Sismik dalgalardaki sönümleme ve kalite faktörünün tahmin

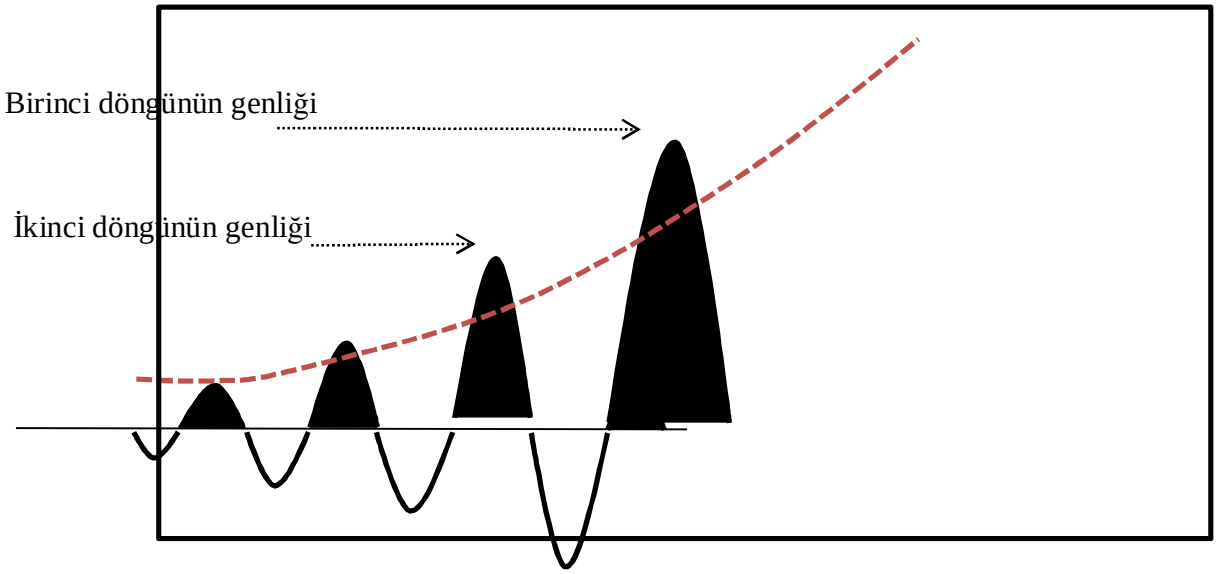
edilmesi özellikle petrol ve diğer hidrokarbon aramaları sırasında gaz doygunluğu ve hidrokarbon viskositesi gibi rezervuar sınıflandırılması için kullanılan petrofiziksel parametreler hakkında önemli bilgiler vermektedir (Winkler ve Nur, 1982; Behura ve ark., 2007; Reine ve ark., 2012b). Bilindiği üzere sönümlenme faktörü kayaçların kırıkları ve bu çatlakların sıkışabilirliği, dane sınırlarının sürtünmesi, gözeneklerde ki sıvı türü ile sıvı doygunluğundan etkilenmektedir (Dvorkin ve ark., 1995; Pride ve ark., 2004; Quintal ve ark., 2012). Bu nedenle yüksek soğurma (Q) anomali değerleri kaliteli bir yayılım gösterirken (kireçtaşı ve magmatik kaya-gözeneksiz ortam) aynı zamanda düşük enerji kaybı anlamına da gelmektedir (Futterman, 1962; Knopoff, 1964). Eğer Q değeri düşük anomali değerine sahipse (konsolide olmayan malzemeler-gözenekli ortam) bu durumda dalganın yayılırken yüksek enerji kaybı meydana geldiğini ifade etmektedir (O'Connell ve Budiansky, 1978; Toverud ve Ursin, 2005, Wilkie ve Gibson, 1995). Önceki bilimsel çalışmalar, kuyu sismolojisi (borehole seismology) (Ganley ve Kanasewich 1980; Tonn 1991) ve laboratuvar ölçümleri (Frisillo ve Stewart, 1980; Winkler ve Nur, 1982; Khazanehdari ve ark., 1998) kullanılarak yapılmasına rağmen, son yıllarda Q değerini belirlemek için sismik yansıma ve kırılma yöntemlerinden yararlanılmaktadır (Dasgupta ve Clark, 1998; Socco ve ark., 2005; Reine ve ark., 2009; Reine ve ark., 2012b). Ülkemizde sismik kalite faktörü ve atenüasyon alanında sınırlı sayıda çalışmalar yapılmıştır (Akinci ve Eyidoğan, 2000; Horosan ve ark., 2004). Yüzeye yakın sedimanların özellikleri ve yer hareketinin anlaşılmasında da hız ve kalite faktörünün belirlenmesi özellikle zemin araştırmaları için önemli bir değere sahiptir (Wang ve ark., 2016). Bu sayede zeminlerin sismik dalgalara olan etkileri (Abercrombie, 1997) ve depremlerle oluşan yer hareketlerinin tahmini ve etkilerinin araştırılması konularında önemli bilgiler elde edilmektedir (Wang ve ark., 2016). Bu çalışmada sismik dalga yayılımındaki soğurulmanın ve kalite faktörünün belirlenmesinin yöntemleri ve önemi tartışılacaktır.

Sismik Dalgaların Soğurulması (Atenüasyon) ve Sismik Kalite Faktörü (Q)

Kaynaktan yayılan sismik enerji uzaklığa bağlı olarak geometrik yayılma, ısıya dönüşüm ve absorbsiyon gibi nedenlerle kayıplara uğrar (Liner, 2004). Bu enerji kayıpları ise yansıma ve kırılmaların neden olduğu soğurulma, tekrarlı yansımalar (Multiples) ve dalga modlarının girişimi gibi fiziksel olaylar şeklinde karşımıza çıkmaktadır. Bir ortamda yayılan dalga enerjisinin karekökü ile genliği doğru orantılı olmasına rağmen yayınım küresinin yarıçapının karesi ile ise ters orantılıdır (Yılmaz, 2001; Liner, 2004). Sabit tek bir frekansa sahip düzlem dalga için, soğurma katsayısının (absorption coefficient) (α) en basit gösterimi, frekanstan bağımsız Q için sönümlenme ve dispersiyonu şeklinde ifade edilebilir (Futterman, 1962)

$$A(x) = A_0 e^{-\alpha x} \qquad (1)$$

Burada x, seyahat uzaklığını; A, ölçülen final genliği; A_0, başlangıçtaki genliği; α is soğurma katsayısını ifade eder.



Şekil.1. Sönümlenmenin logaritmik olarak azalımı.

Dalga yayılımı sırasında sönümleme Şekil-1'de görüldüğü gibi logaritmik olarak gerçekleşir ve Denklem-1'deki gibi gösterilebilir:

$$\delta = log_e \left[\frac{1.Döngünün\ genliği}{2.Döngünün\ genliği}\right] \qquad (2)$$

Buna göre, kalite faktörü (Q) ile Soğurma (α) arasındaki ilişki ters orantılı olup aşağıdaki bağıntı ile ifade edilmektedir;

$$\alpha = \frac{\pi f}{VQ} \qquad (3)$$

Bu denklem ile soğurmanın, dalga frekansına (f), ortamın elastik dalga hızına (v) ve ortamın kalite faktörüne (Q veya Q^{-1}) bağlı olduğu anlaşılmaktadır.

Sismik Yansıma Veri-İşlem Çalışmasında Sismik Kalite Faktörü ve Etkileri

Sismik veriye f-k (frekans-dalga sayısı) filtresi uygulandığında yapay sismik olaylar da oluşmaması için f-k poligon sınırlarını doğru belirlenmesi oldukça önemlidir. Öte yandan, Jeofon aralıkları ile sismik kaynak uzaklığı iyi belirlenmediği durumda yapılan hız analizinde çok ince tabakalar görülemeyip diğer tabaka ile birleşebilmektedir. Hız analizinde birden fazla hız-derinlik modeli varsa burada hangi modelin uygun olduğu jeoloji ile desteklenmelidir. Çünkü sadece veri işlem aşaması modele dayalı bir süreç olup farklı modellerin Q ölçümü için farklılık gösterdiği bilinmektedir. Bu nedenle, Q' nun seyahat zamanı ile ilişkisi nedeniyle Q ölçümünde tabaka çok ince olmamalıdır. Uygulamada hız modellerinin elde edilmesinde (tabaka ara hızları ve kalınlıkları) ışın izleme yöntemi kullanılmaktadır (Jacob, 1970; Julian, 1970). Bu yöntemle geliş açısı (angle of incidence) ve ofset, derinlik / zamanın fonksiyonu olarak kullanıldığından, sinyalin seyahati boyunca hangi tabakadan geçtiği ve hangi alıcı tarafından kaydedildiğinin bilinmesi gerekir.

Sismik Kalite Faktörünün Hesaplanması

Sismik kalite faktörünün (Q) hesaplanmasında; Zaman-uzaklık (t-x) ortamında spektral oran yöntemi ile sıfır atış zamanı-yavaşlık (τ-ρ) (zero-offset time-slowness) ortamında Q hesaplama yöntemleri kullanılmaktadır.

Spektral Oran Yöntemi

Q‘ nun hesaplanmasında en yaygın olarak kullanılan bu yöntemde (Bath, 1974), sadece içsel ve saçılmanın sebep olduğu sönümlemenin yanı sıra toplam soğurmanın belirlenmesi için de kullanılmaktadır (Denklem-4).

$$\frac{1}{Q_{Toplam}} = \frac{1}{Q_{içsel}} + \frac{1}{Q_{saçılma}} \qquad (4)$$

Burada Q_{toplam} toplam sönümleme, $Q_{içsel}$ içsel soğurma ve $Q_{saçılma}$, ise saçılma soğurmasıdır. Frekanstan bağımsız olarak spektral oran yöntemi ile Q değerinin ölçülmesi için gereken temel denklem aşağıdaki gibidir.

$$A_1(x) = A_0 e^{-\frac{\pi f}{V Q}x} \qquad (5)$$

Bu denklem kullanılarak sönümlenmiş ve sönümlenmemiş dalgacık spektrumunun genlik oranının logaritması ile frekansın doğrusal bir fonksiyonu elde edilir (Tonn, 1991; Gusmeroli ve ark., 2010).

$$\ln\left(\frac{A_1}{A_0}\right) = -\frac{\pi f}{Qv}x + c \qquad (6)$$

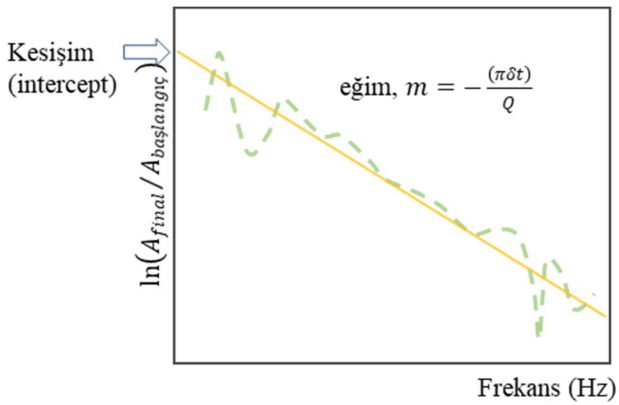
Burada c (ln(GR)) frekanstan bağımsız olan tüm parametreleri ifade etmektedir. Şekil-2’de görüldüğü üzere spektral oran ile frekans eksenlerinde kesişim (intercept) bütün frekanstan bağımsız terimleri yakalamaktadır (G-geometrik yayılma faktörü ve R-yansıma katsayısı). Bu yöntemde ofset eşleşmesini belirlemek için ışın izleme yöntemi kullanıldığından, bu iki terimin (G ve R) bilinmesine gerek yoktur (Bath, 1974; Jacobson ve ark., 1981).

$$m = -\frac{(\pi \delta t)}{Q} \qquad (7)$$

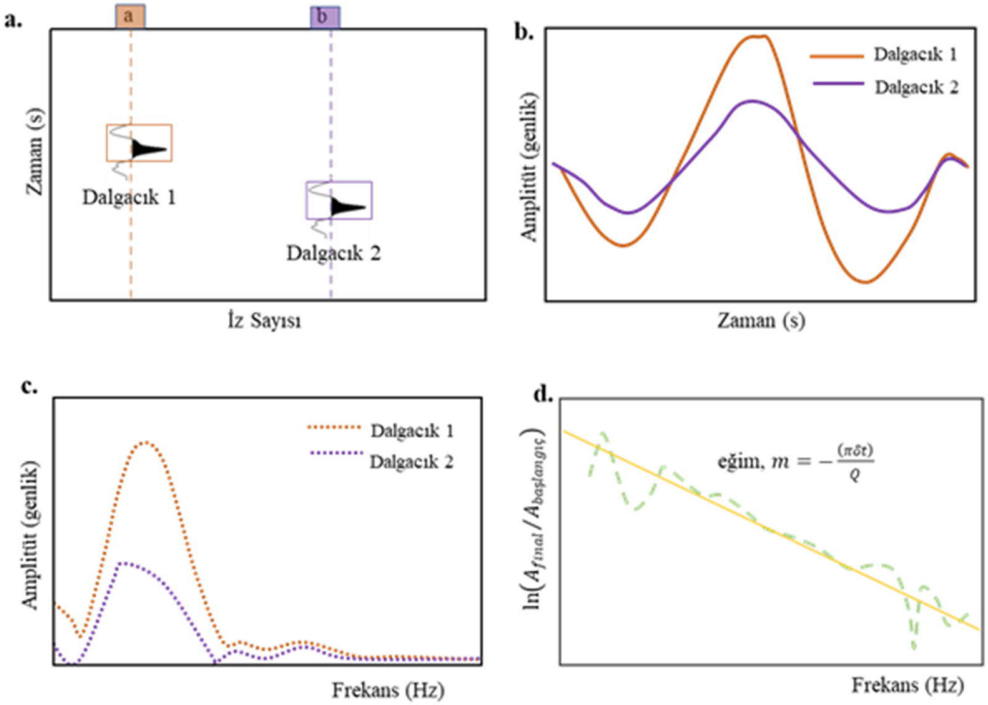
Bu denklemde m, lineer regresyon doğrusunun eğimini, δt ise jeofon çiftleri (ofset eşleşmesi) arasındaki seyahat süresi arasındaki farkı ifade etmektedir.

Zaman-Uzaklık (t-x) Ortamında Q Ölçümü

Burada ışın izleme yöntemi kullanılarak ölçülmek istenen tabakalarda ki seyahat edecek dalganın ofset çifti belirlenir (Şekil-3a). Daha sonra zaman-amplitüd eğrisi Şekil-3b’ de görüldüğü gibi olan dalgacıklara uygun pencere seçilerek Fourier dönüşümü uygulanır. Fourier dönüşümü ile frekans ortamına (Şekil-4.3c) aktarılan verinin Q ölçümü ise, Şekil-4.3d’de ki görüldüğü gibi gerçekleştirilir. Buradan iki dalgaya ait genlik değerinin logaritmik oranının frekansa göre çizimindeki doğrunun eğiminden Q değeri hesaplanabilmektedir.



Şekil 2. Spektral oranla frekans eksenlerinde kesişim (intercept) bütün frekanstan bağımsız terimleri (G ve R) yakalar.



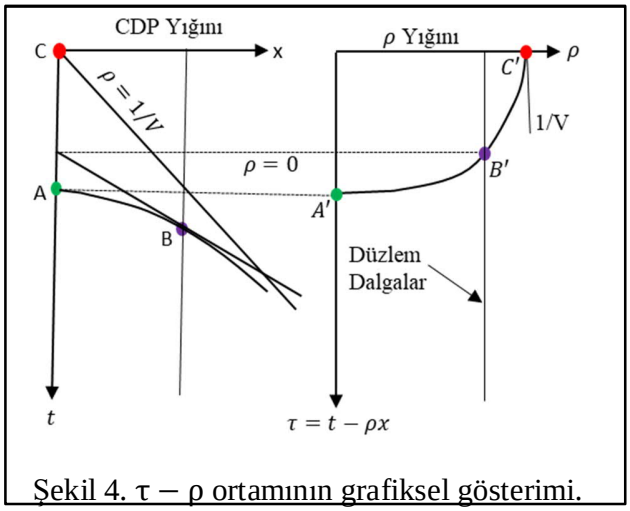
Şekil 3. a- İncelenecek ofset çiftleri, b- Pencerelenen dalgaların zaman ortamında görünümü, c- Dalgaların frekans ortamındaki görünümü, d- Spektral oranın logaritması ile frekans grafiğine ait doğrunun eğiminden Q değerinin hesaplanması.

τ − ρ (Zero-offset time-Slowness) Ortamında Q Ölçümü

Küresel yayılım gösteren sismik dalganın CDP kaydında bu dalganın düzlem dalga, bileşenlerine ayrıldığı görülür. Bu durum, ofset (x) eksenini ışın parametresi olarak bilinen (ρ) yani zero-offset time eksenine dönüştürür (Şekil-4). Bu işlem sonucunda elde edilen çok sayıda ρ değerini veren izlerin

oluşturduğu gruba "τ- ρ grubu (τ- ρ gather)" adı verilir (Selçuk, 2018). Arazide veri toplama esnasında kaydedilen küresel dalga alanından düzlem dalga alanına geçişte bir alıcı konum seçilerek atış ekseni boyunca toplama yapılır (Dondurur, 2009). T- ρ grubundaki her bir iz, düşeyden belirli bir açıyla yayılan bir düzlem dalgaya karşılık gelmektedir (Şekil-4). ρ değişkeni "ışın parametresi " olmak üzere, Snell kanununa göre;

$$\frac{\sin\theta_1}{V_1} = \frac{\sin\theta_2}{V_2} = \rho \qquad (8)$$



Şekil 4. $\tau - \rho$ ortamının grafiksel gösterimi.

Denklem-8' de $(\sin(\theta)/V_1)$ ışın seyahat süresi boyunca sabittir. Farklı atış noktaları arasındaki mesafeye Δx, V' ye ortalama hız ve düşeyden dalganın yayınım açısını da θ olarak alırsak ardışık atışlar arasındaki zaman farkı;

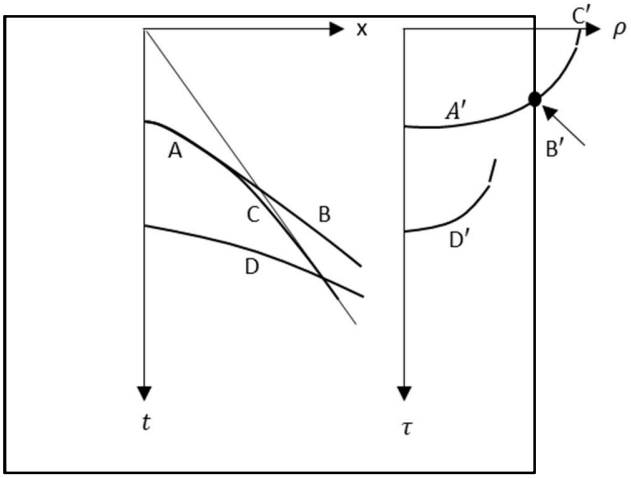
$$\Delta t = \Delta x \left(\frac{\sin\theta}{V}\right) = \rho\, \Delta x \qquad (9)$$

şekline dönüşür. Denklem-9' dan, düzlem dalga yayınım açısının ρ değeri tarafından kontrol edildiği anlaşılmaktadır. Burada ρ = 0 olması durumunda düşey olarak yayılan bir düzlem dalgaya karşılık geldiği görülür. Dolayısıyla verilen hız modeli ve ρ değeri için bir ışın demeti çizilebilir. Bu şekilde tabakalı ortamda ilerleyen düzlem dalga 'Snell dalgası' olarak bilinir (Çiftçi, 2009; Dondurur, 2009).

$$\tau = t_0 - \rho x \qquad (10)$$

Kısaca, t-x ortamından kesişme zaman ortamına (τ; t_0 zamanı) (Diebold and Stoffa, 1981) geçiş sağlanabilir (ρ; yaklaşık 1/V, yavaşlık) (Brysk and McCowan, 1986). Burada denklem, t-x ile $\tau - \rho$ arasındaki ilişkiyi göstermektedir (Durrani ve Bisset, 1984; Trad ve ark., 2003; Liu ve ark., 2004). Şekil-4 ve Şekil-5' da görüldüğü gibi, t-x ortamındaki eğimler $\tau - \rho$ ortamında farklı ρ değerlerini ifade etmektedir. Doğru boyunca etkin enerjiler toplandığından t ekseni ile kesişim noktası yani x = 0 kesişim

zamanı olan τ' yu vermektedir. Burada önemli olan t-x ortamındaki doğruların yani kırılma olayının τ − ρ ortamında noktaya karşılık geldiğinin bilinmesi ve yansıma olaylarının ise elips şeklinde görülmesidir (Şekil- 4 ve Şekil-5).



Şekil 5. t-x ortamından τ − ρ ortamına geçişin grafiksel gösterimi (Çiftçi, 2009).

Şekil-5'da A ve C yansımanın bir bölümünü, D yansımayı, B ise doğru parçasını (post-refraction) göstermektedir. τ − ρ ortamında Q değeri ölçülebildiğinden, açısal etki ortadan kalkmakta ve ayrıca hız modeline de ihtiyaç bulunmamaktadır (Reine *et al*., 2012b). Eğer kesişme zamanı (τ; $t_0$zamanı) ve yavaşlılık (ρ) grafiği çizilirse sabit yatay yavaşlık izleri görülebilmektedir (Şekil-5). Bir ortamda yanal olarak homojen hız ve sönümleme dikkate alınırsa, τ − ρ ortamında aynı ışın yolundaki yansımalar için spektral oran hesaplanabilir (Reine *et al.*, 2012b). Kısaca tüm gerekli olaylar aynı kalkış açısında (take-off angle) aynı geliş açısını kullanarak (incident angle) aynı iz üzerine düşerler. Dolayısıyla aynı yavaşlık ve farklı ofset, kaynak ve alıcı yönlülüğüne (directivity) olan ihtiyacı ortadan kaldırmaktadır (Reine *et al*., 2012b).

TARTIŞMA VE SONUÇ

Bu çalışma, sismik yansıma uygulamaları için Sismik Kalite Faktörü değerinin tahmin edilmesine yönelik uygulamaları içermektedir. Bu amaçla sönümlemenin sismik arazi verilerine olan etkilerinin değerlendirilmesi ve yorumlanmasına yönelik teorik yaklaşımlar yapılmıştır. Uygulamada öncelikle sismik veri işlem sırasında elde edilen hız modeli ile ışın izleme metodu kullanılarak uygun ofset çifti seçilmelidir. Birden fazla hız modeli olması durumunda ise, modellerin Q' yu ölçmedeki etkileri Fresnel Zonu hesaplanarak belirlenebilmektedir. Önemli olan hız analizi yaparken güçlü sinyalleri (yansımaları) veren hızları seçebilmektir. Ölçülen Q değerleri negatif, pozitif, çok küçük ya da büyük çıkabilir. Sonucun negatif çıkması durumunda bu olayın fiziksel olmadığı ve eğer tabaka çok ince ise örneğin tuning etkisinden kaynaklanabileceği düşünülmektedir Böyle durumlarda yeniden arazi çalışmasına ihtiyaç olacağından yüksek frekanslı kaynak kullanmak gerekir. Sismik kalite faktörünün çok küçük çıkması da sönümlenmenin fazla olduğunu gösterir. Buna neden olarak da tabakanın çatlaklı ya da çok yumuşak oluşu gösterilebilir. Q değerinin büyük olması durumunda ise, tabakadaki sönümlenmenin az olduğu ve yüksek hıza sahip olduğu anlaşılmaktadır.

Bir diğer önemli konu ise, pencere büyüklüğü ve Q'nun ölçüleceği bant genişliğidir. Pencere büyüklüğü deneme-yanılma yöntemiyle bulunabilir. Veriler genelde gürültü içerdiğinden pencere büyüklüğü

arttıkça ana sinyalden ziyade gürültü içeren kısım ölçülmekte ve istenilen sonuçlara ulaşılamamaktadır. Pencere büyüklüğünün çok küçük olması durumunda ise sorun olan periyot değerinden daha küçük olan sinyal kısmı incelenmekte bu da yanlış sonuca neden olmaktadır. Öte yandan spektral oran metodu, seçilen bant aralığındaki oranı verdiğinden bu durumun sönümlenmenin frekansa bağlı olduğunu göstermektedir. Her iki durumda karar vermek için doğrusal trendin R^2 değerinin 1'e yakın olması yardımcı olabilmekte. Q değeri ölçümü t-x ortamında yapıldığında hız modeline sahip olunmalıdır. Çünkü, ofset çifti belirlerken açıya bağlı bir metot olan ışın izleme metoduna ihtiyaç bulunmaktadır. Eğer, $\tau - \rho$ dönüşümü yapılırsa, bu açısal etki ortadan kalkacak ve kesitte direkt hız değerleri görünerek Q' yu ölçmek için gerekli olan çift bu ortamda alt alta yer alacaktır.

Bu çalışmada, t-x ve $\tau - \rho$ ortamlarında yapılan Q ölçümleri arasındaki farkların tartışması açıkça yapılmıştır. Bundan sonraki çalışmalarda ise amacımız, gerçek veri üzerinde uygulamasını yaparak Q değerinin alan etkisi üzerindeki etkilerini değerlendirmek ve sağlıklı yorumlamalar yapılmasına katkı sağlamaktır.

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APPLICATION OF MULTIPLE ELECTRODE ARRAY IN ANCIENT CITY LAUBRANDA

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ABSTRACT

The ancient city of Labranda (Laubranda), 14 km northeast of Muğla-Milas, is an important cult center for the Carians on the mountains and is one of the ancient cities established as a sanctuary. The archaeologial excavations in Laubranda started in 1948 and continue for the period. These are important structures that have been excavated on the surface bu archaeological excavations in this ancient city; Temple of Zeus, Water Supply of Zeus, Priest Houses, Eastern Bath, Religious Bath Hall and City Walls. Moussollos (BC. 377-354) and his brother İdrieus (BC. 351-344), who gave the Labranda Ancient City its heyday in the 4th century BC, turned Labraunda into a family sanctuary. Thus, the people of Karia made it traditional to celebrate religious holidays that lasted for 5 days every year in the sanctuary. Moussollos had a series of monumental structures built in the city, including an artificial terrace, an entrance building, a monumental staircase, two banquet halls, a porch, a stoa, and a columned Zeus temple. In the Hellenistic period, which coincided with the 3rd-1st centuries AD, only a fountain structure was built, the North Stoa was rebuilt in the 1-2 centuries AD, and 2 baths and a few more buildings were added. In the 4th century AD, with the conversion of the local people to Christianity, a Byzantine Church was built near the East Propylon, but again in the 4th century AD, the sanctuary ceased to be a cult place due to a great fire. Today, the remains of the 8 m wide holy road that stretches all the way to Milas have been preserved in a few places.

This work; in the Laubranda was built to shed light on the continuity of the structures unearthed on the ground and the possibility of new structures in the areas that have not been opened yet. For this reason, the resistivity (electrical resistivity) measurements were taken at twenty-one different locations at the three different locations in the ancient city and the data were interpreted and the underground modeling was performed. Therefore, in three different locations in the ancient city, a total of twenty-one lines of resistivity (electrical resistivity) was measured and the data were interpreted and ground modeling was performed. Electrical (resistive) tomography (ERT) is the most widely used method in archaeological studies. In this method, the apparent resistivity difference between the buried structure and the surrounding soil is quite successful in detecting walls, building foundations and caves (Neubauer, W and Eder-Hinterleitner., 2004; Gaffney et.al., 2004). Various electrode opening systems such as Wenner, Schlumberger, Dipole-dipole, Pole-pole are used in the application of this method (Clark, 1996; Walker, R., Somers, L., 1994; Tsokas, G.N., Hansen, R.O., 2000; Lopez-Loera et.al., 2000; Kıs, K.I., Puszta, S,, 2006). In recent years, very successful results have been obtained with the application of 2D and 3D

inversion techniques to the data taken in the field (K.I., Puszta, S., 2006; Carr, 1982; Sarris, A., Jones, R., 2000; Barker, 1981; Karavul et al. 2010). In order to apply this method, the working areas were gridded at 1 m intervals and measurements were taken with the ARES-GF multi-channel resistivity device. Electrical (resistive) tomography (ERT) is the most widely used method in archaeological studies. In this method, the apparent resistivity difference between the buried structure and the surrounding soil is quite successful in detecting walls, building foundations and caves (Neubauer, W and Eder-Hinterleitner., 2004; Gaffney et.al., 2004). Wenner electrode array was used in the field application of the electric method. 2D vertical sections were created with the help of the RESDIN2V program from the electrical resistivity data obtained from the inverse solution method. Thus, depth floor maps were prepared from 2D vertical sections.

When the resistivity studies carried out in 3 different regions of the ancient city of Labrauanda are evaluated;

In the first study area; It is understood that regions A, B and C between 1.74-2.5 m depths are the remains of archaeological structures. The D and E regions, on the other hand, are 1.74 m high and cannot be seen at this depth. Accordingly, it is understood that area C is a closed and hollow room measuring 8 x 4 x 2,5 m. Similarly, area B is thought to be a 10 x 4 x 3,37 m room, like zone C, a closed and hollow room. Resistivity values between 55 and 3368 ohm-m were obtained at depths of 0.5 - 4.38 m in the second study area. In this area, regions A, B and C with higher resistivity than the geological unit have been identified. However, since the objects in this region are not in a geometrical structure and are in a scattered state, it is thought that they are stone fragments broken off from ancient structures. Archaeological sites can be viewed as multi-layered by inversion of electrical resistivity data. From here, the general architectural structure and location can be obtained quite successfully. Thus, the importance of such researches made before the archaeological excavation was once again understood.

Keywords: Ancient city of Laubranda, Archeogeophysics, Resistivity

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LABRAUANDA ANTIK KENTINDE JEOFIZIK-REZISTIVITE ARAŞTIRMASI

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ÖZET
Labranda (Laubranda) antik kenti, Muğla- Milas'ın 14 km. kuzeydoğusunda, dağların üstünde, Karialılar için önemli bir kült merkezi olup, kutsal alan olarak kurulmuş antik kentlerden biridir. Labranda'da ki arkeolojik kazılar, 1948 yılında başlamış olup dönem dönem devam etmektedir. Bu Antik Kentte; Zeus Tapınağı, Zeus su kaynağı, Rahip Evleri, Doğu Hamamı, Dinsel Yıkanma Salonu ve Surlar arkeolojik kazılarla yer yüzeyine çıkarılmış önemli yapılardır. Bu çalışma; Labranda yer yüzeyine çıkarılmış yapıların devamlılığına ve henüz açma yapılmamış alanlarda yeni yapıların olma ihtimaline ışık tutmak için yapılmıştır. Bu sebeple antik kentte üç farklı lokasyonda toplam yirmi bir profil olmak üzere rezisivite (elektrik özdirenç) ölçümleri alınmış olup, elde edilen veriler yorumlanarak yer altı modellemesi yapılmıştır.

Anahtar kelimeler: Labraunda Antik Kenti, Arkeojeofizik, Rezistivite

GEOPHYSICAL-RESISTIVITY SURVEY IN THE ANCIENT CITY OF LABRAUANDA

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The ancient city of Labranda (Laubranda), 14 km northeast of Mugla-Milas, is an important cult center for the Carians on the mountains and is one of the ancient cities established as a sanctuary. Tha archaeologial excavations in Laubranda started in 1948 and continue for the period. These are important structures that have been excavated on the surface bu archaeological excavations in this ancient city; Temple of Zeus, Water Supply of Zeus, Priest Houses, Eastern Bath, Religious Bath Hall and City Walls. This work; in the Laubranda was built to shed light on the continuity of the structures unearthed on the ground and the possibility of new structures in the areas that have not been opened yet. For this reason, the resistivity (electrical resistivity) measurements were taken at twenty one different locations at the

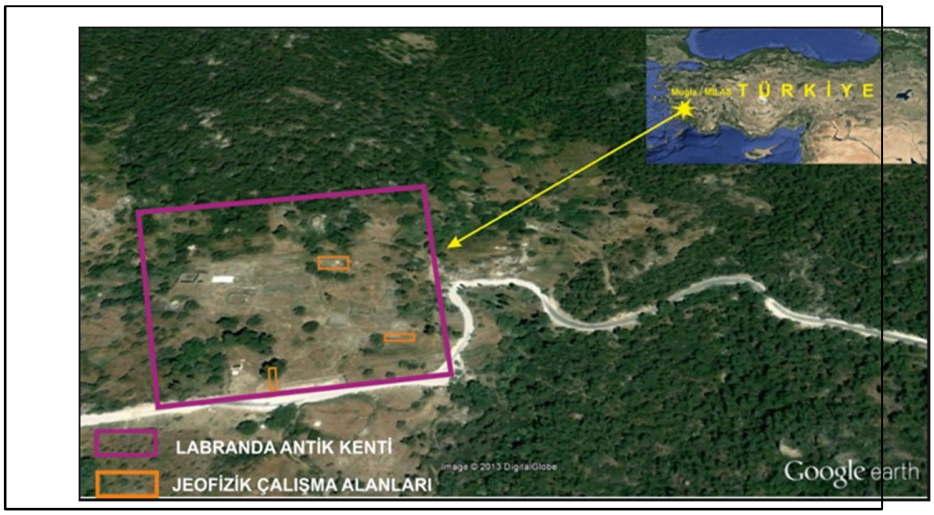
three different locations in the ancient city and the data were interpreted and the underground modeling was performed. Therefore, in three different locations in the ancient city, a total of twenty-one lines of resistivity (electrical resistivity) was measured and the data were interpreted and ground modeling was performed.

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1.GİRİŞ

Antik çağda Karyalılar için oldukça önemli kült bir merkez olan Labranda Antik Kenti'ne MÖ 4. yüzyılda en parlak dönemini yaşatan Maria ve kardeşi Alex Labraunda'yı bir aile kutsal alanı haline getirmiştir. İmparator Moussollos, kentte suni teras, giriş binası, anıtsal merdiven, iki ziyafet salonu, sundurmalı yapı, stoa ve etrafı sütunlu Zeus tapınağı olmak üzere bir dizi anıtsal yapı inşa ettirmiştir. MS 4.yüzyılda ise, yöre halkının Hıristiyanlığı kabul etmesi ile Doğu Propylon yakınında bir Bizans Kilisesi yapıldıysa da yine MS 4. yüzyılda meydana gelen büyük bir yangınla kutsal alan kült yeri olmaktan çıkmıştır. Antik kente ait kalıntıların ortaya çıkarılması için bölgede 1948 yılından bu yana arkeolojik kazılar devam etmektedir. Antik kente ait yerleşim alanının çok büyük olması nedeniyle çalışmaların uzun yıllar devam edeceği öngörülmektedir. Bu tür antik kentlerin gün yüzüne çıkarılmasında en önemli sorun kazıların çok uzun sürmesidir. Böylece kazı maliyeti de artmaktadır. Ancak kazı öncesi yapılan jeofizik uygulamalar ile gömülü yapıların derinliği, şekli ve konumu kısa sürede ve zarar vermeden kolaylıkla belirlenebilmektedir. Bu nedenle arkeolojik kazılarda jeofizik yöntemler çoğunlukla tercih edilmektedir. Labrauanda da yapılan kazılarda; Zeus Tapınağı, Zeus su kaynağı, Rahip Evleri, Doğu Hamamı, Dini Hamamlar ve Surlar arkeolojik kazılar sırasında ortaya çıkarılan önemli yapılardır.

Kazı alanında uygulanan jeofizik-rezistivite yönteminin amacı, zemin seviyesinde ölçüm yaparak yeraltındaki direnç değişimi değerlendirmeyi amaçlar. Rezistivite yöntemi büyük bir jeoloji mühendisliği ve arkeolojik problemlerin çözümünde başarı ile uygulanmaktadır. Arkeolojik alanların özdirenç araştırmasında Wenner ve Schlumberger konfigürasyonları gibi bir dizi elektrot dizisi kullanılmaktadır.

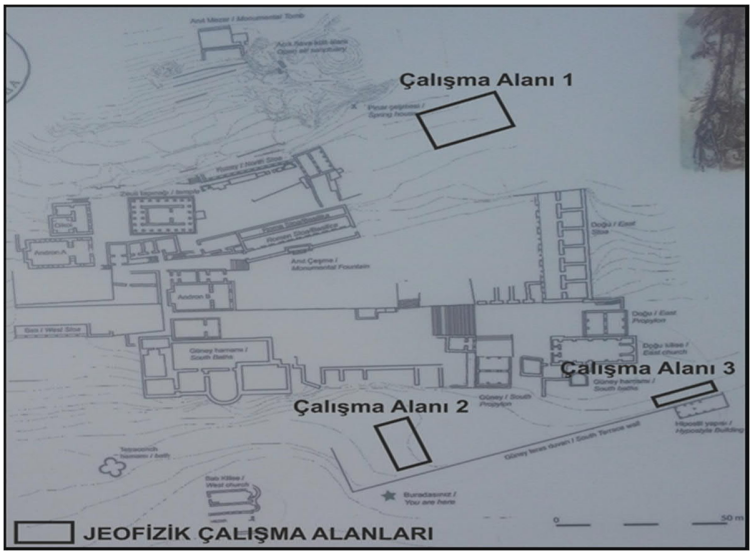


Şekil-1 Çalışma Alanı Yer bulduru Haritası

Labraunda Antik Kenti, Ülkemizin Ege bölgesinde yer alan ve Muğla iline bağlı Milas-Ortaköy' de bulunmaktadır (Şekil-1). Labraunda Antik Kentinde ki arama jeofiziği çalışmalarına 2013 yılında başlanmıştır. Bu amaçla 3 adet çalışma alanında elektrik (rezistivite) yöntemi uygulanmıştır. Rezistivite uygulamasında çalışma alanları 1 m. aralıklarla karelere bölünerek ARES GF marka çok kanallı rezistivite cihazı ile ölçüler alınmıştır. Elektrik (rezistivite) tomografisi (ERT), uygulaması ile gömülü yapı ve çevresindeki toprak arasında belirgin özdirenç farkı duvarların, yapı temellerinin ve mağaraların tespit edilmesinde oldukça başarılıdır. Uygulamada Wenner, Schlumberger, Dipol-dipol, Pole-pole gibi çeşitli elektrot açma sistemleri kullanılmaktadır. Elde edilen verilere 2D ve 3D ters çözüm (inversion) tekniklerinin uygulanması ile oldukça başarılı sonuçlar elde edilmiştir (K.I., Puszta, S., 2006; Carr, 1982; Sarris, A., Jones, R., 2000; Barker,1981; Karavul et al. 2010).

2. LABRAUNDA ANTİK KENTİ'NDE JEOFİZİK REZİSTİVİTE YÖNTEMİ UYGULANMALARI

Labraunda Antik Kenti, Milas ilçesi Ortaköy'e bağlı Çamlıyurt 'un batısında (Çomak dağ eteklerinde) bulunmaktadır. Araştırma alanında 3 farklı kesimde jeofizik çalışmalar yapılmıştır (Şekil-2).

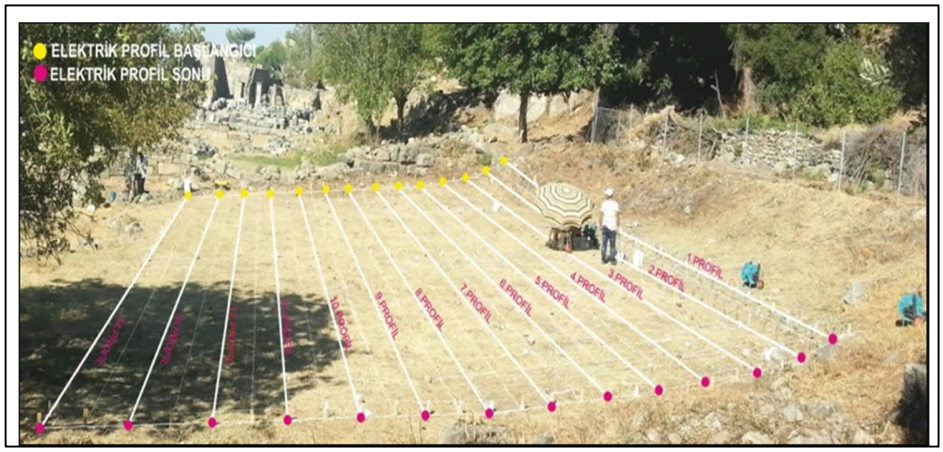


Şekil-2 Çalışma alanı ve Labraunda Antik Kenti Krokisi.

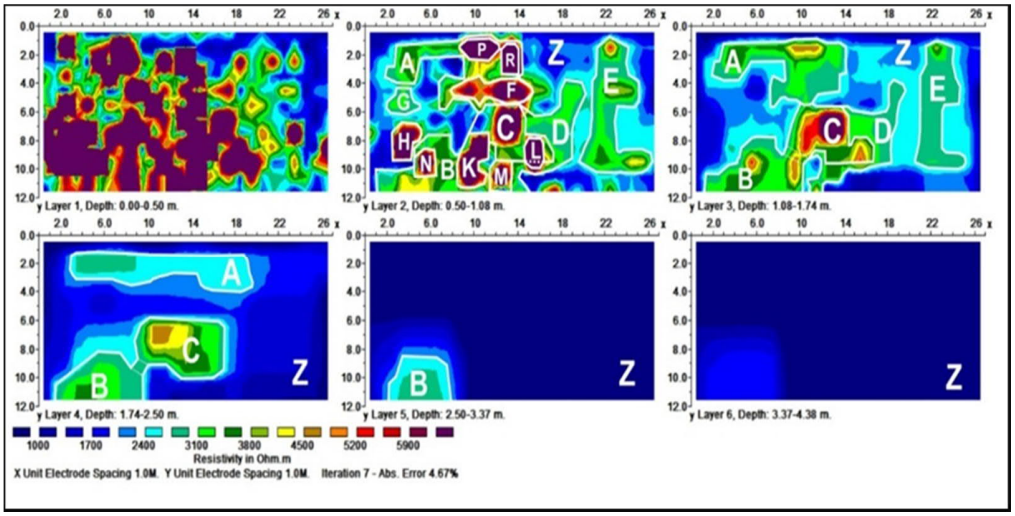
Bu amaçla elektrik yöntemin arazide ki uygulamasında Wenner elektrot dizilimi kullanılmıştır. Profiller ve elektrotlar arasındaki uzaklık 1'er metre olarak seçilmiştir. Elde edilen verilere daha sonra ters çözüm teknikleri uygulanmıştır. Sonrasında ise RESDIN2V programı yardımıyla 2D düşey kesitler oluşturularak derinlik kat haritaları hazırlanmıştır. Jeofizik yöntemlerin uygulandığı 3 farklı alan aşağıdaki bölümlerde ayrıntılı olarak anlatılmıştır.

2.1. Jeofizik-Rezistivite Yönteminin Arazi Uygulamaları Yorumlanması

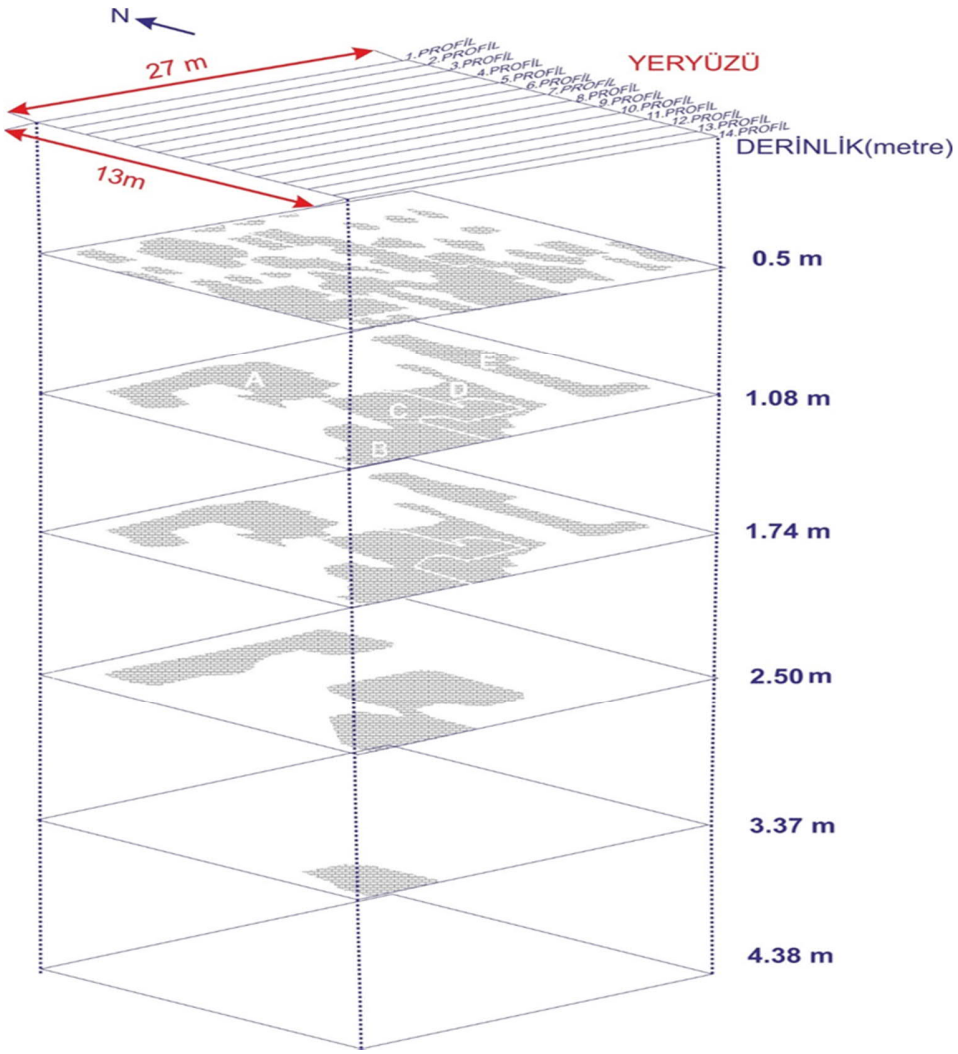
Jeofizik-rezistivite yönteminin uygulandığı birinci çalışma alan, Labraunda Antik Kenti'nin içindeki Zeus Tapınağının yaklaşık 150 metre batısında bulunmaktadır (Şekil-2). Bu kesimde 14 adet doğu-batı doğrultulu jeofizik rezistivite profilleri alınmıştır. 351 m2'lik bir alanda profil ve elektrot aralıkları 1'er metre olarak ölçüler alınmıştır (Şekil-3).



Şekil-3 Birinci Çalışma Alanında Oluşturulan Elektrik Profiller



Şekil-4 Birinci Çalışma Alanından Elde Edilen Farklı derinliklere Ait Üstten Görünüş Haritaları.



Şekil-5 Yeraltında Gömülü Olduğu Düşünülen Arkeolojik Yapının Derinliğe Göre Dağılımı

RESDIN2V ve RESDIN3V programları ile yerin 0,5-4,38 m derinlikleri arasındaki seviyelerden elektrik özdirenç görüntüleri elde edilmiştir. RESDIN3V programından elde edilen üstten görünüş haritaları Şekil-4'da verilmiştir. Bu amaçla Şekil-5'de görüldüğü gibi 0-0.50 m, 0.50-1.08 m, 1,08-1,74 m, 1,74-2,50 m, 2,50-3,37 m ve 3,37-4,38 m derinliklerde kat haritaları oluşturulmuştur. Ölçülen özdirenç değerleri 109 ohm-m ile 49669 ohm-m arasında değişmektedir. Arazi çalışmalarına ait alandaki jeolojik birimin elektrik özdirenç değerinin 109-2400 ohm-m arasında olduğu düşünülmektedir. A, B, C, D, E, G, H, L ve M olarak adlandırılan alanlar, özdirenç değerleri jeolojik birimden (gnays) çok daha yüksek olan alanlardır (Şekil-4). 0,5-1,08 m ve 1,08-1,74 m derinlikler arasındaki üstten görünüm haritalarında A, B, C, D ve E olarak adlandırılan alanların dağılımı geometrik bir şekil oluşturduğundan, bu alanlar bir arkeolojik yapının temel parçalarını temsil ettiği anlaşılmaktadır.

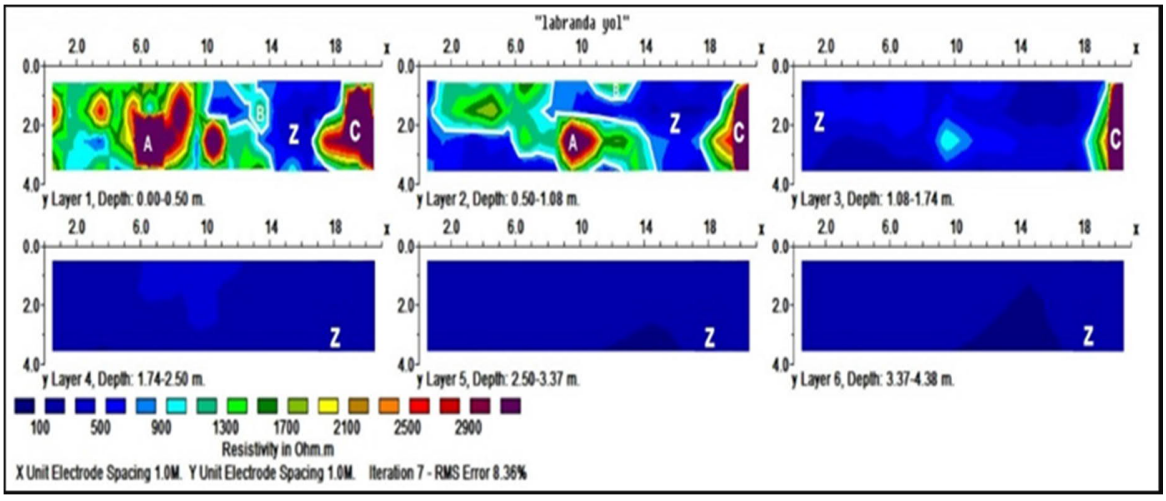
Şekil-4'te RESDIN3V programı ile oluşturulan üstten görünüm haritaları dikkate alındığında, 0-0,5 m derinliklerde jeolojik birime göre daha yüksek özdirençli bu alanlar oldukça karmaşıktır. Öte yandan, G, H, K ve M alanları sonraki derinlik haritasında (1,08-1,74 m) görülmemektedir. C ve B yapı parçalarının özdirenç değerleri diğer arkeolojik yapı parçalarına göre daha yüksektir. C alanı x ekseninde 8 m, y

ekseninde 4 m ve z ekseninde 2,5 m uzunluğa sahip olduğundan, bu yapı üst yüzeyi kapalı bir odadır. Şekil-4 incelendiğinde B alanının x ekseninde 10 m, y ekseninde 4 m uzunluğunda ve 3,37 m yüksekliğinde üst yüzeyi kapalı bir oda olduğu düşünülebilir.

Jeofizik-rezistivite yönteminin uygulandığı ikinci çalışma alanı antik kentin güneyindeki hamamın yaklaşık 50 metre güneydoğusunda bulunmaktadır (Şekil-2). Bu kesimde 84 m^2'' lik bir alanda kuzey-güney doğrultulu, elektrot ve profil aralıkları 1'er metre olacak şekilde 5 adet rezistivite ölçüsü alınmıştır. Şekil-7'de ki kesitler incelendiğinde, 0-0,50 m, 0,50-1,08 m, 1,08- 1,74 m, 1,74-2,50 m, 2,50-3,37 m ve 3,37-4,38 m derinliklere ait özdirenç değerlerinin 55 ohm-m ile 3368 ohm-m arasında değiştiği görülmektedir.



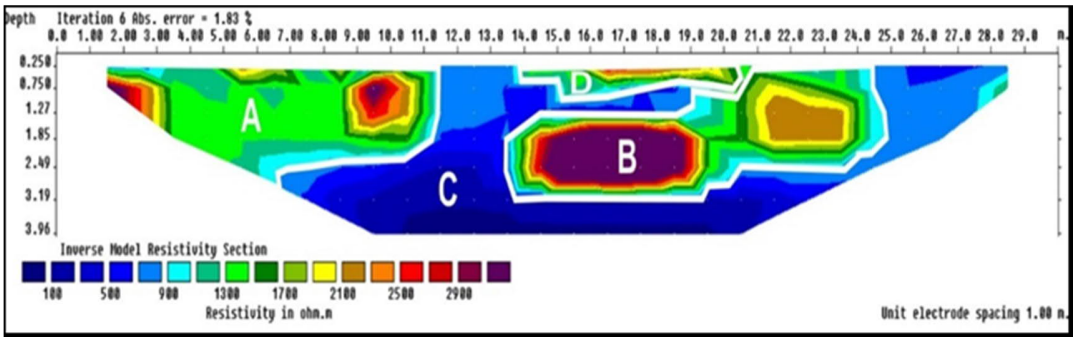
Şekil-6 İkinci Çalışma Alanında Oluşturulan Elektrik Profiller



Şekil-7 İkinci Çalışma Alanından Elde Edilen Farklı derinliklere Ait Üstten Görünüş Haritaları

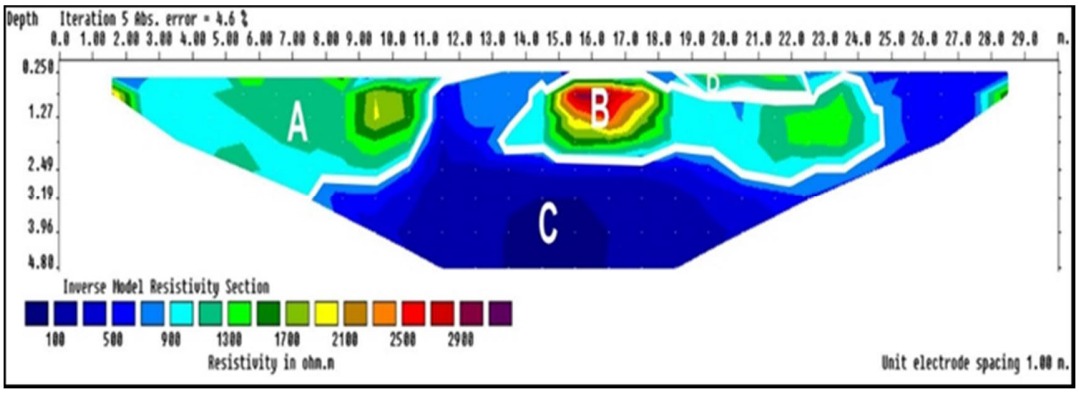
Bu kesime ait jeolojik birimin elektrik özdirencinin 100-900 ohm-m arasında olduğu anlaşılmaktadır. Bu bölgede Z alanı alüvyon zemini temsil etmektedir. Burada da A, B ve C olarak isimlendirilen kısımların özdirenç değerleri jeolojik birim olan gnaysdan daha yüksektir (Şekil-7). Ayrıca, A, B ve C alanlarının

çalışma alanının yakınında bulunan antik yapılara ait taş parçaları olduğu düşünülmektedir.
Jeofizik-rezistivite yönteminin uygulandığı üçüncü bölge ise Labraunda Antik Kentine ait Hipostil yapısının birkaç metre kuzeyindedir (Şekil-2). Bu alanda ise sadece doğu-batı doğrultulu 2 profil ile elektrik özdirenç ölçüsü alınmıştır. Toplamda 30 m' lik bir alanda yapılan ölçme işleminde elektrot ve profil aralıkları 1'er metre olarak seçilmiştir. RESDIN2V programından elde edilen düşey kesitlerde elektrik özdirenç değerlerinin 100 ohm-m ile 2900 ohm-m arasında değiştiği görülmektedir (Şekil-8 ve Şekil-9).



Şekil-8 Üçüncü Çalışma Alanından Elde Edilen Birinci Profil Düşey

Üçüncü bölgedeki jeolojik birimin elektrik özdirenci ise 100-900 ohm-m arasında değişmektedir. Bu bölgede ki C alanı alüvyon zemini temsil etmektedir. Birinci ve ikinci profillerde ki A ve B alanlarının özdirenç değerleri gnaysdan çok daha yüksektir (Şekil-8). Aralarında 1 m uzaklık bulunan bu iki düşey kesitlere bakıldığında 2,5 m derinliğe kadar arkeolojik yapı taşları görülmektedir.



Şekil-9 Üçüncü Çalışma Alanından Elde Edilen 2. Düşey Kesit

3. SONUÇLAR

Bu çalışma Ege bölgesinde yer alan Muğla iline bağlı Milas ilçesinin 14 km kuzeydoğusunda bulunan Laubranda antik kentinde yapılmıştır. Söz konusu antik kente ait arkeolojik yapıların devamlılığının ve yeryüzüne çıkarılmamış arkeolojik yapıların yerlerini belirlemek en önemli amacımızdır. Bu amaçla Labrauanda antik kentinde jeofizik rezistivite yöntemi ile yeraltı araştırması yapılmıştır. Üç farklı

lokasyonda toplam 21 rezisivite ölçüsü ile elde edilen arazi verileri değerlendirilerek 2D ve 3D ters çözüm teknikleri ile yeraltı modellemesi yapılmıştır. Buna göre;
Birinci çalışma alanında; 1,74-2,5 m derinlikleri arasındaki A, B ve C bölgelerinin arkeolojik yapıya ait kalıntılar olduğu anlaşılmaktadır. Diğer D ve E bölgeleri ise 1,74 m yüksekliğe sahip olduğundan bu derinlikte görülmemektedir. Buna göre C alanının 8 x 4 x 2,5 m, B bölgesinin ise 10 x 4 x 3,37 m boyutlarında üstü kapalı ve içi boş odalar olduğu anlaşılmaktadır. İkinci çalışma alanında ise, 0,5 – 4,38 m derinliklerde 55-3368 ohm-m arasında özdirenç değerleri elde edilmiştir. Bu alanda jeolojik birimden daha yüksek özdirence sahip A, B ve C bölgeleri tespit edilmiştir. Ancak bu bölgedeki cismlerin geometrik bir yapıda olmaması ve dağınık bir durumda bulunmaları nedeniyle antik yapılardan kopan taş parçaları olduğu düşünülmektedir. Elektrik özdirenç verilerine ters-çözüm uygulaması ile arkeolojik alanlar çok katmanlı olarak görüntülenebilmektedir. Buradan genel mimari yapı ve konumu oldukça başarılı bir şekilde elde edilebilmektedir. Böylece arkeolojik kazı öncesinde yapılan bu tür araştırmaların ne kadar çok önemi bir kez daha anlaşılmıştır.

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POTENTIOMETRIC INVESTIGATION OF Cu(II)-5-METHYL-1,10-PHENANTHROLINE COMPLEXES CONTAINING SOME AMINO ACIDS

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ABSTRACT
The potentiometric method has been used comprehensively in many branches of solution chemistry. Great attention has been paid to the use of potentiometric methods in the study of binary and ternary complexes of transition metals with molecules of biological and pharmaceutical interest. The importance of potentiometric methods as the most accurate and widely applicable technique in studies related to the ionic equilibrium of different metal complexes.

For the first time in this study, the interaction of copper(II) with 5-methyl-1,10-phenanthroline (5-mphen) and some amino acids {AA: leucine (leu), methionine (met), tryptophan (trp), phenylalanine (phe), asparagine (asn), glutamine (gln), aspartic acid (asp), glutamic acid (glu)} has been investigated by potentiometric method at 298.15 K in an I = 0.1 M KCl ionic medium. The stability constants of the ternary complexes that these ligands formed with copper(II) have been determined at 298.15 K in an 0.1 M KCl ionic medium using potentiometric method. The stability constants of the complexes were calculated with the BEST software. The concentration distribution curves of each complex species in solution were also evaluated by the SPE software. The stability of the ternary copper(II) complexes are compared with those of the corresponding the stability of the binary copper(II) complexes with regard to $\Delta \log K$ values.

Keywords: Copper (II) complexes, amino acids, stability constants, potentiometry.

ÖZET
Potansiyometrik yöntem, sulu çözelti kimyası dalında kapsamlı bir şekilde kullanılmıştır. Biyolojik ve farmasötik açıdan ilgi çekici moleküller ile geçiş metallerinin ikili ve karışık ligant komplekslerinin incelenmesinde potansiyometrik yöntemlerin kullanımına büyük önem verilmiştir. Farklı metal komplekslerinin iyonik dengesi ile ilgili çalışmalarda en doğru ve yaygın olarak uygulanabilir teknik olarak potansiyometrik yöntemlerin önemlidir.

İlk kez bu çalışmada, bakır(II) iyonunun 5-metil-1,10-fenantrolin (5-mphen) ve bazı amino asitler {AA: lösin (leu), metiyonin (met), triptofan (trp), fenilalanin (phe), asparagin (asn), glutamin (gln), aspartik asit (asp), glutamik asit (glu)} ile etkileşimleri 25°C, 0.1 M KCl ve I = 0.1 M KCl iyonik ortamında potansiyometrik yöntem ile araştırıldı. bakır(II) iyonunun seçilen ligantlar ile oluşturduğu komplekslere ait denge tepkimeleri 25°C, 0.1 M KCl iyonik ortamında potansiyometrik yöntem ile araştırıldı. Cu(II) karışık ligand komplekslerinin kararlılık sabitleri BEST bilgisayar programı kullanılarak hesaplandı. Çözeltide oluşan türlerin dağılımı ise SPE bilgisayar programı kullanılarak belirlendi. Karışık ligant sistemlerinde sadece metal ile ligandlar arasında etkileşim

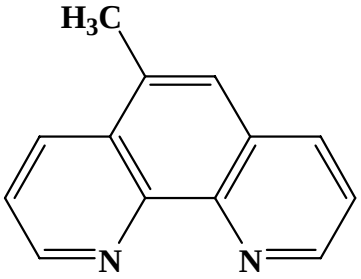
olduğu ve ligandların kendi aralarında etkileşimin olmadığı kabul edilerek ΔlogK değerleri bulundu.

Anahtar Kelimeler: Cu(II) kompleksleri, amino asitler, kararlılık sabiti, potansiyometri.

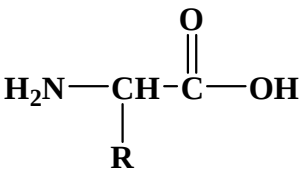
1. INTRODUCTION

Understanding the speciation of metal ions in aqueous solution is the basis for predicting and controlling the behavior of metal ions in biological systems, analytical chemistry and other industrial processes [1]. This understanding ensures the essential foundation for the rational design of ligands with enhanced metal ion affinity and selectivity. In the search for the determination of stability constants for complexation process and the formation of ternary complexes several methods such as potentiometric titration, conductometric and spectrophotometric determination have been reported [2-4].

Considering the facts stated above, in this study, ternary copper(II) complexes containing 5-methyl-1,10-phenanthroline (5-mphen) and some amino acids {leucine (leu), methionine (met), tryptophan (trp), phenylalanine (phe), asparagine (asn), glutamine (gln), aspartic acid (asp), glutamic acid (glu)} (Figure 1) have been determined by potentiometric methods in 0.1 M KCl ionic media at 298.15 K. The ternary copper(II) complexes have been calculated with the BEST software package [5] and the distribution of complex species in these systems was graphically presented using the SPE software package. The tendency of metal ions and ligands to form ternary copper(II) complexes was determined by calculating their $\Delta\log_{10}K$ values.



5-methyl-1,10-phenanthroline



Amino acids

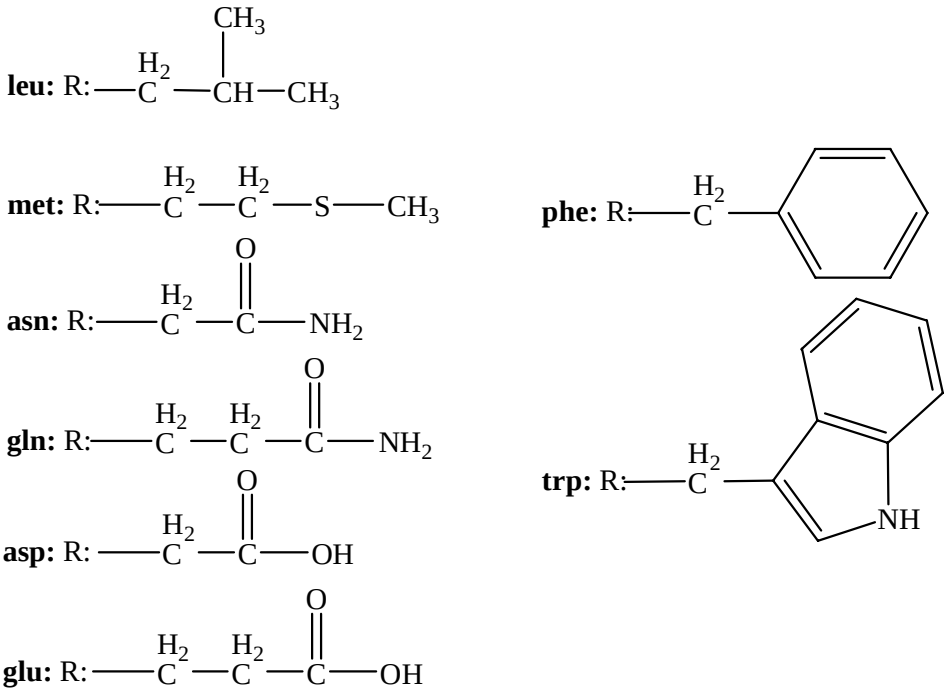


Figure 1. The structures of the ligands used in this study

2. EXPERIMENTAL

All ligands and copper(II) chloride were purchased from Sigma-Aldrich. A copper(II) chloride solution was prepared in concentrated HCl and excess acid in the copper(II) stock solution was determined by potentiometric titration as described previously [6]. A carbonate-free KOH solution was prepared and standardized potentiometrically against the primary standard, potassium hydrogen phthalate [7]. The ionic strength of each solution was adjusted to 0.1 M by the addition of KCl as the supporting electrolyte. All solutions were prepared with analytical grade water (R = 18 MΩ·cm) using grade A glassware. Potentiometric titrations were carried out using a Schott TitroLine Alpha Plus automatic titrator equipped with a Schott combined pH electrode. The all experimental details such as instruments, electrode calibration, and data processing were similar to those described in our previous studies [8-9].

3. RESULTS AND DISCUSSION

The protonation constants and binary copper(II) complexes of 5-mphen and some amino acids {leucine (leu), methionine (met), tryptophan (trp), phenylalanine (phe), asparagine (asn), glutamine (gln), aspartic acid (asp), glutamic acid (glu)} was previously reported our research group under the same conditions [8-10].

3.1. Ternary Copper(II) Complexes

The potentiometric titrations of the copper(II):(5-mphen):(AA) systems were performed at the constant ionic strength 0.1 M KCl and at 298.15 K. When overlooking at the potentiometric titration curves of copper(II):(5-mphen):(AA) systems, it was observed that the 5-mphen and some amino

acids had a buffer zone at a lower pH than the titration curve and a total of four protons were titrated. This experimental result demonstrates that the 5-mphen and some amino acids are bound to the copper(II) ion in aqueous solution. When the potentiometric titration curves for the copper(II):(5-mphen):(leu) system is analyzed, the potentiometric titration curve of $[Cu(5\text{-mphen})(leu)]^{+}$ overlaps with binary $[Cu(5\text{-mphen})]^{2+}$ curve in the m = 0.0-2.0 buffer zone. In this buffer zone, firstly, $[Cu(5\text{-mphen})]^{2+}$ is formed. In the m = 2.0-4.0 buffer zone, the formation of ternary copper(II) complexes was ascertained by comparison the titration curve of $[Cu(5\text{-mphen})(leu)]^{+}$ with the titration curves of the leu and $[Cu(5\text{-mphen})]^{2+}$, indicating the formation of the ternary $[Cu(5\text{-mphen})(leu)]^{+}$. Furthermore, the $[Cu(5\text{-mphen})]^{2+}$ complex formed at a lower pH than the $[Cu(leu)]^{+}$ complex. Therefore, 5-mphen is primarily ligated to the copper(II) ion. This is followed by ligation of leu occupying the remaining coordination positions. It is likely to write the formation and the overall stability constant equation of the $[Cu(5\text{-mphen})(leu)]^{+}$ ternary complexes in range of m = 0.0-4.0 (Figure 2).

$$Cu^{2+} + H_2(5\text{-mphen})^{2+} + H_2(AA)^{+} \rightleftharpoons [Cu(5\text{-mphen})(AA)]^{+} + 4H^{+} \quad (1)$$

$$Cu^{2+} + 5\text{-mphen} + AA^{-} \xrightleftharpoons{\beta^{Cu}_{Cu(5\text{-mphen})(AA)}} [Cu(5\text{-mphen})(AA)]^{+} \quad (2)$$

$$\beta^{Cu}_{Cu(5\text{-mphen})(AA)} = \frac{[Cu(5\text{-mphen})(AA)]^{+}}{[Cu^{2+}][5\text{-mphen}][AA^{-}]}$$

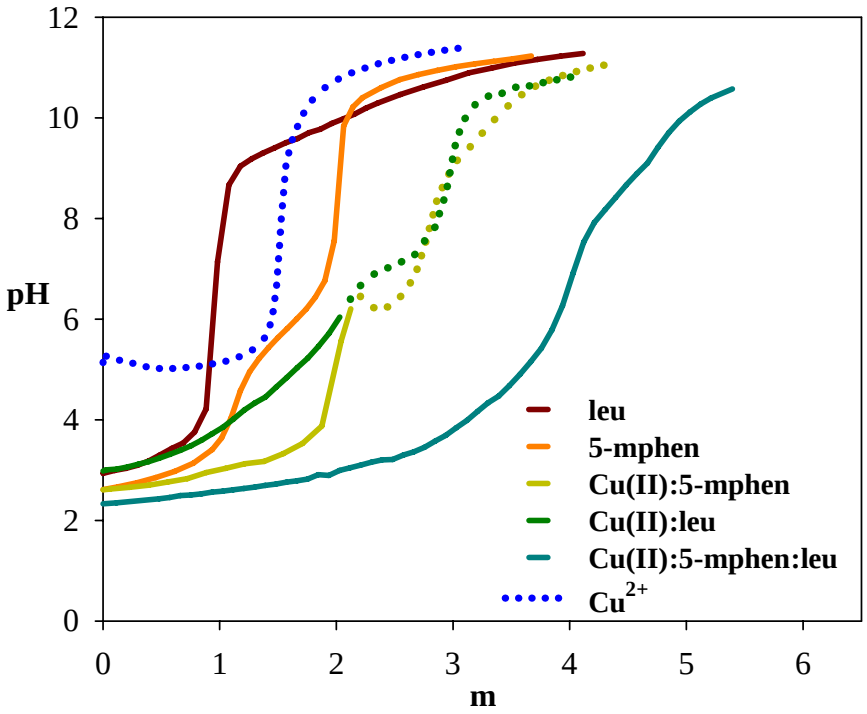


Figure 2. Potentiometric titration curves of copper(II):5-mphen:leu systems

The obtained protonation constants of the 5-mphen and some amino acids, along with their the stability constants with copper(II) in the binary systems were introduced into the BEST program for determination of the stability constants of the copper(II) complexes in ternary systems [5].

Table 1. Stepwise and overall stability constants ((log K and log β) ± $\sigma^x)^y$ of ternary complexes of copper(II) in 0.1 M KCl ionic media at 298.15 K.

Metal	**Ligand**	**Amino acids**	**log$_{10}$ β_{MAB}**	**log$_{10}$ K^{MA}_{MAB}**	**log$_{10}$ K^{MB}_{MAB}**	**Δ log$_{10}$ K**
Cu(II)	5-mphen	Leucine	15.26 ± 0.04	8.60	7.12	+ 1.48
		Methionine	14.80 ± 0.02	8.14	6.94	+ 1.20
		Tryptophan	15.43 ± 0.03	8.77	7.85	+ 0.92
		Phenylalanine	16.05 ± 0.04	9.39	8.09	+ 1.30
		Asparagine	13.43 ± 0.05	6.77	5.97	+ 0.80
		Glutamine	13.12 ± 0.03	6.46	5.44	+ 1.02
		Aspartic acid	17.42 ± 0.03	10.76	8.53	+ 2.23
		Glutamic acid	16.91 ± 0.06	10.25	8.60	+ 1.65

The relative stability of the ternary complexes as compared to those of the corresponding binary species could be evaluated in different ways. In most cases $\Delta\log_{10}K$ values are employed [8-9]. The

$\Delta\log_{10}K$ parameters have been computed with the equation 3 and are given in Table 1. An example is given for copper(II):(5-mphen)(AA) system.

$$\Delta\log_{10}K = \log_{10}K^{Cu(5\text{-mphen})}_{Cu(5\text{-mphen})(AA)} \log_{10}K^{Cu}_{Cu(AA)} = \log_{10}K^{Cu(AA)}_{Cu(5\text{-mphen})(AA)} \log_{10}K^{Cu}_{Cu(5\text{-mphen})} \quad (3)$$

For experimental systems in this study, the $\Delta\log_{10}K$ values are found positive. The positive $\Delta\log_{10}K$ values of this results demonstrates that the ternary copper(II) complexes are more stable than the binary copper(II) complexes. This was envisioned, as this stability order has been observed before when the primary ligand is 5-mphen and the secondary ligand has an oxygen or nitrogen donor atom such as amino acids [11]. The reason for the extra stability of these complexes may be due to interactions outside the coordination sphere, such as the formation of hydrogen bonds between the coordinated ligands, chelate effect and stacking interactions [12-13]. It is likely to predict the ternary copper(II) complex geometry by spectroscopic methods. EPR and electronic absorption spectroscopy is very helpful for this. In our previously studies [14] and other studies in literature [15-17], EPR and electronic absorption data have demonstrated that the ternary copper(II) complexes with phen or substitued phen and several amino acids (glycine, glutamine, tyrosine, etc.) in aqueous solution have a unique molecular geometry, that is a tetragonally elongated octahedron with a coordination plane containing the phen or subtitued phen and the aminoacidate anion; additionally, two water molecules are apically bound. In solid state, single crystal X-ray diffraction analysis have indicated that ternary copper(II) complexes have a distorted square pyramid coordination geometries with a water molecule apically bound [14]. The likely structures of the ternary copper(II) complexes are proposed as given in Figure 3. 5-mphen is a bidentate ligand for transition metal ions. The amino acids act as bidentate ligands with coordination containing the carboxylic oxygen and nitrogen atom of the amino group. In this experimental study, the copper(II) ion could be a square pyramidal and an octahedral geometry. The geometry could vary since Cu-N bond lengths and Cu-O bond lengths might be different. The copper(II) ion could be coordinated by two nitrogen atoms from 5-mphen and one oxygen and one nitrogen atoms from some amino acids.

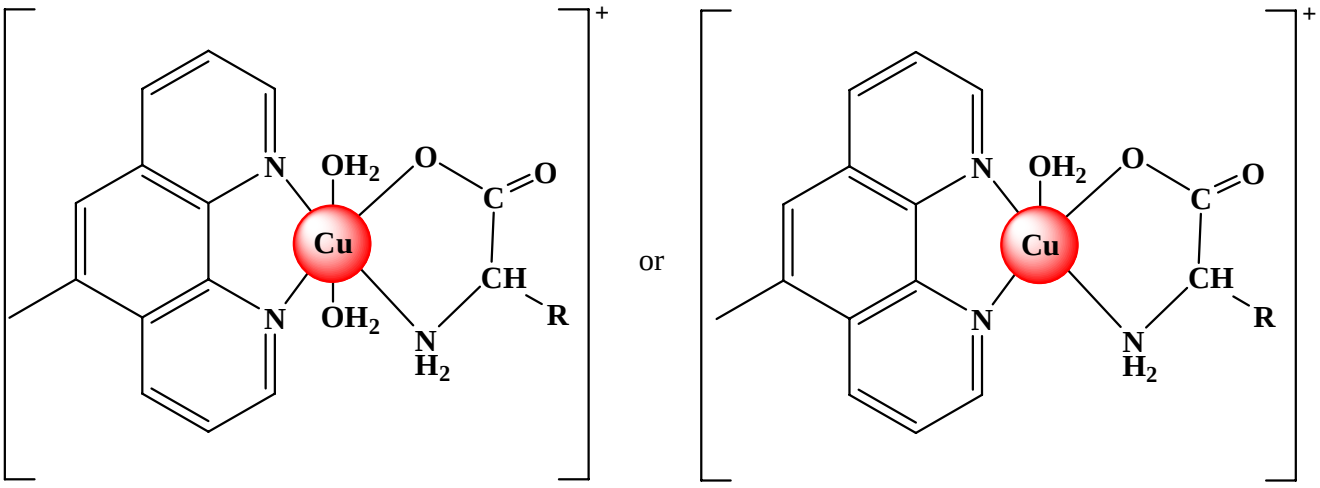


Figure 3. Proposed molecular structures of the ternary copper(II) complexes

3.2. Distribution Diagrams

The species distribution curves for Copper(II):(5-mphen):(leu) systems are shown in Figure 4. At pH 6.0, in the copper(II):(5-mphen):(leu) systems, the concentrations of $[Cu(5\text{-mphen})]^{2+}$ are ca. 64.5 %. $[Cu(5\text{-mphen})(leu)]^{+}$ starts to form at pH = 6.0 and with increasing pH, its concentration increases reaching a maximum of ~ 90.0 % at pH = ~8.0-12.0. The predominant species are H(leu), $H_2(leu)^{+}$, Cu^{2+}, $H(5\text{-mphen})^{+}$, $H_2(5\text{-mphen})^{2+}$, $[Cu(5\text{-mphen})]^{2+}$ and $[Cu(5\text{-mphen})(leu)]^{+}$ at pH=6.0 and pH=8.0, and $[Cu(5\text{-mphen})(leu)]^{+}$ at pH 10.0 and above (Figure 4).

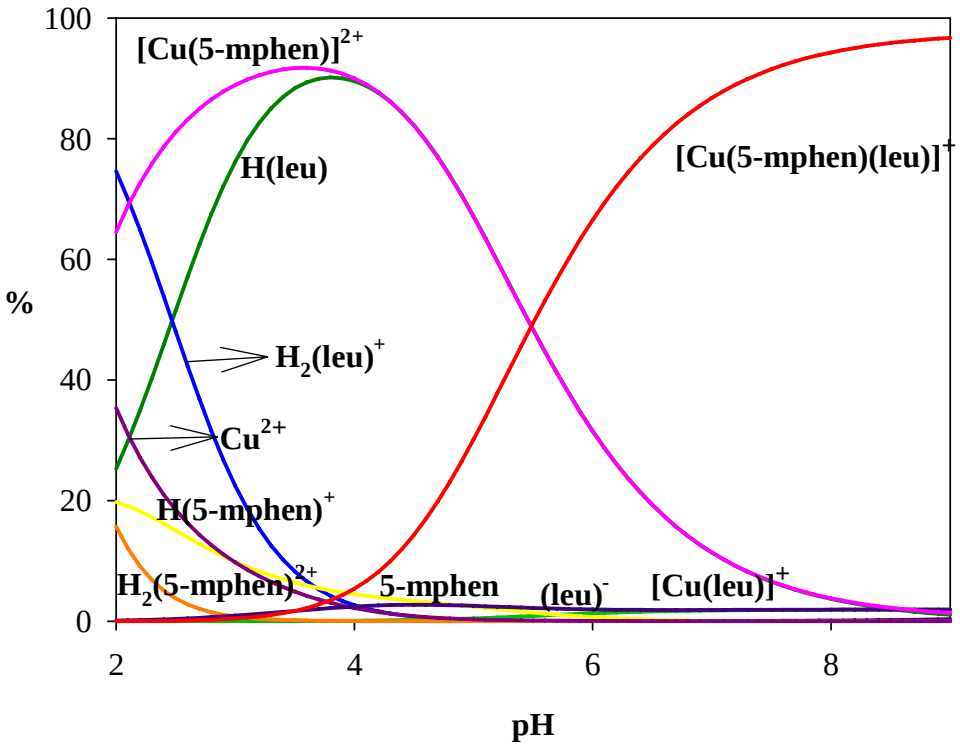


Figure 4. Distribution of species as a function of pH in the copper(II):5-mphen:leu system

3. CONCLUSIONS

We have analyzed the formation of the ternary copper(II) complexes involving 5-mphen and some amino acids using potentiometric methods in 0.1 M KCl aqueous ionic media at 298.15 K. In all studied systems the $\Delta\log_{10}K$ values are found to be positive, indicating that the ternary complexes are more stable than the binary complexes. The reported data in this study will make an important contribution to the literature. Therefore, it is promised that these data will be a remarkable contribution to workers carrying out mechanistic studies in biological media.

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THE INVESTIGATION OF CRYSTAL STRUCTURE, ELASTIC AND OPTOELECTRONIC PROPERTIES OF $Y_XIN_{1-X}N$ SYSTEM

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ABSTRACT

In this work, based on the EPM within the VCA, the elastic constants and their related properties such as bulk modulus, shear modulus, Young's modulus and Poisson ratio have been reported for $Y_xIn_{1-x}N$ ternary alloys in the hypothetical zinc-blende phase. Our findings were found to be generally in reasonable agreement with data in the literature, which are available only for the elastic constants of zinc-blende InN. Other case, our results are predictions and may serve as a reference for future studies. The composition dependence of all features of interest was examined and discussed over the whole composition range showing a monotonic decrease of all studied parameters when proceeding from zinc-blende InN (x=0) to zinc-blende YN (x=1). By way of application, the present results may be useful for the compositional characterization of $Y_xIn_{1-x}N$ ternary alloys.

Keywords: Elastic constants; $Y_xIn_{1-x}N$ alloys; Pseudopotentials

REMOVAL OF PONCEAU S BY UV/H_2O_2 AND UV/$S_2O_8^{2-}$ PROCESSES: EFFECT OF MATRIX, OF OPERATING FACTORS, OF SCAVENGING SPECIES AND COD REMOVAL

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ABSTRACT
Industrial water is known to contain large quantities of organic pollutants the most common of which are dyes such as the Ponceau S (PS) that may present a serious risk for the environment and human health.
The UV/Persulfate (UV/$S_2O_8^{2-}$) process has recently received scientific attention. It operates via the generation of sulfate radical $SO_4^{\bullet-}$, another very strong oxidant (redox potential of (2.5-3.1 V). It has a longer half-life ($HO^{\bullet}$: <1µs, $SO_4^{\bullet-}$: 30–40 µs), higher selectivity and less pH sensitivity than hydroxyl radical. The sulfate radical was generated from the decomposition of persulfate after activation by heat, electrochemical processes, ultrasonic irradiation, UV photolysis and transition metals. Considering economic, energy consumption, and potential heavy metal pollution, UV irradiation is the most appropriate choice for environmental applications.
This work aims, firstly, to study the UV/Persulfate process in terms of reaction kinetics for PS degradation under varying the operating factors. Secondly, to compare the effectiveness of the UV/ Persulfate process in degrading and mineralizing the PS molecule with the UV/H_2O_2 process.
The applicability of the UV/Persulfate process was provided meaningful results for the PS removal compared with the UV/H_2O_2 reaction.

Keywords: Advanced Oxidation processes; Ponceau S; UV/persulfate; UV/H_2O_2; sulfate radical; hydroxyl radical.

SYNTHESIS AND CHARACTERIZATION OF HETEROCYCLIC COMPOUNDS: BASED ON PYRAZOLE AND TRIAZOLE

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ABSTRACT

Since its beginnings nearly two centuries ago, organic chemistry has never stopped evolving. The last century has witnessed considerable progress in the field of synthetic methodology and in its applications in total synthesis. Numerous synthetic tools have been designed and refined in order to allow access to more and more complex molecules. Among these methodologies, those which use the extraction of transition metals by heterocyclic compounds. Indeed, iron can be extracted by the formation of heterocyclic iron-compound ligands, in an efficient and selective way. These new methodologies have found numerous applications, in particular in the formation and/or functionalization of various heterocycles.

Indeed, these metals' capacity to interact with -systems (triple or double bonds) will allow them to lower their electron density and therefore boost their electrophilicity. When nucleophiles (N, O, S) are added to these activated systems, iron-heterocyclic ligand compounds are formed, allowing access to the matching heterocycles. The synthesis and reactivities of heterocyclic derivatives based on pyrazole and triazole, specifically the rate of iron extraction by these two chemicals, are of great interest to our group.

Heterocycles are cyclic compounds in which one or more carbon atoms in the ring are replaced by a heteroatom; nitrogen, oxygen, and sulfur are the most well-known. Because of their varied mechanisms of synthesis as well as their extraordinary biological features, nitrogenous heterocycles are of great interest in the East. Many nitrogenous heterocycles, such as triazoles, are well-known for their varied properties, allowing the chemical industry to flourish.

Keywords: Synthesis and characterization, heterocyclic compounds, pyrazole, triazole.

INVESTIGATIONS OF PSA, EPCA2, PSCA AND PSMA AS SPECIFIC DIAGNOSTIC MARKERS FOR PROSTATE CANCER

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ABSTRACT

Prostate cancer is the most common kind of cancer. Prostate cancer (PCa) is becoming a growing public health concern, especially in regions with an aging population. Patients with prostate cancer (PCa) who have a prostate-specific antigen (PSA) level more than 20 ng/ml, with a Gleason score (GS) of 8–10. The aim of this study was to examine the blood levels of prostate specific antigen and early prostate cancer antigen 2 as potential diagnostic indicators for prostate cancer. The research was carried out at the Rezgari Hospital and the Nanakali Hospital in Erbil. In the "test group," one hundred men with prostate cancer were chosen, and in the "control group," fifty healthy volunteers with similar age and sex were chosen. The data was collected by the use of questionnaires, and the results were analyzed using (SPSS). The result showed a significant increase in PSA concentration for both age group (50-69 and 70-90) prostate cancer patients (5.935±1.746 and 5.996±1.736 ng/mL) respectively as compared to control groups (0.701±0.107 and 1.297±0.197 ng/mL) in the same aged group 50-69. The EPCA2 showed a highly significant increase (73.72±8.529 ng/mL and 77.94±8.951 ng/mL) in both age group (50-69 and 70-90) respectively as compared to control subjects (58.63±8.278 ng/mL and 36.23±4.363 ng/mL) respectively. PSCA, showed significant increase in prostate cancer patients for both age group (50-69 and 70-90) respectively, (1.659±0.307 ng/mL and 1.579±0.339 ng/mL) respectively, as compared to control group (0.697±0.098 ng/mL and 0.693±0.111 ng/mL) respectively in the same age groups. The PSMA result showed a highly significant increase in both age group (50-69 and 70-90) (512.9±84.33 ng/mL and 449.6±68.20 ng/mL) respectively, as compared to its control subjects (78.15±8.096 ng/mL and 113.4±10.64ng/mL) respectively. PSMA is elevated in prostate cancer patients and can used as a marker for prostate cancer because PSMA more accurate than PSA.

Keywords: Prostate Cancer, PSA, EPCA2, PSCA and PSMA

Introduction

Prostate cancer is the most common kind of cancer. Prostate cancer (PCa) is becoming a growing public health concern, especially in regions with an aging population [1]. Prostate cancer is the second most common disease in men, and it presents itself in middle-aged and older men all over the globe, regardless of where they live [2]. Patients with prostate cancer (PCa) who have a prostate-specific antigen (PSA) level more than 20 ng/ml, a Gleason score (GS) of 8–10, or a clinical stage greater than T3 are classified as high-risk PCa patients by worldwide scientific organizations [3]. A nuclear matrix protein known as early prostate cancer antigen-2 (EPCA2) has been linked to the development of prostate cancer. It was discovered that EPCA2 was exclusively found in the prostates of individuals with prostate cancer, and not in the prostates of healthy men [4]. Furthermore, prior research had shown that the EPCA could reliably identify prostate cancer, even at an earlier stage of carcinogenesis than was previously thought possible [5]. Prostate stem cell antigen (PSCA) is a tiny glycosylphosphatidylinositol (GPI)-anchored cell surface protein that is a member of the Thy-1/Ly-6 family. It is expressed in the prostate [6]. For the diagnosis and treatment of prostate cancer, proteins expressed in prostate cancer, such as PSCA, have been evaluated [7]. Because PSCA was discovered as a tumor antigen that was overexpressed in prostate cancer at the time of its discovery, research into its therapeutic applicability has mostly focused on prostate cancer. Approximately 90 percent of initial prostate tumors express PSCA, and the amount of expression is significantly connected with advanced clinical stage, invasion into the seminal vesicle and prostate capsule, and progression to androgen-independent prostate malignancies [6]. The protein, PSMA, is a membrane-bound protein that is highly expressed on prostate cancer cells. Small molecule ligands for prostate-specific membrane antigen (PSMA) have emerged as a promising diagnostic and therapeutic target for prostate cancer [8]. Increased PSMA expression has been related to the risk of tumor development and a higher tumor grade [9].

MATERIALS AND METHODS

The present study included 100 prostate cancer patients recruited from Rezgari hospital and Nanakali Hospital. A Case-control study design will be established from (17/4/2021 to 1/12/2021), patients with prostate cancer who will visit (Rezgari hospital and Nanakali Hospital). The sample collection from prostate cancer patients was then centrifuged and stored for further measuring. Parameters analyzed by using an ELISA microplate reader (BioTek). Also, this study included 50 healthy subjects as the control group.

STATISTICAL ANALYSIS

Statistical analysis was performed using SPSS software, version 24. For comparison of uptake values (independent test test). The significance level used was a P value of (0.05).

RESULTS AND DISCUSSION

CHARACTERISTIC OF GROUPS

The general characteristics of the groups in this study include; age, economic situation, marital status, body mass index, participant family history, marital status, parity, and breastfeeding. The study included a total of 100 prostate cancer patients. The general characteristics of 100 prostate cancer subjects and 50 healthy control groups. The mean age of prostate cancer patients was 71.96 ± 1.712 years, and the mean age of the control group was 57.42 ± 2.310. There was a significant increase in body max index among prostate cancer patients 27.63 ± 1.104 kg/m2 compared to control groups24.40 ± 0.631 kg/m^2. A family history of prostate cancer was observed in 17.86 % of

patients. Regarding marital status, parity, it was shown that most of the prostate cancer patients were found in married 80% than single 20%.

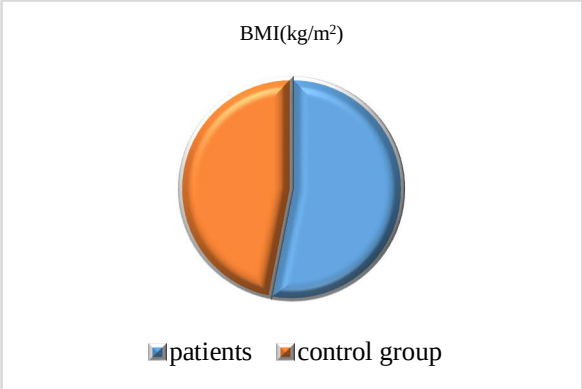


Figure 1. body mass index in patients and control group.

Table1. Characteristics of prostate cancer patients and healthy subjects.

Characteristics	Study groups		P-Value
	Prostate cancer (n=100)	Control group (n=50)	
Age (yrs.) Mean±SE	71.96 ± 1.712	57.42 ± 2.310	
Age distribution No. (%) <50-69 yrs. ≥70-90 yrs	 42 (42%) 58 (58%)	 30 (60%) 20 (40%)	
BMI (kg/m^2) Mean ± SE	27.63 ± 1.104	24.40 ± 0.631	0.05
Family history of PCa No. (%) Yes No	 17.86 % 82.24%		
Marital Status No. (%) Married single	 80.0% 20.0%	 63.0% 37.0%	
Stage of PCA Stage (4) 63.54% Stage (2) 23.08 Stage (1) 15.38			
Gleason grade	(3+4) (60%) (4+5) (20%) (5+4) (10%) (4+4) (10%)		
Smoking	17.86%	30.45%	
PSA at time of case diagnosis mean ±SEM		(ng/ml)	

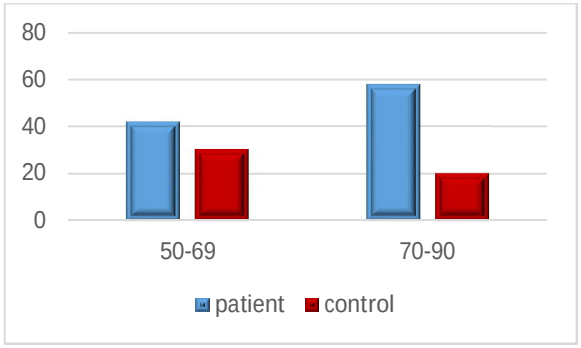


Figure 2. Prevalence of control group and prostate cancer classified by age groups.

The result of this study, as shown in (table 2.), the result showed a significant increase in PSA concentration in prostate cancer (5.935±1.746) patients as compared to control groups (0.701±0.107) in the aged group 50-69. The results of EPCA2 showed a highly significant increase (73.72±8.529 ng/mL) in the study group compared to control subjects (58.63±8.278 ng/mL). PSCA, showed significant increase in prostate cancer patients (1.659±0.307 ng/mL) as compared to control group (0.697±0.098 ng/mL). The results of PSMA showed a highly significant increase (512.9±84.33 ng/mL) in the study group compared to control subjects (78.15±8.096 ng/mL).

Table 2. concentration of the genetic parameters in control and prostate cancer groups age group (50-69).

Parameters	Control group	Prostate cancer group	P-Value
PSA (ng/mL)	0.701±0.107	5.935±1.746	0.018
EPCA2 (ng/mL)	20.68 ±3.158	80.98±8.464	0.0001
PSCA (ng/mL)	0.697±0.098	1.659±0.307	0.005
PSMA (ng/mL)	78.15±8.096	512.9±84.33	0.0001

The results are expressed as mean ± SEM, and p-value < 0.05 was considered statistically significant.

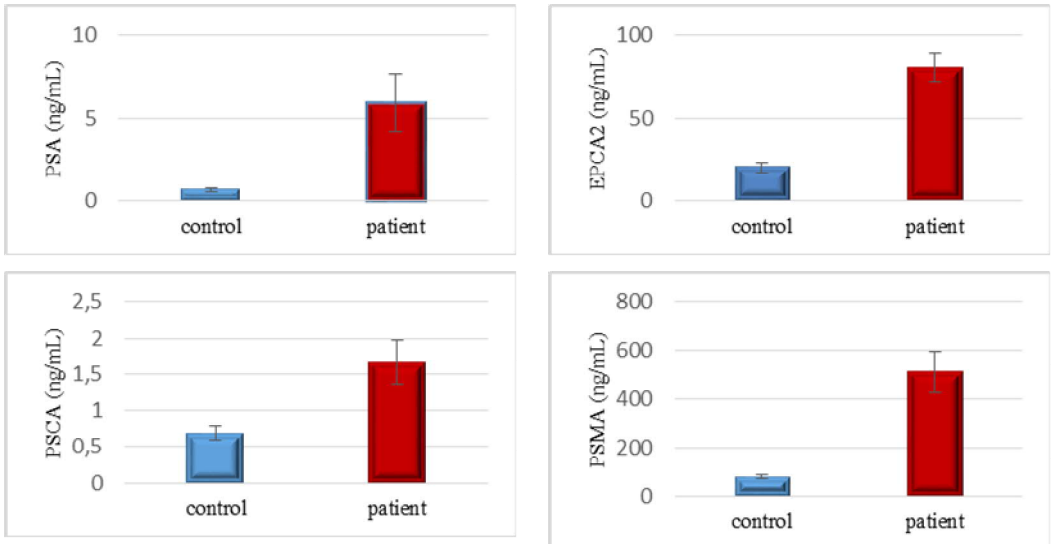


Figure 3. PSA, EPCA2, PSCA and PSMA levels in control group and prostate cancer in age group (50-69).

The result of this study, as shown in (table 3.), the result showed a significant increase in PSA concentration in prostate cancer (5.996±1.736 ng/mL) patients as compared to control groups (1.297±0.197 ng/mL) in the age group 70-90. The results of EPCA2 showed a highly significant increase (77.94±8.951 ng/mL) in the study group compared to control subjects (36.23±4.363 ng/mL). PSCA showed a significant increase in prostate cancer patients (1.579±0.339 ng/mL) as compared to the control group (0.693±0.111 ng/mL). The results of PSMA showed a highly significant increase (449.6±68.20 ng/mL) in the study group compared to control subjects (113.4±10.64ng/mL).

Table 3. concentration of the genetic parameters in control and prostate cancer groups age group (70-90).

Parameters	Control group	Proate cancer group	P-Value
PSA (ng/mL)	1.297±0.197	5.996±1.736	0.032
EPCA2 (ng/mL)	24.21±2.695	77.13±9.388	0.0001
PSCA (ng/mL)	0.693±0.111	1.579±0.339	0.042
PSMA (ng/mL)	113.4±10.64	449.6±68.20	0.0001

The results are express as mean ± SEM and p value < 0.05 was considered to be statistically significant

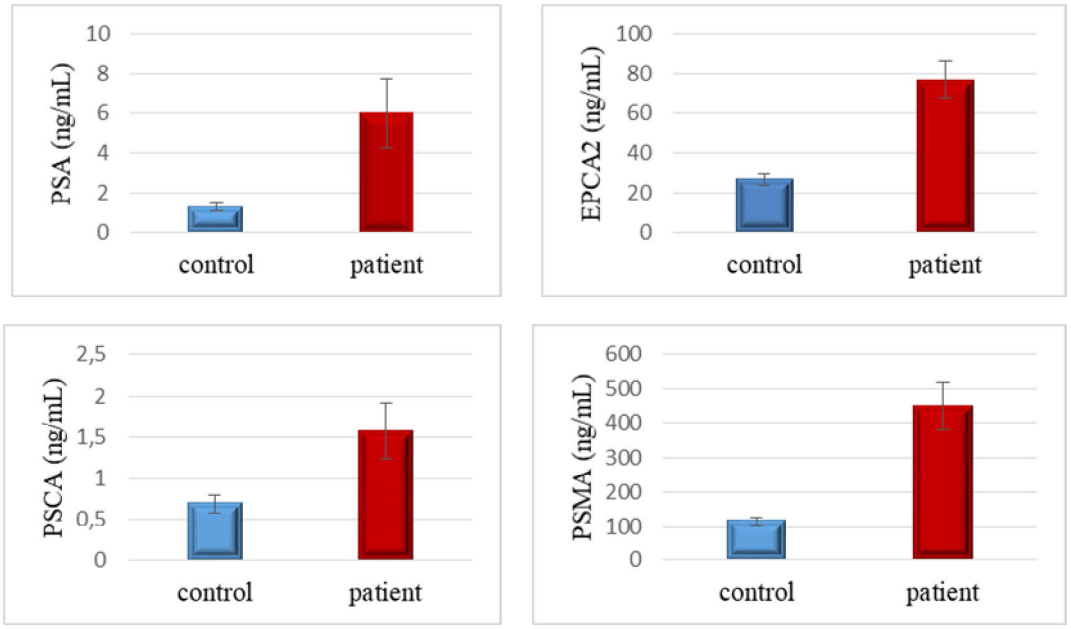


Figure 4. PSA, EPCA2, PSCA and PSMA levels in control group and prostate cancer in age group (70-90).

Prostate cancer is more common in men over 50 and those with a strong family history of the disease, obesity, hypertension, lack of exercise, persistently high testosterone levels, exposure to Agent Orange, and ethnicity [10]. It is the most common male cancer and the fourth leading cause of cancer mortality in men globally [11]. The prostate gland produces prostate-specific antigen (PSA). Prostate-specific antigen(PSA) is a protein generated by both normal and cancerous cells of the prostate gland. A significant increase in blood PSA concentration is associated with advanced malignancy in the vast majority of individuals with untreated prostate cancer. The amount of prostate-specific antigen (PSA) in the blood may be beneficial in staging prostate cancer. As a biomarker for prostate cancer, prostate specific antigen has been extensively used in clinical

diagnosis and effectiveness assessment of prostate cancer treatments in recent years [12]. However, because of elevated PSA levels caused by inflammation or benign hyperplasia of the prostate, the positive rate tended to linger at roughly 20% [13].

The EPCA levels in PCa patients were substantially greater than those in the control group. Moreover, they observed in the same research that no statistically significant link was found between the plasma EPCA level and the PSA level since the majority of the PSA levels were between the clinically indistinguishable range of 4–10 ng/ml. Blood levels of early prostate cancer antigen-2 (EPCA-2) (also known as EPCA-2) increase in prostate cancer patients. Is more accurate than the usual PSA test for early prostate cancer detection [14] In fact, "EPCA-2" is a pseudonym. EPCA-2 is the second marker for prostate cancer that has been discovered by the study team. Prior to the name change, this monument was referred to as "EPCA-1" [5]. Prostate-specific membrane antigen (PSMA) is present at a low level in both normal and cancerous prostate tissue, but the quantity found in prostate cancer cells is much greater [15]. In addition to being a promising target for noninvasive detection of recurrent PCa and therapy of metastatic castration-resistant prostate cancer (mCRPC) using PSMA-targeted agents such as radioligands, [16] prostate-specific membrane antigen (PSMA) is also playing an increasingly important role in the clinical management of PCa patients [17]. PSMA's enzymatic actions in the prostate are still a mystery [18]. It is critical that PSMA is overexpressed in prostate cancer cells, and the level of expression corresponds with the pathological grade [19] [20].

Conclusion

PSMA is elevated in prostate cancer patients and can used as a marker for prostate cancer because PSMA more accurate than PSA.

PSCA and EPCA showed significant increase in prostate cancer as compared to control group.

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DECOLORIZATION KINETICS OF PONCEAU S DYE BY CHEMICAL CHLORINATION: A COMPARISON WITH SUNLIGHT/ CHLORINE AND UV/CHLORINE PROCESSES

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ABSTRACT

Aqueous chlorination of Ponceau S dye (PS) was kinetically investigated through a classical method and under solar or UV radiations. For the classical method, kinetics of PS chlorination were established by varying concentration ratios R = [Free chlorine (Cl(+I))]/[PS], pH, temperature and bromide ions concentration. The decolorization reactions exhibited pseudo first-order kinetics with respect to Ponceau S dye and their apparent rate constants (k_{app}) increased when R increased, in fact, k_{app} reaches 0.205 min^{-1} when R=10. Important removal levels were obtained when pH= 10, 100% of decolorization obtained at only 5 minutes which means that the hypochlorite ion (ClO^-) was more reactive than hypochlorous acid (HClO) for decolorizing PS dye. Otherwise, apparent rate constant of PS disappearance increased with increasing medium temperature and led to activation energy of 39.64 Kj/mol. When bromide ions were present in the medium, the decolorization of the PS solutions was more important than the simple chlorination when R=2.5 and at pH 7.20 following an oxidation result of bromide ions by sodium hypochlorite to hypobromite and/or hypobromous acid, the addition to the N=N double bond of dye is easier in case of Br(+I) than Cl(+I).

Keywords: Ponceau S, UV/Chlorine, kinetic

CHARACTERIZATIONS OF IRON (III) OXIDE DOPED CALCIUM OXIDE NANOPARTICLES

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ABSTRACT

CaO is an attractive CO_2 absorber, due to its high capturing capacity, under low CO_2 concentration conditions. The physical and chemical properties of CaO can be changed in nanoscale, morphology, surface area and capturing efficiency can be carefully controlled under specific synthesis conditions, and positively affected the sorbents' reactivity. Doping CaO nanoparticles with various atoms is considered significant to enhancing the sorbent materials' capturing efficiency and lifetimes. Several researchers have attempted to demonstrate the improved properties of metal oxide doped CaO nanoparticles. During extended operating cycles, doping and co-doping can substantially improve capture performance, stability, and regeneration ability. Iron III oxide is optimal for enhancing catalytic activity and carbon deposition during the catalytic test. The main objective of this study is to synthesize and characterize Iron III Oxide doped Calcium Oxide nanoparticles.

In this research work, Fe_2O_3 doped CaO was prepared by using $CaCl_2$, $FeCl_3$, NaOH as reactants through the precipitation method. The molar ratio of $FeCl_3$ to $CaCl_2$ was 0.5: 1. The wet precipitates of the Fe_2O_3: CaO were investigated by the XRD method in a temperature range between 25 ºC and 650 ºC under vacuum with a heating rate of 60 °C/min. The produced Fe_2O_3: CaO powder confirms the existence of $Ca(OH)_2$ and a small amount of $CaCO_3$ in the sample at 25°C. $Ca(OH)_2$ started to transform to CaO at 200 ºC with a few amounts of $Ca(OH)_2$ and $CaCO_3$, but then completely calcined at 650 ºC with the existence of CaO, Fe_2O_3, and $Ca_2Fe_2O_5$. The crystallite sizes of CaO, Fe_2O_3, and $Ca_2Fe_2O_5$ are less than 80 nm.

Keywords: Fe_2O_3 doped CaO, Nanoparticles, Precipitation method.

UNDERSTAND THE ROLE OF SNRK1 IN THE SYMBIOTIC ASSOCIATION IN *PHASEOLUS VULGARIS*

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ABSTRACT

The symbiosis of some plants such as the common bean (*Phaseolus vulgaris*) and some microorganisms such as *Rhizobium* bacteria and mycorrhizal fungi are of great importance because they help improve crop productivity through the exchange of nutrients with symbiotic microorganisms, mainly phosphorus in the case of mycorrhizae and nitrogen in the case of *Rhizobium*. Due to the great importance of this symbiosis, genes have been found that have the potential to regulate the symbiosis. One of these genes is SnRK1, which is part of the complex known as the plant energy sensor, since it activates energy production (catabolism) and represses energy consumption (anabolism), when carbon and energy are limited. In this study, the spatio-temporal expression of the SnRK1 promoter was studied in *P. vulgaris* hairy roots and during the symbiosis between *Rhizobium* and arbuscular mycorrhiza. Results showed that SnRK1 promoter expression was associated with the infection process of both the symbionts. Further, the overexpression of SnRK1 during symbiosis with *Rhizobium* showed an overall increase in root and shoot biomass and more importantly, an increase in nodule numbers. Finally, a double hybrid analysis was performed to fish the SnRK1interacting proteins under rhizobial infected conditions. The Y2H analysis revealed a number of symbiosis specific proteins to be interacting with SnRK1. Our studies reveal a very significant role of SnRK1 during P. vulgaris and rhizobial symbiosis. The authors wish to acknowledge the DGAPA/PAPIIT UNAM for partially funding this research to grant no. IN216321 to K.N and IN213221 to M.K.A.; and to CONACyT CF-MI-2019101713423419 9/316538 to M.-K.A.

Keywords: *Phaseolus vulgaris, Rhizobium*, mycorrhiza, SnRK1, symbiosis

MATHEMATICAL AND FLUID DYNAMIC ANALYSIS OF THE PUMP AS TURBINE IMPELLER

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ABSTRACT
A pump as Turbine (PAT) is a turbomachine that harnesses the water energy to generate electricity by means of impeller motion and generator coupling. PATs are a feasible alternative, due to their low cost, wide range of selection, and mass production. Studies have been found in the literature to estimate efficiency employing computational simulation. On the other hand, there is evidence of studies in the optimization area, where efficiency improvement is sought from the impeller parameters. However, no articles were found in which the behavior of the water inside the impeller is considered and compared with the theory. In addition, a mathematical equation that focuses on the geometric variables of the hydraulic profile is not evident.
The present work analyzes and compares the flow conditions of a conventional centrifugal pump operating as a turbine, based on the geometric parameters of the hydraulic profile. Initially, the hydraulic efficiency is formulated by analyzing the velocity triangle. The theoretical equation is presented in geometric terms of the hydraulic profile. Then, the hydraulic head is calculated and the efficiency of the turbomachine is estimated. Subsequently, the mathematical modeling is validated through fluid dynamic analysis, where the velocity and pressure contour is verified. With the present methodology, it is possible to obtain an estimated efficiency of the turbomachine operation, by modifying the geometric parameters of the hydraulic profile.
This study is part of a proposal to optimize the hydraulic profile of the PAT to improve hydraulic efficiency. Additionally, it seeks to improve energy conversion to make it efficient and affordable for communities that are part of the non-interconnected zones.

Keywords: Velocity triangle, Hydraulic profile, hydraulic efficiency, impeller.

TÜRBİN FAN OLARAK POMPANIN MATEMATİKSEL VE SIVI DİNAMİK ANALİZİ

ÖZET
Türbin olarak bir pompa (PAT), çark hareketi ve jeneratör bağlantısı aracılığıyla elektrik üretmek için su enerjisini kullanan bir turbo makinedir. PAT'ler, düşük maliyetleri, geniş seçim yelpazesi ve seri üretimleri nedeniyle uygun bir alternatiftir. Literatürde hesaplama simülasyonu kullanarak verimliliği

tahmin etmek için çalışmalar bulunmuştur. Öte yandan, çark parametrelerinden verim artışının arandığı optimizasyon alanında yapılan çalışmaların kanıtları bulunmaktadır. Ancak çarkın içindeki suyun davranışının dikkate alındığı ve teori ile karşılaştırıldığı herhangi bir makaleye rastlanmamıştır. Ayrıca hidrolik profilin geometrik değişkenlerine odaklanan matematiksel bir denklem de belirgin değildir.
Mevcut çalışma, hidrolik profilin geometrik parametrelerine dayalı olarak türbin olarak çalışan geleneksel bir santrifüj pompanın akış koşullarını analiz etmekte ve karşılaştırmaktadır. İlk olarak, hız üçgeni analiz edilerek hidrolik verim formüle edilir. Teorik denklem, hidrolik profilin geometrik terimleriyle sunulur. Daha sonra hidrolik yük hesaplanır ve turbomakinenin verimi tahmin edilir. Daha sonra matematiksel modelleme, hız ve basınç konturunun doğrulandığı akışkan dinamiği analizi yoluyla doğrulanır. Mevcut metodoloji ile, hidrolik profilin geometrik parametrelerini değiştirerek, turbomakine çalışmasının tahmini bir verimini elde etmek mümkündür.
Bu çalışma, hidrolik verimliliği artırmak için PAT'nin hidrolik profilini optimize etme önerisinin bir parçasıdır. Ek olarak, birbiriyle bağlantılı olmayan bölgelerin parçası olan topluluklar için verimli ve uygun fiyatlı hale getirmek için enerji dönüşümünü iyileştirmeyi amaçlamaktadır.

Anahtar Kelimeler: Hız üçgeni, Hidrolik profil, hidrolik verim, çark.

EFFECT OF OIL ON THE DEVELOPMENT OF THE ROOTS OF TWO TREE SPECIES

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ABSTRACT

The root system of plants helps the entire vegetative system to sustain itself and allows the absorption of nutrients for its growth and development and favors the proliferation and metabolism of microorganisms in the soil. However, when the roots encounter a contaminant, for example, with petroleum hydrocarbons when there is a spill, they enter a stress process where they seek to acclimatize to this new polluted environment. Those plant species that do not achieve acclimatization die and those that manage to survive develop morphophysiological mechanisms that help to tolerate the pollutant. In this sense, the objective of the present work was to evaluate the morphological responses of the roots of Tabebuia rosea and Haematoxylum campechianum in a soil contaminated with petroleum hydrocarbons. For this, an experiment was established in a nursery with cylindrical pots of 3.4 dm^3 to which soil contaminated with 15,600 mg kg^{-1} of crude oil was placed. In them, 10 seedlings of T. rosea and 10 of H. campechianum were planted and watered every third day. On the other hand, root length (mm) was measured during transplantation at the beginning (0 days) and at the end of the experiment (404 days) and the root development was recorded. A negative geotropism (formation of knots) was found in T. rosea and H. campechianum, they presented a thinning and reduction in the length of the taproot and a decrease in the secondary roots. In this sense, both species present morphological damage in the main and secondary roots, in addition, there was an excess of nodules. Despite showing damage, the plants were able to tolerate the contaminant, therefore, both species are potential for use as remedial species.

Keywords: hormesis, development, remediation, contamination, rhizosphere effect.

CHARACTERIZATION OF THE SPATIAL AND TEMPORAL EXPRESSION OF NLP GENE AS A NOVEL REGULATOR OF PHASEOLUS NODULATION

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ABSTRACT

The plant **N**odule **In**ception (NIN) family encodes transcription factors such as NIN-like proteins (NLPs), which play a key role in nitrogen use efficiency. The RNA-Seq data shows that NLP proteins specifically express under *Phaseolus vulgaris-Rhizobium tropici* symbiosis. However the function of NLP regulation of nodulation in legumes has been poorly understood. The present work focused on studying the spatiotemporal expression profiles of *P. vulgaris* NLP promoter during the nodule formation and development. To do this, we first amplified a member of the NLP gene from the *P. vulgaris* genome and cloned it into pBGWSF7.0/*PrNLP*::GUS-GFP binary vector using the Gateway cloning system. The cloned binary vector was then transformed into *Agrobacterium rhizogenes* strain K599. To generate transgenic hairy roots, *A. rhizogenes* K599 harboring pBGWSF7.0/*PrNLP*::GUS-GFP construct was injected into 2-day old *P. vulgaris* seedlings. Later, 10-day old hairy roots were inoculated with wild type *Rhizobium tropici* to induce nodulation in roots and the spatiotemporal expression of *PvNLP* promoter was studied at different time points by GUS histochemical assay. Our results show that *PvNLP* expression was induced in the root elongation zone upon *Rhizobium* inoculation in transgenic hairy roots after 3 day post inoculation (dpi). Subsequently, *PvNLP* was strongly expressed in the rhizobial infection threads, dividing cortical cells of nodule primordium. Whereas, in mature nodules of 21day old show *PvNLP* enhanced the expression in the nodule core zone especially in the symbiosome containing cells. Together, based on these observations we conclude that the *PvNLP* promoter was active in *Rhizobium* inoculated roots, around the infection thread progression, in the dividing cortical cells of nodule primordia. Furthermore, *PvNLP* promoter was found to be actively expressed in nodule symbiosomes indicating *NLP* is a novel regulator of *Phaseolus* nodulation, therefore, we propose that *NLP* could be a key gene that coordinates rhizobial symbiosis process in legume *Phaseolus*. The authors wish to acknowledge the DGAPA/PAPIIT-UNAM for partially funding this research to grant no. IN213221 to M.-K.A. and IN216321 to K.N; and to CONACyT CF-MI-2019101713423419 9/316538 to M.-K.A.

Keywords: symbiotic pathway, nodulation, promoter analysis, hairy roots.

OVEREXPRESSION OF PVATG9 INCREASES NODULE NUMBERS BUT AFFECTS ROOT NODULE MATURATION DURING *PHASEOLUS VULGARIS - RHIZOBIUM TROPICI* INTERACTION

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ABSTRACT

Autophagy is a biological process in which cell content is degraded in order to recycle nutrients, eliminate damaged or toxic material, and maintain homeostasis through autophagosomes. Legumes have the unique ability to enter into a symbiotic association with nitrogen fixing bacteria rhizobia. The role played by autophagy is being understood in various different cellular processes. However, legume - rhizobial interactions is a very important area where the implications of autophagy is not well understood. In an intention to elucidate the role of autophagy in *Phaseolus vulgaris*, we have previously identified 17 ATG families. Herein, PvATG9 was chosen for functional analysis based on the high expression levels under symbiotic conditions. CDS of PvATG gene was isolated and was cloned into the binary vector pEarleyGate104 to overexpress (PvATG9-OX) in *P. vulgaris* hairy roots. The hairy roots were inoculated with *Rhizobium tropici* at 10 days post emergence. The root phenotype in the uninoculated roots was found to be shorter with lesser LR density in PvATG9-OX roots when compared to empty vector controls. In the rhizobium inoculated roots the post infection events, root hair curling, infection thread progression were normal and infection events were

accompanied by cortical cell divisions. At 20 dpi, the nodule numbers in PvATG9-OX hairy roots were found to be 6-8 folds higher than empty vector controls. However, 70% of nodules in PvATG9-OX roots were white and were inefficient in fixing nitrogen. Taken together, we understand an indispensable role of ATG9 in root nodule development.

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Keywords: Autophagy, ATG9, nodulation, overexpression, symbiosis.

DEVELOPMENT, STRUCTURAL, MICROSTRUCTURAL, MECHANICAL AND BIOLOGICAL CHEMICAL, MECHANICAL AND BIOLOGICAL CHARACTERIZATION OF THE ZR-25TA-5TI ALLOY

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ABSTRACT

With the growing aging population has also increased the demand for biomedical materials that can repair or replace functions of the human body. Titanium is widely used in biomedical applications due to its physical, chemical, and biological properties. Zirconium has chemical and physical properties like titanium. In this study, zirconium alloys containing 25 wt% tantalum and 5 wt% titanium were prepared and characterized. The structural and microstructural characterizations of the alloy were performed by X-ray diffraction and optical (OM) and scanning electron (SEM) micrography. For the mechanical characterization, microhardness and modulus of elasticity measurements were performed. Cell viability and proliferation were performed to evaluate the cytotoxicity and cell adhesion of the alloys. The results showed the coexistence of the α, β and phases. The hardness of the alloy is superior to titanium and zirconium. The modulus of elasticity shows that the addition of tantalum decreased the modulus, due to the β phase and biological tests indicated that the alloys are not cytotoxic, demonstrating alloy properties with potential for future biomedical applications. (Financial support: CNPq and FAPESP).

Keywords: Zirconium Alloys, Biomaterials, Characterization

LATE SENESCENCE OF RHIZOBIAL NODULES CAUSES AN INCREASE OF BIOMASS IN WILD *PHASEOLUS VULGARIS*

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ABSTRACT

The Mesoamerican common bean (*Phaseolus vulgaris* L.) is conserved in the forests of central Mexico and the molecular evidence suggests that the *P. vulgaris* cultivars have originated from wild Mesoamerican populations. The *P. vulgaris* is an important grain legume that is capable of biological nitrogen fixation efficiently through symbiosis. However, studies on symbiosis in wild populations are yet to be understood clearly. Therefore, this study focused on the systematic analysis of *Rhizobium* symbiosis in Mesoamerican wild common beans compared to the domestic common bean variety. Plants of the Mesoamerican wild bean and domestic black bean cv. Negro Jamapa were grown in randomized block designs and inoculated with *Rhizobium tropici*. The nodule anatomy was studied systematically from young, mature and senescence stages up to 48 days post-inoculation. The observations on several shoot, root and nodule parameters were recorded at different time points. Our results show that the mature nodule numbers were significantly ($p< 0.01$) high in the Mesoamerican compared to cultivar. Though there are no differences observed in nodule anatomy interestingly, the onset of nodule senescence was delayed for 9 days in Mesoamerica compared to cultivar indicating the longer lifespan of the mature nitrogen-fixing nodules. This data correlated with the 35% increase in total plant biomass. Together, our data concludes that wild Mesoamerican beans show extended nodule life span and prolonged nodule function which resulted in higher plant biomass. This work could be an important source for bean crop improvement through breeding programs and in particular, maximization of the symbiosis nitrogen fixation ability from wild to cultivars. The authors wish to acknowledge the DGAPA/PAPIIT-UNAM for partially funding this research to grant no. IN213221 to M.-K.A. and IN216321 to K.N; and to CONACyT CF-MI-2019101713423419 9/316538 to M.-K.A.

Keywords: Common bean, *Rhizobium*, Nodule senescence, Symbiosis.

EVALUACIÓN DE UN SISTEMA DE PANELES SOLARES FOTOVOLTAICO EN CASA HABITACIÓN EN LA CIUDAD DE VILLAHERMOSA, TABASCO

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RESUMEN

Se presenta la evaluación de un sistema de paneles solares foltovoltaicos instalados en una casa habitación, con el objetivo de aprovechar las condiciones de intenso sol que se tienen en la mayoría de los meses del año, en el Estado de Tabasco, México para la producción de energía limpia, monitorear el consumo eléctrico de la vivienda, dar seguimiento a la producción de energía eléctrica por medio de paneles solares y minimizar el costo de consumo de energía eléctrica. Este proyecto incluyó la instalación de 14 paneles solares Connera de 435 kW, en la azotea de una vivienda situada en la ciudad de Villahermosa, Tabasco, México, los cuales fueron conectados a la red eléctrica a mediados del año 2021 en un área de 28 mts2, y se dio seguimiento a las lecturas de la producción y consumo hasta la presente fecha. Tuvo una fase de pruebas durante los meses de septiembre, octubre y noviembre del año 2021, para conocer las condiciones de operación y monitoreo. El usar un sistema monocristalino Connera trajo como consecuencia, la reducción de hasta un 99.97% de los costos del pago del consumo de energía, lo que conllevó a tener ahorros significativos. Con este sistema al bimestre puede generar

hasta 1,363 Kw de electricidad, teniendo en cuenta que esto depende de las buenas condiciones de radiación solar que se tenga durante el día.

Keywords: Paneles solares, fotovoltaica, reducción, costos

1. Introduccion

Hoy en día, México tiene un gran potencial para el uso y aprovechamiento de la radiación solar para la generación de energía renovable, esto debido que por su ubicación geográfica estratégica tiene una de las zonas con mayor radiación solar a nivel mundial [4] y que puede ser aprovechada para reducir costos por consumo de luz en hogares y empresas al generar electricidad. Una de las principales razones que se tiene con este Proyecto es contribuir al cumplimiento de los acuerdos de París sobre el Clima (COP21) donde se busca combatir el cambio climático y acelerar e intensificar las acciones e inversiones necesarias para un futuro sostenible con bajas emisiones de carbono [5].

El uso de paneles solares fotovoltaicos ha ido en crecimiento en México[1], por las ventajas que anteriormente se señalaron y que para la presente investigación se se requeria analizar y evaluar un sistema de paneles solares foltovoltaicos instalados en una casa habitación en la Ciudad de Villahermosa, Tabasco, México y que este fuera interconectado a la red eléctrica.

2. Materiales Y Métodos

Conforme al consumo promedio diario de 18 kW de energía eléctrica en una casa habitación, se determinó que el tipo de paneles solares foltovoltaicos adecuados era el de 430 W, por su eficiencia y desempeño. Por lo anterior se adquirieron e instalaron en una superfice de 28 mts2 14 paneles solares Connera de 430 kW, 1 inversor de 6 kW Connera Beyond, 1 base de soporte para los páneles y caja de interruptores. Se tomo en cuenta para la instalación de los paneles solares, la ubicación geográfica y climatológicas del lugar para realizar los calculos de inclinación, sombras y distancias para su correcta ubicación y operación. La vida útil de los paneles solares es de 25 años en condiciones normales de mantenimiento y uso [3]. En la figura 1 se observa como esta compuesto un modulo solar foltovoltaico.

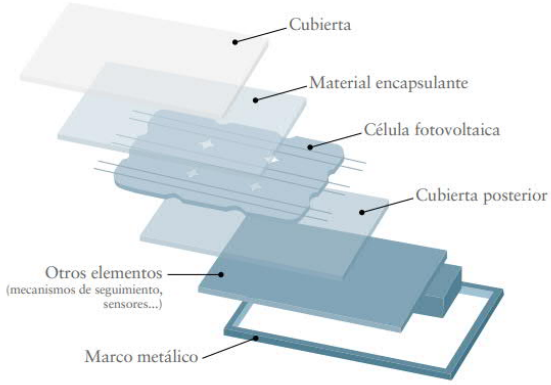


Figura 2. Representación esquemática de un modulo solar foltovoltaico

Los paneles solares fueron instalados mediante una conexión mixta en serie y paralelo, esto debido por que la recomendación es por aquellas instalaciones con más de 5 paneles de 60 celulas y potencias superiors a 200W, en este caso son 14 paneles solares de 435.

La combinación propuesta e instalada fue la de tener dos líneas en paralero y en cada línea conectar en

serie 7 paneles. Los datos fueron tomas de la tabla 1.
Paneles en serie, 7: Voc Total = 7 * Voc = 7*49.40 V = 345.8 V
Paneles en serie, 7: Vmp Total = 7 * VMMP = 7*40.80 V = 285.6 V
Hay 2 series / cadenas en paralelo. lmp = 2 * lmp = 2 * 10.67 = 21.34 A
Hay 2 series / cadenas en paralelo. l cc total = 2 * lmp = 2 * 11.26 = 22.52 A
Voc Total = 345.8 V, Vmp Total = 285.6 V, Imp Total = 21.34 A, Isc Total = 22.52 A

Tabla 1. Especificaciones eléctricas de los paneles solares

Atributo	Valor
Potencia pico (Wp)	435 W
Voltaje de circuito abierto (Voc)	49.40 V
Corriente de cortocircuito (lsc)	11.26 A
Voltaje a la máxima potencia (Vmp)	40.80 V
Corriente a la máxima potencia (lmp)	10.67 A
Máximo voltaje del Sistema	1500 Vcc
Valor de corriente del fusible	20 A

3. Resultados

En la Tabla 2 se presentan los costos conforme al rango de consume en kW en la Comisión Federal de Eléctricidad y que varian conforme al mes del año.

Tabla 2. Rango de costos por consumo en kW en México

Rango	Precio en Pesos Mexicanos
0 a 150 kW	$0.875
151 a 250 kW	$1.064
251 a más kW	$3.134

Tomando en cuenta los datos anteriores se procedio a realizar una proyección de los costos conforme al consume de energía, lo que da como resultado los datos presentados en la Tabla 3 y Figura 2.

Tabla 3. Proyección de costos conforme al consuma de energía elétrica

CONSUMO KW	BASICA	INTERMEDIA	EXCEDENTE	TOTAL A PAGAR
100	$88.20	$0.00	$0.00	$102.31
150	$132.30	$0.00	$0.00	$153.47
200	$132.30	$53.65	$0.00	$215.70
250	$132.30	$107.30	$0.00	$277.94
400	$132.30	$268.25	$0.00	$464.64

450	$132.30	$268.25	$156.70	$646.41
500	$132.30	$268.25	$313.40	$828.18
600	$132.30	$268.25	$626.80	$1,191.73
800	$132.30	$268.25	$1,253.60	$1,918.81
900	$132.30	$268.25	$1,567.00	$2,282.36
1000	$132.30	$268.25	$1,880.40	$2,645.90
1100	$132.30	$268.25	$2,193.80	$3,009.45
1200	$132.30	$268.25	$2,507.20	$3,372.99
1300	$132.30	$268.25	$2,820.60	$3,736.53
1400	$132.30	$268.25	$3,134.00	$4,100.08
1500	$132.30	$268.25	$3,447.40	$4,463.62

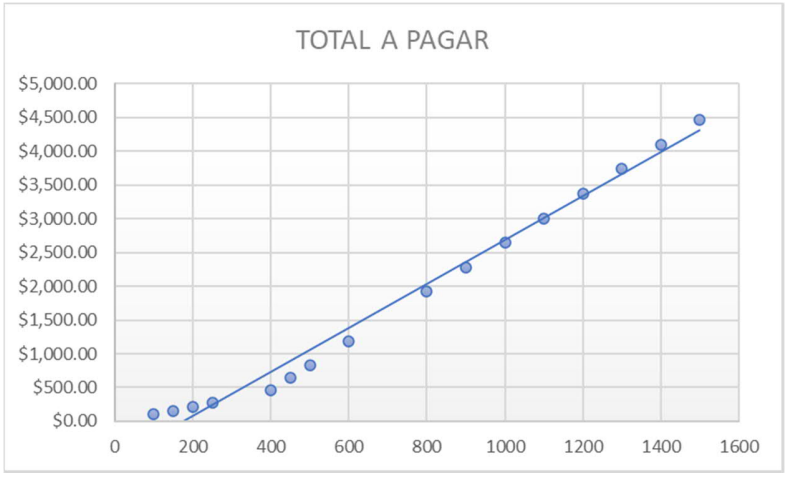


Figura 2. Gráfica de costos por consume de energía eléctrica

Como se muestra en la Tabla 4 y 5 se tiene un registro del consumo y producción diario que se tiene con los paneles solares, por lo cual se puede observar en la figura 3, que la producción supera al consumo eléctrico, lo que brinda tener excedentes y estos puedan ser canalizados a la red eléctrica.

Tabla 4. Datos de consumo y producción diaria 20 Dic 2021 a 31 de enero de 2022

Fecha	Lectura CONNERA	Lectura Inicial	Consumo Inicial	Consumo Diario	Producción Diaria	Diferencia Consumo vs Producción
20-dic-2021		5741		0	0	
25-dic-2021	0.59	5826	85	85	0	-85
26-dic-2021	29.81	5843	17	19	21	2
27-dic-2021	31.46	5855	10	14	23	9
28-dic-2021	32.88	5870	11	11	28	17
29-dic-2021	27.96	5892	22	26	21	-5
30-dic-2021	28.4	5912	16	17	19	2
31-dic-2021	24.51	5929	16	17	21	4

1-ene-2022	31.17	5947	17	21	23	2
2-ene-2022	30.6	5967	16	20	21	1
3-ene-2022	5.97	5978	7	12	3	-9
4-ene-2022	5.86	5991	8	11	2	-9
5-ene-2022	25.87	5998	4	7	22	15
6-ene-2022	22.72	6010	3	3	17	14
7-ene-2022	16.67	6016	6	10	11	1
8-ene-2022	31.77	6030	10	10	26	16
9-ene-2022	32.8	6036	6	7	27	20
10-ene-2022	20.74	6051	14	16	16	0
11-ene-2022	20.72	6066	13	18	13	-5
12-ene-2022	19.79	6076	5	7	13	6
13-ene-2022	16.32	6093	15	15	10	-5
14-ene-2022	30.38	6104	11	15	24	9
15-ene-2022	32.75	6115	7	8	25	17
16-ene-2022	6.44	6125	9	12	2	-10
17-ene-2022	26.21	6133	5	9	20	11
18-ene-2022	34.41	6141	4	6	26	20
19-ene-2022	34.61	6150	7	10	28	18
20-ene-2022	32.84	6163	10	14	26	12
21-ene-2022	14.04	6175	8	12	6	-6
22-ene-2022	5.92	6184	5	10	3	-7
23-ene-2022	7.88	6194	5	7	2	-5
24-ene-2022	22.38	6203	7	9	17	8
25-ene-2022	33.12	6211	6	7	29	22
26-ene-2022	3.28	6215	3	10	0	-10
27-ene-2022	17.07	6223	1	3	12	9
28-ene-2022	17.69	6229	4	5	13	8
29-ene-2022	4.34	6237	7	11	0	-11
30-ene-2022	35.1	6248	7	8	30	22
31-ene-2022	35.76	6255	6	7	28	21

Tabla 5. Datos de consumo y producción diaria 1 al 18 de febrero 2022.

Fecha	Lectura CONNERA	Lectura Inicial	Consumo Inicial	Consumo Diario	Producción Diaria	Diferencia Consumo vs Producción

1-feb-2022	34.51	6263	7	7	29	22
2-feb-2022	34.24	6271	8	15	26	11
3-feb-2022	34.63	6281	3	7	28	21
4-feb-2022	9.75	6293	8	10	5	-5
5-feb-2022	5.5	6302	7	9	1	-8
6-feb-2022	10.68	6308	4	5	7	2
7-feb-2022	11.1	6313	4	5	8	3
8-feb-2022	6.5	6321	7	9	2	-7
9-feb-2022	7.97	6329	6	8	4	-4
10-feb-2022	24.97	6336	5	9	18	9
11-feb-2022	27.99	6345	5	6	22	16
12-feb-2022	20.67	6351	5	9	14	5
13-feb-2022	6.2	6363	8	11	1	-10
14-feb-2022	10.95	6373	7	7	7	0
15-feb-2022	22.01	6380	7	10	19	9
16-feb-2022	36.79	6387	4	10	33	23
17-feb-2022	36.93	6397	4	5	33	28
18-feb-2022	29.04	6400	2	10	25	15

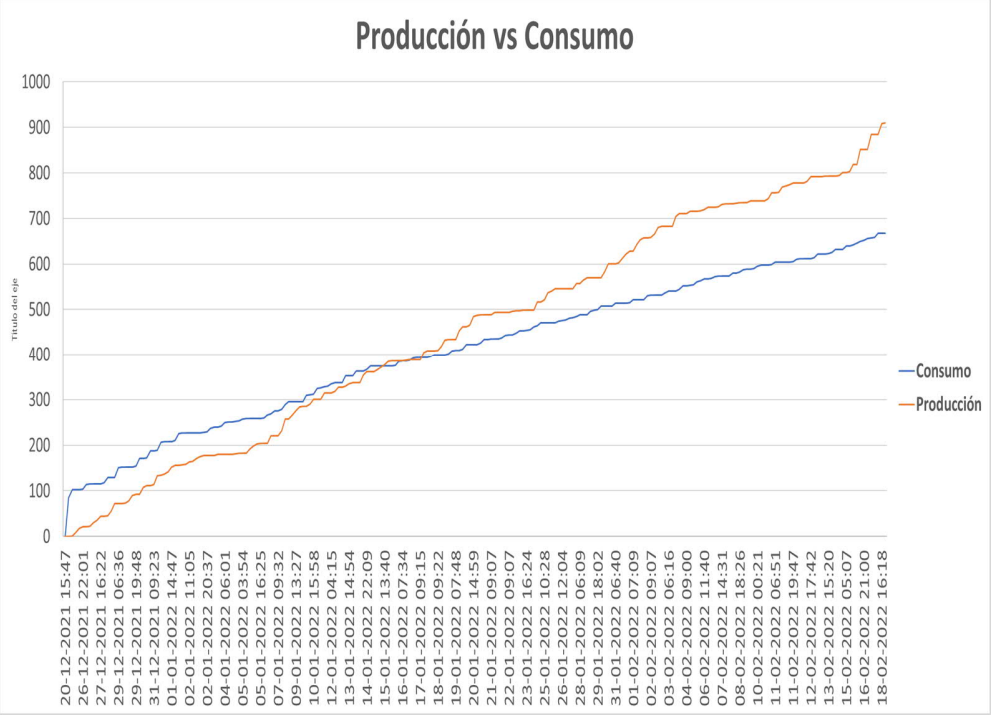


Figura 3. Gráfica de comparación de Producción vs Consumo del 20 de diciembre de 2021 al 18 de febrero de 2022

En lo que respecta a la Figura 4, la línea roja es la producción y la línea azul es el consumo, por lo cual en la mayoría de los días existe mayor producción que consumo, por lo cual es

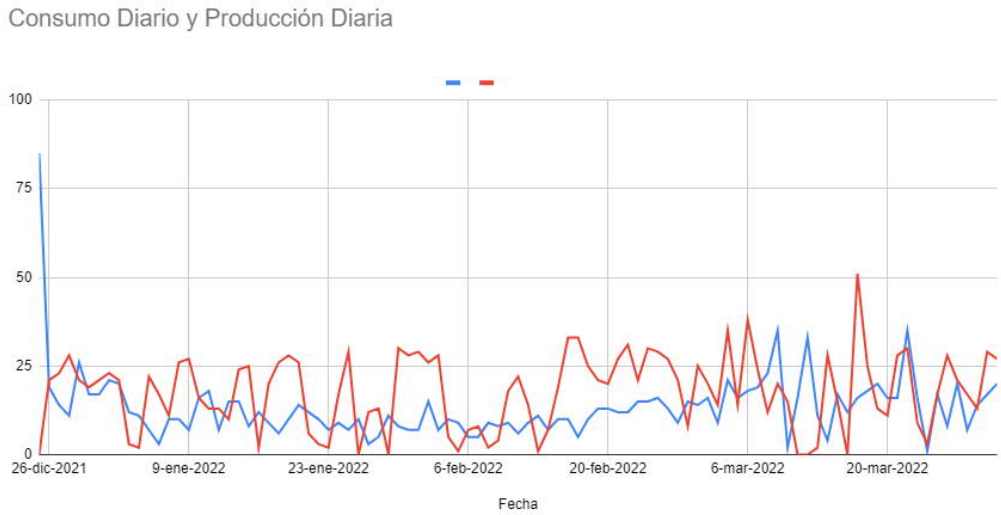


Figura 4. Gráfica de comparación de Producción vs Consumo díaría del 20 de diciembre de 2021 al 20 de marzo de 2022

4. Conclusiones

El usar un sistema de paneles solares monocristalino Connera, trajo como consecuencia la reducción de hasta un 99.97% de los costos del pago del consumo de energía, lo que conllevó a tener ahorros significativos. Con este sistema al bimestre puede generar hasta 1,363 Kw de electricidad, teniendo en cuenta que esto depende de las buenas condiciones de radiación solar que se tengan y del mantenimiento que se le brinde.

Reconocimiento

Para este trabajo de investigación, se tuvo apoyo del usuario que nos permitió conocer datos técnicos y brindar seguimiento a las lecturas diarias.

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FACTORES QUE AFECTAN EL DESEMPEÑO DE LOS EQUIPOS DE CÓMPUTO Y ESTRATEGIAS DE SOLUCIÓN

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RESUMEN
Se presenta la evaluación de un sistema de paneles solares foltovoltaicos instalados en una casa Este artículo aborda los factores que afectan el desempeño de los equipos de cómputo y sus consecuencias. Se debe de tomar en cuenta que conforme a los parámetros de estimación de vida útil de los equipos de cómputo establecido en la Ley General de Contabilidad Gubernamental en México, se establecio que es de 3 años con un 33.3% de depreciación anual. Sin embargo, hay instituciones y organizaciones donde la vida útil de los equipos la han prolongado desde 6 hasta 12 años o mas, esto se debe porque la adquisición de equipos nuevos es muy costoso y poco viable en algunos casos.

Por lo general, se sigue trabajando con estos equipos, aún cuando con el paso del tiempo sufren desgaste por las condiciones de uso, por el escaso mantenimiento que se realice en estos, por los requerimientos de hardware de los software, son cada vez mayores y lo que ocasiona cierta incompatibilidad con los equipos con los cuales se esta trabahjando.

Según un artículo publicado por Microsoft (2019) señala que "El 35% de las PCs que son utilizadas hoy por las PyMEs mexicanas tienen cuatro o más años de antigüedad. Además, el 36% de estas empresas no cuenta con una política de actualización tecnológica o no la siguen"[6]

La tecnología ha avanzado y los equipos de cómputo que ya han cumplido su vida útil pueden prolongarse aún más, siguiendo las estrategias que se plantean en el presente artículo.consecuencia.

Keywords: Equipo de cómputo, soluciones, factores, afectan, desempeño.

Introduccion

Cuando hablamos procesos en una computadora, hablamos del tiempo de ejecución de un programa o aplicación, también a la velocidad de búsqueda así como velocidad de escritura y lectura de la memoria, por eso proceso es todo aquello que nos permite realizar una tarea de una manera óptima, y con un equipo que no desempeña su trabajo no se puede lograr la optimización del proceso por parte del usuario y puede verse afectado en sus tareas, hay ocasiones en que el sistema no soporta el peso de ciertas tareas que colapsa y cierra la aplicación con tal de liberar memoria, ya nos hemos acostumbrado que poco a poco el equipo de cómputo esté cada vez más lento y es que este proceso es lento que a veces nos damos cuenta, cuando realmente nos está afectando el rendimiento, quizá no lo podamos percibir cuando solo estamos ejecutando una aplicación a la vez, el problema es cuando trabajamos con múltiples tareas que habrá ocasiones donde se cierren de forma inesperada, en este artículo podremos darnos cuenta cuales son los factores que afectan el rendimiento y cuáles son sus posibles soluciones, ya que en ocasiones es mejor reemplazar el hardware que esté funcionando de manera incorrecta que adquirir un equipo nuevo, y al reemplazar un componente podemos alargar la vida de nuestra computadora. Tomaremos en cuentas todo lo que pueda afectar el rendimiento, y existen varios factores como lo es el uso adecuado, mantenimiento, capacidad e incluso el ambiente en el que se encuentra el equipo de cómputo.

Desarrollo

"Una computadora es dispositivo electrónico que es capaz de recibir información, almacenarla, procesarla y generar un resultado"[14], en el presente cada persona ya sea que estudie o trabaje puede que ocupe una computadora para realizar sus actividades, y cuando hablamos de desempeño puede variar según la necesidad de cada usuario ya que la necesidad de cada uno es distinta. Se puede evaluar el desempeño de una Computadora Empresarial "Un buen punto de partida para este análisis son los resultados de pruebas comparativas de rendimiento, las cuales sirven como una referencia clave para seleccionar un equipo". Podemos basarnos en las especificaciones físicas, es muy importante realizar las pruebas con equipos que estén dentro del mismo rango de precios para tener resultado más preciso, Podemos también poner a pruebas las tareas o multitarea.[8]

Con el paso del tiempo los equipos se desgastan más que nada los componentes y seguramente los equipos estén un poco más lentos y el desempeño no sea el mismo, son varios los factores que provocan que el desempeño de los equipos disminuya, pero cada factor que esté presente podemos darle una solución estratégica a continuación se mencionan cuáles son estos factores que afectan a nuestros equipos en su día a día y una posible solución estratégica:

A) Uso: Dependiendo del uso que le demos a la computadora cuidaremos del rendimiento, esto afectando indirectamente por medio de los componentes, el uso que le da un niño, un adolecente o un adulto puede variar según el grado de cuidado que se tengan, los niños puede utilizar el computador para jugar o para entretenerse, mientras que un joven puede entretenerse y realizar trabajos escolares al igual que un adulto, incluyendo si su herramienta de trabajo es la computadora, podemos mejorar el rendimiento con 7 consejos que nos servirán para darle un buen uso algunos ejemplos [7] son:
Desinstalando el software innecesario: Por lo general, los equipos traen aplicaciones que son instalados por el fabricante y estas aplicaciones ocupan un espacio en el almacenamiento y también ocupan el procesador si es que se ejecutan en segundo plano afectando la memoria que podemos utilizar con nuestras aplicaciones. Así que puedes ver cuales son estas aplicaciones y puedes desinstalarlas de manera permanente, siempre y cuando no sea necesaria para que funcione el sistema.
Podemos quitar el permiso a aplicaciones que se inician de manera automática al encender la computadora deteniendo o poniendo en espera los demás programas que sí son importantes.
También se menciona el uso de la ram, esto dependerá de qué programas utilices por ellos es muy importante investigar qué espacio de ram ocupan los programas que utilizamos a menudo, y si no estamos utilizando alguno podemos cerrarlo para que no afecte las demás aplicaciones.
Es necesario hacer uso de los antivirus ya sea propio del sistema o un programa de tercero que pueda ayudarte a detectar los software maliciosos que dañan el sistema.

B) Tiempo de vida: Se considera tiempo de vida útil de un equipo de cómputo al tiempo en el cual el equipo trabaja de manera óptima y eficaz, este periodo concluye cuando se cambia de equipo. Esto varía en función de la manera y tipo de uso que les den a los equipos, aunque actualmente el promedio del tiempo de vida oscila entre 4-5 años.
Los componentes que más desgaste presentan por uso, son el teclado y el ratón; el resto del equipo (software y demás hardware) deben de recibir mantenimiento por lo menos dos veces al año, desde la limpieza externa hasta depuración de documentos dentro del equipo, que a su vez pueden ocasionar que trabaje con menor velocidad.
Hay equipos que, dependiendo la marca, tienen garantía de uso entre 5-10 años, pero si no se les brinda un mantenimiento adecuado esa garantía de durabilidad puede verse reducida considerablemente.
Entonces si queremos mantener o alargar el tiempo de vida útil de nuestro equipo de cómputo, se debe de tener en cuenta los siguientes puntos que son los más recomendables [3]:

- Mantenga el flujo de aire sin obstrucciones a través del computador; revise que los ventiladores funcionen bien y no estén obstruidos por muebles, o estén llenos de polvo o suciedad.
- Ejecute de manera periódica un mantenimiento preventivo tanto de hardware como de software.
- Use un buen antivirus.
- Ejecute un programa limpiador de malware y spyware, por lo menos una vez al mes.

- Optimice la memoria del computador.
- Sólo descargue programas que usted realmente necesite.
- Elimine los programas que ya no utilice y que ocupen espacio innecesario.
- Ejecute sólo unos pocos programas a la vez.
- Conecte su computador a un estabilizador de voltaje, o al menos a un protector contra sobrecargas (supresor de picos). No lo conecte directamente a la toma de corriente.
-

C) Tecnología desfasada (obsoleta): La tecnología tiene un ciclo de vida, que está ligado a diferentes factores, y es recomendable cambiar la PC, tableta o "smartphone" en períodos de entre tres o cuatro años.

En promedio se pierden alrededor de 42 horas anuales como consecuencia de la necesidad de reparar permanentemente los PCs con cuatro años o más de antigüedad, en estos casos, la frecuencia de reparaciones ronda las nueve al año, según lo revela un estudio realizado por el grupo Intel[2].

Entre los principales problemas de los que se quejan la mayoría de usuarios con relación al desempeño de los PCs más antiguos en sus distintas actividades son, según el orden de importancia: reducción en desempeño y respuesta del equipo, aplicaciones que no funcionan, infección por virus, sistemas operativos que fallan, no poder conectarse a otros dispositivos móviles y la batería que se agota rápidamente.

Entonces la mejor recomendación al momento de comprar un dispositivo personal es elegir una opción que brinde una buena combinación entre hardware y software basada en las nuevas tecnologías.

Pero si lo que uno quiere es restaurar el equipo de cómputo que consideramos como obsoleta o darle un nuevo a ciertas partes de nuestra antigua PC, para renovar así, de manera astuta e ingeniosa, aquel equipo que utilizamos sin necesidad de invertir en ello mucho dinero, se puede lograr realizando pasos inteligentes.

Según Andrés Indaverea[10], consumer marketing manager de AMD dio estos consejos prácticos para llevarlo a cabo:

Realizar una pequeña inversion: Hacer que nuestro antiguo equipo funcione correctamente otra vez, en este caso, será necesario realizar el pequeño esfuerzo de invertir en la reposición de aquellas partes dañadas, además de llevar a cabo una limpieza y renovación de software, como, por ejemplo, instalar un nuevo sistema operativo.

Salvar ciertas partes: Muchas veces, se puede rescatar aquellas partes que aún nos son útiles (como la memoria RAM o el lector de DVD), aunque el equipo no funcione en su totalidad, pudiendo conectarlas a otras computadoras o darles nuevos usos.

Usar la PC para conectar a un proyector: Se puede usar la antigua PC para enchufarla a un proyector y utilizarla para proyectar presentaciones, películas o juegos.

Convertir a la antigua PC en un monitor o servidor: Se puede usar la pantalla de una laptop para reconvertirla en una PC de escritorio o también, utilizar las partes separadas para asignarle nuevas funciones ligadas a otros equipos que se posea.

D) Hardware: Cuando se habla de hardware nos referimos a los componentes internos de una computadora portátil y en el caso de las de escritorio son los componentes que se encuentran dentro del gabinete.
El procesador es uno de los componentes que menos sufren el desgaste, pero igualmente pueden ver su rendimiento mermado por factores como su temperatura de funcionamiento o el voltaje [1].
Pero con el paso del tiempo todos los componentes de hardware van disminuyendo su rendimiento lentamente, y por mucho mantenimiento y optimización que se le haga el desgaste por el uso siempre está presente, y esto sucede en el procesador, la tarjeta gráfica, los medios de almacenamiento y la fuente de alimentación principalmente, pero también en los ventiladores (se hacen más ruidosos y menos eficaces) y el resto de componentes. El desgaste del hardware y por ende el bajo rendimiento de nuestro equipo de cómputo es inevitable.
La recomendación más apropiada para tratar de alargar la vida útil de un componente de hardware es la aplicación de un mantenimiento preventivo de hardware, y en caso de ser necesario un mantenimiento correctivo de hardware reemplazando el componente dañado lo más pronto posible para así evitar daños a algún otro componente de hardware.

E) Mantenimiento: Un factor que a veces no se le da la debida importancia, pero que es uno de los principales problemas que afectan el rendimiento de un equipo de cómputo es la falta de un mantenimiento pertinente. Como bien sabemos cualquier aparato tecnológico se le debe brindar un mantenimiento óptimo para tratar de mantenerlo en las mejores condiciones posibles y con los equipos de cómputo esto no es la excepción.
Existen dos tipos de mantenimiento que pueden hacérseles a los equipos de cómputo, el preventivo y el correctivo.

Mantenimiento preventivo: Este tipo de mantenimiento consiste en crear un ambiente favorable para el sistema y conservar limpias todas las partes que componen una computadora. La mayoría de las fallas que presentan los equipos es por la acumulación de polvo en los componentes internos, ya que éste actúa como aislante térmico.

Mantenimiento correctivo: Este tipo de mantenimiento se llega a necesitar cuando no realizamos ningún mantenimiento preventivo a nuestro equipo, y como su nombre lo dice consiste en la corrección o reparación de alguno de los componentes de la computadora, puede ser una soldadura pequeña, el cambio total de una tarjeta (sonido, video, SIMMS de memoria, entre otras), o el cambio total de algún dispositivo periférico como el ratón, teclado, monitor, etc.
Como recomendación se sugiere realizar un mantenimiento preventivo al equipo de cómputo cada seis meses como máximo, es decir que por lo menos se debe brindarle mantenimiento dos veces al año, el tiempo dependerá de cada usuario, de la ubicación y uso de la computadora, así como de los cuidados adicionales que se le dan a la PC.

F) Ambiente de trabajo (Ubicación física): Al referirnos al ambiente de trabajo, hacemos referencia a la ubicación física de la computadora en el hogar u oficina o cualquier lugar donde se encuentre, el cual

puede afectar a la PC si no se tienen los cuidados necesarios. Para evitar el bajo rendimiento por un mal ambiente de trabajo le dejamos algunas recomendaciones.

Hogar: Es necesario mantener el equipo alejado de las ventanas, con el fin de evitar que los rayos del sol dañen a la PC. También si queremos evitar que el polvo se acumule con mayor rapidez, también hay que tratar de ubicar a la PC en un mueble que se pueda limpiar con facilidad.
Para evitar un sobrecalentamiento tanto del monitor o gabinete, hay que evitar utilizarlos como "repisa", esto quiere decir que no hay que poner nada sobre ellos ya que genera una gran cantidad de calor y es necesario disiparlo.

Oficina: Aplican los mismos cuidados en la oficina, aunque probablemente nos encontremos con un ambiente de trabajo diferente. Se añaden riesgos nuevos que son mas comunes en las oficinas como posibles descargas eléctricas o magnéticas, humedad, etc.
Así mismo las oficinas se mueven a cada instante, por lo mismo el mantenimiento preventivo será más frecuente.
Algunas estrategias ante posibles riesgos son:

- No exponer a la PC a los rayos del sol.
- No colocar a la PC en lugares húmedos.
- Mantener a la PC alejada de equipos electrónicos o bocinas que produzcan campos magnéticos ya que pueden dañar la información.
- Limpiar con frecuencia el mueble donde se encuentra la PC, así como aspirar con frecuencia el área si es que hay alfombras.
- No fumar cerca de la PC.
- Evitar comer y beber cuando se esté usando la PC.
- Usar "No-Break (regulador de corriente)" para regular la energía eléctrica y por si la energía se corta que haya tiempo de guardar la información.
- Cuando se deje de usar la PC, esperar a que se enfríe el monitor y ponerle una funda protectora, así como al teclado y al chasis del CPU para evitar la acumulación de polvo.
- Revisión de la instalación eléctrica de la casa u oficina, pero esto lo debe de hacer un especialista.
- Variaciones de voltaje.

Uno de los factores más silenciosos que afectan el desempeño de un equipo de computo es la variación de voltaje, al igual que cualquier aparato electrónico, las computadoras necesitan una cantidad especifica de voltaje para trabajar. Y sobre todo sus componentes internos suelen trabajar a diferentes medidas de voltaje, sin importar cual sea el voltaje que la computadora reciba.
La recomendación más eficaz es la implementación de un regulador de corriente, el cual regula la corriente necesaria, sin importar las condiciones de la corriente eléctrica, incluso cuando se va la energía eléctrica de improviso, este evita esa variación abrupta de voltaje.
De igual forma si se trata de un equipo de cómputo portátil lo más recomendable al momento de cargarlo, es solo mantenerlo conectado hasta que la batería del equipo se cargue completamente así evitaremos una sobrecarga a la pila y una variación de voltaje si se usa cargador original.
En caso de haberlo perdido o descompuesto se recomienda conseguir el original del equipo, ya que si

usamos algún cargador distintito puede que cargue, pero maneje diferente entrada de voltaje al que el equipo necesita.

G) Internet: Si al conectarte a internet tu equipo tiende a ralentizarse puede que no sea tu velocidad a internet ya que esto no debería afectar el rendimiento de tu equipo, pero deberías de tomar en cuenta según (Hernández, 2019) puede deberse a estos puntos:
Las actualizaciones en segundo plano, las actualizaciones son importantes para que el sistema funcione correctamente, pero hay que tener en cuenta que este proceso se ejecuta en segundo plano, podemos configurar el equipo para que solo busque actualizaciones y se instalen cuando tú las requieras, para así evitar este proceso cuando te conectes a internet.
La sincronización con la nube es otro punto importante ya que estos programas se encargan de revisar si existen archivos para su sincronización y al igual que el punto anterior se ejecuta en segundo plano para mantener tus archivos en la nube de manera continua, para ello puedes configurar la sincronización de estos programas para que definitivamente las pauses o configurar el horario de sincronización o para que se haga de manera automática cada cierto tiempo.
Los virus que se conectan a internet también pueden alentar el equipo y como ya se mencionó puedes usar el antivirus que desees para combatirlos.
La velocidad de descarga supera la velocidad de tu disco duro (HDD), es decir que si cuentas con un HDD muy antiguo este tiene una velocidad de lectura y escritura definida y esto le sumamos la antigüedad que tiene y lo estropeado que está dependiendo el uso que se le haya dado, y si contamos con una velocidad de internet muy alta puede alentar el equipo al no ir al mismo ritmo, la única solución es que cambien tu HDD por una unidad de estado sólido (SDD).
Por último podemos realizar un diagnóstico de problemas para ver qué programas están consumiendo red, en el administrador de tareas puedes ver qué programas están utilizando la red y de esta manera detenerlos si es que no es necesario que la utilice.

H) Capacidad: Para conocer la capacidad de Una Computadorase debe de conocer la velocidad de procesamiento, la capacidad de almacenamiento y la capacidad de memoria, hay que mencionar que no todas las personas ocupan las mismas características de una computadora ya que cada persona tenemos necesidades diferentes y le damos distintos usos, un estudiante promedio que solo utiliza la paquetería de office (word, powerpoint, excel, etc), no exige mucha capacidad del equipo, comparado con un estudiante de ingeniería que utiliza programas más pesados que le exigen más al sistema, y ni hablar de las personas que strimean o hacen ediciones de videos. es muy importante que al adquirir un equipo ya sea nuevo o de segunda mano tomes en cuenta para que lo quieres y qué programas vas a utilizar, normalmente los programas dan una lista de características que tu equipo necesita para poder instalarlo y con esto te puedes dar una idea que cuanta capacidad debe tener el equipo que vas a adquirir. En el caso de que compres uno con una capacidad inferior a la que necesitas, tu equipo irá lento y en el caso contrario, no se va a aprovechar al máximo su capacidad.

Conclusiones

Al exponer los factores que afectan el rendimiento, nos damos cuenta que podemos alargar la vida, dependiendo del tiempo que se haya usado el equipo desde que se compró hasta su uso actual, si no

tomamos las medidas necesarias las computadoras pueden quedar obsoletas ya que los equipos de cómputo tienen una vida que está definida por el fabricante, las estrategias de solución nos ayudarán a mantener nuestras computadoras en un estado donde se puedan utilizar sin ninguna frustración porque esta lenta o que las aplicaciones se cierran. Los punto más importantes son el uso y cuidado que brindemos al equipo, si cuidamos el equipo del agua, el calor, el polvo, los sobrecalentamientos, la batería, no exponerlos a la luz directa del sol, los golpes y los factores ambientales que puedan afectar al equipo, podemos sacar gran ventaja para que nos dure un poco más, por eso hay que tener en cuenta todos esos factores e incluso podemos recurrir a cambiar algún componente para que nuestro equipo mejore sin la necesidad de reemplazarlo en su totalidad y dándole un poco más tiempo de vida, ya que muchas personas al frustrarse por que el rendimiento del equipo no es el mejor que en el momento que se adquirió, terminan por comprar uno nuevo, y desaprovechan los componentes y el darle una oportunidad mejorándolo poniendo en práctica las estrategias de solución que se proponen.

Reconocimiento

Para este trabajo de investigación, se tuvo apoyo de parte de ingenieros que se dedicand a brindar servicio de mantenimiento a equipos de cómputo.

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“EVALUACIÓN DEL EFECTO DE LA 6-BENCIL-AMINOPURINA (BAP) EN EL DESARROLLO *IN VITRO* DE *CYMBIDIUM SPP*.”

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RESUMEN

La Orquídea (*Cymbidium spp*.), se ha caracterizado por tener una magnífica inflorescencia, razón por la cual es una de las más apreciadas en el mercado y se considera en peligro de extinción, debido principalmente a la destrucción (tala inmoderada, incendios), de su hábitat natural (bosques tropicales húmedos), baja tasa de germinación y extracción excesiva de especies (comercio ilegal). El cultivo in vitro, ofrece una alternativa para la conservación de esta y muchas otras especies, sin embargo en el cultivo in vitro de esta especie se han encontrado algunos retos que constituyen un factor determinante (genotipo, composición del medio de cultivo, concentración de reguladores de crecimiento). Esta investigación permitió establecer un protocolo de introducción y multiplicación de brotes *in vitro* para las posteriores etapas de micropropagación de *Cymbidium spp*, el material vegetal se obtuvo de plantas germinadas *in vitro* de embriones cigóticos de 2 años. Se probaron dos sistemas de micropropagación (medio semisólido e inmersión parcial). El establecimiento *in vitro* se logró empleando explantes desinfectados con Etanol (70%) durante 1 min, Hipoclorito de Sodio (1.5%) durante 10 min. El medio de cultivo Murashige & Skoog (1962), fue suplementado con regulador de crecimiento: 6-Bencil-AminoPurina (BAP), con cinco concentraciones 0, 0.5, 1.0. 1.5 y 2.0 mg/L. El pH del medio fue ajustado a 5.8, antes de la esterilización. El medio fue esterilizado en autoclave a 110°C, 1.2 kg/cm^2 por 15 minutos. Los datos obtenidos se sometieron a Análisis de Varianza (ANDEVA) y Prueba de

Tukey, de comparación de medias ($p \leq 0.05$). Los resultados mostraron diferencias significativas a la adición de la citoquinina. La formación de tejidos diferenciados (brotes), se evaluó a los trienta días después de la siembra del material vegetal. El mayor número de brotes por explante se obtuvo en medio MS semisólido suplementado con la citoquinina en concentración 1.5 mg/L de 6-BAP.

Palabras clave: Cultivo de tejidos, Micropropagación, *Cymbidium spp*, Biotecnología, Regulador de crecimiento.

“PROTOTIPO DE MEDICIÓN DE CONSUMO DE ENERGÍA ELÉCTRICA DOMÉSTICA”

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RESUMEN

La energía eléctrica es un elemento básico, importante y necesario que existe en cada uno de los hogares en México, bimestralmente se emite un recibo de luz por parte de la Comisión Federal de Electricidad (CFE), en el cual señalan un consumo, el total a pagar y la fecha límite de pago. Han existido casos, donde los recibos han sido elevados en costos y no coincide en el consumo de los electrodomésticos existentes en el hogar. Al acudir a la CFE a pedir una explicación, solo informan que ese es el consumo que se tiene y que se de pagar. Razón por la cual se diseño un prototipo que mide el consumo de energía eléctrica en el hogar y que a diario muestra al usuario el consumo real y el total a pagar. Este prototipo consiste en un sensor tipo imán no invasivo, el cual censa la línea principal del centro de carga del hogar y es enviado a una base de datos a la nube. Este prototipo le es de utilidad a los usuarios, porque permite conocer el consumo acumulado en kilowatt y en pesos. La mayoría de los usuarios de CFE desconocen como calcular el costo de su consumo, interpretar lo datos que arroja el medidor y la falta de alertas sobre el consumo actual. Lo anterior, ha dado que exista morosidad y resistencia civil por cerca de 500 mil usuarios y una deuda superior a los 11 mil millones de pesos.

Palabras clave: Medición, Consumo y Energía Eléctrica.

TECNOLOGÍAS EMERGENTES PARA LA VIRTUALIZACIÓN DE ESCRITORIOS REMOTOS

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RESUMEN
Hoy en día el término de virtualización, está tomando cada vez más importancia debido que nos permite reducir costos, tiempos y optimizar recursos en las organizaciones e instituciones educativas, la virtualización es la tecnología que permite lograr la transformación de la infraestructura de TI orientada a la centralización de entornos y aprovechando lo potencia de los servidores y su almacenamiento para beneficio de sus usuarios. Sus principales características son creación de particiones y múltiples sistemas operativos en una sola máquina física, aislamiento, encapsulamiento e independencia del hardware. La virtualización de escritorios remotos es un término relativamente nuevo, el cual fue introducido en la década de los 90, las bondades que tiene es que mayor seguridad en el acceso a los equipos virtuales a través de cualquier tipo de dispositivo personal, mantenimiento, despliegue de equipos es con mayor rapidez y eficiencia. Las tecnologías emergentes para la virtualización de hoy en día, nos brindan ventajas como las siguientes: Implementación instantánea de nuevos escritorios virtuales, reducción de tiempos improductivos a causa de fallos de hardware, alta reducción de costos, gestión de plantillas de sistemas operativos y escritorios, ampliación de la vida útil de los equipos obsoletos de 2 a 6 años, soporte para gestión de audio y video bidireccional, streaming de video, capacidad de uso de USB, acceso de los usuarios a sus escritorios virtuales desde cualquier PC o dispositivo electrónico.

Keywords: Virtualización, Escritorio, Remoto, Tecnología

Introduccion

En este artículo veremos información general sobre la virtualización y demás tecnologías que pueden contribuir con este, con el fin de mejorar una sala de equipos de cómputo, aunque su aplicación puede ser también aplicada en otros nichos laborares, nosotros nos queremos enfocar en la mejora de equipos de cómputos para que los alumnos puedan realizar sus tareas, practicas y trabajos de una manera eficiente y rápida. Gracias a la virtualización, podemos invertir en un solo equipo con unas características de gamas alta o en un buen servidor para después crear plantillas y compartir a otros equipos de cómputo, los cuales ya pueden estar obsoletos, pero con que tengan acceso a una red o internet estos podrán disfrutar de una mejor experiencia, como si estuvieran usando el equipo principal de la infraestructura. Otras de varias ventajas aparte del ahorro de inversión, energía eléctrica y demás gastos en generales, también podemos tener un mejor control en los usuarios, limitando o viendo que hacen estos al momento de usar los equipos.

Desarrollo

En la actualidad a nivel mundial la virtualización se ha está implementando para realizar la abstracción de los recursos de un computador también llamado VMM, con la cual creamos una capa intermedia de abstracción entre la maquina física del host y el Sistema Operativo de la máquina virtual también conocida como VMG.

Con esta implementación, en la actualidad se logró que la virtualización renaciera y alcanzara un gran auge o tendencia en los diversos departamentos, porque se diversifico la virtualización para escritorios, servidores, base de datos, aplicaciones y entre otros usos adicionales.

La virtualización se ha usado e implementado desde hace tiempo, permitiendo que en una misma máquina sean ejecutadas simultáneamente dos o más entornos diferentes y aislados. Ese concepto de virtualización se remonta a los antiguos mainframes, que debían ser divididos para varios usuarios en entornos de aplicación completamente diferentes, para ser más preciso esto fue usada por ahí de los años 60, esta tecnología la han aplicado para poder tener ahorros económicos, ya que anteriormente se destinaban muchos recursos a la compraventa y principalmente a la renovación de recursos de tecnología de información, esto era visto como un desperdicio de capital ya que en pocos años serían recursos obsoletos y que perderían su valor absurdamente, esto debido que la tecnología avanza exponencialmente, de energía, debido a que abrían menos equipos tecnológicos involucrados en el consumos de esta y así permitiendo crear centros de datos virtual ecológicos.

La virtualización puede ser dividida en las siguientes capas de virtualización: Acceso (Access virtualization), Aplicación (Application virtualization), Procesamiento (Processing Virtualization), Almacenamiento (Storage virtualization) y Red (Network Virtualization), nosotros nos centraremos un poco más en esta última.

Ya que la virtualización de red, agrega tecnologías de software y hardware que presentan una visión de la red que se difiere de la visión física. De esa forma, un ordenador puede "ver" solamente los sistemas que tienen permiso de acceso. Otra forma de utilización es consolidar múltiples conexiones de redes en una única.

La tecnología permite que diversas cargas de red fluyan por el mismo medio de forma segura. Los clientes solamente acceden a los servidores donde tienen el acceso permitido y los servidores solamente visualizan a los clientes a los que deben prestar soporte.

Ese recurso se hace esencial en estrategias de recuperación de entornos sin necesidad de realizar una reconfiguración completa de la red por parte de los administradores.
Gracias al hipervisor que es una pieza de software, hardware o firmware que crea y gestiona máquinas virtuales. Con esto podemos lograr crear un puente entre el hardware físico y las máquinas virtuales, para poder trasladar esta última a una gran distancia y estar disponible para usarlo sin importar el hardware del otro equipo.
Hay 2 tipos de hipervisores del cual usaremos el 1 (si se llegara ocupar usaríamos ambos):
1) Hipervisor de Tipo 1 son denominados como virtualización en modo nativo que se caracteriza principalmente porque el software se instala directamente sobre el computador del host y así lograr las funciones de Sistema Operativo (SO) y de virtualización.
Este tipo de metodología de virtualización suelen ser implementadas por las empresas que pueden disponer de uno o varios servidores dedicados para una función específica y exclusiva para la virtualización del sistema.
2) El Hipervisor de tipo 2 es conocida también como hosted, porque la aplicación hipervisor se instala y ejecuta sobre un equipo que contenga un sistema operativo tradicional previamente instalado como Debian, Fedora, Windows, Mac Os y entre otros para luego virtualizar los diversos sistemas operativos.
Esta metodología de virtualización es idónea para los usuarios finales, informáticos, estudiantes que deseen probar nuevos sistemas operativos y aplicaciones sin correr el riesgo de perjudicar la máquina anfitriona.
El Entorno Virtual (VE) de Proxmox es un hipervisor basado en clústeres y uno de los secretos mejor guardados de la industria de la virtualización.
La razón es sencilla y es porque permite construir una infraestructura virtual de clase empresarial a un precio de clase empresarial pequeña sin sacrificar la estabilidad, el rendimiento y la facilidad de uso.
Proxmox, como empresa, fue fundada por Martin Maurer y Dietmar Maurer en 2005. La historia de la empresa Proxmox comenzó poco antes de que Proxmox Mail Gateway fuera lanzado por primera vez. En 2008, se lanzó Proxmox Virtual Environment en la versión 0.9.
Proxmox VE es una plataforma completa de gestión de servidores de código abierto para la virtualización empresarial. Integra estrechamente el hipervisor KVM y los contenedores de Linux (LXC), la funcionalidad de redes y almacenamiento definido por software, en una sola plataforma. Con la interfaz de usuario basada en web integrada, puede administrar máquinas virtuales y contenedores, alta disponibilidad para clústeres o las herramientas integradas de recuperación ante desastres con facilidad.
Las características de clase empresarial y un enfoque 100 % basado en software hacen de Proxmox VE la elección perfecta para virtualizar su infraestructura de TI, optimizar los recursos existentes y aumentar la eficiencia con un gasto mínimo. Puede virtualizar fácilmente incluso las cargas de trabajo de aplicaciones de Linux y Windows más exigentes, y escalar dinámicamente la computación y el almacenamiento a medida que crecen sus necesidades, asegurando que su centro de datos se ajuste al crecimiento futuro.
Las ventajas por la cual decidimos escoger Proxmox son las siguientes:

- **Administrador Web HTML5**: PROXMOX proporciona un interfaz Web para configurar los servidores físicos, cluster, máquinas virtuales, políticas de backups, restauración de backups, snapshots.

- **No es necesario instalar aplicaciones clientes** en su máquina para administrar y siendo HTML5 le permite conectarse y gestionar el entorno virtualizado desde su Smartphone Android, Iphone, tablet's, entre otros.
- **Virtualización para la mayoría de Sistemas Operativos, en sus versiones 32/64bits:** Linux en todas sus versiones, Microsoft Windows 10 / 2016 / 2012 / 7 / 8/ 2003 / xp, Solaris, AIX, entre otros.
- **KVM (Máquina virtual basada en el núcleo)**: Es una solución para implementar virtualización sobre Linux. Puede funcionar en hardware x86/x86_64 y es necesario que el microprocesador tenga soporte de virtualización Intel "VT" y en AMD "SVM".
- **Container-based Virtualization (LXC):** Es una alternativa para ejecutar máquina "Linux" en espacios separados. A diferencia de la virtualización este funciona como un módulo agregado al servidor físico y hace uso directo del hardware (también conocido como Paravirtualización).
- **Backup & Restore de "Máquinas Virtuales":** En Proxmox el efectuar estas tareas es muy sencillo y se administra a través de su interfaz Web. Puede efectuar un backup de forma inmediata o dejarlo programado. La restauración es simple, solo debe de seleccionar el backup a restaurar y listo.
- **Snapshot Live:** le permite hacer copias instantáneas de "Máquinas Virtuales" incluyendo el contenido de la RAM, su configuración y el estado de los discos virtuales. Se puede retroceder el tiempo de la "Máquina Virtual" restaurando spanshot's.
- **“Migración en caliente:** La administración de los nodos es centralizada a través de un interfaz Web, permitiéndole movilizar “Máquinas virtuales” entre cada “Servidor Físico (NODO)” sin tener que apagar la “Máquina Virtual”.
- **Cluster Alta disponibilidad:** Esta característica le permite definir reglas de “Alta disponibilidad” en el cluster.
- **Administración centralizada:** En un "Cluster Proxmox" se debe definir una de los Nodos como "Orquestador" con el objetivo de centralizar el trabajo, sin embargo, cada nodo cuenta con su propio administrador Web.
- **Cluster no SPOF (Single Point Of Failure):** Cada nodo "Servidor físico Proxmox" cuenta con su propio interfaz Web permitiendo acceso a la administración de las "Máquinas Virtuales". Si el nodo "Orquestador" llega a fallar, cada nodo tiene replicado la información del "Orquestador" y desde cualquiera de los nodos puede tomar control del cluster.
- **Puentes de red:** Proxmox administra las tarjetas físicas a través de "Bridges" que comparte a las "Máquinas Virtuales". Es muy sencillo asociar 1 o varias tarjetas a un "Bridge" haciendo un balanceo automático del tráfico de datos.
- **NAS & SAN:** Es muy fácil el uso de NAS o SAN ya sea a través de Fibra Canal, iSCSI Over Ethernet o NFS. Proxmox no le limita.
- **Autenticación:** Puede configurar la autenticación de acceso al área de "Administración a los Nodos" a través de cuentas propias con Proxmox o utilizando LDAP/Active Directory.
- **Firewall:** Proxmox VE Firewall proporciona una manera fácil de proteger su infraestructura en un entorno virtualizado. Puede definir reglas de firewall para todas las máquinas virtuales o definir reglas precisas a una máquina virtual (Juan Estuardo Hernandez, 2017).

En pocas palabras haremos el uso de esta tecnología debido a que la mayoría de productos de

Virtualización Empresarial tienen un alto costo y su modelo de licenciamiento lo basan en la cantidad de equipos instalados, Procesadores, Socket's, entre otros. Con Proxmox podremos usarlo libremente de y sin límites. Actualmente PROXMOX se mantiene en constante mejora y a gracias de sus actualizaciones constantes nos permite hacer uso de lo nuevo en su programación sin tener que pagar por ello.

Nosotros queremos usar la tecnología mencionada anteriormente para implementar en Windows Server 2019 en la versión que cuenta con interfaz gráfica similar al Windows 10, hablemos un poco más de Windows server, es una línea de sistemas operativos que Microsoft crea específicamente para usar en un servidor.

Los servidores son máquinas extremadamente poderosas que están diseñadas para ejecutarse constantemente y proporcionar recursos para otras computadoras que se usa normalmente en empresas.

Gracias que el S.O. está dirigido para empresas, este nos incluye una gran cantidad de software empresarial.

A continuación, se muestran algunas funciones que un servidor puede realizar gracias a sus diversas herramientas:

a) Active Directory: Active Directory es un servicio de administración de usuarios que permite que un servidor actúe como un controlador de dominio. En lugar de que cada usuario inicie sesión en una computadora local, el controlador de dominio maneja toda la autenticación de la cuenta de usuario.

b) DHCP: El protocolo de configuración dinámica de host es un protocolo que permite que un servidor asigne automáticamente direcciones IP a todos los dispositivos en la red. En casa, su enrutador probablemente maneja esto. Pero en un entorno empresarial, el personal de TI puede aprovechar la mayor funcionalidad de DHCP en Windows Server.

c) Archivo y Almacenamiento: Tener un servidor de archivos para su empresa es otro uso común. Esto le permite mantener datos importantes en una ubicación central y establecer permisos para controlar quién puede acceder a qué archivos.

d) Servicios de impresión: si una empresa tiene docenas de impresoras en todo el edificio, es una pérdida de tiempo para el personal de TI configurarlas individualmente para cada nueva estación de trabajo. Configurar un servidor de impresión le permite asignar fácilmente impresoras a computadoras y reducir el trabajo redundante.

e) Servicios de actualización de Windows: a menudo, las empresas no quieren que todas las actualizaciones de Windows lleguen de inmediato. Al configurar un servidor como un controlador de actualización de Windows, puede enrutar todas las actualizaciones de la estación de trabajo a través de ese servidor y configurar reglas específicas sobre cómo deberían funcionar.

Estos son solo algunos de los roles de servidor que Windows Server que se nos puede ofrecer. Según el uso que se le vaya a dar se puede tener más de un servidor y dividirá las funciones anteriores en varios dispositivos.

Otros factores importantes por el cual se escogió Windows Server son por sus limitaciones de hardware el cual puede reconocer más de 24 terabytes de memorias RAM, también admite más de 64 zócalos de CPU, este nos permite que el servidor pueda ejecutar decenas de máquinas virtuales permitiendo que todas funcionen se usen sin problemas al mismo tiempo.

Obviamente no se llevará al tal limite ya que su uso será menos exigente y será centrado en el nicho educativo, para ser más específico para mejorar la calidad de los laboratorios que cuente con equipos

de cómputo y así lograr un mayor aprendizaje.
Como nuestro objetivo es la mejora de la educación Windows Server también quita muchas funciones que podrían o son una distracción al momento de su uso, estas funciones son Microsoft Store, Cortana, Your Phone en general muchas aplicaciones y funciones de calidad de vida, que estén orientadas al consumidor.
Nuestro proyecto se basaría en una infraestructura de un servidor, por el momento, pero gracias a esto podemos convertir dicha a infraestructura en virtual, esta nos permitiría compartir los recursos físicos en toda la infraestructura.
Se puede clasificar a las máquinas virtuales en dos grandes grupos que a continuación se listan:
i. Máquinas virtuales de sistema.
ii. Máquinas virtuales de proceso.
Nos centraremos en las Máquinas virtuales de sistema, este tipo de máquinas virtuales permiten que el computador anfitrión (físico) y sus componentes sean representados o distribuidos en diferentes máquinas virtuales por medio del Hipervisor, donde el Hipervisor opera en el hardware o sistema operativo.
La máquina virtual se comporta exactamente igual que lo hace un servidor físico y contiene sus propios CPU, RAM, disco duro y tarjetas de interfaz de red (NIC) virtuales (es decir, basados en software). Las necesidades según la carrera son el factor en función del cual se rige la asignación dinámica de los recursos físicos de la infraestructura a las aplicaciones, incluso a medida que van evolucionando y cambiando tales necesidades.
La virtualización de un servidor físico único es solo el principio. Puede construir una infraestructura virtual completa, que abarque cientos de servidores físicos y dispositivos de almacenamiento interconectados.
Para que nuestros usuarios tengan accesos a las plantillas que se crearan previamente y se configuraran según las necesidades de este, será por Escritorio Remoto esta tecnología puede ser definida como el medio por el cual uno o varios usuarios pueden acceder a distancia a un ordenador desde otro ordenador. Como su propio nombre indica, la conexión ha de ser remota, lo cual implica que ambos ordenadores estén situados en redes diferentes, cada uno con su propio IP (Protocolo de Internet).
Esta tecnología es extremadamente útil tanto para empresas como para particulares que deseen hacer uso de un determinado ordenador se encuentren donde se encuentren, simplemente contando con una conexión a internet y permaneciendo ambos ordenadores encendidos de manera simultánea. Gracias a ello, el ahorro económico, técnico y de tiempo se hace patente al prescindir de desplazamientos innecesarios.
Aunque el escritorio remoto tiene muchas opciones de uso nosotros nos centramos en Escritorio remoto como mejora en el sistema de educación a distancia dentro del mismo instituto.
Esto se debe a que nos hará más eficaz llevar a cabo clases y poder hacer prácticas en las salas de cómputo.
Con todo ello, el escritorio remoto también se puede utilizarse para que el profesor pueda acceder a los trabajos de los alumnos e ir monitorizando las acciones de los mismos en tiempo real.
Las conexiones desde un escritorio remoto siempre se hacen a través de Internet. Sin embargo, hay dos formas distintas de ejecutar esta tecnología. Tenemos planeado usar la forma más básica y de hacerlo es la conexión a través del sistema operativo.

Son los siguientes:
Los estándares IEEE 802.11b, IEEE 802.11g e IEEE 802.11n disfrutan de una aceptación internacional debido a que la banda de 2,4 GHz está disponible casi universalmente, con una velocidad de hasta 11 Mbit/s, 54 Mbit/s y 300 Mbit/s, respectivamente.
En la actualidad ya se maneja también el estándar IEEE 802.11ac, conocido como WIFI 5, que opera en la banda de 5 GHz y que disfruta de una operatividad con canales relativamente limpios. La banda de 5 GHz ha sido recientemente habilitada y, además, no existen otras tecnologías (Bluetooth, microondas, ZigBee) que la estén utilizando, por lo tanto, existen muy pocas interferencias. Su alcance es algo menor que el de los estándares que trabajan a 2,4 GHz (aproximadamente un 10 %), debido a que la frecuencia es mayor (a mayor frecuencia, menor alcance).
Wifi 6 se trata de la nueva generación del estándar de red de área local inalámbrica (WLAN) y llega como el sucesor del estándar Wi-Fi 5 (802.11ac), que usamos mayoritariamente hoy en día. Uno de los aspectos más destacados de esta evolución radica en que permitirá que los puntos de acceso admitan más usuarios en entornos densos y proporcionará una mejor experiencia para las redes LAN inalámbricas típicas (Cancino H., 2020).
Una de sus varias ventajas del wifi 6 es más alcance, cobertura incluso en espacios saturados y mejor gestión de varios dispositivos a la vez, el avance que consigue es gracias, en parte, a su modulación 1024-QAM, lo que permite que en un determinado ancho de banda se pueda enviar más cantidad de información por símbolo que con los protocolos WiFi anteriores. Esto es especialmente interesante en escenarios de alta densidad de conexiones a una red WiFi, que es donde el nuevo estándar espera poder incrementar en 4 veces el rendimiento promedio por usuario respecto al anterior (Penalva, J. 2019).
El interés en la futura WiFi 6 no está pues en la velocidad máxima por dispositivo sino en la mejora global que experimentarán los usuarios en situaciones cada vez más habituales y donde queremos tener muchos dispositivos conectados a la misma red WiFi. También habrá mejora en la latencia, que será mucho menor, y por supuesto en la seguridad, al estar preparada para usar WPA3 (Penalva, J. 2019).
Debido a toda sus características y funciones se ha decido trata implementar el wifi en el control de escritorio remoto, ya que así aprovecharemos los recursos de la escuela y también las que traigan los alumnos, debido que en ocasiones se sienten más cómodos usando sus equipos de cómputo.
Para poder almacenar trabajo, proyectos y entre otras cosas, tenemos planeado usar la Nube, esta comenzó a aparecer a principios de la década de 2000, tenía un tono esotérico. La idea de acceder a los recursos informáticos desde un lugar que no sea una infraestructura de TI local y sonaba a ciencia ficción. La realidad fue mucho más profunda y cambió para siempre la tecnología y la forma en que hacemos negocios.
El desarrollo de la computación en la nube comenzó a través de grandes empresas de servicios de Internet como Google y Amazon los cuales construyeron su propia infraestructura. A partir de allí surgió una arquitectura: un sistema de recursos distribuidos de manera horizontal, introducidos como servicios virtuales de tecnologías de información (TI) escalados masivamente y manejados como recursos agrupados y configurados continuamente.
Algo que caracteriza a la nube es que no es necesario disponer de un equipo potente, tan solo de un aparato con conexión a internet; esto debido a que el dispositivo del usuario no realizaría ningún proceso complejo y los ficheros pueden guardarse en la nube. Los servidores en donde se hallan los programas que se utilicen son los encargados de las tareas complicadas que antes se realizaba

localmente.

Con el uso del Cloud Computing no hay necesidad por parte del usuario de conocer la infraestructura detrás de esta, ya que pasa a ser una abstracción, “una nube” donde las aplicaciones y servicios pueden fácilmente crecer, funcionar rápido y con pocas fallas3. Este tipo de servicio se puede pagar según alguna métrica de consumo, no por el equipo usado en sí, sino por uso de CPU/hora como en el caso de Amazon EC2.

Mediante la virtualización se permite tratar a un servidor como muchos servidores. Otro método usado es el clustering, que consiste en tratar a muchos servidores como uno solo. Esto permite muchas mejoras como:

- Reducción de los costos de espacio y consumo.
- Rápida incorporación de nuevos recursos para los servidores virtualizados.
- Administración global centralizada y simplificada.
- Facilidad para la creación de entornos de test que permiten poner en marcha nuevas aplicaciones sin detener el desarrollo, agilizando el proceso de las pruebas.
- Aislamiento: un fallo en una máquina virtual no afecta al resto de máquinas virtuales.

Por último, pero no menos importante, una de las tecnologías que sea quiere implementar en el uso de los equipos y servidores son los cables de UTP, existen varias versiones o modelos de este cable, empezando desde el Cat.e. 1 hasta el Cat.e. 8, siendo el mas usado el Cat.e. 5e y teniendo un gran cambio de velocidad y frecuencias notable para la actualidad en el Cat.e. 6ª, dicho cable UTP se piensa implementar en la infraestructura en la cual se procuraría usar las entradas Gigabit Ethernet.

Hay distintas categorías, las cuales se conocen mejor como CAT. A continuación, se detallan cada una:

- **Cable UTP Categoría 1**: Es usado en sistemas de telefonía, pero no hace envío de señales digitales de audio de forma directa, solo analógicas. No lo reconoce la TIA (Asociación de la Industria de las Telecomunicaciones) ni tampoco la EIA (Asociación de Industrias Electrónicas).
- **Cable UTP Categoría 2:** Es un tipo de cable que no puede transferir señales de datos superior a 4 Mb y no es reconocida ni por la TIA ni la EIA.
- **Cable UTP Categoría 3**: Se usa en redes Ethernet.
- **Cable UTP Categoría 4:** Posee una velocidad de transmisión de 16 Mb, pero tampoco la reconocen ni la TIA ni la EIA.
- **Cable UTP Categoría 5:** No es reconocida ni por la TIA ni la EIA.
- **Cable UTP Categoría 5:** Es el más usado en las conexiones de redes, se usan en las Fast y Gigabite Ethernet.
- **Cable UTP Categoría 6:** Es un tipo de cable que tiene altas velocidades de transmisión.
- **Cable UTP Categoría 7:** Este cable tiene longitudes superiores a los 100 metros, y es de alta velocidad de transmisión.

Nos enfocamos en este debido a sus prestaciones, comparados con las otras categorías y precio (Yúbal Fernández, 2021):

A) La velocidad determina la velocidad máxima soportada por cada cable.

B) La frecuencia define la potencia de la red, y suele establecer su anchura y el rángo de pérdida de datos a lo largo del cable. Cuando más largo sea un cable de red, más potencia se irá perdiendo. Y es que un cable de un metro normalmente ofrecerá un mayor pico de velocidad que uno de tres, aunque la diferencia la establece la frecuencia.

El cable UTP o trenzado, está compuesto de conductores o hilos eléctrico que están enlazados, y cubiertos de una cobertura o camisón plástico, los cuales fueron desarrollados por Alexander Graham en 1881.

Este cable es una de las variedades más utilizadas en el ámbito de las conexiones a internet, por la gran cantidad de información que pueden transmitir, la precisión con la que realizan estos trabajos y la rapidez, que son aspectos muy importantes para el cumplimiento del cometido por el que se recurre a estos sistemas.

Así, el cable UTP es una solución muy presente en este sector, especialmente en las conexiones de redes LAN o de área local, aunque también puede verse en otras modalidades de redes.

Su nombre se debe a las siglas en inglés de Unshielded Twisted Pair, lo que en castellano se traduce como par trenzado no apantallado, para diferenciarse de las otras dos alternativas.

Conclusión

Una vez llegado hasta este punto y como logramos apreciar, la virtualización, aunque es muy sonada en la actualidad en realidad esta se ha venido usando y mejorando desde hace mucho tiempo atrás, al igual las otras tecnologías que tiene relación con esta.

Recordemos que el objetivo principal de este proyecto es la mejora de salas de equipos de computa sin invertir tanto capital y reutilizando los equipos existentes sin la necesidad de cambiarle algún componente interno en caso que no lo necesite.

Debido a todo el progreso que ha tenido la virtualización podemos hacer un uso adecuado de esta tecnología en el ámbito educativo, lo bueno de esto que dicha tecnología no se limita hasta ese punto, ya que puede ser mas explotando en empresas o incluso usando en pequeñas familias, desafortunadamente todo esto no es de color de rosas, también tiene sus desventajas pero logrando implementarlo de una manera adecuando y dándole los servicio adecuados de limpieza podemos mitigar estas desventajas de manera rápida y sin afectar a toda la infraestructura.

Igual nos centramos en explicar que llevaría la infraestructura ya que no se puede virtualizar todo, cosa que es obvio, mencionando los cables que nos pueden dar un mejor desempeño en toda la red en general, incluso se menciona como la nube puede ser un gran aliado, favoreciendo el ahorro económico y reducción un poco la contaminación, debido al menor uso de equipo de cómputos y al reutilizar equipos que puede estar obsoletos o que necesitaban algún cambio de hardware.

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DROUGHT STRESS ENHANCES RHIZOBIUM NODULE NUMBERS AND YIELD IN THE MESOAMERICAN WILD OVER CULTIVAR COMMON BEAN

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ABSTRACT

The domestication process of *Phaseolus vulgaris* (common bean) has multiple advantages. Creating commercial cultivars such as Negro Jamapa guarantees greater production in less time. Still, it has also made them susceptible to infections by pathogens or various kinds of abiotic stresses, including drought. Drought is considered one of the greatest threats to crop production. Climate change and global warming increase the frequency of drought phenomena, which menaces food security. Novel strategies are thereby essential to face this problem. Legume symbiosis with nitrogen-fixing bacteria *´Rhizobium´* has proven to be highly beneficial for the plant, positively impacting its growth and development. In *P. vulgaris*, this association allows a better yield of commercial cultivars. However, the information found on Mesoamerican wild species is limited and is further reduced when analyzing the effects of drought on the symbiosis with *Rhizobium*. Therefore, this work aims to evaluate the impact of the *Rhizobium* symbiosis on nodulation, yield, and biomass of wild Mesoamerican vs Negro Jamapa cultivar of common bean under drought stress. The wild and cultivar plants were grown for two weeks in a greenhouse and inoculated with *Rhizobium tropici*. Inoculated plants were exposed to drought stress by modifying the field capacity (FC) of each pot in percentages of 20% FC, 40% FC, 60% FC, 80% FC and 100% FC for five weeks. Our results show that with a reduction of up to 40% (60% FC) of water there is no significant variation in the number of nodules present in the wild Mesoamerican, in contrast to the nodules in the commercial cultivar. In addition, the number of primary nodules and functional nodules increases over time, while the number of senescent nodules remains low, indicating an increase in nodule lifespan. Furthermore, the total plant biomass and yield increase in the wild relative to cultivar. Based on these observations, we conclude that drought stress enhances the rhizobial symbiosis in wild Mesoamerican compared to the commercial cultivar, thus it demonstrates the better water use efficiency of the wild plants. This information could be used to improve drought resistant varieties in beans through breeding programs. The authors wish to acknowledge the DGAPA/PAPIIT-UNAM for partially funding this research to grant no. IN213221 to M.-K.A. and IN216321 to K.N; and to CONACyT CF-316538 to M.-K.A.

Keywords: Common bean, domestication, *Rhizobium*, symbiosis, yield

NATURAL SCIENCE

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ABSTRACT
The natural sciences are rich in concepts. The usage of the terminology to name these concepts may change over time and due to mistaken or extended use of terms. Some are adopted from a particular vernacular language where the word may have a different meaning than its use in science (e.g., endemic) and some scientific terms may become used in wider society (e.g., ecosystems). Alternative meanings of the same words can cause confusion, especially among students and nonspecialists not familiar with the nuances of usage. It is thus useful to provide a glossary of how a community defines its terminology at the present time. Here we provide definitions of about 300 terms commonly used in marine ecology, oceanography and geology.

Keywords: Biology,Concepts,Definitions,Ecology,Geology,Glossary,Marine,Oceanography,Terminology.

AUTOMATIC RECOGNITION OF CONTROL CHART PATTERNS (CCP'S) IN THE CONTEXT OF ARTIFICIAL INTELLIGENCE (AI)

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ABSTRACT

SPC chart is one of the most important techniques for monitoring a manufacturing process and decide whether it is running under its normal pattern or unnatural one.

Recognition of Control Chart Patterns (CCP) is gaining increasingly attention in last years as long as it greatly upgrade process quality. AI provides several tools for the recognition of all types of CCP's especially Artificial Neural Network (ANN), Support-Vector Machines (SVM) and Fuzzy Logic.

Our goal is setting up a comprehensive review of associated topics from machine learning (ML) and its association with automatic recognition of Control Chart Patterns, based on our analysis of pertinent studies that has been conducted on this field during the last decade.

We first review the key concepts such as CCP patterns and AI tools for CCP recognition. Then we describe differences between these topics especially the main AI methods used in the relevant recent studies. Finally, we focus on the future research orientations.

Keywords: Control Chart Pattern, Artificial intelligence, Statistical Process Control.

THE ROLE OF SCENARIOS IN DISASTER AND EMERGENCY

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ABSTRACT

Introduction: Injuries, loss of life, environmental damage caused by natural, human or technology-induced disaster and emergencies, increasing frequency and intensity, day after day, in order to prevent heavy economic and social losses and to ensure rapid and accurate response to such incidents, risk management work must be carried out effectively under disaster and emergency management. A risk-driven disaster and emergency management includes assessing risks, prevention of disaster and emergencies, mitigation of effects and consequences, and subsequent preparation for disaster and emergencies. Disaster and emergency scenarios developed for risk management have a key role in the execution of accurate and effective work, ensuring that the current situation and predictability of future unpredictable possibilities [1]. The scenarios developed by the information and logic formatting of the predictions for disaster and emergencies are of great importance as they clearly see the nature, quantity and how they should be used and provide opportunities for developing intervention skills, strengthening information and improving decision making capabilities [2], [3].

Purpose: The scenarios are widely used in many different areas to overcome crises. There are different uses of scenarios in studies carried out with the adoption of risk management in the fight against disasters and emergencies. In our study, it is aimed to contribute to the literature by explaining the importance of scenarios developed for disaster and emergency situations and the role and use of scenarios in risk and crisis management, which are the two main processes of disaster management.

Research Questions: What is the role and importance of scenarios in terms of disasters and emergencies? How is the use of scenarios beneficial in the management of disasters and emergencies? Is there a versatile use of disaster and emergency scenarios?

Literature Review: When the national and international literature is examined; it is emphasized that it is possible to prevent crises or mitigate losses by predicting future crises and their effects with scenarios. However, when the national and international literature is examined within the scope of the research; it is observed that the publications explaining the importance of disaster and emergency scenarios in the national literature are more limited than in the international literature. Reference [4] explains the use and importance of scenarios in trying to predict possible earthquakes in the future, while Reference [5] explains how scenarios can be used in disaster and emergency training. Reference [2] emphasizes the importance of scenarios in learning disaster and emergency management principles. Reference [3] explains how disaster and emergency scenarios should be used in disaster and emergency planning.

Methodology: A detailed literature search was conducted with the terms "disaster", "emergency",

"scenario" and "risk management" in related databases such as ProQuest, Google Scholar, ScienceDirect. The scenarios developed in the projects carried out within the scope of risk management at national and international level have been examined in terms of their role and importance in the fight against disasters and emergencies. Accessed publications and projects have been analyzed narratively in terms of content and method.

Conclusions: Disaster and emergency scenarios; it can be used in many different studies carried out within the scope of risk management for natural, human or technology-induced hazards. In this context, it is possible to draw conclusions about the role and importance of scenarios in a disaster management where a risk-oriented and proactive approach is adopted. Disaster and emergency scenarios; Its use in risk reduction plans, trainings and exercises is an indication that it is an integral part of an effective risk management [2], [3], [5]. Scenarios created by shaping the predictions about disasters and emergencies that negatively affect living things and the environment in many different ways within the framework of knowledge and logic play an important role in preventing or mitigating the negative effects of disasters and emergencies by eliminating uncertainties and complexities about the future. The use of scenarios that have proven success in being prepared for crises in history and overcoming them with the least damage [6], [7], [8]; adapting it to the risk management carried out for disasters and emergencies will increase the predictability of the future and will enable a proactive approach to be adopted at the point of carrying out the necessary studies. As a result, it is possible to be a successful party in the fight against such crises by predicting damages and losses thanks to scenarios.

Keywords: Disaster, Emergency, Risk Management, Scenario.

ÖZET

Senaryolar, gelecekte meydana gelebilecek olasılıkların önceden tahmin edilmesi ile birlikte belirsizliklerin giderilmesini ve çelişkilerin üstesinden gelinmesini sağlayan çok yönlü bir araçtır. Afet ve acil durumların etkili bir şekilde yönetilmesi, öngörülemez nitelikteki risklerin önceden tahmin edilmesi ve gerekli eylemlerin gerçekleştirilmesiyle ilgilidir. Risk yönetimi kapsamında gelecekte yaşanması olası afet ve acil durumlara ilişkin öngörülerin bilgi ve mantık çerçevesinde biçimlendirilmesi ile geliştirilen senaryolar, geleceğe dair bir dizi seçenek sunması ve belirsizlikleri gidermesi ile afet ve acil durumlara hazırlıklı olunmasını ve etkili bir şekilde yönetilmesini sağlamaktadır. Bu senaryolarda; yakın geçmişte yaşanmış afet ve acil durumların referans olay olarak ele alınması ile birlikte bu olaya ilişkin süre, risk altındaki nüfus, etkilerin ciddiyeti gibi temel değişkenlerinin mevcut ve gelecekteki koşullara uyarlanması ele alınmaktadır. Risk azaltma planlarında senaryoların kullanımı ise, yerel alanda mevcut olan tehlikelerle mücadelede gerekli eylemlerin ve kaynakların tespit edilmesiyle birlikte planların geliştirilmesinde bir temel oluşturmaktadır. Planlamaların yanı sıra senaryoların afet ve acil durumlar ile mücadele eğitimi kapsamında kullanımı da büyük bir önem taşımaktadır. Senaryoların teorik eğitim ve saha tatbikatlarında kullanılması; öğrencilerin güvenli, kapsamlı ve kontrollü bir ortamda pratik becerilerini geliştirme, bilgilerini güçlendirme ve karar verme yeteneklerini geliştirme fırsatı sunmaktadır. Çalışmamızda, afet ve acil durumların yönetiminde proaktif bir yaklaşım benimsenmesi noktasında senaryoların önemi ve rolü açıklanarak literatüre katkı sağlanması amaçlanmıştır.

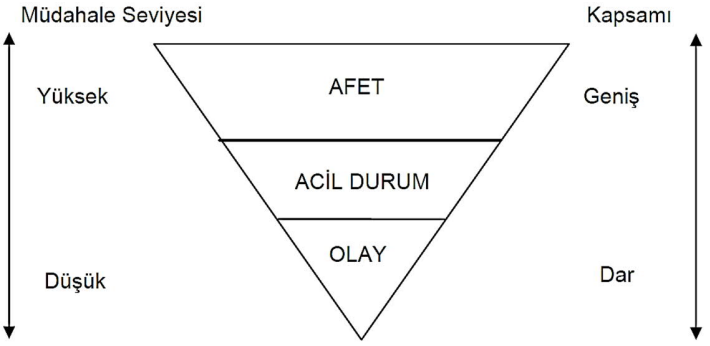
Anahtar Kelimeler: Acil Durum, Afet, Risk Yönetimi, Senaryo.

1. GİRİŞ

Dünya tarihi boyunca insanlar güvenliğini, hayat akışını ve faaliyetlerini farklı seviyelerde etkileyen pek çok tehditle karşı karşıya kalmıştır ve günümüzde bu tehditlerin sıklığı ve şiddeti farklı nedenlerden dolayı artış göstermektedir. Doğal, insan veya teknoloji kaynaklı tehditler, etkili bir şekilde yönetilmedikleri takdirde can ve mal kayıplarına ve çevresel zararlara sebebiyet veren büyük krizlere neden olmaktadır [9]. Afet ve acil durum gibi krizlerin yönetiminde, reaktif bir yaklaşımla kriz yönetiminin gerçekleştirilmesinden ziyade proaktif bir yaklaşımla risk yönetiminin benimsenmesi, olayların acil durum veya afete dönüşmesini engelleyecektir ya da etkilerinin ve sonuçlarının hafifletilebilmesini sağlayacaktır [1], [10]. Risk yönetimi kapsamında afet ve acil durumlar ile ilgili senaryoların geliştirilmesi, gelecekte yaşanması olası afet ve acil durumların etkilerinin ve sonuçlarının öngörülmesini sağlayarak gerekli önlemlerin alınması ve gerçekleştirilecek müdahalelerin geliştirilmesinde bir temel oluşturmasından dolayı büyük bir öneme sahiptir [11]. Afet ve acil durum senaryolarının afet yönetimi kapsamında pek çok farklı yönde kullanılabiliyor olması, afet ve acil durumlar ile mücadelenin her aşamasında kilit bir role sahip olduğunun göstergesidir. Çalışmamızda, afet ve acil durumların yönetiminde proaktif bir yaklaşım benimsenmesi noktasında senaryoların önemi ve rolü açıklanarak literatüre katkı sağlanması amaçlanmıştır.

2. AFET VE ACİL DURUMLAR

Doğal, teknoloji veya insan kaynaklı tehlikelerin sonuçları; kapsamları, büyüklükleri ve gerçekleştirilecek müdahale seviyelerine göre olay, acil durum ve afet olmak üzere üç gruba ayrılabilmektedir [10], [12] (Şekil 1):



Şekil 1. *Doğal, teknoloji ve insan kaynaklı tehlikelerin sonuçları [10], [13].*

Yerel ve oldukça sınırlı bir etkiye sahip olan, ilk müdahale ekiplerinin kolaylıkla kontrol altına alabildiği ve yerleşim alanları ile kurum ve kuruluşları etkilemeyen hadiseler, olay olarak tanımlanmaktadır [12]. Acil durum; toplumun tamamı veya belirli kesiminin günlük hayat akışını bozan ve faaliyetlerinin durmasına yahut kesintiye uğramasına sebebiyet vermesiyle birlikte yerleşim birimleri ile kurum ve kuruluşların iş yapma kapasitesini etkileme potansiyeline sahip acil müdahale gerektirmesinin yanı sıra yerel imkânlarla baş edilebilecek seviyedeki olaylar ve bu olayların meydana getirdiği kriz durumu olarak ifade edilebilmektedir. Afet ise, bir olayın kendisinden ziyade doğurduğu sonuçlar olarak nitelendirilebilmektedir. Acil durumlardan farkı, yerel imkân ve kaynaklar ile baş edilemeyecek seviyede olmalarıdır. Bu bağlamda; toplumun tamamı ve belirli kesiminin günlük hayat

akışını bozan ve faaliyetlerinin durmasına ya da kesintiye uğramasına sebebiyet vererek fiziksel, sosyal, ekonomik, kültürel, çevresel ve doğal zararlar meydana getiren doğal, insan veya teknoloji kaynaklı olaylar olarak tanımlanabilmektedir [12], [14].

2.1. *Afet Ve Acil Durum Yönetimi*

Olay, acil durum ve afet olarak sonuçlanan tehlikelerin teşkil ettiği olası risklerin gerçekleşme ihtimaline yönelik öncesinde, anında ve sonrasında yapılan çalışmalar; olay, acil durum ve afet yönetimi başlıkları altında seviyelerine göre sınıflandırılmaktadır. Olay yönetiminde, sadece standart operasyon prosedürleri uygulanmaktadır ve küçük bir ekibin müdahalesinin yeterli olmasıyla birlikte planlamalarda yer alan her servisin aktif hale getirilmesine ihtiyaç duyulmamaktadır [12].

Acil durum yönetimi, bir olayın acil durum olarak değerlendirilmesiyle birlikte başlamakta olup süreklilik durumuna sahip değildir ve acil durumun gerçekleşmesine sebebiyet veren faktörler ortadan kalktığında sona eren bir yönetim biçimidir. Acil durum yönetimi ile etkilenen kişilerin ihtiyaç duyduğu ilk yardım, arama ve kurtarma, temel ihtiyaç malzemeleri, barınma gibi hizmetlerin zamanında, hızlı ve etkili bir şekilde gerçekleştirilmesi amaçlanmaktadır. Olağan yönetim biçimlerinden farklı olarak olağan dışı yetki, imkan ve kaynak gerektirmektedir. Afet yönetimi çerçevesinde gerçekleştirilen müdahale ve iyileştirme aşamalarındaki kısa süreli faaliyetleri kapsamaktadır [14].

Afetlerin meydana gelmesine sebebiyet verecek olayların önlenmesi, risk ve zararlarının azaltılması ile birlikte afet öncesi, sırası ve sonrasında alınması gereken önlemlerin ve gerçekleştirilmesi gereken çalışmaların planlanması, koordine edilmesi, yönlendirilmesi ve desteklenmesinin yanı sıra afet anında hızlı ve etkili bir müdahalenin gerçekleştirilmesi ve sonrasında da afetten etkilenenler için yeni ve daha güvenli bir çevrenin inşa edilmesini kapsayan çok yönlü yönetim süreci afet yönetimi olarak nitelendirilmektedir. Bütünleşik bir yapıya sahip olmasından dolayı çok taraflı olan afet yönetimi, toplumun tüm kurum ve kuruluşları ile belirlenen stratejik hedefler ve öncelikler doğrultusunda imkan ve kaynakların kullanılmasını gerektirmektedir. Çok yönlü, çok aktörlü ve çok disiplinli olma özelliğine sahip olan afet yönetimi; süreklilik gerektiren, karmaşık ve dinamik bir yönetim biçimidir [10], [14]. Afet yönetimi; afetler meydana gelmeden önce her türlü tehlikeye karşı zarar azaltma ve hazırlık çalışmalarının gerçekleştirilmesi ve afet sonrasında yeniden inşa ile geleceğe yönelik gerçekleştirilen çalışmaları kapsayan risk yönetimi ve afet anı ve sonrasında müdahale, kurtarma ve iyileştirme faaliyetlerini kapsayan kriz yönetimini içermektedir. Bu noktada risk ve kriz yönetimi olarak iki ana süreçten oluşan afet yönetimi; zarar azaltma, hazırlık, müdahale ve iyileştirme gibi dört aşama dahilinde gerçekleştirildiği ifade edilebilmektedir [10], [13].

3. SENARYO TANIMI

Senaryo kelimesi genel olarak, geleceğin tasarlanmasına yönelik olayların sıralanımı anlamına gelmektedir [3], [8]. Afet ve acil durumlar açısından senaryolar; ulusal ve yerel düzeyde gelecekte meydana gelebilecek pek çok sonuca sahip olay ile birlikte bu olaya sebebiyet veren neden ve tetikleyicilerin ele alınarak zarar görebilen veya maruz kalmış ögeler üzerindeki etkilere yönelik gerçekleştirilmesi gereken önlemlerin ve müdahalelerin anlatı tarzında oluşturulmasını ifade etmektedir [3], [15].

Geleceğe dair olasılıkların tahmin edilerek daha iyi anlaşılması için pek çok farklı alanda senaryoların

kullanımı mevcuttur. Çatışma ve barışı koruma durumları ile ilgili askeri eğitim ve planlamalarda yaygın bir şekilde kullanılan senaryolar, siyasetçiler ve şirketler tarafından da geleceğe yönelik muhtemel sonuçların öngörülebilmesi adına geliştirilmektedir. Senaryolar, bölgesel ve kentsel planlama uzmanları tarafından belirsiz ve karmaşık olan geleceğe ilişkin yaratıcı bir düşünme tarzı benimsenebilmesi adına kullanılmaktadır. Senaryolar, olası sonuçların öngörülerek belirsizliklerin giderilmesini sağladığı için afet ve acil durumlar bakımından büyük bir önem arz etmektedir [3].

3.1. *Afet ve Acil Durumlar Bakımından Senaryoların Önemi ve Kullanımı*

Geçmişte yaşanmış afet ve acil durumlardan dersler çıkararak gelecekte yaşanabilecek afet ve acil durumlara yönelik alınacak önlemlere ve gerçekleştirilecek müdahalelere ilişkin senaryolar geliştirilebilmektedir [2], [3]. Afet ve acil durumlar ile ilgili alınan önlemler ve gerçekleştirilecek müdahalelere dair eksikliklerin belirlenebilmesi ve risk ve kriz yönetimi kapsamında etkili bir şekilde yönetilebilmeleri için senaryoların geliştirilmesi büyük bir önem taşımaktadır [11], [16].

Afet ve acil durum senaryolarının pek çok farklı yönde kullanımı mevcuttur. Gelecekte yaşanabilecek depremlerin etkilerinin ve olası kayıpların öngörülebilmesi için farklı senaryolar geliştirilmektedir [3], [17], [18]. Afet ve acil durum planlaması, senaryoların en kapsamlı kullanımını içermektedir [19]. Risk azaltma planlarında senaryoların kullanımı, ulusal ve yerel alanda mevcut olan tehlikelerle mücadelede gerekli eylemlerin ve kaynakların tespit edilmesiyle birlikte planların geliştirilmesinde bir temel oluşturmaktadır. Planlamaların yanı sıra senaryoların afet ve acil durumlar ile mücadele eğitimlerinde de kullanılması büyük bir önem teşkil etmektedir. Senaryoların teorik eğitim ve saha tatbikatlarında kullanılması; afet ve acil durumlara müdahale becerilerinin geliştirilmesi, bilgilerin güçlendirilmesi ve karar verme yeteneklerinin geliştirilmesi fırsatı sunmaktadır [2], [3].

4. SONUÇ

Bir dizi olası varsayım ve sonuçların üretilmesi ile geleceğe dair belirsizliklerin ve karmaşıklıkların giderilmesi konusunda kilit bir role sahip olan senaryoların kullanımı, günümüzde pek çok farklı alanda yaygın bir hale gelmiştir. Afet ve acil durumlar ile ilgili senaryoların risk yönetimi kapsamında çok yönlü kullanıma sahip olması, gelecekte yaşanması olası afet ve acil durumlar ile mücadelede önemli faydalar sağlamaktadır [2], [8]. Tarihte krizlere karşı hazırlıklı olma ve en az zararla üstesinden gelinmesi konusunda kanıtlanmış bir başarıya [6], [7], [8] sahip olan senaryoların kullanımının; afet ve acil durumlara yönelik gerçekleştirilen risk yönetimine adapte edilmesi, geleceğin öngörülebilme yeteneğini arttırarak gerekli çalışmaların gerçekleştirilmesi noktasında proaktif bir yaklaşım benimsenmesini sağlayacaktır. Sonuç olarak, senaryolar sayesinde zarar ve kayıpların öngörülebilmesi ile bu tür krizler karşı gerçekleştirilen mücadelede başarılı taraf olunması söz konusudur.

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OLASI BİR NÜKLEER SAVAŞIN SINIR AŞAN ETKİLERİ

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ABSTRACT

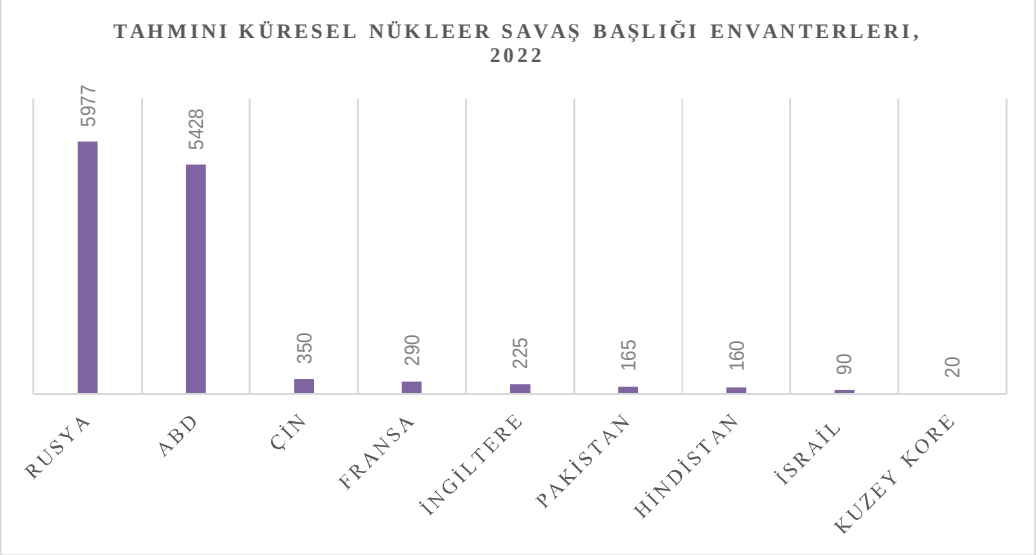
In the modern world, the concepts of technology, power and security have begun to be used together. Against the increasing needs of people who started to live in small groups, the desire to get what they want has always been a priority. In this way, states that were large, powerful and spread over wide areas were established throughout the ages. Large armies, powerful arsenals and many war tactics have been created to stay safe with it. As a result of all these; There have been many wars that have shaped history. With the development of technology, the initiatives have changed constantly. The atomic bomb, which ended the recent World War I in a single move, completely changed the understanding of war and power in history. Now, the level of technological development is considered one of the most important factors of power. This situation has caused the borders between countries to become insignificant. Nuclear weapons are considered to be the most technological weapons of our time, which is at the forefront of these developments. The development and use of the energy created by the fission or fusion reactions of the atomic nucleus as a weapon is called nuclear weapons. If it is necessary to define the effects of nuclear weapons; It is a type of weapon that is difficult to control, which destroys all living things in the target area, leaves radioactive fallout for many years, causes mutations in the genetics of living things and causes deadly diseases. Today, countries have entered the race to increase both the effects and numbers of nuclear weapons in order to create a deterrent force against their allies and to stay safe and secure. In the recent arms race, the United States of America for the first time in the world II. The atomic bombs he used in Hiroshima and Nagasaki to end World War II are the first nuclear weapons to take their place in history. As a result of nuclear wars, nuclear tests and nuclear accidents, many dangerous situations occur beyond borders. With the growth, expansion and deepening of these dangerous situations, the transboundary nature of the problems has been noticed. Studies show that the effects of radiation continue for many years. As a result of the increasing world population and needs; It is an undeniable fact that regional conflicts will increase and the potential for nuclear war will escalate. After a nuclear weapon is detonated; It creates immediate and residual effects where it is thrown. Considering the immediate effects; within the first 1 minute after a nuclear explosion; heat, light, sudden nuclear radiation, pressure, electromagnetic radiation occur. In residual effects, occurring approximately 30 - 60 minutes after a nuclear explosion; Along with heat and light, it appears as sudden nuclear radiation, pressure and long-term radioactive fallout. The mushroom cloud formed by the nuclear explosion can cover a huge area with "fallout" and contain particles of radioactive dust and other debris. This mushroom cloud will wrap the upper parts of the atmosphere like a blanket, causing the planet to cool. This will cause freezing temperatures, creating a "Nuclear Winter". By causing

climate changes; will reduce the photosynthetic efficiency of plants. The dust and smoke cloud created by the nuclear explosion can cover a huge area with "fallout" and because it contains radioactive dust and other residual particles, this dust and smoke prevents increased ultraviolet radiation from reaching the earth. However, ultraviolet radiation reaches the earth after 6-24 months, long after the dust and smoke fall back to earth in time. Thus, survivors of nuclear war are exposed to high levels of ultraviolet radiation. With atmospheric dispersion, dust and smoke cloud will cause soil and water pollution over time and will be taken into the bodies of living things in various ways, reducing the quality of life of living things. In the event of a possible nuclear war or nuclear terrorism, ecosystem and human health will be adversely affected. These effects, apart from the geography where the war is taking place, may also pose a transboundary threat by atmospheric convection. Although not as much as wars, nuclear accidents can also have transboundary effects. One of them is the Chernobyl power plant accident that occurred in 1986. Although many years have passed since the Chernobyl accident, the damages still continue. The effects of this accident have been seen in a wide geography, including our country. Another event is the Tsunami that occurred after the earthquake in Japan in 2011, and the nuclear disaster that caused the emission of radiation at the Fukushima Nuclear Power Plant and its effects still continue. In our study, it is aimed to reveal the environmental and health effects of war that may result in a nuclear disaster and to emphasize the transboundary effects of nuclear power.
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Keywords: Nuclear War, Radioactivity, Nuclear Disarmament, Environment, Health.

1. Giriş

Modern dünyada teknoloji, güç ve güvenlik kavramları birbiri ile beraber kullanılmaya başlanmıştır. Küçük gruplar halinde yaşamaya başlayan insanların artan ihtiyaçlarına karşı, istediğini elde etme arzusu her zaman öncelikli olmuştur. Böylelikle çağlar boyu büyük, güçlü ve geniş alanlara yayılan devletler kurulmuştur. Beraberinde güvende kalmak için geniş ordular, güçlü cephanelikler ve birçok savaş taktikleri oluşturulmuştur. Tüm bunların sonucunda, tarihe yön veren birçok savaş yaşanmıştır [1]. Teknolojinin de gelişmesiyle yapılan girişimler sürekli değişiklik göstermiştir. Yakın zamanda yaşanan I. Dünya Savaşı'nı tek hamlede bitiren atom bombası, tarihin savaş ve güç anlayışını bütünüyle değiştirmiştir. Artık teknolojik gelişmişlik düzeyi, gücün en mühim faktörlerinden biri sayılmaktadır. Bu durum ülkeler arası sınırların önemsizleşmesine neden olmuştur. Nükleer silahlar bu gelişmelerin başında gelen, günümüzün en teknolojik silahları olarak kabul edilmektedir [2]. Bu silahlar, atom çekirdeğinin fisyon veya füzyon tepkimeleri ile oluşturduğu devasa enerji miktarının geliştirilmesi ile oluşur. Buradaki tepkimeler; fisyon olayı yani ağır radyoaktif atomların sahip olduğu bir nötronun çarpışarak daha küçük atomlara ayrılması ya da füzyon tepkimeleri yani hafif radyoaktif atomların birbirleri ile birleştirilmesi sonucu meydana gelir [3]. Nükleer silahların etkilerini tanımlamak gerekir ise; hedef alındığı alandaki bütün canlıları yok edip çok uzun yıllar radyoaktif serpinti bırakan ve canlıların genetiğinde mutasyonlara neden olan, ölümcül hastalıklara sebebiyet veren kontrol edilmesi zor bir silah türüdür [4]-[5]. Amerika Birleşik Devletleri'nin (ABD) Japonya'da bulunan Hiroşima ve Nagazaki'ye atmış olduğu nükleer silahlar, savaş alanında kullanılan tek nükleer silah örnekleridir [6]. 20.yüzyıl dünyası nükleer silahlarının etkilerine tanıklık ederken, doğal çevre büyük ölçüde zarar görmüş ve milyonlarca insan hayatını kaybetmiştir [5]. Etkileri bu denli büyük

olan nükleer silahları geliştirmek amacıyla nükleer teknoloji alanında pek çok ilerleme yaşanmış ve yok etme güçleri artırılmıştır [7].
1980'li yılların sonlarına doğru ise hızla artan nükleer silah sayısı; soğuk savaş dönemine son verilmesi ile önemli ölçüde azalmıştır. Bu dönemden sonra nükleer savaş tehlikesi yerini nükleer silahların yayılması tehlikesine ve nükleer terörizme bırakmıştır [6]. 1986'da yaklaşık 70.300 adet nükleer silah mevcutken, 2022'nin başlarında tahmini sayıları 12.700 adete kadar düşmüştür [8].



Grafik 1: Nükleer silah tahminleri [8].

Grafik 1'de verilen 2022 yılına ait nükleer silah başlığı tahminlerine göre; dünyada güncel olarak 12.700 adet nükleer savaş başlığı mevcuttur [8].

2. Nükleer Terörizm

Nükleer terörizm; kişilerin veya terörist örgütlerin, 'nükleer silahları'' insanların ölmesi veya psikolojik olarak etkilenmesi, ekolojik zararlar oluşturması vb. siyasi ve/veya ekonomik etkiler yaratmak için kullanmasıdır. Terörist saldırıların tartışmasız en şiddetli hallerinden birisi olan nükleer terörizm; pek çok farklı şekilde ortaya çıkabilir. Bunlar, nükleer tesislere teröristlerce saldırılması, nükleer silahların direkt olarak kullanılması, su ve besin kaynaklarına radyasyon yayılmasına ve insan hayatını tehlikeye atabilecek daha ciddi birçok felakete yol açabilir [13]. Bir terörist grubun eline nükleer silahlarının geçmesi üç farklı senaryo ile gerçekleşebilir. Birincisi ve içlerinden en iddialı olanı, terör örgütlerinin nükleer silahı yapabilme yeteneğine sahip olmasıdır. İkincisi ise, terör örgütü grupların bir nükleer silahı çalarak ele geçirmesidir. Son senaryoda ise, terör örgütlerinin nükleer silah teknolojisine sahip bir başka ülkenin desteğini almasıdır [9]-[10].

3. Nükleer Savaşın Sınır Aşan Etkileri

Nükleer savaşların, nükleer denemelerin ve nükleer kazaların sonucunda sınırları aşan birçok tehlikeli durumlar meydana gelmektedir. Bu tehlikeli durumların çevre sorunlarının büyümesi, genişlemesi ve derinleşmesiyle birlikte sorunların sınır aşan niteliği fark edilmiştir. Bir nükleer silah infilak edildikten

sonra; atıldığı yerde ani ve kalıntı etkiler oluştur. Ani etkilere bakıldığında; bir nükleer patlamadan sonra ilk 1 dakika içerisinde; ısı, ışık, ani nükleer radyasyon, basınç, elektromanyetik radyasyon meydana gelir. Kalıntı etkilerde ise; bir nükleer patlamadan sonra yaklaşık 30 - 60 dakika sonra ortaya çıkan; ısı-ışık ile birlikte, ani nükleer radyasyon, basınç ve uzun süreli radyoaktif serpinti olarak karşımıza çıkmaktadır [6]. Nükleer patlama ile oluşan mantar bulutu, devasa bir alanı "serpinti" ile kaplayabilir ve içerisinde radyoaktif toz ve diğer kalıntı parçacıkları içermektedir. Oluşan bu mantar bulutu atmosferin üst kısımlarını bir örtü gibi sararak gezegenin soğumasına neden olur. Bu durum dondurucu sıcaklıklara neden olacaktır [3]. Savaşlar kadar olmasa da yaşanan nükleer kazalar da sınır aşan etkiler doğurabilirler. Bunlardan biri, 1986 tarihinde meydana gelen Çernobil Santral Kazasıdır. Çernobil kazasının üzerinden uzun yıllar geçse de verdiği zararlar halen devam etmektedir. Bu kazanın etkileri ülkemizde dahil olmaz üzere geniş bir coğrafyalarda görülmüştür. Diğer bir olay, 2011'de Japonya'da yaşanan deprem sonrasında oluşan tsunami ve devamında Fukuşima Nükleer Santralinde meydana gelen radyasyon salınmasına neden olan ve halen etkilerinin devam ettiği nükleer felakettir [11]-[12]. Geçtiğimiz günlerde Rus birliklerinin, Ukrayna'da bulunan ve Avrupa'nın en büyük nükleer santrallerinden biri olan Zaporijya Nükleer Santrali'nin bombaladığı bilinmektedir [14]. Burada yaşanabilecek nükleer bir sızıntı sadece yaşandığı bölgeyi değil, aynı zamanda birçok Avrupa ülkesini büyük ölçüde etkileyecektir. Bunu bilen Rus birlikleri, nükleer gücün sınır aşan etkilerini kullanarak sadece Ukrayna'yı değil kendisine tüm karşı çıkan ülkeleri caydırarak, istediğini kabul ettirme politikası güttüğü ortadadır.

4. Sonuç

Nükleer silahlanma ve nükleer terörizmi önlemek için devletlerin, nükleer silahları ve nükleer silah yapımı için kullanılan teknoloji özenli bir şekilde korumalıdır. Bu konuda tüm devletlerin; nükleer santrallerin korunması için özel koruma sistemi hazırlaması gereklidir. Olası bir nükleer olayın yaşanması sonucu; ekosistem büyük oranda etkilenmesine, pek çok türün yok olmasına ve milyonlarca insanın açlık ve soğuk yüzünden ölmesine sebep olacaktır. Zararlı mutasyonlara ve birçok genetik bozukluklara neden olup; uzun zamanlar boyunca tüm canlıları etkileyecektir. Bununla birlikte önemli olan başka bir nokta ise nükleer silahların sayımının yapılması, kesin rakamların belirlenmesi ve sürekli kontrol edilmesi gerekmektedir. Nükleer silahların sınır aşan etkilerine karşı iş birliği ve etkin önleyici politikalar geliştirilmelidir.

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РОЛЬ ИГРЫ В БИОЛОГИЧЕСКОМ И ЭКОЛОГИЧЕСКОМ ОБРАЗОВАНИИ ШКОЛЬНИКОВ

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РЕЗЮМЕ

Среди инновационных технологий ведущее место занимают игровые технологии, так как они обладают всеми признаками активных методов обучения, имеют ряд преимуществ, главное из которых состоит в том, что игровые технологии моделируют инновационную деятельность. Игровые технологии способствуют формированию тех черт творческой личности, которые побуждают к активному участию в инновационном процессе. В силу своих особенностей игровые технологии предполагают процесс получения инновационной информации активным путем.

Обучающие игры занимают важное место среди современных психолого- педагогических технологий обучения. Как метод они получили распространение в 70-е годы 20 века. В настоящее время в зависимости от сферы применения существуют различные модификации обучающих игр.

Обучающие игры выполняют 3 основные функции:

Инструментальная: формирование определенных навыков и умений;

Гностическая: формирование знаний и развитие мышления учащихся;

Социально-психологическая: развитие коммуникативных навыков.

Каждой функции соответствует определенный тип игры: инструментальная функция может выражаться в игровых упражнениях, гностическая - в дидактических, последняя – в ролевых играх.

Ключевые слова: игровые технологии, игровые упражнения, навыки и умения, ролевые игры.

ABSTRACT

Among the innovative technologies, the leading place is occupied by gaming technologies, since they have all the features of active learning methods, have a number of advantages, the main of which is that gaming technologies simulate innovative activity. Gaming technologies contribute to the formation of those traits of a creative personality that encourage active participation in the innovation process. Due to their characteristics, gaming technologies involve the process of obtaining innovative information in an active way.

Educational games occupy an important place among modern psychological and pedagogical learning technologies. As a method, they became widespread in the 70s of the 20th century. Currently, depending on the scope of application, there are various modifications of educational games.

Educational games perform 3 main functions:

Instrumental: the formation of certain skills and abilities;

Gnostic: the formation of knowledge and the development of students' thinking;

Socio-psychological: development of communication skills.

Each function corresponds to a certain type of game: an instrumental function can be expressed in game exercises, a gnostic one in didactic ones, and the last one in role-playing games.

Keywords: game technologies, game exercises, skills and abilities, role-playing games.

Современное общество характеризуется очень быстрыми и глубокими изменениями. Мы наблюдаем их в общественной структуре, в отношениях между отдельными странами и народами, в отношениях «индивид-общество» и наоборот. Все изменения, которые вносят что-то новое, обычно называются новшествами. Сегодня они вторгаются во все сферы общественного труда.

Образование как подсистема глобальной общественной системы, от которой ему нельзя отставать, должно учитывать все происходящие изменения, меняя соответственно свою структуру.

В последние годы все больше заявляет о себе новая область знания - педагогическая инноватика - сфера науки, изучающая процессы развития школы, связанные с созданием новой практики образования. Эти процессы и называют инновационными (Поташник М.М., Лазарев В.С.).

Понятие «инновация» впервые появилось в исследованиях в XIX в. и означало введение некоторых элементов одной культуры в другую. Это его значение до сих пор сохранилось в этнографии. Педагогические инновационные процессы стали предметом специального изучения ученых примерно с конца 50-х гг. на Западе и в последнее десятилетие в нашей стране.

Педагогическая инновация - это изменение, направленное не улучшение развития, воспитания и обучения школьников (К. Ангеловски).

К основным функциям инновационной деятельности учителя педагоги-исследователи относят прогрессивные (так называемые бездефектные) изменения педагогического процесса и его компонентов, одним из которых является педагогическая технология.

Среди инновационных технологий ведущее место занимают игровые технологии, так как они обладают всеми признаками активных методов обучения, имеют ряд преимуществ, главное из которых состоит в том, что игровые технологии моделируют инновационную деятельность. Игровые технологии способствуют формированию тех черт творческой личности, которые побуждают к активному участию в инновационном процессе. В силу своих особенностей игровые технологии предполагают процесс получения инновационной информации активным путем.

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Для повышения эффективности обучающей игры ее технология должна отвечать определенным требованиям:

Игра должна соответствовать целям обучения;

Имитационно-ролевая игра должна затрагивать практическую педагогическую (психологическую) ситуацию;

Необходима определенная психологическая подготовка участников игры, которая бы соответствовала содержанию игры;

Возможность использования творческих элементов в игре;

Преподаватель должен выступать не только в роли руководителя, но и как корректор и консультант в процессе игры.

Любая обучающая игра состоит из нескольких этапов:

1) Создание игровой атмосферы. На данном этапе определяется содержание и основная задача игры, осуществляется психологическая подготовка ее участников;

2) Организация игрового процесса, включающая инструктаж - разъяснение правил и условий игры участникам - и распределение ролей среди них;

3) Проведение игры, в результате которой должна быть решена поставленная задача;

4) Подведение итогов. Анализ хода и результатов игры как самими участниками, так и экспертами (педагогом).

Следует отметить, что в обучающих играх используется не только игровой метод как таковой. В процессе игры можно применять групповую и индивидуальную работу, совместное обсуждение, проводить тестирование и опрос, создавать ролевые ситуации. Иными словами, игра органично сочетает и позволяет использовать различные методы – анкетирования, социометрии, «мозгового штурма» и др.

Вместе с тем, в педагогике игровой метод имеет некоторую специфику. В процессе обучения игра зачастую используется как вспомогательный элемент, дополнение к теоретическому материалу и не может выступать в качестве основного метода обучения.

Исходя из методов, целей и особенностей обучающих игр можно выделить следующие их разновидности:

имитационные игры используются в обучении при формировании определенных производственных навыков.

сюжетно-ролевые. В их основе лежит конкретная ситуация - жизненная, деловая или иная. Игра в этом случае напоминает театральную постановку, где каждый участник выполняет(играет) определенную роль. Это игры творческие, в которых сюжет – форма интеллектуальной деятельности, поэтому в данном случае большое значение играет подготовка участников и разработка сценария игры.

инновационные игры. Их основное отличие от других видов состоит в их подвижной структуре и проведении игры в нескольких обучающее - развивающих «пространствах» - например, с использованием компьютерных программ. Инновационные игры направлены на получение качественно иного знания с использованием новейших педагогических и информационных технологий.

Если вышеперечисленные виды игр различались по методу, то принцип выделения последних – это цель, назначение игры, состоящая в формировании определенных навыков управления конкретной ситуацией.

организационно-деятельностные. В них акцент ставится на диагностике игровой ситуации и обосновании выбора вариантов решения проблемы. С точки зрения методов здесь больше внимания уделяется диалогу, общению участников и другим формам групповой работы.

Эта классификация не является окончательной и может быть продолжена. Следует также отметить, что формы обучающих игр отличаются разнообразием и могут сочетаться и взаимодополнять друг друга– например, может быть ролевая деловая игра, инновационно-имитационная и т.д.

Здесь от кандидатов требовалось не просто показать свои знания, но сделать это наилучшим образом, т.е. проявить компетентность и оригинальность при решении управленческих задач.

Деловые игры в образовательном процессе часто используются при изучении экономических дисциплин. В целом в процессе деловой игры у ее участников формируется и закрепляется механизм поиска решения проблемы. Кроме того, она оказывает корректирующее влияние на психологию учащихся, т.к. лишена психологической напряженности, присущей традиционным формам обучения и ориентирует участников на более полное восприятие учебного процесса.

Психологические игры позволяют выявить у них специфические качества и навыки, необходимые для делового общения, создания и поддержания «духа компании». Во время психологических тренингов игры могут носить и раскрепощающий характер. Так, например, игра «Знакомство деловых партнеров» направлена на создание благоприятной атмосферы в группе. «Эффективная коммуникация»- пример психологического тренинга.

Основная цель тренинга состоит в обучении участников навыкам эффективного общения, т.е.такого, от которого сам человек и его слушатели получали бы удовлетворение.

В процессе тренинга участники усваивают основные принципы вербального и невербального общения, получая не только коммуникативные навыки, но и навыки «обратной связи»(умение слушать), учатся элементам переговорного процесса и поведению в конфликтной ситуации общения. Особое место отводится формированию личностной позиции («Я-концепция»), усвоению психологических моделей (например, модель «Айсберг», отражающая механизм и аксиомы коммуникации). Использование игровых технологий способствует органичному сочетанию теории и практики и делает сам тренинг динамичным.

Таким образом, деловые игры учат:

сопоставлять свое мнение с мнением других;

оценивать свои амбиции и возможности, уровень авторитета и степень доверия со стороны коллектива;

находить выход из конфликтных ситуаций в деловой сфере и межличностном общении;

осознавать свои поведенческие и психологические установки;

выполнять различные функциональные роли и др.

Роль игровых технологий в образовании и психологии чрезвычайно важна. В педагогике они являются неотъемлемой составляющей развивающего обучения, которое основывается на развитии активности, инициативы, самостоятельности учащихся. Говоря о роли игр, известный отечественный педагог и психолог М.И.Махмутов отмечал, что

значение этой технологии состоит в развитии познавательной, социальной и профессиональной активности учащихся, формирования у них навыков участия в играх.

О результатах применения обучающих игр в целом свидетельствуют многочисленные исследования отечественных специалистов, которые отмечают, что эта технология позволяет повысить эффективность обучения в среднем в 3 раза. Обучающие игры в целом и деловые в частности имеют также психологическое значение и широко применяется в образовательной сфере, способствуя развитию интеллектуальных и личностных качеств учеников.

Концептуальные положения игровых форм обучения:

Целевым ориентиром в обучении является развитие и формирование творческой индивидуальности человека. А самое начальное звено – осознание уникальности своего интеллекта, самого себя.

Переориентация сознания учащегося с обезличенного общественного на сугубо личное социально важное развитие.

Свобода выбора, свобода участия, создание равных возможностей в развитии и саморазвитии.

Приоритетная организация учебного процесса и его содержания на общее развитие учащихся, выявление и «взращивание» открытых талантов, формирование предпринимательской деловитости.

Опираясь на данные концептуальные положения, определяем цель применения технологии игровых форм обучения – развитие устойчивого познавательного интереса у учащихся через разнообразные игровые формы обучения.

Задачи:

Образовательные:

Способствовать прочному усвоению учащимися учебного материала.

Способствовать расширению кругозора учащихся через использование дополнительных исторических источников.

Развивающие:

Развивать у учащихся творческое мышление.

Способствовать практическому применению умений и навыков, полученных на уроке.

Воспитательные:

Воспитывать нравственные взгляды и убеждения.

Вырабатывать историческое самосознание – осознанную сопричастность к прошлым событиям.

Способствовать воспитанию саморазвивающейся и самореализующейся личности.

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KNOWLEDGE, ATTITUDES AND BEHAVIORS OF GENERATION Z ON FOOD SAFETY: KUTAHYA PROVINCE EXAMPLE

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ABSTRACT

Food safety, which is great importance at the national and international level, has started to attract more attention due to the social health problems that have increased recently. In order to meet the expectations about food safety, businesses have had to follow a more systematic way by making use of technological developments. Rules have been developed that every business that produces food and makes it ready for consumption has to comply. This system and rules need to be revised and shaped according to the needs of the society and time. The concept of generation created by the individuals born into the period it belongs to, has different characteristics from the past generation with its consumption habits and preference methods, it will transfer different knowledge and dynamics to future generations. As a result of the research, factors affecting preferences of the generation, who were determined to be sensitive to healthy conditions, about traditional meals and healthy products were revealed with survey method. Although Z generation individuals, who seem to have limited knowledge about food processing methods, are exposed to economic conditions, insufficient education opportunities, excessive exposure to synthetic foods, their desire to seek and prefer healthy food still continues. This promising situation is desired to continue increasingly. In order to ensure and maintain safe food production, compliance with all necessary hygiene and sanitation rules from the harvest to processing, storage, transportation and distribution and taking precautions against risks is defined as food safety. Food safety is a sensitive issue that includes different applications and that all generations should understand its importance. Reasons for needing different applications; increasing consumption need, increase in per capita income levels, change in family structure and traditional consumption understanding, urbanization phenomenon, the emergence and spread of epidemics, increasing product diversity and the increase in processed food consumption as a result of all these, a social structure focused on ready-to-eat consumption factors. Good Agricultural Practice (GAP) to ensure the control and safety of food; Good Manufacturing Practices (GMP) in order to closely monitor the food safety functioning of the food industry; Good Hyggienic Practice (GHP) to oversee food processing, cooking, presentation, storage, storage and control of food producing venues; Good Laboratory Practice (GLP) to eliminate potential microbiological risks or prevent their occurrence in the first place; Applications such as Critical Control Points and Hazard Analysis (HACCP) continue to exist and continue to develop as internationally accepted food safety systems, in order to control all kinds of food processing, storage, storage and agriculture. The goal in quality management systems is to provide

hygiene and sanitation. The points that businesses should pay particular attention to in order to ensure food hygiene; complying with personal hygiene rules, having sufficient knowledge of food hygiene, equipment hygiene and environmental hygiene. It is known that the hygiene issue contributes to public health, business economy, increases the competitive environment and accelerates growth, thanks to its pro-active structure, which foresees not only the consumption of healthy food, but also the elimination of food-borne diseases at a potential threat stage before they occur. In this study, it has been concluded that individuals prefer organic food, preferably organic food, but because it is not at an accessible level, they prefer more satisfying, economical, ready-made foods with additives, appealing to the palate and the eye. It has been concluded that it is very important to carry out more studies in order to understand what the food safety issue, which is extremely important for the pursuit of welfare and health, means for the new generation, and that it is very important to deal with the issue as a whole and to transfer the effects at the social level to the younger generations by making them more understandable. In this study, it is aimed to contribute to the researches on food safety in the future, thanks to the data to be obtained as a result of measuring the knowledge, attitudes and behaviors of the Z generation, known as the potential consumption society.

Keywords: Food safety, nutrition, Generation Z.

Z KUŞAĞININ GIDA GÜVENLİĞİ KONUSUNDA BİLGİ, TUTUM VE DAVRANIŞLARI: KÜTAHYA İLİ ÖRNEĞİ

ÖZET

Ulusal ve uluslararası düzeyde büyük önem taşıyan gıda güvenliği, son dönemlerde artış gösteren toplumsal sağlık sorunları nedeniyle daha fazla dikkat çekmeye başlamıştır. İşletmeler, gıda güvenliği konusunda beklentileri karşılamak için teknolojik gelişmelerden faydalanarak daha sistematik işleyen bir yol izlemek durumunda kalmıştır. Gıda üreten ve tüketime hazır hale getiren her işletmenin uymak zorunda kaldığı kurallar geliştirilmiştir. Bu sistem ve kuralların, içerisinde bulunduğu toplum ve zamanın gereklerine göre yeniden gözden geçirilmesi ve şekillendirilmesi gerekmektedir. Ait olduğu dönemin içine doğan bireylerin oluşturduğu kuşak kavramı, tüketim alışkanlığı ve tercih yöntemleriyle geçmiş kuşaktan farklı özellikler taşıdığı gibi gelecek kuşaklara da farklı bilgi birikimi ve dinamikler aktaracaktır. Araştırma sonucunda, sağlıklı yaşam koşullarına duyarlı olduğu tespit edilen jenerasyonun, yüz yüze anket yöntemiyle, geleneksel yemekler ve sağlıklı ürünler konusunda tercihlerini etkileyen faktörler ortaya konulmuştur. Güvenli gıda üretimini sağlamak ve sürdürmek amacıyla gıdaların hasat anından, işleme, saklama, taşıma, dağıtım anına kadar gereken tüm hijyen ve sanitasyon kurallarına uyulması ve risklere karşı önlemlerin alınması gıda güvenliği olarak tanımlanır [1]. Gıda güvenliği farklı uygulamaları içine alan, tüm kuşakların önemini kavraması gereken hassas bir konudur. Farklı uygulamalara ihtiyaç duyulmasının nedenleri; artan tüketim ihtiyacı, kişi başı gelir seviyelerindeki yükselme, aile yapısında ve geleneksel tüketim anlayışındaki değişim, kentleşme olgusu, salgın hastalıkların ortaya çıkış ve yayılma sıklığı, artan ürün çeşitliliği ve tüm bu sayılanların getirisi olarak işlenmiş gıda tüketiminin artış göstermesi, hazır tüketim odaklı bir sosyal yapının ortaya çıkması gibi etkenlerdir [2]. Gıdaların denetim ve güvenliğini sağlamak amacıyla İyi Tarımsal Uygulamaları (Good Agricultural Practice-GAP); gıda endüstrisinin gıda güvenlik işleyişini yakından

takip etmek amacıyla İyi Üretim Uygulamaları (Good Manifucturing Practice-GMP); gıda üretimi yapan mekanların gıda işleme, pişirme, sunma, saklama, depolama ve kontrollerini denetlemek amacıyla İyi Hijyen Uygulamaları (Good Hyggienic Practice-GHP); potansiyel mikrobiyolojik riskleri ortadan kaldırmak veya oluşumunu en baştan önlemek amacıyla İyi Laboratuar Uygulamaları (Good Laboratory Practice-GLP); sadece gıdaya yönelik her türlü işleme, depolama, saklama, tarım dahil her aşamayı denetim altına almak amacıyla Kritik Kontrol Noktaları ve Tehlike Analizi (Hazard Analysis and Critical Control Points HACCP) gibi uygulamalar uluslararası kabul görmüş gıda güvenlik sistemleri olarak varlığını sürdürmekte ve gelişerek devam etmektedir [3]. Kalite yönetim sistemlerinde hedef hijyen ve sanitasyonu sağlayabilmektir. Gıda hijyenini sağlamak için işletmelerin özellikle dikkat etmesi gereken noktalar; kişisel hijyen kurallarına uyum sağlamak, gıda hijyeni konusuna yeterli bilgiye sahip olmak, ekipman hijyeni ve çevre hijyenidir [4]. Hijyen konusunun sadece sağlıklı gıda tüketimine değil aynı zamanda gıda kaynaklı oluşabilecek hastalıkların henüz ortaya çıkmadan bir potansiyel tehdit aşamasında ortadan kaldırılmasını öngören pro-aktif yapısı sayesinde toplum sağlığına, işletme ekonomisine büyük ölçüde katkı sağladığı, rekabet ortamının artmasına ve büyümenin hızlanmasına yarar sağladığı bilinmektedir [5]. Bu çalışmada bireylerin, tercihen organik gıdayı talep etmekte olduğu fakat erişebilir düzeyde olmadığı için tercihini katkı maddeli, damağa ve göze daha çok hitap eden, doyurucu, ekonomik, hazır gıdalardan yana kullandıkları sonucuna varılmıştır. Refah ve sağlık arayışı açısından son derece önem taşıyan gıda güvenliği konusunun yeni kuşak için ne ifade ettiğini anlamak adına daha fazla çalışma yapılması gerekliliği ve konunun bir bütün halinde ele alınmasının toplumsal düzeyde etkilerini genç kuşaklara daha anlaşılır hale getirilerek aktarılmasının çok önemli olduğu sonucuna varılmıştır. Gıda işleme yöntemleri konusunda sınırlı bilgiye sahip oldukları görülen Z kuşağı bireylerin, ekonomik koşullar, yetersiz eğitim olanakları, sentetik gıdalara gereğinden fazla maruz bırakılmalarına rağmen sağlıklı gıda arayışı ve tercih etme isteğinin hali hazırda sürdüğü saptanmıştır. Umut verici olan bu durumun artarak devam etmesi istenmektedir. Yürütülen bu çalışmada geleceğin potansiyel tüketim toplumu olarak bilinen Z kuşağının gıda güvenliğine yönelik bilgi, tutum ve davranışlarının ölçülmesi sonucu elde edilen verilerin ilerleyen zamanlarda gıda güvenliği konusunda yapılacak araştırmalara katkı sağlaması amaçlanmıştır.

Anahtar kelimeler: Gıda güvenliği, beslenme, Z kuşağı.

GİRİŞ

Gıda güvenliği uygulamalarının temelinde sağlıklı gıda üretimi ve üretilen gıdalara güvenle erişebilme amacı öne çıkmaktadır. Güvenli gıda, yapısında insanların yaşamlarını iyi beslenme görevini yerine getirecek ölçüde yeterli ve dengeli miktarda gıda bileşeni bulunduran, fiziksel etkiler, kimyasal bileşenler ve mikrobiyolojik riskleri azaltılmış gıdalardır [6]. Gelişen teknoloji, kırsal yaşamdan şehir hayatına olan göçün artış göstermesi, tarımsal arazilerin kullanımının yaygınlıktan çıkması hatta kırsal yaşamın unutulması, günümüz toplumlarının hızlı tüketim toplumu olmanın getirdiği şartlara ayak uydurmak istemesi, kadının iş yaşamına girmesi sonucu evde yemek yapma olgusunun önemini ve etkinliğini yitirmesi gibi konular gıda endüstrisinde ve bu endüstriye olan yatırım isteğinin artmasına neden olduğu gözlenmektedir [7, 8]. Bu durum beraberinde bir takım ulusal gıda güvenlik mevzuatlarının uygulanmasını da beraberinde getirmektedir. Globalleşmenin etkisiyle ortadan kalkan

sınırlar dünya ticaretinin hız kazanmasına da olanak sağlamıştır. Dolayısıyla gıda ürünlerinin ihracata yönlendirilmesi ve ürünlerden en üst seviyede maddi kazanç elde edilmesi, ancak tüm işlem aşamalarında bütünleşik bir sistem uygulanması ile sağlanabilecektir. Sonuçta ekonomik şartlar, artan nüfus, demografik yapının değişmesi, eğitim düzeyin artmasıyla gelişen sağlıklı yaşam algısı, kuşaklar arası beklenti ve farkların ortaya çıkması gibi nedenler bütünleşik ve sistematik gıda güvenlik unsurlarını zorunlu kılmıştır [9]. Bu zorunluluk, kalite kavramını öne çıkarmıştır. Kalite, üretilen ürün veya ortaya konulan hizmetin potansiyel ihtiyaçları karşılama seviyesinin bir ölçütüdür. Yani kalite, mal veya hizmetin tüketicilerin arzu ve ihtiyaçlarını karşılama yeteneğidir [10]. Ürün ve hizmet kalitesini sağlamak için kalite unsurunun önünde duran engelleri bilmek gerektiği ortaya çıkmaktadır. Kaliteyi sağlamak ve sürdürmek tespit edilen sorunları ortadan kaldırmakla mümkün olacaktır. Bu noktada toplam kalite yönetim anlayışı ortaya çıkmaktadır. Toplam kalite yönetim anlayışı, tüketicilerin arzularını karşılamayı, çalışanlar ve tüketiciler için yüksek fayda sağlamayı amaçlayan, odak noktası gerçek kalite olan ve tüm çalışanların, kalite çalışmalarına katılımını temel alan bir yönetim modelidir [11]. Kalitenin önemli hedefleri arasında sürekli gelişimi sağlamak olduğu sonucuna varılmıştır. Problemlere geçici çözümler bulmak yerine, tehlike sebebi araştırılmalı ve o sorun için çözümler üretilmelidir [12]. Neticede toplam kalite yönetimi, müşteri tarafından arzu edilen kaliteye öncelik vererek işletmelerin ürün ve hizmetlerinin yanında yönetimin kalitesi ve verimliliğini de yükseltmeyi hedefleyen bir çalışma veya yönetim uygulaması olarak benimsenmiştir [13]. Gıda teknolojisindeki önemli gelişmeler ve tüketicinin kalite algısı üzerinde oluşan değişimleri, farklı ürün çeşitlerinin sunduğu rekabet ortamı gibi nedenler daha fazla dışarıda yemek yeme ve tüketim eyleminde bulunma davranışını ortaya çıkarmıştır [8].

Çalışmalar sonucu ortaya konulan gıda güvenlik sistemleri ve işletmelerin bu sistemlere uyumunun zorunlu bir uygulama haline getirilmesindeki asıl hedefin tüketici ve toplum sağlığını korumak olduğu sonucuna varılmıştır. İnsan, metabolik faaliyetlerini sürdürebilmek için gıdaları tüketir. Bu noktada tüketim; bireylerin ihtiyaç, arzu, taleplerine ilişkin mal ve hizmetlerin para veya paranın yerini alabilecek bir ölçüt, değişken sosyal ve ekonomik yapıya bağlı bir ilişki biçimidir. Tüketiciler tercih ettikleri veya tüketim eğilimi gösterdikleri ürünler sayesinde kişisel farklar, etnik algılar, siyasal ve sosyal kimliklerini sunma imkânına kavuşur [14]. Tüketici davranışlarını etkileyen faktörlerin tüketimde önemli bir konuma sahip olduğu sonucuna varılmıştır. Tüketici davranışlarının değerlendirilmesi, hem gıda sektöründe faaliyet gösteren işletmeciler hem de ürün çeşitlendirme, pazar bölümlendirme ve geliştirme boyutunda alınacak kararların doğru ve etkili olması için oldukça büyük önem taşır [15]. Gıda sektöründe doğru hedef kitleye doğru ürünün ulaştırılması noktasında sektörün içinde bulunduğu dönem ve özelliklerinin doğru tespit edilmesi gerektiği önemli bir çıktıdır. Globalleşen gelişim sürecinde yaşanan bilimsel ve teknolojik alandaki ilerlemelerin, farkların toplum yapısında ve tüketim algısında değişikliklere yol açtığı ve özellikle genç nesillerin bu durumdan kayda değer ölçüde etkilendiği görülmektedir [16]. Belirlenen gıda güvenlik uygulamalarının zaman içerisinde geçirdiği değişimin toplumun beklenti ve talepleriyle şekillendiği gözlemlenmiştir. Günümüz ve geleceğin tüketim toplumu olarak görülen Z kuşağının ihtiyaçları ve talepleri bu değişimi önemli ölçüde etkilemektedir [17]. Hızlı beslenme şeklinin zamandan tasarruf etme gerekliliğine duyulan ihtiyaçtan kaynaklandığı tespit edilmiş ancak böyle bir kültürün yüzyıllar öncesinden de var olduğu belirtilmiştir. Yapılan uzun yolculuklar esnasında alınan hazırlaması ve tüketmesi kolay yiyecekler fast-food tarzı beslenmenin başlangıcı olarak kabul edilebilmektedir. Geleneksel yemeklere alternatif

sayılabilecek fast-food kültürünün gelişmesi, beslenme alışkanlıklarını değiştiren unsurların ön plana çıkarmıştır [18]. Başlıca unsurlar; nüfus genelinde yaşanan değişimler, yerleşim alanları ve tercihlerinde yaşanan değişimler, eğitim düzeyinin artması, besin endüstrisinde ki değişimlerin hızlanması, sosyal medya ve iletişim araçlarının günlük yaşamda artış göstermesi şeklinde sıralanabilir. Bu oluşumların toplumun farklı dönemlerinde demografik, sosyolojik ve politik yapıların değişmesi sonucu ortaya çıktığı düşünülmektedir. Her dönemin kendine özgü tüketim biçimi, üretim ve paylaşım biçimi, mekân, araç ve uygulamaları gibi öznelliklerinin olduğunu düşünürsek dönemler arası farklılıkların ortaya konulması daha açıklayıcı olacaktır. Bu noktada kuşak; yaklaşık olarak aynı yıllarda dünyaya gelmiş, aynı çağın ve zamanın şartlarını, dolayısıyla birbirine benzer sorunlarını, kaderleri paylaşmış, benzer yükümlülükleri olmuş kişilerin bir araya gelerek oluşturduğu topluluk; Yaklaşık 25-30 yıllık yaş ortalamalarını oluşturan kişiler öbeği, göbek, nesil, batın, jenerasyon olarak ifade edilmektedir (TDK). Kuşak tanımlamaları; Belli tarih aralığında doğmuş, sosyalleşme süreci içerisinde aynı sosyal, politik, ekonomik vb. olaylardan etkilenmiş, içinde bulunduğu koşullar gereği benzer sorumluluklar yüklenmiş oldukları için ortak bir kültür geliştirmiş ve değer, inanç, beklenti ve davranışlara sahip gruplar olarak ifade edilmektedir [19]. Neticede popüler kültür ve geleneksel kültür arasında bazı değişimlerin söz konusu olduğu belirlenmiştir. Kuşaklar arası bu değişim yeni iletişim sistemlerine ve modellerine ihtiyacı arttırmıştır.

Z kuşağının diğer kuşağa mensup bireylere göre daha dikkatsiz alışveriş davranışı sergileyen, kalite odaklı, bireysel tarzı benimsemiş, teknolojik gelişmeler nedeniyle çok fazla bilgiye erişim olanağı bulduğu için bilgi karmaşasına maruz kalıyor olması sonucu dikkatsiz alışveriş odaklı ve pozitif algısı yüksek bireyler oldukları görülmektedir [20]. Farklı özellikler gösteren kuşaklar ve bu özellikler etrafında şekillenen tüketim anlayışlarıyla birlikte fast-food beslenme alışkanlığı ve toplu beslenme alanlarının sayısının arttığı gözlenmektedir. Hızlı ve kolay tüketim alışkanlığı, farklı kültürlerden uyarlanan yemeklere duyulan ilginin artması, kesintisiz gıda tüketim anlayışı gibi etkilerin gıda güvenliğini tehdit eden birer unsur haline geldiği tespit edilmiştir. Bu bağlamda Z kuşağı talep ve alışkanlıkları doğrultusunda gelişen beslenme olgusunun ve Z kuşağının gıda güvenliği konusu hakkında bilgi, tutum ve davranışlarının üzerinde durularak, Z kuşağı bireyler bu konuya ne düzeyde önem verdiğinin yansıra gelecekte gıda güvenliği planlamalarına nasıl yön verilmesi gerektiği gibi konularının ortaya çıkarılması hedeflenmiştir.

MATERYAL VE METOT

Araştırma sonuçlarının yorumlanmasında kullanılan veriler Kütahya ili Merkez ilçesinde yaşayan Z kuşağına mensup 54 kişiden yüz yüze anket yoluyla elde edilmiştir. Belirli ölçekler dikkate alınarak yapılan anket çalışması Aralık 2021/ Ocak 2022 tarihleri arasında gerçekleştirilmiş, elde edilen sonuçların değerlendirilmesinde SPSS programı kullanılmıştır.

BULGULAR VE TARTIŞMA

Z kuşağı bireylerin bilgi, tutum ve davranışlarının ölçüldüğü bu çalışmada katılımcılara sunulan ölçeklerin (1: Hiç bilmiyorum/ 5: Çok iyi biliyorum) genel güvenilirlik katsayısı uygun seviyede belirlenmiştir. Anket çalışmasında gıda güvenliği hakkında 11 adet farklı soru sorulmuştur: ‘Gıda güvenliğini duydunuz mu?, gıda ürünlerinin etiket bilgisini okuyor musunuz?, gıda ürünün etiketinde HACCP ve ISO 22000 ibarelerinin önemini biliyor musunuz?, gıdaların son kullanma tarihlerini

kontrol edip etmeme yönteminin faydasını biliyor musunuz?, gıdaların ambalajlarının zarar görüp görmediğini kontrol etme yönteminin faydasını biliyor musunuz?, satın aldığınız gıdaların muhafaza yöntemleri hakkında bilginiz var mı?, soğuk zincir kuralı hakkında bilginiz var mı?, gıda bileşenleri hakkında bilginiz var mı?, gıda tercihi esnasında referans aldığınız kriterlerin (ekonomik veya sağlıklı olması) arasındaki farkı biliyor musunuz?, organik gıda ve katkı maddeli gıda hakkında bilginiz ne kadar?, Türk Gıda Kodeksi hakkında bilginiz var mı?'. Katılımcılara sorulan 11 adet soruya ait ortalamalar sırasıyla 2,33, 3,09, 2,27, 3,61, 3,88, 3,48, 2,75, 2,59, 4,09, 4,12, 1,62 olarak tespit edilirken standart sapma değerleri sırasıyla 1,1655, 1,3213, 1,1396, 1,1060, 0,8165, 0,7458, 1,3165, 1,2211, 0,7337, 0,6742 ve 1,0514 olarak tespit edilmiştir. 11 sorudan oluşan ölçeğin tamamı için ortalama, varyans ve standart sapma değerlerinin ise sırasıyla 33,8889, 26,7420 ve 5,1712 olduğu tespit edilmiştir. Ayrıca soruların genel ortalaması 3,081 iken ortalama madde varyansı ise 1,107' dir. 11 soruya ait ortalamaların değişim aralığı 2,5 ve varyansların değişim aralığı ise 3,8 olarak belirlenmiştir. İlave olarak sorular arasındaki korelasyonların genel ortalamasının 0,105 olduğu tespit edilmiştir. Soru ortalamalarının eşitliği açısından bakıldığında $p<0,05$ olduğundan soru ortalamaları arasındaki farklılıklar anlamlıdır.

Tüm istatistiksel veriler değerlendirildiğinde ifade edilebilir ki $p<0,05$ olduğundan ölçümler arasında farklılık vardır ve bu çalışma literatüre katkıda bulunabilecektir. Bu istatistiksel verilerin yorumlanması ile önemli bulgulara ulaşılmıştır. Ankette yer alan sorulara verilen cevaplar incelendiğinde: 'Gıda güvenliğini duydunuz mu?' sorusuna büyük bir çoğunluğun duydum/ biliyorum cevaplarını verdiği ancak ardından gelen 'HACCP sistemleri ve ISO 22000 sistemlerini biliyor musunuz?' sorularına yanıt olarak bu konu hakkında hiç bir fikri olmadığını/ bilmediklerini belirtmişlerdir. Bu durum gıda güvenliği konusunun sosyal çevre, okul, sosyal medya gibi yaygın ortamlarda adının geçtiği ancak sistem olarak tam anlamıyla ne ifade ettiğinin bilinmediğini ortaya koymaktadır. 'Satın aldığınız gıdaların muhafaza yöntemleri hakkında bilginiz var mı?' sorusuna büyük çoğunluğu var/çok iyi biliyorum cevabını verirken aynı zamanda, 'soğuk zincir kuralı hakkında bilginiz var mı?' sorusuna hiç bilmiyorum/bilmiyorum cevabını vermeleri de bu tespiti destekler niteliktedir. Z kuşağı gençlerin hız ve haz duygusunu aynı anda yaşamayı istediği aynı zamanda sağlıklı yaşam sürme konusunda oldukça duyarlı olduğu gözlemlenmiştir. Bu noktada Z kuşağı bireylerin geleneksel yemeklere karşı ön yargısız ve doğal beslenmeye istekli olduğu ortaya çıkmıştır. Çoğunluğun öğrenci olduğu genç nesil, 'gıda tercihi esnasında referans aldığınız kriterlerin (ekonomik veya sağlıklı olması) arasındaki farkı biliyor musunuz?' sorusuna biliyorum/ çok iyi biliyorum cevabını vermiş ancak 'gıda bileşenleri hakkında bilginiz var mı?' sorusuna çoğunluğu bilmiyorum/ hiç bilmiyorum şeklinde cevap vermiştir. Bu iki soruya farklı iki cevabın verilmesi şu şekilde yorumlanmıştır; sağlıklı ürün tercih etmek isteyen bireylerin tüketmek istedikleri gıdaların kalitesinin besin bileşenleriyle yakından ilgili olacağı düşünülürse Z kuşağı bireylerin, düşük gelir grubunda olmalarının etkisiyle bu konunun önemini bildikleri halde sağlık koşullarını etkileyen bazı konuları göz ardı etme eğiliminde oldukları görülmektedir. Bu durumda 'sağlıklı gıda mı? ekonomik gıda mı?' konusunda ekonomik koşullar ölçüsünde satın alma davranışı meydana gelmektedir. 'Organik gıda ve katkı maddeli gıda hakkında bilginiz ne kadar?' sorusuna bireyler çoğunlukla biliyorum/ çok iyi biliyorum cevaplarını vermişlerdir. Sonuç olarak yeni nesil için gıda hijyeni ve sanitasyon başta olmak üzere gıda güvenliği konularında gereken seviyede eğitim ve öğretimin ne derece önem arz ettiği anlaşılmaktadır. Pro-aktif davranışların gıda güvenliği hakkında edinilen bilgilerle iyileştirilebileceği aşikardır.

Gıda üreten işletmelerin eğitim ve öğretim konularının çalışanlara aktarılması konusunun önemi üzerine yapılan bir araştırmada çalışanların neyi, nasıl ve neden yapmaları gerektiği bilincinde olmalarının önemi üzerinde durulmuş ve bu durum araştırma sonuçlarımızı destekler nitelik sunmuştur [21].

Pro-aktif davranışın gıda risklerini azaltma potansiyeli üzerinde gerçekleştirilen bir çalışmada, pro-aktif davranışların gıda kaynaklı hastalıkların önüne geçebileceği ve çocuk beslenmesi ile ilgili sağlıksız koşulların ortadan kaldırılarak sağlıklı toplum nüfusu sağlamaya yönelik çözümlerin mevcut olduğuna vurgu yapılmıştır (4).

Mutfak hizmetleri yönetimi konulu bir çalışmada, mutfak içerisinde gıda güvenliği sağlama koşulları, çalışan personele verilmesi gereken eğitimler, mutfakta hijyen ve sanitasyonun optimize edilmesi gibi hususların önemi üzerinde durulmuş, çalışmamızda da vurgulanan gıda güvenliği bilgisini edinmenin ne derece önemli olduğu, bunu sağlamada yönetimin rolü ortaya konmuştur [22].

Farklı kuşakların gıda güvenliği bilgi, tutum ve davranışları konusunun araştırıldığı bir çalışmada X, Y ve Z kuşaklarının genel özellikleri incelenmiş, nicel araştırma yöntemi kullanılarak tanımlayıcı araştırma yaklaşımından hareketle gıda güvenliğinin önemi vurgulanmış ve elde edilen bulgular çalışmamızı destekler nitelik sunmuştur [23].

SONUÇ

Gıda güvenliği konusunun önemi ve uygulama yöntemlerinin araştırıldığı bu çalışmada bir sistemin, toplum üzerindeki etkisi ve bilinirliği üzerinde durulmuş örnek grup olarak da Z kuşağı bireyler seçilmiştir. Günümüz koşullarında satın alma davranışlarına büyük ölçüde yön veren genç kuşakların gelecekte ve bir sonraki nesiller üzerinde etkili olacağı düşünülürse var olan bilgi birikiminin ne ölçüde doğru olduğu, eksiklerinin hangi noktalar üzerinde yoğunlaştığı, tüketim sürecine giden tercih yöntemlerinde nelere dikkat ettiği konularının bilinmesinin, yapılacak yeni araştırma ve sistem üzerinde gerçekleştirilecek iyileştirme çalışmalarına büyük ölçüde katkı sağlayacağı ön görülmüştür.

Elde edilen sonuçlar ışığında bazı öneriler sunulabilir. Sağlıklı ve organik gıdaya toplumun her kesiminden bireylerin erişimi mümkün ve sürekli kılınmalıdır. Ulusal ve uluslararası gıda güvenlik mevzuatlarını benimseyen işletmelerce sunulmuş tüketime hazır gıdaların satın alınması konusunda teşvik ve farkındalık geliştirmek adına sosyal çalışmalara daha fazla yer verilmelidir. Sağlıklı ürünlerin yerini yapay ve katkı maddeli gıdalar almamalıdır, bu yönde çalışmalara daha fazla ihtiyaç duyulmaktadır. Sentetik ürünlerin alternatif bir gıda tüketim ürünü olarak kolay erişilebilir fiyatlarla market raflarında yer alması yeni jenerasyonun algı karmaşası yaşamasına ve gelir düzeyi doğrultusunda sağlıksız ürünleri tercih etmesine neden olabileceği gözlemlenmiştir. Toplumsal bilinçlenmeye büyük katkı sağladığı düşünülen kamu spotu reklamları, kısa film ve tanıtımlar gibi dijital medya üzerinden gıda güvenliği konularını kapsayan ve anlaşılır nitelikte yayın ve kampanyalar düzenlenmelidir. Son olarak teknolojik araçları etkin kullanan genç nesil için güvenli gıda üretmeyi ilke edinmiş işletmelerin yer aldığı sosyal medya uygulamaları geliştirilmelidir.

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ATTITUDES OF ATHLETES PARTICIPATING IN TURKISH UNIVERSITY SPORTS COMPETITIONS TOWARDS THE COVID-19 VACCINE

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ABSTRACT

Aim: Attitudes towards vaccination in the fight against the COVID-19 pandemic pose significant challenges in many parts of the world. Continuing infection among unvaccinated individuals may put vaccinated individuals in a difficult situation, leading to an increased risk of further virus mutations. The aim of this study is to examine the attitudes of athletes studying at Dicle University towards the COVID-19 vaccine.

Methods: This study was carried out in accordance with the descriptive survey model. The population of the research consisted of athletes participating in intercollegiate sports competitions organized by the Turkish University Sports Federation. 133 Volunteer athletes who studied at Dicle University and took part in intercollegiate sports competitions using cluster sampling method, one of the random sampling methods, were included in the sample group. In the study, a Personal Information Form was used to collect the gender and age data of the athletes and the Attitudes Towards the COVID-19 Vaccine (ATV-COVID-19) was used to determine their attitudes towards the COVID-19 vaccine.

Results: Total of 133 athletes including 73 (54,9%) male and 60 (45,1%) female participated in the study. The mean age of the athletes was 21,37 and the standard deviations were 2,33. The mean scores of female athletes in the positive attitude and negative attitude sub-dimensions were found to be statistically significantly higher than the mean scores of male athletes ($p<0,001$). A statistically significant difference was found between the total score averages of the Attitudes Towards the COVID-19 Vaccine (ATV-COVID-19) by gender ($p<0,05$). It was found that the average scores of female athletes were higher than the average scores of male athletes.

Conclusion: As a result, according to the average scores obtained from the scale, it can be said that the attitudes of all the athletes participating in the study towards the COVID-19 vaccine, regardless of gender, are in a positive direction. The fact that the athletes participating in the study were at the university education level can be considered to have a positive effect on their attitudes towards the COVID-19 vaccine.

Keywords: COVID-19, COVID-19 Vaccine, Vaccination Attitudes.

FACTORS DETERMINING THE DEVELOPMENT OF THE LANDSLIDE PROCESS

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ABSTRACT

The on-going reform of design and survey work in Georgia, as well as the accepted direction of harmonizing Georgian regulatory documents with international standards, make us take a fresh look at the state of engineering-geological and geotechnical research. This fully applies to the problems of forecasting landslide hazards. The merits of the national engineering-geological school, its contribution to solving this difficult problem, can hardly be overestimated. However, it should be noted that in recent decades this direction in Georgia has practically not developed.

A landslide process factor is any circumstance that affects the stability of slopes and, therefore, may contribute to the occurrence or re-displacement of a landslide. The subject of the theoretical study of landslide processes is the landslide hazard. Landslide hazard is understood as the probability of causing damage due to the activation of landslide processes. The main objects subjected to destruction by landslide processes are slopes and slopes. The nature of the slope is determined by the composition and occurrence of the rocks that make it up, the absolute and relative heights of the terrain, and the nature of the slope processes. These processes depend on the climatic features of the area, the exposure of the slope, the characteristics of vegetation, and other components of the natural environment.
Favorable factors contributing to the development of landslides are the presence of steep slopes (especially those washed away by rivers, lakes, or the sea), the presence of clayey rocks, the fall of layers towards the slope, and groundwater outlets.

The immediate cause of the landslide is a change in the physical state and the weakening of the strength of the rock mass. The most important factor is the presence of permeable rocks underlain by a water-resistant layer of clays: moistening of clay deposits gives them a plastic state, and they begin to act as a "lubricant" for the overlying strata.

The article discusses the main most common identification signs of the appearance of a landslide process and their examples in the mountainous territory of Georgia.

Keywords: landslide, soil movement types and processes, water intrusion on slopes.

Introduction

The study of landslide processes is a priority area of a number of sciences, and primarily: geological, geographical, climatology and geotechnical cycles. Therefore, despite the difference in the tasks being solved, a synthesis of various knowledge is necessary to obtain a complete picture of the landslide process. Without a comprehensive understanding of the reasons for the development of landslides, the forecast of their activation is impossible.

The landslide process, which develops due to the loss of stability by the slope (embankment), is the movement of the mass of rocks that make up this slope along the other part of the slope, which remains motionless, under the influence of gravity, while maintaining a material connection between both parts. The landslide mass is called the landslide body, and the surface along which the slumping occurs is called the sliding surface or the displacement surface.

A landslide process can be defined as a sequence of phenomena or states of a landslide body, and a landslide event can be defined as a fixed state of a landslide body. Under the "state" understand the structure and properties of the object at an arbitrary point in time. Then the phenomenon is the structure and properties of the object at the given moment, and the process is the change in the structure and properties of the object. Currently, there are many definitions of the landslide process.

Main Part

Various authors define the content of the concept of "landslide process" in different ways. But, despite this, the following positions are common:

1. landslide process is a displacement of rock masses down the slope;
2. the main driving force is the weight of the shifting rocks;
3. the movement of landslide masses on the slope occurs in the form of sliding or, in some cases, flow;
4. the displacement of the landslide occurs without loss of contact between the moving rocks and the fixed base.

The subject of theoretical landslides is the landslide hazard. Landslide hazard is understood as the probability of causing damage due to the activation of landslide processes. Taking into account the fact that the engineering-geological study of landslides is always associated with the economic development of the territory, from the point of view of engineering geology, the landslide hazard can simply be understood as the probability of activation of landslide processes.

The main objects subjected to destruction by landslide processes are slopes and embankments.

According to the generalization of several definitions, a slope is an inclined section of the surface of the lithosphere, which is formed under the influence of relief-forming processes. The nature of the slope is

determined by the composition and occurrence of the rocks that make it up, the absolute and relative heights of the terrain, and the nature of the slope processes. These processes depend on the climatic features of the area, the exposure of the slope, the characteristics of vegetation and other components of the natural environment.

A simple slope consists of the slope proper, slope crown, toe of surface rupture and foot (see. Fig. 1.).

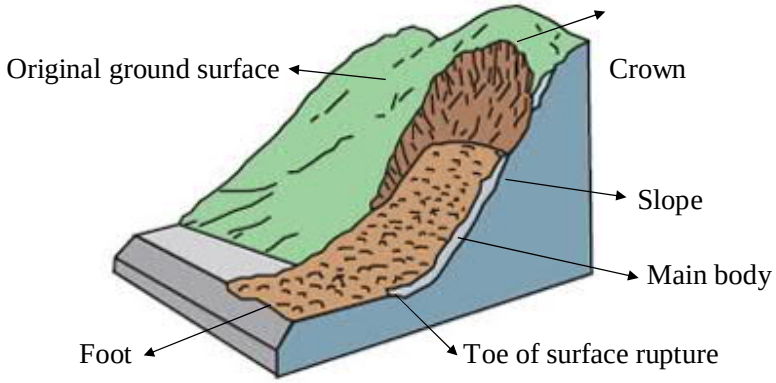


Fig.1. Profile diagram of a simple slope.

Based on experimental and analytical studies, A. I. Bileush identifies two main causes of slow landslide (creep):

– change in the stress state in the thickness of the soils that make up the slope, in the direction of increasing tangential shear stresses;
– change in the direction of decreasing the strength properties of slope ground.

To assess the degree of stability, types of slope failure geo-hazards are divided into two groups: landslides crack falls and debris flows.

An embankment is an artificially created surface that limits a natural ground massif, excavation or bank. Slopes are formed during the construction of various types of embankments (roadbed, dams, earthen dams, etc.), excavations (pits, trenches, canals, quarries, etc.) or during the re-profiling of territories.

With an unfavorable combination of various factors, a mass of ground, limited by a slope or embankment can move into a non-equilibrium state, which can cause the development of a landslide process.

One of the main geotechnical characteristics of a slope is its stability. Under the stability of the slope (embankment) is understood its ability to maintain its profile (and thus the appearance and structure as a whole) for a long time.

On the territory of the Black Sea coast of Georgia (Batumi, Kobuleti, Ajara region) one of the most common types of forms of instability are flow landslides, characterized by a plastic consistency of soils and a shallow depth of up to 7 meters (see Fig. 2).

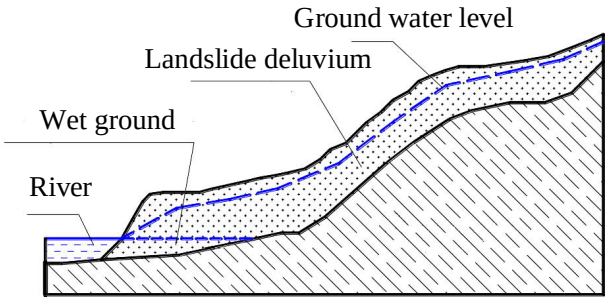


Fig. 2. The mechanism of formation of a flow landslide

Moreover, mainly clayey soils have a plastic consistency of soils. In addition, the territory under consideration is subject to seismic impacts, which can lead to changes in the physical and mechanical properties of soils.



Fig. 3. Occurrence of Landslide phenomena in several villages of Kobuleti, 25.09.2016 (Black Sea Coast of Georgia)

The following are most often used as identification signs of the formation of a landslide process:

1. ***Landslide cracks***, which are barely noticeable at the initial stage of landslide development, but as the process develop, they gradually expand, lengthen and, connecting with each other, create a continuous line of separation of the landslide body.



Fig. 4. Land slide crack in Vashlijvari settlement, 19 March, 2021 (Tbilisi, Georgia)

2. ***Landslide cirques***, which are recesses formed in the slope, as a result of the slumping of part of the ground massif.
3. ***Disruption planes*** formed when a mass of creeping rocks is torn off.
4. ***Ridges*** formed at the foot of the slope as a result of wedge-shaped uplift of rocks located at the foot of the slope as a sliding mass.
5. ***Landslide ledges*** are areas that are usually inclined towards the slope and are formed as a result of sliding of a landslide body along a curved surface.
6. ***Wetlands*** with the development of swamp vegetation in the rear part of the ledge of the landslide, formed due to the accumulation of precipitation in the recesses of the ledges.
7. ***"Drunken Forest"*** - Twisted trees growing on a landslide slope and taking on an inclined position as a result of landslide movements.
8. ***Rough surfaces*** formed as a result of erosive smoothing of landslide ledges and the subsequent formation of erosive landforms.
9. The presence of a **large number of water occurrences** on the slopes.
10. The presence of ***deformations in structures*** located in the zone of influence of the landslide process.

Factors determining the development of the landslide process

A landslide process factor is any circumstance that affects the stability of slopes and, therefore, may contribute to the occurrence or re-displacement of a landslide.

It is considered obvious that in problems of mechanical balance of a slope/slope, the main force factor acting in the geological environment is the own weight of this environment. More formally, at each point of this medium there is a factor called the gravitational tensor: Any landslide displacement of rock masses occurs under the influence of gravity and is possible only when the shear component of gravity exceeds the strength of the rocks as a whole, or along surfaces or zones of weakening.

Landslides are secondary exogenous geological processes (EGP), it means processes, the conditions of which are prepared by the primary EGP. Landslides can occur:

- as a result of weathering (contact of the lithosphere with the atmosphere);
- as a result of coastal erosion (contact of the lithosphere with the surface hydrosphere);
- as a result of earthquakes (contact of the surface area of the lithosphere with its deep parts);
- due to human economic activity (contact of the lithosphere with the techno-sphere).

Numerous additional factors that determine the development of landslide processes, according to the nature of the action, can be combined into the following groups:

– The factors that create the environment in which slope processes develop are rock complexes; folded and discontinuous tectonic structures; lithogenetic, tectonic and other fractures of rocks; degree and regime of water cut; spatial correlation of tectonic disturbances with the orientation and steepness of the slope, etc. In the general case, this group of factors is determined by the engineering and geological conditions of the territory.
– Factors that change the state and properties of rock masses: the processes of unloading and deconsolidation of rocks caused by erosion and abrasion dissection of the territory; the processes of weathering and mechanical suffusion in all their diversity of action; leaching and karst processes; modern tectonic movements, causing an increase in the fragmentation of rocks in tectonic and adjacent zones; increase in rock watering due to atmospheric and groundwater, especially along fractures, contacts, interlayers and lenses.
– Technogenic factors affect both the strength of slope rocks and their stress state as a result of the creation of various excavations, dumps, vertical planning, and surcharges from the weight of structures; vibrations from mechanisms and explosions; additional moisture due to unorganized runoff of utility water, leaks, irrigation, etc.; open pit and underground mining of mineral deposits, including coal gasification, oil and water pumping.
– Hydrological and hydrogeological criteria responsible for the constant and seasonal watering of rocks. Watering of rock masses, especially seasonal, is one of the significant causes of landslides and collapses of high mountain slopes. Depending on the composition and structure of the rock massifs of the slope, the role of the hydrogeological factor will be qualitatively and quantitatively significantly different. First, the strength of the rock mass is significantly reduced, especially in weakened zones and contacts, where there are accumulations of clay material. Secondly, hydrostatic and hydrodynamic pressure arises on separate parts of the massif. Thirdly, the speed of seismic waves in the flooded compared to the "dry" array of fractured rocks increases. Therefore, it is necessary to distinguish between the nature and different water cut of rock massifs: a) permanent and seasonal; b) the presence of water in rocks in gravitational and bound forms; c) confinement of waters to individual layers, cracks and contacts of the rock mass; d) head and gradient values, groundwater regime, taking into account atmospheric precipitation infiltration, filtration in construction sites, drawdowns of reservoir levels and utility water leaks.

Since each circumstance is a factor of the landslide process only to the extent that it affects the coefficient of slope stability, only those classifications that determine the nature of this influence are important for assessing landslide factors.

A group of factors that combines the conditions of landslide formation (determining the average value of the stability coefficient), which includes:

- terrain;
- geological structure of slopes and embankments;
- features of physical and mechanical properties of rocks;
- hydrogeological conditions;
- modern and newest tectonic movements and seismic phenomena;
- climatic features of the area;
- hydrological regime of reservoirs and rivers for coastal landslide areas;
- development of accompanying exogenous geological processes and phenomena;
- human engineering activities.

In practice, many factors in various combinations are involved in the emergence and development of the landslide process, often reinforcing each other, but in each case, in a specific geological and geomorphological setting, the impact of one of the factors becomes decisive for the emergence or activation of the landslide process.

Conclusions

Based on the above analysis, the causes of landslides can be summarized in three main groups:

1. **Changing the shape and height of the slope.** This group includes slope trimming, caused by both anthropogenic activity and natural due to the erosion of the slope by constant water flows, marine abrasion of the slope.
2. **Changes in the structure, condition and properties of the rocks that make up the slope.** This group combines processes that change rocks, their physical and mechanical properties. This is physical and chemical weathering, moistening of rocks by atmospheric and groundwater. Suffosion and karst processes.
3. **Additional load on the slope.** These are various additional loads, such as seismic, hydrodynamic, hydrostatic, artificial static or dynamic effects.

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EVALUATION OF THE PURIFYING PERFORMANCE OF THE WASTEWATER TREATMENT PLANT BY NATURAL LAGOON IN ARID CLIMATE: A CASE STUDY

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ABSTRACT
Management of water is one of the key challenges in the current scenario of environmental protection. In spite of the progress achieved by Morocco in term of wastewater treatment, the development of simple and cost-effective biotechnologies such as natural lagoon is particularly interesting, especially in small and medium communities. To face this condition, the National office of Drinking Water (ONEP) puts the accent on the biotechnological techniques to reduce the harmful effect which undergoes the receiving environment (Oued Umm Er-Rbia), and to re-use purified water in the field of agriculture. The objective of this work is, to study the performance of the purification plant of Zaouiat-cheikh. by the study of physicochemical analysis data during the period between 2014 and 2020, at the entrance and exit of STEP. The flow measurements are carried out at the entrance to the WWTP via an ultrasonic flow meter permanently installed. The daily flow of wastewater varies between 2221 m3/d and 811 m3/d, with an average of 1350 m3/d. The results obtained by statistical treatment of Physicochemical quality parameters, BOD (biochemical oxygen demand), COD (chemical oxygen demand), and TSS (Total Suspended Solids) at the output, showed that: The COD Avg = 400.34 mg/l, BOD5 Avg = 157.21 mg/l and the TSS Avg = 140.10 mg/l. In order to have biodegradability information on the purifying performance, biodegradability-index (ratio) showed that these wastewaters have a high organic load COD / BOD5 between 3,11 and 1,6 TSS / BOD5 = 1.5 to 0,5. In fact, these values of pollution parameters are relatively high compared to the usual average concentrations in Moroccan urban wastewaters, due to the olive mill effluent being drained into the surrounding environment without any treatment. That made it possible to note that this wastewater from the city of Zaouiat-cheikh is relatively charged with various pollutants.

Keywords: Wastewater, Natural lagoon, Purifying Performance, Physicochemical Analysis, Zaouiat-cheikh.

AFETLERIN NEDEN OLDUĞU ÇEVRE SAĞLIĞI SORUNU; SU KIRLILIĞI VE GÜVENLI SU KULLANIMI

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ÖZET

Doğal ya da insan kaynaklı fark etmeksizin afetlerin neden olduğu etkiler sadece sosyal, ekonomik ve insan sağlığına yönelik değildir. Her tür ve ölçekteki afetin meydana getireceği etkiler çevre sağlığını tehdit etmektedir. Çevre sağlığına olan etkileri de ciddi risk oluşturmaktadır. Afetlerin neden olduğu çevre sağlığı sorunları arasında su kirliliği ele alınması gereken önemli konulardan biridir.

Su, insan vücut ağırlığının %58'ini oluşturan, yaşam için vazgeçilmez bir besin maddesidir. Su olmadan canlıların hayatlarını devam ettirebilmesi mümkün değildir. Sadece içmek için değil kişisel ve çevresel hijyen açısından da önem taşımaktadır. Tarım ve hayvancılık, sulama hizmetleri, yangın söndürme ve sanayi gibi farklı alanlarda suyun kullanımı söz konusudur.

Su kirliliği çeşitli etkenler ile gerçekleşmektedir. Kirliliğe neden olan etkenler biyolojik, kimyasal ve fiziksel olarak sıralanabilir. Bu etkenlerin yanı sıra deprem, sel, tsunami ve heyelan gibi doğal afetler ile petrol sızıntıları ve terör olayları gibi insan kaynaklı afetlerden sonra da su kirliliği meydana gelebilmektedir. Afetlerden sonra su kirliliği; temiz su altyapısı, kanalizasyon alt yapısı veya dağıtım şebekelerinin zarar görmesi ile yer altı ve yüzey sularındaki kirliliğe bağlı olarak oluşmaktadır.

Afet sonrasında kişiler bölgeye su ulaşıncaya kadar buldukları her kaynaktan su içmeye eğilim göstermektedirler. Bunun sonucunda uygun olmayan içme sularının tüketimi; ishal, leptospiroz, hepatit A ve hepatit E gibi salgın hastalıklara yol açabilmektedir. Bu nedenle afetlerde yeterli miktarda temiz suyun sağlanması kısa vadede çözülmesi gereken öncelikli bir sorun niteliğindedir. Tüm afetzedeler içme ve hijyen için yeterli miktarda suyu temin etmek, saklamak ve kullanmak için yeterli tesis ve koşullara sahip olmalıdır. Su kirliliğini ve ilgili hastalıkları önlemek için tüm kaynaklara yeteri kadar koruma ve özen gösterilmeli, afet sonrasında tüm su tesisleri onarılmalı ve uygun yöntemlerle dezenfekte edilmelidir. Özellikle biyolojik arıtma tesislerinde ve diğer tesislerde oluşabilecek hasarlar ile içme sularına pis suların karışması; cesetlerin, endüstriyel ve evsel toksik maddelerin suya karışması sonucunda salgın hastalıkların görülmesi kaçınılmazdır.

Bu çalışmada öncelikle su kirliliğine neden olabilecek afetler ve su kirliliğine bağlı ortaya çıkan salgın hastalıklar ele alınmıştır. Afetlerden sonra çevrede meydana gelebilecek kirleticiler göz önünde bulundurularak; afetlere bağlı olarak gelişen su kirliliğini önlemeye yönelik ve afetlerde güvenli su kullanımına yönelik çözüm önerilerinin sunulması amaçlanmıştır.

Doğal afetler öngörülemeyen fakat uygun önlemlerle olumsuz sonuçları en aza indirgenebilecek olaylardır. Afet sonrasında su kirliliği ve salgın hastalıkların önüne geçilmesi için bütünleşik afet sisteminde yer alan tüm basamakların eksiksiz bir şekilde planlanması ve uygulamaya konulması

büyük önem taşımaktadır. Risk yönetimi ve kriz yönetiminin birbirinden ayrılmaz bütün olduğu gerçeğiyle, tüm faaliyetler doğru ve eksiksiz şekilde afet öncesi ve afet sonrası olmak üzere yerine getirilmelidir. Tüm bölge ve ülke düzeyinde risk yönetimine yönelik olarak çalışmalar yapılmazsa, kriz süreci ne kadar iyi yönetilirse yönetilsin başarıyla sonuçlanmayacaktır. Bu bağlamda özellikle risk yönetimi sürecinde yer alan faaliyetlerin eksiksiz bir şekilde uygulanması gerekmektedir.

Afet risk azaltma planları, bölgedeki doğal afetlerin sıklığına göre önceliklendirilmiş farklı afet türleri için afet risklerinin belirlenmesi, belirlenen risklerin ne zaman ve kim tarafından tanımlanması gerektiğinin ilave edilmesiyle risklerin önlenmesi ve azaltımasına yönelik oluşturulan planlardır. Bu planların uygun şekilde hazırlanması ve uygulanması ile afetlerden sonra gerçekleştirilen müdahale faaliyetleri için gereksinim duyulan kaynaklar azaltılacaktır. Böylece toplumların daha dirençli hale gelmesi ve daha güvenli yerleşim yerlerinin oluşturmasıyla afetlerin verdiği zararı azaltmak mümkün olacaktır.

Bu bağlamda afetlerden kaynaklanan su kirliliği ve salgın hastalıkların hem önlenmesi hem de etkin müdahalesi için bütünleşik afet yönetimi sisteminin tüm evrelerinde su güvenliğine ilişkin planlamaların yapılması önem arz etmektedir. Ayrıca afet risk azaltma planlarında da suyun önemi göz önünde bulundurularak, su yönetimine yönelik oluşturulan planlara önem verilmelidir. Ek olarak tüm topluma afet öncesi ve afet sonrası olmak üzere güvenli su kullanımına yönelik eğitimlerin verilmesi gerekmektedir.

Anahtar Kelimeler: Su Kirliliği, Afetler, Çevre Sağlığı, Güvenli Su, Salgın

ENVIRONMENTAL HEALTH PROBLEM CAUSED BY DISASTERS; WATER POLLUTION AND SAFE WATER USE

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ABSTRACT

Regardless of whether natural or man-made, the effects caused by disasters are not only for social, economic and human health. The effects of disasters of all types and scales threaten environmental health. Its effects on environmental health also pose a serious risk. Among the environmental health problems caused by disasters, water pollution is one of the important issues to be addressed.

Water is an indispensable nutrient for life, constituting 58% of human body weight. Without water, it is not possible for living things to continue their lives. It is important not only for drinking but also for personal and environmental hygiene. Water is used in different fields such as agriculture and animal husbandry, irrigation services, fire fighting and industry.

Water pollution is caused by various factors. The factors can be listed as biological, chemical and physical. In addition to these factors, natural disasters such as earthquakes, floods and landslides; Water pollution can also occur after man-made disasters such as oil spills and terrorist incidents. Water pollution after disasters; damage to clean water infrastructure, sewerage infrastructure or distribution networks, and pollution of ground and surface waters.

After the disaster, people tend to drink water from every source they find until water reaches the region. As a result, consumption of inappropriate drinking water can lead to epidemic diseases such as diarrhea, leptospirosis, hepatitis A and hepatitis E. For this reason, providing sufficient clean water in disasters is a priority problem that needs to be solved in the short term. All survivors should have adequate facilities and conditions to procure, store and use sufficient water for drinking and hygiene. Adequate protection and care should be given to all resources to prevent water pollution and related diseases, all water facilities should be repaired and disinfected with appropriate methods after the disaster. Especially the damages that may occur in biological treatment plants and other facilities and the mixing of dirty water into drinking water; It is inevitable to see epidemic diseases as a result of the mixing of corpses, industrial and domestic toxic substances into the water.

In this study, first of all, disasters that may cause water pollution and epidemics due to water pollution are discussed. Taking into consideration the pollutants that may occur in the environment after disasters; It is aimed to present solutions for preventing water pollution due to disasters and safe water use in disasters.

Natural disasters are unpredictable events that can be minimized with appropriate measures. It is of great importance that all steps in the integrated disaster system are fully planned and implemented in order to prevent water pollution and epidemic diseases after a disaster. With the fact that risk management and crisis management are inseparable from each other, all activities must be carried out accurately and completely, both before and after the disaster. No matter how well the crisis is managed, it will not result in success if studies are not carried out on risk management at the whole region and country level. In this context, especially risk management should be fully implemented.

Disaster risk reduction plans are the plans created for the prevention and reduction of risks by determining disaster risks for different disaster types, prioritized according to the frequency of natural disasters in the region, adding when and by whom the identified risks should be defined. With the proper preparation and implementation of these plans, the resources needed for response activities after disasters will be reduced. Thus, it will be possible to reduce the damage caused by disasters by making societies more resilient and creating safer settlements.

In this context, it is important to make water safety plans at all stages of the integrated disaster management system for both the prevention and effective intervention of water pollution and epidemic diseases caused by disasters. In addition, considering the importance of water in disaster risk reduction plans, water management plans should be given importance. In addition, training on safe water use should be given to the whole community before and after the disaster.

Keywords: Water Pollution, Disasters, Environmental Health, Safe Water, Epidemic

Giriş

Su, insan vücut ağırlığının %58'ini oluşturan, yaşam için vazgeçilmez bir besin maddesidir [1]. Su

olmadan canlıların hayatlarını devam ettirebilmesi mümkün değildir [2]. İçme, yemek pişirme, hijyen aynı zamanda tarım ve hayvancılık, sulama hizmetleri, yangın söndürme, sanayi ve ticari amaçlar ile suyun kullanımı söz konusudur [3].

Worldomaters'ın verilerine göre 2022'de dünya nüfusu 7.936 milyar kişidir [4]. Dünya nüfusunun artmasıyla birlikte su tüketiminde de artış görülmektedir. Suyun dünya üzerindeki dağılımına bakıldığında, yeryüzünün %71'inin su ile kaplı olduğu; deniz ve okyanusların dünya suyunun %96.5'ini kapsadığı; geri kalan %3.5'lik kısmını buzulların, yer altı ve yer üstü sularının oluşturduğu görülmektedir [5]. Tatlı suların ise yaklaşık %99, 7'si yer altı suları ve buzullarda bulunmaktadır. Küresel iklim değişikliği nedeniyle tatlı su kaynaklarının azalması üzerindeki baskı her geçen gün artmaktadır. Artan nüfus nedeniyle de suya olan rekabetin artması, tatlı su kaynaklarını risk altında bırakmaktadır [6].

Su kirliliği çeşitli etkenler ile gerçekleşmektedir. Etkenler biyolojik, kimyasal ve fiziksel olarak sıralanabilir. Bu etkenlerin yanı sıra doğal yada insan kaynaklı afetler meydana geldikten sonra da su kirliliği oluşabilmektedir. Su ekosisteminde yaşanmış bir toksikolojik afet olan Jiyeh Enerji Santrali'ndeki petrol sızıntısı, insan kaynaklı olarak meydana gelen su kirliliğine neden olan çevresel felaketin bir örneğidir. 2006 yılında İsrail Hava Kuvvetleri tarafından Santral'in bombalanması, tesislerde hasar oluşturarak Akdeniz'e 30.000 ton petrol sızıntısına neden olmuştur. Oluşan petrol tabakası su canlılarının yaşam alanları tehdit etmiştir ve potansiyel kanser riskini artırmıştır [1].

Deprem, sel, heyelan, tsunami gibi afetler de su kirliliğine neden olabilmektedir. Afetlerden sonra temiz su altyapısı, kanalizasyon alt yapısı veya dağıtım şebekeleri zarar görebilmektedir. Bunların sonucunda ise yer altı ve yüzey suyu kirliliği oluşmaktadır. Özellikle biyolojik arıtma tesislerinde oluşabilecek hasarlar ile içme sularına pis suların; cesetlerin, endüstriyel ve evsel toksik maddelerin karışması sonucunda salgın hastalıkların görülmesi kaçınılmazdır.

Doğal afetler öngörülemeyen fakat uygun önlemlerle olumsuz sonuçları en aza indirgenebilecek olaylardır. Bu bağlamda su kirliliği ve su kirliliğine bağlı olarak ortaya çıkabilecek salgın hastalıkların önlenmesine yönelik, afet öncesinde uygun önlemlerin alınması ve etkin bir risk yönetimini takiben kriz yönetimi uygulamalarının yapılması gerektirmektedir.

Bütünleşik afet yönetimi sistemi afetlerin önceden önlenmesi ve meydana gelebilecek zararların azaltılması amacıyla afet olaylarına yönelik yapılması gereken çalışmaların, toplumun tüm kurum ve kuruluşları ile koordineli olarak ve kullanılacak kaynakların bu ortak amaç doğrultusunda yönetilmesini gerektiren sistemdir [7]. Bütünleşik afet yönetimi sisteminin 4 ana ve 4 alt bileşeni olmak üzere toplam 8 bileşeni bulunmaktadır. Zarar azaltma ile hazırlık evreleri risk yönetimi sürecini oluştururken; kriz yönetimi sürecini müdahale ve yeniden inşa/iyileştirme evreleri içermektedir. Bu sistemin tüm aşamalarında su kirliliğine ve bulaşıcı hastalıklara ait yürütülen faaliyetler aşağıda sıralanmıştır;

Zarar Azaltma: Bu aşamada, afet öncesinde alınan önlemlerle, sorunları oluşmadan tahmin etmek ve zararları en aza indirgemek üzere altyapı düzenlemelerine odaklanılır. Üst yapı ve altyapı hasarları belirlenerek oluşturulan risk haritaları, karar vericilerin afetin boyutunu kolayca anlayabilmeleri için amaçlarına göre ölçeklenen olasılıklardan oluşturulan senaryolar ile hesaplanmaktadır [8]. İçme suyu temin ve dağıtım sistemleri açıkça tanımlanarak, su için risk oluşturabilecek afetler değerlendirilir [9].

Hazırlık: Hazırlık evresi, afet öncesinde yapılması gereken planlama, eğitim, tatbikat, erken uyarı sistemlerinin kurulması, malzeme stoklarının belirlenmesi, toplumun bilgilendirilmesi gibi faaliyetlerin yürütüldüğü süreçtir [10].
Hazırlık evresinde yapılan çalışmaları içerisinde, arıtma tesislerinde, dağıtım şebekelerinde, su kaynakları ve havzalarda oluşabilecek hasarlara yönelik kontrol önlemleri yer almaktadır [9]. Bu aşamada, içilebilir su erişimi çözümleri; merkezi sistemlerde çökme veya kırılmaları takip edebilecek olası su kesintilerine karşı alınacak önlemler; kişi başına düşen su gereksinimi; tahmini arıza süresi; etkilenen nüfus ve su kalitesi hedefleri gibi planlamalar yapılır. Ayrıca, bir salgın durumunda potansiyel olarak etkilenecek nüfus dikkate alınarak aşı stoklaması da planlanmaktadır [10].

Müdahale: Afet bölgesindeki su, kanalizasyon ve arıtma gibi altyapı tesislerinin hızlı bir şekilde restore edilmesi, kritik öneme sahip tesislerin kısa sürede devreye girmesi sağlanmalıdır. Salgın gibi sonradan oluşabilecek afetlere yönelik önlemlerinde alıması gerekmektedir [8]. Bu aşamada gerçekleştirilen faaliyetler içerisinde, etkilenen bölgelere su temini, kanalizasyon ve kanalizasyon arıtma tesislerinin süratle onarımı ve bu hizmetlerin bir an önce normale dönmesine yönelik koordinasyonun sağlanması yer almaktadır.

İyileştirme: Bu aşamada yürütülen faaliyetlerde; afetten etkilenen topluluğun su ve kanalizasyon gibi önemli ihtiyaçlarının ivedilikle karşılanması için gerekli tüm çalışmalar yapılmalı ve gerekli su altyapı sistemi kısa vadede sağlanmalıdır [11].
Bu çalışmada öncelikle su kirliliğine neden olabilecek afetler ve su kirliliğine bağlı ortaya çıkan salgın hastalıklar ele alınmıştır. Afetlerden sonra çevrede meydana gelebilecek kirleticiler göz önünde bulundurularak; afetlere bağlı olarak gelişen su kirliliğini önlemeye yönelik ve afetlerde güvenli su kullanımına yönelik çözüm önerileri sunulmuştur.

Su Kirliliğine Neden Olan Afetler

Deprem

Depremler yer altı ve yer üstü su kaynakları üzerinde farklı performans gösterir. Depremler yeryüzündeki sularda alçalmalara ve yükselmelere neden olarak, yeraltı sularında ve nehir yataklarında değişim oluşturur. Yer altında meydana gelen titreşimler, doymuş zeminleri yumuşatır ve yapısal mukavemeti azaltır. Öte yandan zemindeki sismik dalgalar sıvılaşmaya neden olur ve su sisteminin bileşenlerine zarar verir [12]. Deprem sonrası hasarlı yapılar ve drenaj şebekeleri, toksik maddelerin su kaynaklarına taşınmasına neden olarak, çevre ve sağlık sorunlarına yol açabilmektedir [13].
Depremden sonra hasarların büyük bir kısmı şu şebekeleri, iletim boru hatları ve depolarda oluşmaktadır. Geçmiş depremlere bakıldığında, içme suyu sistemlerinin sarsıntı, sıvılaşma, heyelan ve faylanmadan kaynaklanan hasarlara karşı savunmasız olduğu ve toplum sağlığının hasar gören şebeke noktalarından atık su sızıntısı ile risk altında olduğu görülmektedir [14].

Kasırga

Kasırgalar, hortum şeklinde dönerek ilerleyen çevre ve toplum üzerinde yıkıcı hasarlar meydana getiren şiddetli fırtınalardır [15]. Kasırgalar 74 km/s ya da daha şiddetli ve sürekli rüzgâr hızına sahip olabilmektedir. En şiddetli kasırga sırasında rüzgâr hızları saatte 155 km/s'yi geçebilmektedir [16].

Kuvvetli rüzgârlar su depolama tanklarının tahrip olmasına ve depolama suyunun dökülmesine neden olabilmektedir. Kasırgaların içme suyu ve atık su sistemlerine etkileri; akarsu ve nehirlerde güçlü akıntılar nedeniyle boru hatlarının patlaması, yeraltı ve yer üstü su rezervuarlarının zarar görmesi, rezervuar su kaynaklarının ve borularının kirlenmesi, yağmur ve sel nedeniyle su boru hatlarının zarar görmesi olarak sıralanabilir [17].

Sel

Sel, kıyıda ya da nehir kanalı boyunca arazilerde su baskınlarına neden olan suyun yükselmesi durumu olarak tanımlanabilmektedir. Sellerden sonra oluşan taşkınların, temiz ve atık su sistemleri üzerinde etkisi sonucunda salgın hastalıklar tehdit oluşturmaktadır.

Taşkınlar sırasında gözlemlenen su kirliliği, yüzey kaynaklarının ölü hayvanlar, artan su bulanıklığı ve tarımsal/endüstriyel kirleticiler tarafından kirlenmesinden kaynaklanmaktadır [12].

Sel ve taşkınların evsel su ve atık su üzerindeki etkileri; nehirlerde veya geçitlerde bulunan kaybolan su kütleleri; su bileşenlerinde çamur birikimi; su borularının açıkta kalan kısımlarında kırılma; dalga hareketi nedeniyle su dağıtım borularının ve bağlantılarının kopması; yukarı akış kirliliği ve pompa ekipmanlarının hasarı olarak sıralanabilir [17].

Heyelan

Heyelanlar, askıda katı maddeleri ve organik maddeleri taşıyarak içme suyuna zarar verebilir. Kötü su kalitesinin, içme suyu rezervuarlarının üzerindeki havzalardaki heyelan aktivitesiyle ilişkili olduğu düşünülmektedir. ABD, Washington'daki Sumas Nehri'nin membalarındaki ana kaya heyelanı, doğal asbeste maruz kalmıştır. Heyelanın akıntı yönündeki tortularında yüksek nikel ve krom seviyeleri tespit edilmiştir [18].

Heyelanlar, akıntıların ve çığların üzerinde ya da yolunda bulunan boru, kanal, vana ve pompa tesisatı bölümlerinin su ile aşınmasına, tahrip olmasına veya arıtma tesislerinde hasar oluşmasına neden olabilmektedir [12].

Volkanik Patlama

Volkanik patlamalar içme suyunu çeşitli şekillerde kirletir. Volkanik patlamalarda içme suyu kirliliğinin nedenleri kül birikimi, gazların veya toksik maddelerin etkisi veya su girişlerinin yakınında bulunan ölü hayvanlardır.

Kül yağışı çok sık olmadığı, yüksek konsantrasyonlarda kirletici içermediği veya kuyu deliklerine girip su rezervlerini kirletmediği sürece yeraltı suyunun kirlenmesi nispeten olası değildir [12]. Volkanik patlamalarda açığa çıkan kül büyük mesafeler kat ettiğinde kısa vadede bitki örtüsünü, yüzey sularını, toprakları ve yeraltı sularını bakır, kadmiyum ve arsenik gibi ağır metaller ve flor gibi metal olmayan kirleticilerle kirletebilmektedir [19]. Ayrıca patlama etkisiyle boru hatları, yarı gömülü depolar ve diğer tesisler zarar görebilmektedir [12].

Kuraklık

Kuraklığın etkileri asıl olarak içme suyu kaynaklarının azalmasına veya tükenmesine yansımaktadır. Nehirler ve göletler gibi yüzey suları genellikle kuraklıktan yeraltı suyundan önce etkilenir [17]. Yüzey suyu kaynaklarının özelliklerine ve kuraklığın tipine bağlı olarak etkiler, normal su mevcudiyetinde

azalmaları içerebilir, bu da orta ila şiddetli ölçekte bazı kaynakların tamamen yok olmasına neden olabilir [12].
Azalan akış nedeniyle nehirlerin veya göletlerin kendi kendini temizleme kapasitesinin azalması; artan pestisit veya endüstriyel atık konsantrasyonlarına, balık ölümlerinden kaynaklanan kirliliğe neden olan serbest oksijenin azalmasına, içme suyu girişine yakın ölü hayvanlardan kaynaklanan kontaminasyonu neden olmaktadır [17].

Orman Yangınları

Orman yangınları, toprağı erozyona karşı koruyan bitki örtüsünü yok ederek akışı artırır. Bitki örtüsü hasarı, su kaynaklarının bitki örtüsü-toprak-su dengesinde değişikliklere yol açar. Ayrıca yangının oluşturduğu kül, yüzeyde kaygan bir tabaka oluşturup yüzeyde akan su miktarını artırarak taşkınlara ve barajın istenmeyen maddelerle dolmasına neden olmaktadır.
Su kaynaklarının bulunduğu alanlarda meydana gelen yangınlar, ormanların hidrolojik işlevini bozarak, tahrip ederek su kaynaklarının kirlenmesine ve kalitesinin bozulmasına yol açacaktır [20]. Yangınlar ayrıca belediyenin su sistemlerine bağlı evlerde plastik su borularını tutuşturarak ve potansiyel olarak daha geniş su sistemine tehlikeli uçucu organik karbon salabilmektedir [21].

Tsunami

Bir tsunami sırasında ortaya çıkan su sorunu, tatlı su kaynakları ile tuzlu suyun karışımıdır. Bu suların karıştırılması insanlar için risk oluşturmaktadır [22]. Deniz suyu kıyıya ulaştığında içme suyu kuyuları sular altında kalabilmektedir ve insan sağlığını etkileyebilecek mikroorganizmalar ve kimyasallar ile kontamine olabilmektedir. Mikroorganizma içeren su, az miktarda bile olsa kronik ishal ve kolera gibi yaşamı tehdit eden salgın hastalıklara hızla neden olabilir. Tsunamiden sonra küçük kesiklerin ve açık yaraların kontamine su ile temizlenmesi de ciddi bir enfeksiyon riski oluşturmaktadır. Sel sırasında yaygın olarak bulunan kimyasal kirleticiler kuyu kirliliğine neden olabilmektedir. Bu kirleticiler, dökülen yakıt tanklarından veya depolanan pestisitlerin salınımından gelen ürünleri içerebilir [23].

SU KİRLİLİĞİNE BAĞLI OLARAK ORTAYA ÇIKAN BULAŞICI HASTALIKLAR

Afet sonrası salgınların nedenleri, kontamine gıda ve su kaynaklı enfeksiyonlar, solunum yolu enfeksiyonları, vektör ve böceklerin neden olduğu enfeksiyonlar ve yaralanmalara bağlı enfeksiyonlar olmak üzere dört ana grupta sınıflandırılabilir. Bu enfeksiyonlar arasında ishal ve akut solunum yolu enfeksiyonları en sık görülen ve aynı zamanda en yüksek morbidite ve mortaliteye sahip olanlardır [24].
Afet durumlarında içme, kişisel hijyen ve diğer ihtiyaçlar için yeterli su ve sanitasyonun sağlanması gerekir. Aksi takdirde afetzedeler ölümcül su kaynaklı hastalıklarla karşı karşıya kalabilmektedirler. 1994 yılında, *Vibrio chlorea* ile kirlenmiş suyun salgını nedeniyle Zahile'deki geçici konutlarda 50.000'den fazla kişi hayatını kaybetmiştir [25].

İshal Hastalığı

İshal salgınları, içme sularının kirlenmesinden kaynaklı olarak ortaya çıkabilmektedir. Başlıca nedenleri arasında *Vibrio chlorea* ve enterotoksijenik *Escherichia coli* yer almaktadır [24].
İshal, afet bölgelerinde başlıca ölüm nedenlerinden biridir. Afet bölgelerindeki salgınlar genellikle

suyun fekal kontaminasyonu, dağıtım ve depolama sırasında suyun kontaminasyonu ile ilişkilidir. Ayrıca su kapları, mutfak eşyaları, kötü hijyen ve bölgedeki kontamine yiyeceklerle bağlantılıdır.
İshal salgınları daha çok sel afetlerinden sonra rapor edilmiş olsa da diğer afet türlerinde de su kontaminasyonuna bağlı olarak görülmektedir. 2004 Bangladeş selleri nedeniyle göç sonrasında 17.000'den fazla ishalli hastalık rapor edilmiştir. 2005 Pakistan depreminden sonra, plansız ve kötü tasarlanmış mülteci kamplarında ishal salgınlarında yaklaşık %42 civarında bir artış bildirilmiştir. 2003 İran depreminde, etkilenen 75.586 kişinin %1.6'sı ishal hastalığından muzdarip olmuştur. Nedenleri kötü hijyen, aşırı kalabalık, temiz içme suyu eksikliği ve yetersiz hijyen olarak açıklanmıştır. 2004 Endonezya tsunamisinden sonra araştırmalar afetzedelerin %85'inin kirli kuyulardan su içtiğini ve ardından ishal salgını yaşandığını göstermiştir [26].

Hepatit A ve E

Hepatit A ve E, esas olarak su sanitasyonu eksikliği ile kendini gösterir ve fekal-oral yolla bulaşır [24]. Hepatit A; çoğu gelişmekte olan ülkelerde endemiktir ve maruz kalanların çoğu çocuklardır. Bu nedenle, bu yerlerde büyük bir salgın riski genellikle düşüktür. Hepatit E genellikle endemik bölgelerde yoğun yağışlar ve seller sonucu ortaya çıkmaktadır. Prognoz genellikle hafiftir fakat hamile kadınlarda mortalite %25 kadar yüksek olabilmektedir. Hepatit E vakaları Pakistan'da meydana gelen 2005 depreminden sonra güvenli suya erişimin kısıtlı olduğu bölgelerde sporadik olarak gözlemlenmiştir. Aralık 2004'te meydana gelen tsunamiden sonra ise Aceh'de hem hepatit A hem de hepatit E salgınları on of prostate stem

Leptospiroz

Leptospiroz, kontamine su aracılığıyla direkt temas ile bulaşabilen, salgına yatkın zoonotik bakteriyel bir hastalıktır. Bulaşma deri ve mukoza zarlarından kemirgenlerin idrarlarından saçmış olduğu leptospirenin suya, nemli toprağa veya bitki örtüsüne geçişi ile olmaktadır. Özellikle sel afetleri, kemirgenlerde çoğalmaya neden olarak kemirgenlerin afetzedelere yakınlığı ile organizmaların yayılmasına neden olmaktadır. Hastalık gelişmekte olan ülkelerdeki sellerden sonra sıklıkla bildirilmektedir. 2000 yılında Hindistan'da ve Tayland'ın selden etkilenen topluluklarında yapılan bir araştırma, leptospiroz salgınlarının kontamine su ile temas, banyo ve içme ile ilişkili olduğunu bildirmiştir [26].

SU KİRLİĞİNİNİn ÖNLEMEsine VE AFETLERDE GÜVENLİ SU KULLANIMINA YÖNELİK ÇÖZÜM ÖNERİLERİ

Bir afet durumunda su kalitesini her zaman korumak ve tahmin etmek önemlidir. Risk değerlendirme araçları hayatın birçok alanında var oldukları gibi afet yönetimi için de önem taşımaktadır. Yöneticiler afet bölgeleri için su kirliliği risk değerlendirme araçlarını kullanmalıdır [28].
Afet durumlarında güvenli su kullanımına ve su sağlığını iyileştirmeye yönelik olarak yapılması gerekenler şu şekilde sıralanabilmektedir;

- Afetlerin öncesinde yeterli su arıtma kimyasalları ve saklama kapları stoklarının muhafaza edilmesi gerekmektedir. Ayrıca kolera, hepatit A ve tetanoz dahil olmak üzere yeterli aşı stokları bulundurulmalıdır [29].

- Afet sonrası zarar gören içme suyu ve sanitasyon sistemleri mümkün olan en kısa sürede onarılmalı ve en kısa sürede güvenilir bir birincil su kaynağı sağlanmalıdır [25].
- Ilık mevsimlerde kişi başına günlük 3 litre, sıcak mevsimlerde kişi başına günlük 6 litre olacak şekilde su sağlanmalıdır. Geçici afet merkezlerinde içme ve kullanma suyu günlük kişi başına 15-40 litre olacak şekilde sağlanmalıdır [30].
- Afet bölgelerinde su temininde aksaklık meydana geldiği zaman afetzedeler ilk olarak yağmur ve kar sularını biriktirerek kullanmaya yönelmektedirler. Fakat bu biriken sular hava kirliliğin durumuna bağlı zehirleyici miktarda karbondioksit ve ağır metal kalıntılarını barındırabilmektedir. Diğer bir yöntem olarak yer altı suları da tercih edilmektedir ancak yer altı sularının evsel, tarımsal ve diğer çevresel faktörlerden dolayı kirlendiği unutulmamalıdır.
- Yeraltı suyunu kullanmaktan başka bir seçenek yoksa, tercih edilen su kaynağı tuvaletlerden 25 metre, kanalizasyon ve fosseptiklerden 15 metre, tuvalet çukurlarından 15 metre ve otlaklardan en az 35 metre uzakta olmalıdır [25].
- Su tanklardan sağlanacak ise tankların çadıra uzaklığı en fazla 100 metre olacak şekilde ayarlanmalıdır. Ayrıca bu tankların daha önce hiç kullanılmamış olmasına ve kullanımından önce temizlenmiş olmasına dikkat edilmelidir [30].
- Afet durumlarında suyun dezenfekte edilmesi için farklı yöntemler mevcuttur. Maliyet ve kolaylık açısından daha çok kaynatma ve klorlama tercih edilmektedir. Kaynatma yönteminde su 100 derecede 5-10 dakika süre ile kaynatılmaktadır. Klorlama yönteminde ise hazır klor tabletleri kullanılmaktadır. 40 litre su için 160 mg'lık tabletler kullanılmaktadır. Acil durumlarda sodyum hipoklorit ile dezenfeksiyon işlemi gerçekleştirilmektedir. Sularda dezenfekte edilmesine rağmen bulanıklık görülürse klorlama miktarı iki katı olacak şekilde arttırılmalıdır [25].
- Afet bölgesine ulaştırılan ambalajlı sularda dikkat edilmesi gereken bazı hususlar vardır. Bu suların etiketlerinde bakanlık tarafından izin tarih numarası yer almalıdır. Suların tek kullanımlık schlling kapaklı olmasına dikkat edilmelidir. Ayrıca ambalaj ile kapakta aynı markaların olmasına ve kapakta bulunan logoda kabartma olmasına dikkat edilmelidir [24].
- Sığınaklar aşırı kalabalık olmamalı ve yeterli tuvalete ve bol miktarda el yıkama istasyonu ve sıvı sabun bulunan güvenli suya sahip olmalıdır.
- Afetlerden sonra önemli risk iletişim mesajlarını yaymak için topluluk gruplarının ve STK'ların etkin kullanımı önemlidir.
- Afetlerden sonra sıtma ve dang gibi vektör kaynaklı salgınları önlemek için vektör kontrolleri önemlidir. Bu vektörler durgun suda yayılma eğilimindedir.
- Geçici barınaklarda bulunan afetzedelere su dezenfeksiyonu konusunda eğitimler verilmelidir [25].

sonuç

Afetler dünyanın her yerinde hemen hemen her gün meydana gelmektedir ve meydana gelen afetlerden sonra çevreye ve halka yönelik riskler çıkmaktadır. Bu çevresel riskler içerinde yer alan su kirliliği, afetle ilgili ele alınması gereken en önemli çevre ve halk sağlığı sorunlarından biridir.

Afet sonrasında su kirliliği ve salgın hastalıkların önüne geçilmesi için bütünleşik afet sisteminde yer alan tüm basamakların eksiksiz bir şekilde planlanması ve uygulamaya konulması büyük önem taşımaktadır. Zarar azaltma ve hazırlık evrelerini içeren risk yönetimi sürece asıl olarak afet öncesinde yapılması gereken faaliyetleri ve alınacak önlemleri içermektedir. Burada bir afetin meydana gelmesi

halinde suya erişimin nasıl olacağı, su kesintilerine karşı hangi önlemlerin alınacağı, afet öncesinde halkın eğitim ve bilinçlendirmesine ve salgın halinde aşı envanterinin etkilenebilecek potansiyel nüfusa yönelik olarak planlanması söz konusudur. Müdahale ve iyileştirme evrelerinden oluşan kriz yönetimi safhasında ise afet bölgesinde bulunan kişilere temiz suyun temin edilmesi, su sistemlerinde meydana gelen hasarın en kısa sürede onarılması, salgın hastalıklara yönelik olarak birincil koruyucu sağlık hizmetlerinin sağlanılması planlanmalıdır. Risk yönetimi ve kriz yönetimi sürecinin birbirinden ayrılmaz bütün olduğu gerçeğiyle tüm faaliyetler koordinasyon içinde; doğru ve eksiksiz olarak afet öncesi ve afet sonrasında yerine getirilmelidir. Tüm bölge ve ülke düzeyinde risk yönetimi sürecinde yer alan çalışmalar yapılmazsa, kriz sürece ne kadar iyi yönetilirse yönetilsin başarı ile sonuçlanmayacaktır. Bu bağlamda özellikle risk yönetimi sürecinin eksiksiz bir şekilde uygulanması gerekmektedir.

Afet risk azaltma planları, bölgenin afetselliğine göre önceliklendiren afet türleri için, afet risklerini belirleyen, belirlenmiş risklerin ne zaman ve kim tarafından tanımlanması gerektiğinin dahil edildiği ve risklerin önlenmesi ve azaltılabilmesi üzerine oluşturulan planlardır. Bu planların eksiksik ve doğru bir şekilde hazırlanıp uygulamaya konulmasıyla afetlerden sonra yapılacak müdahale faaliyetlerinde gereksinim duyulan kaynaklarda azalma olacaktır. Dolayısıyla toplumun daha dirençli hale gelmesi ve yerleşim yerlerinin daha güvenli olarak oluşturulması ile afetlerden kaynaklanan kayıpların en aza inmesi mümkün olacaktır. Günümüzde artan kentleşmeye paralel olarak toplumun ihtiyacının karşılanması için inşa edilen altyapılar da artmıştır. Altyapıların bu denli artmış olması, afet sonrasında oluşabilecek hasarında artmasına neden olabilecektir. Bu bağlamda afet risk azaltma planlarında; yerleşim yerlerindeki mevcut su yapılarına yönelik düzenlemelerin yapılması gerekmektedir.

Sonuç olarak afetlerden kaynaklanan su kirliliği ve salgın hastalıkların önlenmesi ve etkin müdahalesi için bütünleşik afet yönetimi sisteminin tüm basamaklarında su güvenliğine ilişkin planlamaların yapılması önem arz etmektedir. Ayrıca afet risk azaltma planları oluşturulurken suyun önemi göz önünde bulundurularak risk altındaki bölgelerde su güvenliğine yönelik gerekli çalışmalara yer verilmelidir. Ek olarak birey ve toplum bazında afet öncesi ve afet sonrası olmak üzere güvenli su kullanımına yönelik eğitimlerin verilmesi gerekmektedir.

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APPLICATION OF GREEN CHEMISTRY FOR ENVIRONMENTAL CONSERVATION AND SUSTAINABLE DEVELOPMENT

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ABSTRACT

Green chemistry is also known as sustainable chemistry approaches to reduce chemical pollution in the environment. In the green chemistry products are designed keeping in focus to adopt the processes which minimize or eliminate the use and generation of hazardous substances. Sustainable chemistry aims at prevention of waste and byproducts, safer chemical designs, hazardous products minimization and maximum use of materials into the final products to reduce the waste and reducing environmental impacts by conserving natural resources for the future generation. Sustainable chemistry helps to lower global warming, ozone depletion etc. Green chemistry targets to introduce less chemical contamination to ecosystems resulting in less harm to the plants and animals from toxic chemicals. Green chemistry also targets the less use of hazardous waste landfills to reduce the contamination to land, air and water. Therefore, sustainable chemistry practices are envisioned to deliver eco-friendly and economic aids to society. By the adaptation of the twelve principles of green chemistry we can achieve sustainable development. Green chemistry normally leads to low cost, less energy usage, eco- friendly solvents or green solvent and less waste production. Green chemistry is not a new concept it's a new philosophical approach to achieve sustainable development. Industries should focus on adopting the principles of green chemistry to design safer and eco-friendly products and chemicals released by the industries should be disposed of without causing any damage to the environment. Training and education of the young chemists should be done extensively to introduce the practice of sustainable chemistry. This paper discusses the concept of green chemistry, principles and its application.

Keywords: Green chemistry, safer products, eco-friendly solvents, sustainable development.

HAVA KIRLILIĞI KAYNAKLI AFETLER VE SAĞLIK ÜZERINE ETKILERI

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ÖZET

Hava kirliliği, hem gelişmiş hem de gelişmekte olan ülkelerde olmak üzere dünya çapında önemli bir sorundur. Tarih boyunca meydana gelen hava kirliliği incelendiğinde çarpık kentleşme, nüfus artışı ve endüstriyel gelişmelerin barındırdığı risklerin afetleri ciddi oranda arttırdığı gözlemlenmiştir. Özellikle yaşadığımız yüzyılda tüketilen fosil yakıtların yoğun olarak kullanımı ve havaya zehirli gazların salınmasıyla da kirlilik hızla artarak sağlık sorunlarının ortaya çıkmasına neden olmuştur.

Nüfusun ve şehirlerdeki trafik hacminin artış göstermesi, fosil yakıtların kullanımının artması, çarpık kentleşmenin devam etmesi ve kimyasal kullanım oranının artmasının beraberinde hava kirliliğinin daha şiddetli biçimde artacağı öngörülmektedir.

Ayrıca her yıl milyonlarca hektar alanın orman yangınları nedeniyle yok olması ve çıkan yangınlar sonucunda zehirli gazların hava kirleticilerine katkıda bulunması hem hava kirliliğine neden olmakta hem de solunum sistemi hastalıklarına önemli ölçüde sebep olmaktadır.

Bu çalışmada, hava kirliliği nedeniyle meydana gelen afetler ve sağlık üzerindeki etki incelenmiş ve alınabilecek önlemler ele alınmıştır. Çalışmamız hava kirliliğinin neden olduğu afetler ve sağlık sorunlarını önlemeye yönelik çözüm önerilerinin sunulması açısından literatüre katkı sağlayacaktır.

Hava kalitesini kötüleştirerek kirlenmeye sebep olan başlıca kirleticiler partikül madde, karbonmonoksit, nitrojen oksitler, azot ve kükürt oksitler, fosil yakıtlar ve ağır metallerdir. Fosil yakıtların ürünü olan karbondioksit gazının küresel ısınmaya sebep olması ve diğer zehirli gazların da ozon tabakasının incelmesine yol açması doğadaki bütün canlıları olumsuz etkileyecek ve doğal dengenin bozulmasına neden olacaktır.

Hava kirliliğinin sağlık açısından etkileri genellikle bilinmektedir. Hava kirliliği insan sağlığına olan etkilerinde vücuda giriş şekli, maruziyet süresi, etkenlerin yoğunluğu ve kişinin genel sağlık durumu en önemli etkilerdir.

Hava Kirliliği insanlarda başlıca solunum sistemi ile dolaşım sistemini etkilemektedir. Rusya'da yapılan bir araştırmada toprağa çöken kirleticilerinin gıda ile sindirim sistemine de girdiğini gözler önüne sermiştir.

Fosil Yakıtlardan petrol, doğal gaz, kömür gibi yakıtların çok miktarda kullanımı sonucu da hava kirliliği ile bağlantılı olarak bronşit, astım, Kronik Obstrüktif Akciğer Hastalığı (KOAH) gibi solunum yolu hastalıkları önemli seviyelere ulaşmıştır. DSÖ, artan hava kirliliğinin birçok solunum yolu hastalıklarının yanında senede milyonlarca ölüme neden olduğunu rapor etmiştir. Hava Kirliliğinden en

çok etkilenen gruplara baktığımızda bu gruplar 5 yaş altı çocuklar, yaşlılar ve kronik hastalardır.
Genellikle tropik yaşam alanlarında karşılaşılan Sıtma, Nil Ateşi ve yakın geçmişte ise Zika gibi hastalıkların sıcak hava dalgaları nedeniyle nüfusun yoğun olduğu bölgelerde görülmesi, gelecekte de daha ciddi sağlık problemlerini yaratacaktır.
Türkiye'de her yıl hava kirliliği sebebiyle 28.881 erken ölüm gerçekleşmektedir. Fosil yakıt teşviklerinin kaldırılması durumunda bu ölümlerin %73,8'inin önlenebileceği tahmin edilmektedir. Türkiye'de 2015 yılında sadece kömür kullanımından kaynaklı sağlık maliyeti 2.876 erken ölüm, yetişkinlerde yaklaşık 3.823 kronik bronşit başlangıcı yaşanmıştır.
Hava kirliliği yarattığı sağlık sorunlarının yanında içinde yaşadığımız çevre de felaketleri beraberinde getirmektedir. Hava kirliliği sonucunda, asit yağmurları, ozon tabakasının incelmesi, küresel ısınma, iklim değişiklikleri ve sıcak hava dalgası gibi afetler meydana gelmektedir.
Sonuç olarak kaynağı ve türü ne olursa olsun kirlilik konusu önemli bir çevre sorunudur. Hava kirliliği büyük afetlere neden olabilir ve insan sağlığını önemli ölçüde etkileyebilir. Dolayısıyla bu konuda, toplum bilinçlenmesine yönelik yeni çalışmalar, planlamalar ve eğitimler tasarlanarak, riskler belirlenmeli ve önlemler alınmalıdır.

Anahtar kelimeler: Hava kirliliği, İklim değişikliği, Sağlık

AIR POLLUTION DISASTERS AND ITS EFFECTS ON HEALTH

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ABSTRACT
Air pollution is a major problem worldwide, both in developed and developing countries. When the air pollution that has occurred throughout history is examined, it has been observed that the risks of unplanned urbanization, population growth and industrial developments have increased the disasters significantly. Especially in the century we live in, the intense use of fossil fuels and the release of toxic gases into the air have increased pollution rapidly, causing health problems.
It is predicted that air pollution will increase more severely with the increase in the population and traffic volume in cities, the increase in the use of fossil fuels, the continuation of unplanned urbanization and the increase in the rate of chemical use.
In addition, the destruction of millions of hectares each year due to forest fires and the contribution of toxic gases to air pollutants as a result of fires cause both air pollution and respiratory system diseases.
In this study, disasters caused by air pollution and the impact on health are examined and the measures that can be taken are discussed. Our study will contribute to the literature in terms of presenting solutions to prevent disasters and health problems caused by air pollution.

The main pollutants that cause pollution by deteriorating air quality are particulate matter, carbon monoxide, nitrogen oxides, nitrogen and sulfur oxides, fossil fuels and heavy metals. The fact that carbon dioxide gas, which is the product of fossil fuels, causes global warming and other toxic gases cause the depletion of the ozone layer, will adversely affect all living things in nature and cause the natural balance to deteriorate.
The health effects of air pollution are generally known. Air pollution's effects on human health are the most important effects on the way it enters the body, the exposure time, the intensity of the factors and the general health status of the person.
Air Pollution mainly affects the respiratory system and circulatory system in humans. In a study conducted in Russia, it was revealed that the pollutants settled in the soil also enter the digestive system with food.
Respiratory diseases such as bronchitis, asthma, and Chronic Obstructive Pulmonary Disease (COPD) have reached significant levels in connection with air pollution as a result of the use of fossil fuels such as oil, natural gas and coal in large quantities. WHO has reported that increasing air pollution causes millions of deaths annually, as well as many respiratory diseases. When we look at the groups most affected by Air Pollution, these groups are children under 5 years old, the elderly and chronic patients.
The occurrence of diseases such as Malaria, Nile Fever, and recently Zika, which are generally encountered in tropical habitats, in densely populated areas due to heat waves will create more serious health problems in the future.
In Turkey, 28,881 premature deaths occur every year due to air pollution. It is estimated that 73.8% of these deaths could be prevented if fossil fuel subsidies were removed. In 2015, the health cost of coal use alone in Turkey was 2,876 premature deaths and approximately 3,823 onset of chronic bronchitis in adults.
In addition to the health problems caused by air pollution, the environment we live in also brings disasters. As a result of air pollution, disasters such as acid rain, depletion of the ozone layer, global warming, climate changes and heat waves ocur.
As a result, regardless of its source and type, pollution is an important environmental problem. Air pollution can cause major disasters and significantly affect human health. Therefore, new studies, plans and trainings for raising public awareness should be designed, risks should be determined and precautions should be taken.

Keywords: Air pollution, Climate change, Health

GİRİŞ

Hava atmosferi çevreleyen tatsız, renksiz ve kokusuz bir gaz karışımıdır. Kirleticiler, normal konsantrasyonların üzerinde tüketilen çevre kompartımanlarını bozan tehlikeli sıvılar, katılar veya gazlardır. Kirlilik ise insanlara ve diğer canlılara zararlı bu maddelerin havaya, suya veya toprağa karışması olarak tarif edilebilmektedir [1].

Hava kirliliği, hem gelişmiş hem de gelişmekte olan ülkelerde olmak üzere dünya çapında önemli bir sorundur. Nüfusun ve şehirlerdeki trafik hacminin artış göstermesi, fosil yakıtların kullanımının artması, çarpık kentleşmenin devam etmesi ve kimyasal kullanım oranının artmasının beraberinde hava kirliliğinin de daha şiddetli biçimde artacağı öngörülmektedir [2].

Hava kirliliğine birçok faktör neden olmaktadır Bu faktörleri doğal ve insan kaynaklı olarak iki şekilde sınıflandırmak mümkündür. Doğal nedenler arasında bitki örtüsü yangınları, orman yangınları, volkanik patlamalar ve toz fırtınaları bulunmaktadır. İnsan faaliyetlerinden kaynaklanan başlıca nedenler ise sanayileşme ve kentleşmedir. Sanayileşme, kirletici maddelerin gerekli tedbirler alınmadan atmosfere salınmasıyla hava kirliliğine sebep olmaktadır. Benzer biçimde büyükşehirlerin yoğun nüfuslu alanlar olması buralarda kirlilik yükünün fazla olmasına neden olmaktadır. Isınma için fosil yakıtların kullanılması, kentleşme ile yeşil sahaların azalma sorunu ve beraberinde araç sayılarındaki artış şehirlerde hava kirliliğini kaçınılmaz kılmaktadır [3].

1940'lı senelerden beri etkileri hissedilmeye başlayan hava kirliliğinin yarattığı afet etkileri, 1952 yılının Aralık ayında Londra'da 4 gün içerisinde binlerce insanın ölümü ile biten felaketle anlaşılmıştır. Antisiklon ve rüzgar olmayan atmosfer şartlarının soğuk bir hava periyotu ile bir araya gelmesi, kömür bazlı hava kirleticilerinin İngiltere üstünde büyük bir duman tabakası olarak yer almasına sebep olmuştur. Bu, ülkenin tarihinde en kötü hava kirliliği olayı ve hava kirliliği ile insan sağlığı arasındaki ilişkinin halk tarafından fark edilmesi açısından en önemli vaka olarak bilinmektedir. Bu vaka afetlerin ve sağlığın önemini bir kez daha göstermiştir [4].

Ülkemizde sorun haline gelen ilk hava kirliliğine ise, 1970'li senelerde Ankara'da rastlanılmıştır. Günümüzde ise büyük şehirlerin yanı sıra tüm kentleri etkileyen yaygın bir hal almıştır ve özellikle kış aylarında nüfus artışı ile hızlı ve düzensiz yapılaşmadan kaynaklı birçok faktöre bağlı olarak önemli boyutlara ulaşmıştır [4].

Hava kirliliğinin sağlık açısından etkileri de bilinmektedir. Gerek Sağlık Bakanlığı'nın gerekse Dünya Sağlık Örgütü (DSÖ)'nün raporlarında ürkütücü sonuçlardan bahsedilmektedir [15], [16]. Havada bulunan partikül maddeler kadmiyum, kurşun, cıva gibi ağır metaller ile kanserojen kimyasallar sağlığı tehdit etmektedir. Bu toksik maddeler, nemle bütünleşerek asidik bir yapı oluşmaktadır. Uçucu kül, kurum, mazot, benzin ve egzoz partikülleri gibi maddeler kanser yapıcı maddeler olduğundan uzun zaman maruz kalınması sonucunda kansere neden olmaktadır [5].

Fosil Yakıtlardan petrol, doğal gaz, kömür gibi yakıtların çok miktarda kullanımı ile oluşan hava kirliliği ile bağlantılı olarak bronşit, astım, Kronik Obstrüktif Akciğer Hastalığı (KOAH) gibi solunum yolu hastalıkları önemli seviyelere ulaşmıştır [6]. DSÖ, artan hava kirliliğinin birçok solunum yolu hastalıklarının yanında senede milyonlarca ölüme neden olduğunu rapor etmiştir [7].

Hava kirliliği yarattığı sağlık sorunlarının yanında içinde yaşadığımız çevre de felaketleri beraberinde getirmektedir. Hava kirliliği sonucunda, asit yağmurları, ozon tabakasının incelmesi, küresel ısınma, iklim değişiklikleri ve sıcak hava dalgası gibi afetler meydana gelmektedir [1].

Mevcut hava kirliliğinin giderilmesinde yaşanan zorlukların en önemli nedenleri; Hava kirliliğine farkındalık konusunda eksiklik, insanların eğitimsiz olması ve toplumda yaşanan bilinç düzeyi eksikliğidir. Alınacak tedbirler ise; kaliteli yakıt kullanımı, yeşil sahaların çoğaltılması, motorlu taşıtların egzoz gazı ölçümlerinin yapılması, bilinçlendirme ve ağaçlandırma çalışmaları ve denetimlerin çoğaltılması olarak sıralanabilmektedir [8].

Bu çalışmada, hava kirliliği sonucu oluşan afet olaylarını değerlendirmek ve oluşan kirliliğin insan ve çevre sağlığı üzerine olan etkilerini araştırmak amaçlanmıştır. Çalışmamız hava kirliliğinin neden olduğu afetler ve sağlık sorunlarını önlemeye yönelik çözüm önerilerinin sunulması açısından literatüre katkı sağlayacaktır.

HAVA KİRLİLİĞİ KAYNAKLI AFETLER

Teknolojinin gelişmesi ile birlikte her geçen gün daha hızlı bir şekilde meydana gelen hava kirliliği, afetler üzerinde büyük bir sorun haline gelmiştir [9].

Hava kirliliği, kirliliği alınan önlemlere, uyarılara, bilimsel ve teknolojik gelişmelere rağmen hala büyüyen bir sorundur. Kirletici kaynaklardan havaya doğru yükselen maddeler havanın doğal yapısını bozarak hava kirliliğini oluşturmaktadır. Havadaki kirliliğin çamur, gaz bulutu, su veya rüzgar, yağış, sel ile iç bölgelere taşınması, çevresel riskleri olan küçük-büyük ölçekteki yerleri etkilemesi farklı türlerde afet olaylarına zemin hazırlamaktadır [10].

Hava kirliliği asit yağmurları, ozon tabakasının incelmesi, küresel ısınma, iklim değişiklikleri ve sıcak hava dalgası gibi afetlere neden olmaktadır. Bu afetlerden biri olan asit yağmurları, zehirli miktarlarda nitrik ve sülfürik asit içeren kuru (gaz ve partiküller) veya ıslak (sis, yağmur, kar) yağıştır. Bu yağış su ve toprak ortamlarını asitleştirebilir. Yer seviyesindeki ozon ise bir kirleticidir ve insan sağlığı için zararlı etkiye sahiptir. Ancak Dünyamızı saran ozon tabakasının uzaydan gelen zararlı ışınlara karşı koruyucu görevi bulunmaktadır. Bu tabakayı incelten maddeler (kimyasallar, pestisitler ve aerosoller) tarafından kademeli olarak yok edilmektedir. Eğer koruyucu ozon tabakasında incelme olursa, UV ışınları insan hayatı (cilt kanseri) üstünde tehlikeli seviyelere gelebilmektedir [1]. Fosil yakıt tüketiminde büyük oranda ortaya çıkan Azot oksitler (NOx) ve Ozon (O3) da, stratosferde 77 °C lere kadar uzanan bir sıcaklık artışı ile sıcak hava dalgasına sebep olmaktadır. Meydana gelen hava kirliliği ister doğal nedenlerden ister insan faaliyetlerinden kaynaklanan kirlilik olsun her şekilde afetlere sebep olabilir [8]. Küresel iklim değişikliği sonucunda ise insan sağlığı, tarım, su ortamı, ormanlar ve hayvanlar ciddi boyutta etkilenmektedir [1]. Bu konuda tedbir alınmazsa, iklim değişikliği sonucunda oluşan afet olaylarının etkileri olan kuzey kutbundaki buzulların erimesi, kuraklık, ısı dalgaları, yağış şekillerinde değişiklik, yüksek sıcaklıklar ve kasırgaların daha güçlü yaşanmasını çok fazla hissetmeye devam edeceğiz [11].

3. HAVA KİRLİLİĞİNİN SAĞLIK ÜZERİNE ETKİLERİ

Hava kirliliği özellikle kışın ciddi bir sorun olarak karşımıza çıkmaktadır. Olumsuz hava koşullarının yanı sıra havaya salınan kirletici maddeler, büyükşehirlerde sağlığın olumsuz etkilenmesine sebep olmaktadır [9]. Hava kirliliği'nin her yıl yaklaşık 9 milyon ölüme neden olduğu bilindiğinden, dünyadaki en büyük halk sağlığı risklerinden biri olarak kabul edilmektedir [1].

Çevre, Şehircilik ve İklim Değişikliği Bakanlığı'nın Ulusal Hava Kalitesi İzleme Ağından alınan hava kalitesi değerleri, Türkiye'deki insanların 24 saat içerisinde neredeyse zehirlendiğini göstermektedir [6]. İnsanları zehirleyen, insanlarda hastalık oluşturan kirleticiler arasında çok küçük çaplı partiküller, yer seviyesindeki ozon, karbon monoksit, kükürt oksitler, nitrojen oksitler ve kurşun olmak üzere altı ana hava kirleticisi bulunmaktadır. Bu kirleticiler, insanlara zararlı olarak kabul edilen hava kirleticileridir [1].

Bunlara ek olarak ağır metaller (çinko, nikel, krom, kadmiyum), petrol, doğalgaz, kömür gibi fosil yakıtların yoğun olarak kullanımıyla da atmosferde zehirli sera gazlarının miktarı artmış ve hava kirliliği meydana gelmiştir [12].

Hastalığa sebep olan kirleticilerden partikül madde (PM), doğal (örneğin, volkanik patlamalar) ve jeo-antropojenik (toz fırtınaları, insan faaliyetinin sonucu oluşan yangınlar) gibi çeşitli kaynaklardan tüketilen önemli hava kaynaklı kirleticilerden biridir. Bu maddeyi hem kısa hem uzun dönem

solumanın hem morbiditeyi hem de mortaliteyi arttıracağına dair kanıtlar bulunmaktadır [13].
Diğer kirletici madde olan karbonmonoksit, yanma reaksiyonunu tamamlayabilseydi karbondioksit açığa çıkacaktı. Ancak yanma tamamlanamadığı için karbondioksit yerine karbonmonoksit gazı açığa çıkmaktadır ve bu gaz fosil yakıt tarafından üretilmektedir. Karbon monoksit, küresel iklim değişikliğine neden olan sera gazlarından biridir. Sera gazları, toprak ve su sıcaklıklarında bir artışa sebep olmakta ve aşırı sıcak hava dalgası olaylarını meydana getirebilmektedir [1]. Karbonmonoksit sonucu oksijen seviyesinde azalma yaşanması nedeniyle doku hipoksisi oluşmaktadır. Toksik etki göstermesi sonucunda ise hücre nekrozu, laktik asidoz ve rabdomiyoliz hastalıkları ortaya çıkabilmektedir [14].
Azot oksit, araç motorlarından yayılarak havayı kirleten bir gazdır. Yüksek miktarlarda maruz kalındığında akciğere girerek solunum yolu hastalıklarına, nefes darlığına, öksürüğe hatta akciğer ödemine varan hastalıklara sebep olduğu bilinmektedir [1].
Kükürtdioksit, fosil yakıt tüketiminden veya endüstriyel kaynaklardan havaya karışan zehirli bir gazdır. Özellikle sanayinin yoğun olduğu bölgelerde kükürt dioksit emisyonlarıyla ilişkili başlıca sağlık sorunları mukus üretimi, bronşit, bronkospazm ve solunum yolu tahrişi hastalıklarıdır [1].
Kurşun ise farklı endüstriyel alanlarda bulunan ve radyatörlerden, atık sulardan ve pillerden yayılan ağır bir metaldir. Maruz kalındığında karaciğerde, akciğerde, kanda, kemiklerde, yumuşak dokuda, sinir sisteminde ve kardiyovasküler sistemde birikmektedir. Ayrıca yetişkinlerde hafıza kaybı, kas ve eklem ağrıları; çocuklarda ise öğrenme güçlüğü, hiperaktivite ve hatta zeka geriliğine sebep olduğu bilindiğinden en küçük dozuna bile maruziyette son derece hassas oldukları görülmektedir [1].
Genel olarak hava kirliliğinin sağlık konusunda kısa vadede ki etkileri KOAH, nefes darlığı, astım, öksürük ve hastaneye yatış oranları ile yakından ilişkilidir. Uzun süre maruziyette ise kardiyovasküler hastalıklar, pulmoner yetmezlik, kronik astım ve mortalite ile sonuçlanmaktadır [1]. Sanayi kuruluşlarının sebep olduğu hava kirlenmesi sonucunda insan sağlığına etkilerinin yanında su ve toprak kirlenmesi, bitki dengesini bozarak fotosentez olayını azaltması, tarım arazilerine zarar vermesi gibi çevre sağlığı etkileri de bulunmaktadır [11].

4. SONUÇ VE ÖNERİLER

Kirliliğin kaynağı ve türü ne olursa olsun kirlilik yarattığı afet ve sağlık sonuçları açısından önemli bir çevre sorunudur. Hava kirliliği bir alanı aniden ve büyük ölçekte etkileyebilmektedir. Öte yandan, ilk başta etkilediği alan küçük olsa bile, kirlilik kaynağı ortadan kaldırılmadığı sürece kısa sürede daha geniş bir alanı etkileyecek ve bulunduğu yerden hızla yayılabilecektir. Bu nedenle önce kaynağında önlem almak olası afetleri ve meydana gelebilecek sağlık sorunlarını önlemede etkili bir yöntem olacaktır. Nüfusla birlikte paralel olarak artan enerji ihtiyacının yenilenebilir enerjilerden karşılanması, bu konuda devlet tarafından sanayicinin teşvik edilmesi, hava kirliliği ölçüm istasyonlarının yaygınlaştırılması, denetleme mekanizmasının sağlıklı işlemesi, cezai yaptırımların ağırlaştırılması, çevre ve insan sağlığına etkilerinin tespit edilerek gerekli önlemlerin alınması, toplum bilincinin artırılması ve ormanlık alanların artırılması büyük önem taşımaktadır.
Şehirlerde coğrafi konumun neden olduğu sıcaklık inversiyonu (Sıcaklık terselmesi)sorunu nedeniyle kirli havanın dağılamaması sorunu için kentsel alanların imar işlemleri bir an önce durdurulmalı ve hava koridorlarının önüne bina yapılması engellenmelidir. Eğer bir kentsel dönüşüm fikri olacaksa, bu fikir sadece deprem gibi afetlere yönelik değil hava kirliliği açısından da değerlendirilmelidir.

Sonuç olarak, sürdürülebilir bir hayat, sosyal refah ve çevrenin korunması adına bu faaliyetlerin yapılması hava kirliliğinin neden olduğu afetleri ve sağlık sorunlarını önlemede büyük rol oynayacaktır.

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DEVIATING FUNDAMENTAL NATURAL PERIODS OF LOW-RISE REINFORCED CONCRETE BUILDINGS UTILIZING COMPRESSIBLE INCLUSION AROUND THE FOUNDATIONS

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ABSTRACT

Low-rise reinforced concrete buildings are more prone to seismic actions due to their short fundamental natural periods that typically lies the dominant period range of most earthquakes. This is due to the fact that low-rise buildings possess high rigidity than that of high-rise buildings of similar configurations resulting in high induced seismic loads. Altering the fundamental period away from common earthquake dominate period range could reduce the effect of such earthquakes. Increasing the lateral flexibility of such structures can be reached by surrounding the foundations with compressible inclusions.

This research study the effect of utilizing compressible inclusion around foundations on the fundamental period of low-rise buildings parametric study on the amount of deviation by varying the number of stories, story height and thickness of the compressible inclusion was performed.

A finite element analysis was conducted in this study - dimensional solid elements. Modal analysis was performed to determine the fundamental period for the considered cases. Verification of the analysis results were compared with the literature and with various structural design codes

Results show that a deviation of up to 2.5 sec increase in the fundamental period could be reached with 15 cm compressible inclusion around the foundation. In conclusion utilizing compressible inclusion around foundation can deviate the value of the fundamental period from its original value and this concept can be used in deviating the fundamental period of low-rise buildings away from the dominate values of common earthquakes.

Keywords: Compressible inclusion, earthquakes, finite element, foundations, natural period.

Introduction

Earthquakes are one of the natural occurring phenomena. They existed from the beginning of universe and it will continue until the end of life. Earthquakes can be a threat to our lives and make us in danger due to the fact that most of our buildings are made of reinforced concrete which is solid and inflexible with heavy weight. Low-rise buildings are more likely to be affected by earthquakes than high-rise building as its fundamental natural period is close to the dominant periods of most earthquakes Figure 1.

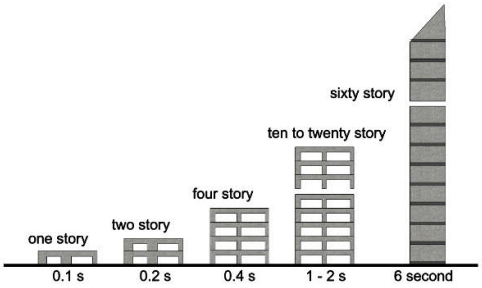


Figure 1: Natural period for low, medium and high rise buildings.

In addition, being low-rise will result in less flexibility than that of high-rise with similar configurations which usually results in high stresses on columns, beams and beam-column joints. There are many studies in this field. According to what has been seen. they can be divided into two categories: passive control and active control. passive control strategies are currently the most common and the new objective is to reduce the vibration load applied to the building Figure 2 & Figure 3 .

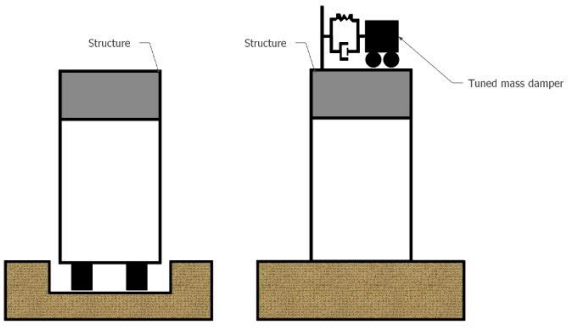


Figure 2: Passive control in structure.

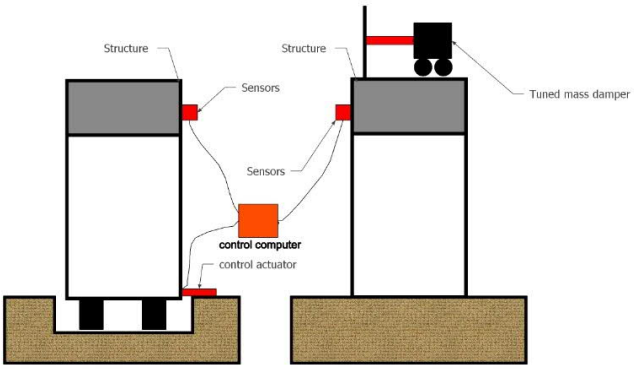


Figure 3: Active control in structure.

Also, there a traditional solution to this problem by increase ductility of the structure by providing steel reinforcements in the areas of high stresses to protect against brittle failures, which consequently will raise the cost of the building and will reduce the resources for next generations.

The main objective of this study is to study the feasibility of using compression inclusion around low rise building foundations so that it shifts its low fundamental natural period from that of common earthquake values to higher values and hence protect the structure of the building entirely. This will be conducted by covering all the sub structural elements by a compressible material that will disrupt the wave propagation of the earthquake causing the whole system to change the fundamental natural period to a higher value and hence minimize the impact of the earthquake on the building. The study will be performed by simulating typical structures and determine their dynamic properties for various parameters, such as the dimensions of the structures and the inclusion, and the type of soil that enhance the usage of these materials. Other factors that contribute in deviating the fundamental natural period may include building dimensions will be also investigated.

There are researches close to the same principle that study the effect of EPS on structural elements in the event of earthquakes, including research:

1- Nishant Roy, Shiv Dayal Bharti and Ankesh Kumar (2019) [8]: study circular lined tunnel in blocky rock mass a liner surrounded by EPS Geofoam under the action of the acceleration time history recorded in the Kobe (1995) earthquake. EPS Geofoam is It was found to have excellent earthquake mitigation capabilities Load and reduce seismic demand. Thus, EPS Geofoam Offers promising capabilities as a preventative material for Underground tunnels.

2- Hanaa E. Abd-El-Mottaleb, M.A. Salah b and S.S. AbdelSalam (2022) [6] : study the ultrasonic characterization of expanded polystyrene used for shallow tunnels under seismic excitation. The EPS density significantly affects the peak amplitude and the wave velocity of the dynamic response. The EPS density has a significant effect on the predicted dynamic modulus.

1.1.Code fundamental period formulae:

Many codes (ASCE 7-10[1], ASCE 7-16[2],UBC97(1997) [10], Saudi Building code -2007[9]) use the same formula for estimate the approximate natural period for buildings Table 1. Estimate the fundamental period of buildings, includes the following formula:

1- The approximate fundamental period (Ta), in seconds, shall be determined from the following

$$Ta = C_t h_n^x \quad (1)$$ 9

where h_n is the height in (m) above the base to the highest level of the structure and the coefficients c_t and x are determined from Table in the code depend on the type of structure (RC moment resisting frame, Steel moment resisting frame, Eccentrically braced steel frames, RC/Masonry shear wall and Other builings) .

2- Alternatively, it shall be permitted to determine the approximate fundamental period *(Ta)*, in seconds, from the following equation for structures not exceeding 12 stories in height in which the lateral-force-resisting system consists entirely of concrete or steel moment resisting frames and the story height is at least 3 m :

$$Ta = 0.1 * N \quad (2)$$

where N = number of stories.

3- The approximate fundamental period, Ta, in seconds for masonry or concrete shear wall structures shall be permitted to be determined from Eq. 3 as follows:

$$Ta = \frac{0.0062}{\sqrt{Cw}} h_n \quad (3)$$

where *hn* is as defined above and *Cw*, is calculated from Eq. 4 as follows:

$$C_w = \frac{100}{A_B} \sum_{i=1}^{n} \left(\frac{h_n}{h_i}\right)^2 \frac{A_i}{\left[1 + 0.83\left(\frac{h_i}{D_i}\right)^2\right]} \quad (4)$$

Where:
A_B = the base area of the structure m^2
A_i = the area of shear wall "i" in m^2
D_i = the length of shear wall "i" in m
n = the number of shear walls in the building effective in resisting lateral forces in the direction under consideration.

Table 1: Codes formula for estimate the approximate natural period for buildings.

<table>
<tr><th>Code</th><th>RC Moment resisting frame</th><th>Steel Moment resisting frame</th><th>Eccentrically braced steel frames</th><th>RC/ Masonry shear wall</th><th>Other</th></tr>
<tr><td rowspan="3">Saudi Building code (2007)</td><td colspan="5">$T = C_t h_n^x$ (1)</td></tr>
<tr><td>Cr=0.044
x =0.9</td><td>Cr =0.068
x =0.8</td><td rowspan="2">Cr =0.07
x =0.75</td><td>Or</td><td rowspan="2">Cr=0.055
x=0.75</td></tr>
<tr><td colspan="2">or T =$0.1 * N$ (2)</td><td>$Ta = \frac{0.0062}{\sqrt{Cr}} h_n$</td></tr>
</table>

<table>
<tr><td></td><td colspan="2"></td><td></td><td>(3)</td><td></td></tr>
<tr><td rowspan="3">ASCE 7-10</td><td colspan="5">$T = C_t h_n^x$ (Eq.1.1)</td></tr>
<tr><td>Cr= 0.047 x =0.9</td><td>Cr = 0.072 x =0.8</td><td rowspan="2">Cr =0.073 x =0.75</td><td>Cr =0.049 x =0.75
Or</td><td rowspan="2">Cr=0.049 x=0.75</td></tr>
<tr><td colspan="2">or T =$0.1 * N$ (2)</td><td>$Ta = \frac{0.0062}{\sqrt{Cr}} h_n$ (3)</td></tr>
<tr><td rowspan="2">UBC97(1997), Euro code 8 (2006</td><td colspan="5">$T = C_t h^{3/4}$ (1)</td></tr>
<tr><td>Ct=0.075</td><td>Ct=0.085</td><td>Ct=0.075</td><td>Ct=0.05
Or $Ct = \frac{0.0075}{\sqrt{A_c}}$</td><td>Ct=0.05</td></tr>
<tr><td rowspan="2">ATC3-6(1978)</td><td colspan="3">$T = C_t h^{3/4}$ (1)</td><td colspan="2" rowspan="2">$Ta = \frac{0.09}{\sqrt{D}} h_n$ (4)</td></tr>
<tr><td>Ct=0.075</td><td colspan="2">Ct=0.085</td></tr>
</table>

1.2.Goel and Chopra fundamental period formula:

Goel and Chopra [4] & [5] (1998) evaluated the code period equation using the periods of 16 RCSW buildings identified from their recorded seismic motions. They found that eq. (2) poorly fit the measured period data and suggested that building height alone is not sufficient to accurately predict the fundamental period since it does not capture the increased stiffness contributed by additional walls or walls of larger dimensions. They proposed a more complex equation, derived considering flexural and shear deformations of a uniform cantilever, and calibrated to the measured periods of a subset of 9 buildings, for which shear wall dimensions were available. This equation was incorporated as an alternative equation for RCSW buildings in several international codes (BSSC 2003; ASCE2005) and is given by

Where

$$T_1 = \frac{0.0062\,h}{\sqrt{A_e}} \quad (5)$$

$$A_e = \frac{100}{A_B}\sum_{i=1}^{NW}\left(\frac{h\sqrt{x}}{h_i}\right)^2 \frac{A_i}{\left[1+0.83\left(\frac{h_i}{D_i}\right)^2\right]} \quad 0(6)$$

AB = the base area of the structure m2

Ai = the area of shear wall "i" in m2

Di = the length of shear wall "i" in m

n = the number of shear walls in the building effective in resisting lateral forces in the direction under consideration.

1.3.Lee et al. fundamental period formula:

e et al. fundamental period formula Similarly to Goel and Chopra (1998), Lee et al. (2000) [7] derived a theoretical model to predict the fundamental period of a uniform cantilever, considering both flexural and shear deformations; however, they assumed the thickness of all walls to be identical. Using regression analysis on the fundamental periods of 50 RCSW buildings in Korea, identified from ambient vibration records, they proposed the following equation for the mean value of the fundamental

period:

where $$T_1 = 0.4\left(\frac{h^{0.2}}{\sqrt{L_w}}\right) - 0.5 \quad (7)$$ Lw

represents the total wall width per unit plan area (in m^{-1})

1.4.Wallace and Moehle fundamental period formula:

Wallace and Moehle (1992) [11] studied the fundamental period of a uniform concrete cantilever of rectangular cross section, supporting regularly distributed floor loads, considering only flexural deformations. Based on a theoretical analysis with assumed values of floor weight, concrete modulus of elasticity, and storey height, they suggested computing the fundamental period of uncracked and cracked RCSW buildings using, respectively,

where $$T_1 = 0.0019\frac{h_w}{D}\frac{n}{\sqrt{P}} \quad (8)$$ h_w

represents the wall height, D the wall width, n the number of stores, and p

the $$T_1 = 0.0027\frac{h_w}{D}\frac{n}{\sqrt{P}} \quad (9)$$ ratio

of wall

area to floor plan area for the walls aligned with the lateral direction under consideration. According to the authors, periods identified from low-amplitude ambient motions should compare well with eq. (8); while periods from moderate seismic motions should compare well with eq. (9).

Methodology

A finite element method is used in this study. A three-dimensional element Solid 185 was used in this study to represent the different concrete elements (foundation, beams columns) as well as the compressible inclusion. Table 2 shows the properties of the used material. The restraint in this study was outside the foam. Modal analysis is used in this study to calculate the fundamental natural period. Figure 4 shows the used numerical model for the case of 3 story structure.

Table 2 Materials Properties

Material	weight	Modulus of Elasticity	Poisson ratio
Concrete	24 KN/m3	200 GPa	0.3
Foam	0.0012 KN/m3	0.1 MPa	0.2

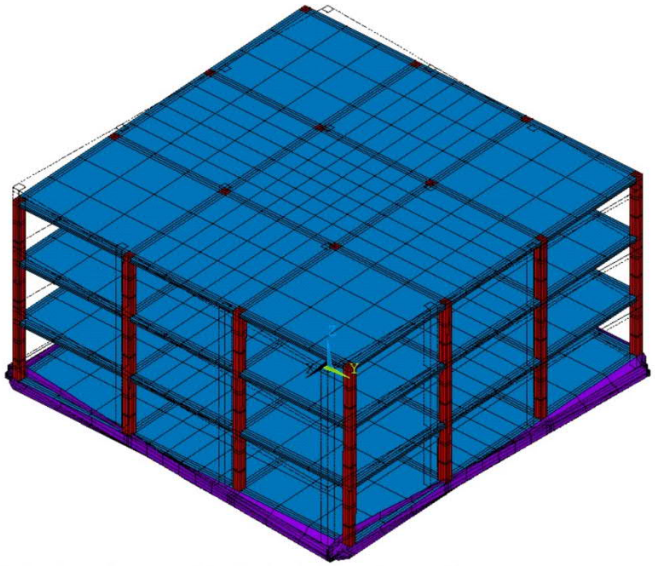


Figure 4 The model used in this study for the three-story structure

Results and Discussion

A total of 27 results is presented and discussed in this study. As shown in figure 5 and in table 3, as the floor height increases the fundamental natural period increases, as well as in the case of increasing the number of floors the fundamental natural period increases with the increase of number of floors, also the fundamental natural period increases with the increase of the foam thickness for all floor heights. For the same floor height, the amount of increase for 5 cm foam thickness was less than the amount of increase in the fundamental natural period for the 10 cm and for the 15cm foam thickness. For all cases the fundamental natural period is higher than the values for the zero foam case and higher than the values extracted from the traditional equation T=0.1N where N is the number of stories, which is equivalent to 0.3 sec, 0.4 sec and 0.5 sec for three, four and five stories respectively.

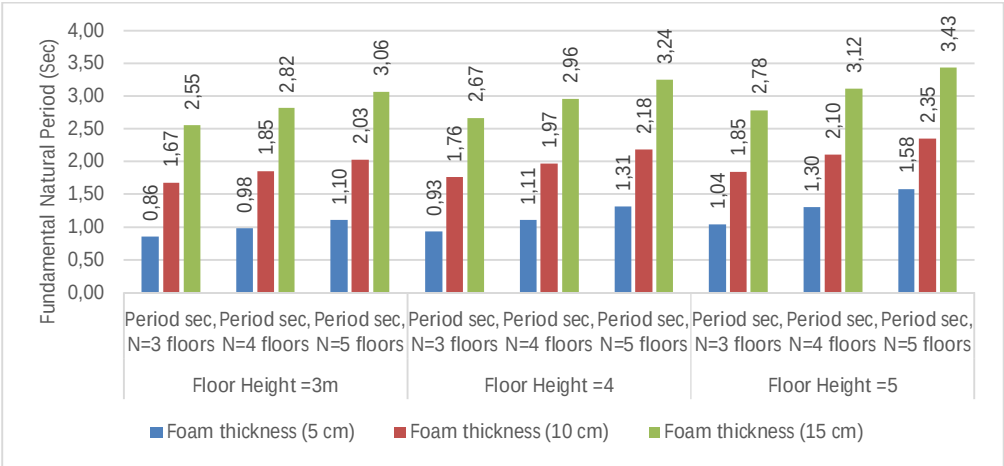


Figure 5 Fundamental natural period for all 27 cases

Table 3 Fundamental natural period for all 27 cases

Foam thickness (cm)	0	5	10	15
Period sec, N=3 floors	0.31	0.86	1.67	2.55
Period sec, N=4 floors	0.42	0.98	1.85	2.82

Period sec, N=5 floors	0.53	1.10	2.03	3.06
Period sec, N=3 floors	0.43	0.93	1.76	2.67
Period sec, N=4 floors	0.59	1.11	1.97	2.96
Period sec, N=5 floors	0.74	1.31	2.18	3.24
Period sec, N=3 floors	0.57	1.04	1.85	2.78
Period sec, N=4 floors	0.77	1.30	2.10	3.12
Period sec, N=5 floors	0.98	1.58	2.35	3.43
Average T, Sec (N=3)	0.44	0.94	1.76	2.67
Average T, Sec (N=4)	0.59	1.13	1.97	2.96
Average T, Sec (N=5)	0.75	1.33	2.19	3.24
Average T, Sec All	0.59	1.13	1.97	2.96

The Relation between the fundamental natural period with the foam thickness for the case of 4 m floor height is shown in figure 6. This shows the trend for all cases for foam thicknesses between 5m and 15 cm,for all heights and all number of stories used in this study. The relation is almost a straight line for three cases (number of story = 3, 4 and 5) The equation of each case is shown for quick correlation haveng the R-Squared (R^2 or the coefficient of determination) almost equal 1.

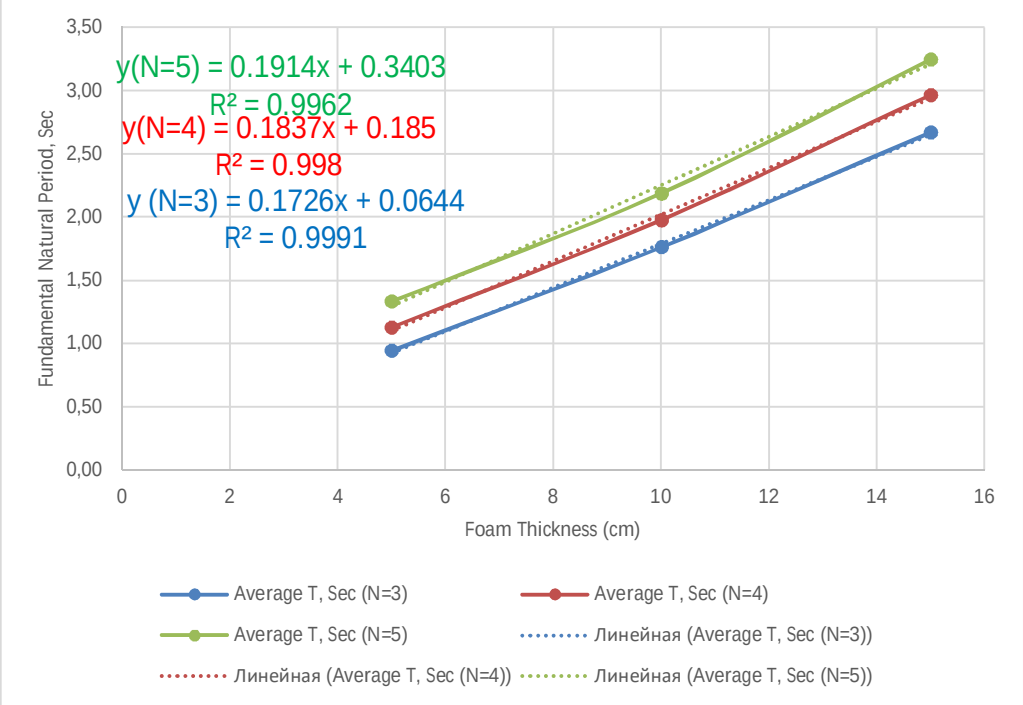


Figure 6 Relation between the fundamental natural period with the foam thickness for the case of 4 m floor height

The results of the deviation of the fundamental natural period of the 27 cases with foam from the case of zero foam is presented in figure 7 and in table 4, as the floor height increases the deviation increases, as well as in the case of increasing the number of floors the deviation increases with the increase of number of floors, also the deviation increases with the increase of the foam thickness for all floor heights. For the same floor height, the amount of increase for 5 cm foam thickness was less than the amount of increase in the fundamental natural period for the 10 cm and for the 15cm foam thickness. The deviation reached values of the order of 2.5 sec for 15cm foam and of the order of 1.5 sec for 10cm foam and in the order of 0.5sec for the case of 5cm foam which could be quickly related to an increase in deviation of a 0.2 sec for each 1cm foam for the foam thickness ranging from 5cm to 15cm.

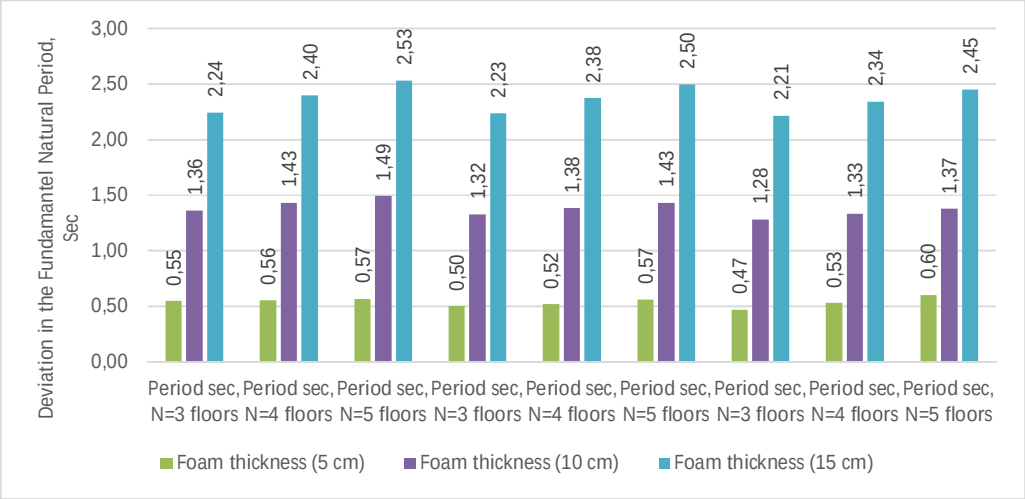


Figure 7 Values of deviation in the fundamental natural period for all 27 cases from the original 9 cases with out foam.

Table 4 Values of deviation in the fundamental natural period for all 27 cases from the original 9 cases without foam

Foam thickness (cm)	5	10	15
Deviation sec, N=3 floors	0.55	1.36	2.24
Deviation sec, N=4 floors	0.56	1.43	2.40
Deviation sec, N=5 floors	0.57	1.49	2.53
Deviation sec, N=3 floors	0.50	1.32	2.23
Deviation sec, N=4 floors	0.52	1.38	2.38
Deviation sec, N=5 floors	0.57	1.43	2.50
Deviation sec, N=3 floors	0.47	1.28	2.21
Deviation sec, N=4 floors	0.53	1.33	2.34
Deviation sec, N=5 floors	0.60	1.37	2.45
Average Deviation, Sec (N=3)	0.50	1.32	2.23
Average Deviation, Sec (N=4)	0.53	1.38	2.37
Average Deviation, Sec (N=5)	0.58	1.43	2.49

Average Deviation, Sec All	0.54	1.38	2.37

Figure 8 represent the deviation of the fundamental natural period for the different foam thickness (average for all cases). The regression analysis shows a straight line for the trend of the relation This relation is for foam thicknesses between 5cm and 15cm. The slope of the curve indicates 0.18sec deviation for each 1cm increase in foam thickness.

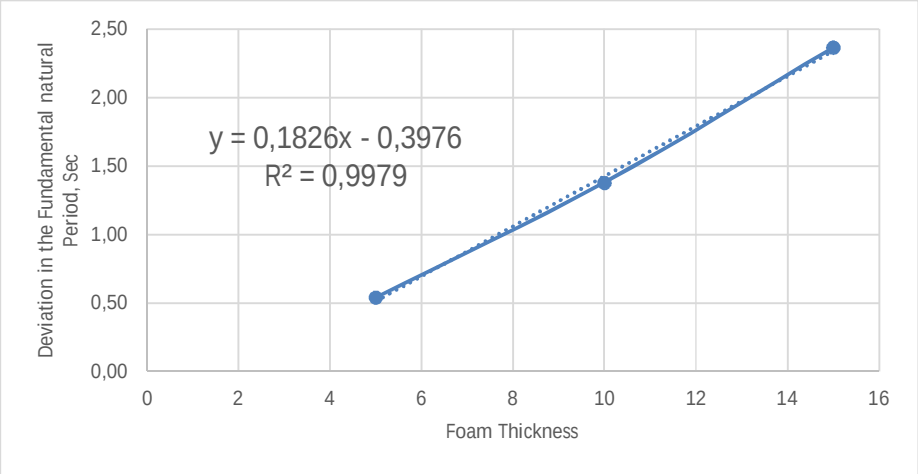


Figure 8 Deviation of the fundamental natural period for the different foam thickness (average for all cases)

Conclusion:

In conclusion utilizing compressible inclusion around foundation can deviate the value of the fundamental period from its original value and this concept can be used in deviating the fundamental period of low-rise buildings away from the dominate values of common earthquakes. the amount of deviation of the fundamental natural period for the different foam thickness ranged from the order of 0.5 sec to 2.5 sec for the foam thickness of 5cm to 15cm. The regression analysis shows a straight line for the trend of the relation between the amount of deviation and the foam thickness. This analysis is for foam thicknesses between 5cm and 15cm. The slope of the curve indicates 0.18sec deviation for each 1cm increase in foam thickness.

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STRUCTURAL STUDY OF MODIFIED CLAYS APPLIED TO THE ADSORPTION OF POLLUTANTS

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ABSTRACT

This work aims to study the adsorption potential of natural materials for the treatment of wastewater loaded with metallic and organic pollutants. Benetonite, from a deposit northwest of the town of Nador (GPS coordinates: N35° 09' 07", W03° 07' 45") is used as an adsorbent in its raw state and modified to recover heavy metals (lead, chromium and copper) and dyes (bemacid yellow E-4R and procion yellow Mx-4R) in aqueous phase. Two inorgano- and organo-montmorillonite complexes with large specific surface areas were prepared by intercalating a bentonite with two bridging solutions, based on aluminum (Al13), and cetyl-trimethyl ammonium bromide (CTAB). The prepared CIM and COM matrices are characterized by several methods such as: XRD, SEM, BET, IRTF spectroscopy, ATD/ATG. The characterization of the two adsorbents showed that the bridging was well achieved by increasing the basal space of the sheets, as well as improving the specific surface. The experimental data show that the Freundlich model better simulates the adsorption isotherms of the heavy metals studied. This adsorption process is physical in nature and follows second-order kinetics controlled by intra-particle diffusion. The thermodynamic study for the two metals Cr3+ and Pb2+ showed that the retention process is spontaneous and endothermic. The results of adsorption of dyes E-4R and Mx-4R by B-Al and B-CTAB showed that B-CTAB has the best retention capacity of the two dyes. The Freundlich model better describes these adsorption isotherms. The kinetic study obeys the pseudo-second order reaction rate law and also follows intraparticle diffusion. The thermodynamic study revealed that this process is physical, exothermic and spontaneous.

Keyword: Bentonite, adsorption, heavy metals, dyes...

DISTRIBUTION OF THE DIATOM GENUS *CHAETOCEROS* IN THE LAGOON OF NADOR, MOROCCO

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ABSTRACT

Phytoplankton form the basis of food webs in aquatic ecosystems, representing an important biological component **(Sin *et al.*, 1999)**. Planktonic organisms can be grouped according to their size, nature, the biological characteristics of their developmental cycle, their vertical distribution on the water column or the type of environment they inhabit **(Rossi, 2008)**.

Chaetoceros is one of the most abundant and diverse marine genera among the planktonic diatoms throughout the oceans **(Malviya *et al.*, 2016)**. This genus is found with a cosmopolitan distribution and is often dominant in plankton **(Cupp, 1943; Jensen & Moestrup, 1998; Bérard-Therriaut *et al.*, 1999; Hoppenrath *et al.*, 2009)**. Members of the genus are mainly marine, with hundreds of species **(Hasle & Syvertsen, 1997)**. A limited number of these species, specifically in inland waters, live in saline areas such as saltwater and saline lakes **(Rushforth & Johansen, 1986)**.

The genus *Chaetoceros*, is known for its abundance and diversity among the planktonic diatoms. Diatoms have long been used in aquaculture, especially as food for bivalves and juvenile gastropods.

The general morphology and ultra- structural characters are presented for each species with special emphasis on the distinctive features with respect to species. The diversity and distribution of *Chaetoceros* (Bacillariophyceae) were studied at monthly intervals, throughout the experimental period (2018-2019) in the Nador Lagoon. A total of 24 *Chaetoceros* species were identified by inverted light microscopy. The highest recorded abundance of *Chaetoceros* species was 29320 cell/L, whereas *Chaetoceros compressus* (16000cell/L), *Chaetoceros danicus* (7200cell/L) and *Chaetoceros descipiens* (4120cell/L) showed the highest dominance. The present work was constructed to determine the distribution of **Chaetoceros** at the lagoon of Nador in relation to the physicochemical parameters of the environment.

Keywords: Phytoplankton, diatom, *Chaetoceros,* Lagoon of Nador…

ECOTOURISM IN KOSOVO, DESIGN OF ECO-LODGES PROTOTYPES

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ABSTRACT

Kosovo has excellent potential for developing regular four-season nature-based tourism as a form of a more responsive and sustainable relaxation or recreation in a natural environment. However, it lacks a genuine offer of mountainside architecture in almost all tourist hotspots, which affects the number of visitors compared to similar destinations in developed countries. A well-thought design approach and interventions are necessary to increase and strengthen tourism in these destinations. It is necessary to create a network of mountainside cabins, respectively the architectural design of cabin prototypes for use by visitors, which in addition to the function would further enrich the landscape, and over time would become the reference and identifying elements of these areas. The research is based on identifying tourism potentials throughout Kosovo with the primary goal of creating a genuine offer of mountainside architecture based entirely on ecotourism. The aim is to increase visitors' interest and awareness and strengthen ecotourism development. All interventions will adapt to natural environments' preservations and sustainable development, creating even higher awareness of visitors and the local community.

Keywords: Ecotourism, mountainside cabin, prototype architecture, Kosovo, sustainable architecture

INTERPRETATION OF THE ARCHITECTURAL FEATURES OF THE CLASSICAL PERIOD TURKISH-ISLAMIC RELIGIOUS BUILDINGS FROM A BIOHARMOLOGICAL PERSPECTIVE

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ABSTRACT
In this study, the architectural features of the classical period Turkish-Islamic religious buildings were examined from a bioharmological point of view. For this purpose, two classical period structures were selected from the historical peninsula in Istanbul. The selected buildings were built five centuries ago. These buildings, which are still open to service today, are the Blue Mosque and the Süleymaniye Mosque. The architectural features of the buildings in question were presented within the scope of 12 basic criteria and 221 features of the Bioharmological Conformity Assessment (BCA). As a result of the Bioharmological Conformity Assessment carried out on the buildings, it has been understood that the buildings are currently Bronze Certified structures. This result is an indication of the importance given to the construction of Turkish-Islamic religious structures five centuries ago. In addition, it has been understood that an important part of the architectural features in the construction of Turkish-Islamic religious buildings are still valid today.

Keywords: Historical Religious Buildings, Bioharmology, Sultan Ahmet Mosque, Süleymaniye Mosque, Architectural Features of Structures

1. INTRODUCTION
As it is known, building is one of the oldest elements of civilization. In this context, in the historical process, humankind has built buildings with special and general functions and with different materials and construction techniques in order to meet their special and basic needs. Over time, there has been a tendency to approach these places with a more qualified and specific perspective on issues such as housing, accommodation, education and belief.

For example; over time, man has searched for one of the most fundamental questions of his own nature and started to question his existence. This search for a cause brought with it the need to believe in and worship the God. Worshiping people to show their faith in their creator on this journey, they started to build places of worship to fulfill their worship. These built places of worship were among the first examples of architectural structures all over the world. Religious artifacts that sprouted in different geographies and as a result of different cultural influences, for the need to worship within the framework of faith, paved the way for the creation of works of variety in many different types and styles, and religious architecture was born as a rich sub-branch.

Mosques, on the other hand, are an indicator of political, social and economic power, as well as hosting worships that have existed in the religion of Islam for centuries and have become one of the most important signs of both our national culture and human cultural heritage.

Religious buildings are structures of high psychological, sociological and cultural importance that we spend a certain part of our daily activities in that we build in order to find peace, to meet our need for worship, to make an account of our self and conscience. However, a structure that we can define as healthy should not only meet its own qualities, but also meet the psychological, social, physical, anthropometric and, of course, biological needs of its user (Ekinci; 2010).

In general, the building should be aimed at the user, that is, the living thing. It is necessary to look at the building and construction in line with the principles of compatibility with the user, as well as architectural and engineering principles. In this framework, the fact that we need another vision has emerged and the "Bioharmological Conformity Assessment" has started to gain importance. In this context, bioharmology deals with the harmony or incompatibility of the living thing with its environment.

Bioharmology; It can be defined as a new branch of science that researches and examines the harmony between all kinds of natural and artificially formed physical environment and the user in the life process of living things, produces rational solution suggestions and transfers this information to the structure in practice (Ekinci, ; Ekinci, Ozan, & Elyiğit, 2012). As Akman said, a healthy person depends on a healthy structure, a healthy structure depends on a healthy environment, and a healthy environment depends on healthy people. In this sense, people should be able to live in harmony with their environment (Akman, 2005).

In this study; The architectural features of the Blue Mosque and the Süleymaniye Mosque, which are among the most important examples of places of worship, which are among the most important structures of human life, have been examined in terms of bioharmology. In addition to better understanding of the most important works of our historical identity by the experts of the subject, the findings to be obtained as a result of the study; It is hoped that the works that will be built today and in the following years will serve to reveal works that are compatible with their environment, ecology and users by taking into consideration the harmony with living things (Ozan, 2022).

2. GENERAL FEATURES OF OTTOMAN ARCHITECTURE

Architecture is a reflection of the social structure. Structures and cities, which are places where daily needs are met, reflect the socio-cultural structure, economy, education, defense plans, trade, worship, etc. of that society. Provide important data on thus, the analysis of the buildings gives information both in terms of architecture and about some features seen in the society and the changes that occur in them. For example; Seljuk structures and classical period Ottoman structures differ from each other in terms of both quality and quantity. Because over time, there have been differences in social, economic and cultural issues. These changes, as well as being reflected in the architecture, also caused stylistic differentiations specific to the periods.

The Ottoman Empire has given great importance to architecture with the civilization construction it has undertaken since the first years of its establishment. The topography and demographic structure of the settlement in the areas of material culture created in the geographies it rules are in a quality that integrates with the architecture. In the cities that developed by following a planned settlement policy, worship structures took place at the center of the settlement and gave references to the urban texture. In this way, mosques became prominent structures in architecture. Although the structure and spiritual position of the mosques have remained the same over the years, the architectural features and interior atmospheres of the buildings have changed and developed in the process. Adoption of different cultures together over the centuries has led to the strengthening of cultural synthesis and has enabled the enrichment of Ottoman mosque architecture. Cultures such as

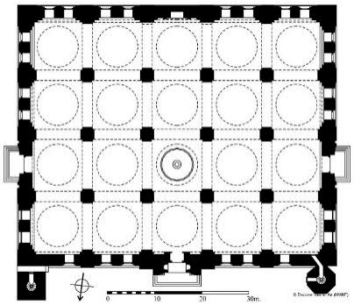
the Great Seljuk State, the Anatolian Seljuk State, the Mamluk State, Iran, Egypt, Byzantium and the Mediterranean; It showed itself in mosque architecture by influencing the Ottoman Empire. With the conquest of Istanbul, Byzantine art had a significant impact on Ottoman mosque architecture. Architecture was used as a tool to show the magnificence and power of the empire. Therefore, architects built mosques splendidly in large areas according to the possibilities of the period (Ozan, 2022).

2.1. Early Ottoman Architecture

The prominent structures of the Ottoman Early Period Architecture, covering the 14th and 15th centuries, are concentrated in the regions of Iznik, Bursa and Edirne. In the process, it has matured with the birth of the Bursa Style, which can be considered the essence of Early Period Architecture. Bursa Ulu Mosque can be considered the most important example of this style (Photo 1 and Plan 1). It would not be wrong to say that Early Period Ottoman Architecture has important traces of Seljuk art. In this period, examples of stone carvings come to the fore in buildings (Ozan, 2022).



Photo 1. Bursa Ulu Mosque (URL-1, 2022)



Plan 1. Bursa Ulu Mosque Plan (URL-1, 2022)

2.2. Classical Period Ottoman Architecture

Classical Ottoman Architecture was interpreted in the period between 1501 and 1703. This period is also a period when the Ottoman state and, in parallel, its architecture was at its peak. With the Classical Period, Ottoman Architecture changed its form, structure, style, etc. In terms of aspects, it has revealed differences and has become a unique school. In the Classical Period Ottoman Architecture, mostly stone was used as the main building material. The openings are crossed with a dome, and the windows are generally flat on the lower levels and arched on the upper levels. Stone carving, on the other hand, left its place to issues such as tile decorations, stained glass and calligraphy.

The name that brought the Classical Period Ottoman Architecture to its peak and left its mark on the period is Mimar Sinan. The most important innovation brought by Mimar Sinan to Ottoman architecture is his reformulation of the dome-space relationship in the most ideal way. From the domes to the walls, from the buttresses to the pendentives, in short, every point of the buildings was innovated and carried forward. The most striking element in the design of monumental mosques in Classical Period Ottoman Architecture was the domes. Especially the domes made by Mimar Sinan are among the important examples in the history of world architecture. Mimar Sinan made arrangements to ensure geometric integrity with his dome designs, tried designs that would not disturb the geometric purity of the spherical half dome, and continued to work by increasing the aesthetic quality of these trials throughout his life. In his architecture, the dome; formed the center of gravity of the building, and the building structure was shaped in line with the support of the dome. Not only that; When we examine the works of Mimar Sinan, the development of his works over time has come

to the fore. For example; He built the Suleymaniye Mosque, a work of his journeyman period, which is a much larger mosque, with the dome-floor area ratio of 17.15% almost preserved (16.98%) in the Şehzade Mosque, which he called his apprenticeship work. In Selimiye, a masterpiece of mastery, this rate increased to 38.45% (Erdem 2011).

When we look at the buildings designed by Mimar Sinan, it is seen that they are in harmony with the physical conditions they are in. Architect Sinan's use of the topographic features of the plots enabled him to come up with original and creative plans, and caused the buildings to be perceived differently from every point of view. Mimar Sinan has built structures in various and different points of the urban fabric, while these form the silhouette of Istanbul, the population and settlement have developed around them. When we look at the buildings designed by Mimar Sinan, it is seen that they are in harmony with the conditions they are in (Ozan, 2022).

While all people are affected by the feeling of power and splendor created by the holistic exterior of the building, the visual language of the interior, which is filled with Islamic symbols and messages, is directed towards the people in this culture. As with all artistic languages, the visual language of Classical Ottoman Art is also related to the symbol production and messages of the time it emerged. However, the moderation, balance and harmony, in other words, “style” in the delivery of these messages are a reflection of the humanistic outlook of that period and the personality of Mimar Sinan (Erdem 2011).

According to Ödekan, the features of Classical Period Ottoman Architecture are as follows;

• The use of half domes is quite common in this period. The middle dome is placed on arches and the remaining parts are supported by half or quarter domes.

• Cut stone in mosques and tombs; Stone and brick are often preferred in madrasahs and commercial buildings.

• The decorations are quite natural and do not put the architecture into the background. In addition to stone, brick and two-color stones, marble is also helped for decorations.

• In addition, tiles, an indispensable element of Ottoman architecture, were also used in interior decorations in this period.

• Magnificent structures that can be seen from everywhere and change the silhouette of the city have been built (Ödekan 2015).

With the effects of these features, the following results were observed in Ottoman Architecture;

• The building is completely shaped according to the dome structure.

• Space integrity has been achieved instead of fragmented space.

• Complex structural systems are solved in a rational way.

• An organic bond has been established between the infrastructure and the superstructure, descending from the top of the dome to the ground.

• Different solutions have been brought to the central space design.

• New themes such as cloistered courtyard, weight tower, sultan's lodge, gallery have entered the building dictionary.

• Light, acoustic and plastic values gained importance.

• A rhythmic and dynamic balance has been established between the building elements.

• A harmonious arrangement has been made for individual architectural elements such as window rows, porticoes and domes (Ödekan 2015).

2.3. Late Ottoman Architecture

With the death of Mimar Sinan, the "Classical Period" ended in Ottoman architecture, but the style

and features of the period continued to be used for many years. In the 18th century, art movements in Europe began to show themselves in Ottoman architecture as well. The movements that started with the Tulip Era Architecture and Baroque Architecture, and later on, the Empire, known as the Ottoman Empire style, and the 19th century. It continued with the Mixed Style (Eclectic), which includes both domestic and foreign elements, seen at the end of it. Developing relations with the West visibly influenced art in the Ottoman Empire. These effects began to show themselves in architectural works at the beginning of the 18th century. For mosque works built under the influence of styles such as Baroque, Rococo and Ampir; Although there are comments that the Ottomans have moved away from their identity and reflect a completely western style; It is possible to say that the traditional architectural heritage has not been completely abandoned, on the contrary, these newly introduced western styles have been enriched by blending them with the existing traditional architectural accumulations (Ünlütürk 2021).

3. EXAMPLE OF CLASSICAL PERIOD STRUCTURES AND MOSQUES PROPERTIES

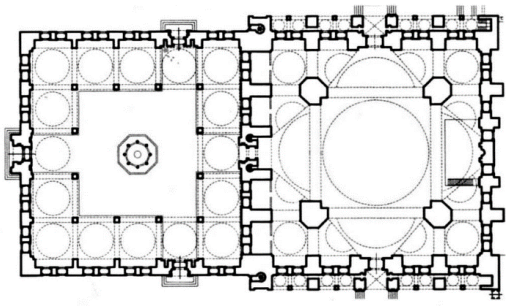
3.1. Süleymaniye Mosque

It is in the center of the Süleymaniye region, behind Istanbul University. Süleymaniye Mosque was built by Suleiman the Magnificent between 1551 and 1558 (Photo 2 and Plan 2). The mosque, together with its social complex, was completed in seven years. It was built as a part of the Süleymaniye Complex, which consists of a madrasa, library, hospital, bath, soup kitchen, burial ground and shops (Ozan, 2022).

Suleymaniye Mosque, one of the most distinguished works of not only Ottoman architecture but also world architecture, described as "my journeyman's work" by Mimar Sinan, is like the dominant element of the city silhouette with its location in the landscape and the most symbolic structure of the empire (Document 1999). There is no definite information about the start date of the mosque's construction. However, according to the Süleymaniye Mosque inscription, “the construction of the mosque started in Evahir of 957 Cemaziyülevvel (late June 1550) (Kuran 1988).



Photo 2. Süleymaniye Mosque



Plan 2. Süleymaniye Mosque Plan (URL-2, 2022)

The complex structure shows a "U" plan, with the mosque in the middle. Madrasahs providing education at different levels, a hadith school, a hospital, a school teaching the Qur'an, a primary school, a soup kitchen, guest house, inn, Turkish bath, library, burial place and the architect's own tomb, and many shops were established on an area of approximately 60 decares (Öz, 1997).

Süleymaniye Mosque (1550-1557), in which the central dome rises up to 48 meters from the ground, is an indication of the importance Mimar Sinan gave to the center of the building. Since the Süleymaniye Mosque, which Sinan referred to as my journeyman's work, was built in the name of Suleiman the Magnificent, the ruler of the period, and symbolizes the power of the empire in a way; It is aimed to build with the most accurate solutions possible, by carefully thinking and making

calculations in all fields of engineering, architecture and interior architecture, with an emphasis on every detail (Ozan, 2022).

Mimar Sinan, II. As in the Beyazid Mosque, he added two half domes on the qibla axis to the central dome, but II. The flattened semi-domes in Beyazid Mosque gained a full character with the rise of the central dome in Süleymaniye. According to Burckhardt; The Sulaymaniyah plan, which has roughly the same proportions as Hagia Sophia, is a reflection of Hagia Sophia. However, unlike the Byzantine period cathedrals, it creates a spacious and bright interior instead of a gothic atmosphere. In this way, Mimar Sinan brought the features of gothic architecture together with the bright interior with different approaches (Buckhardt, 1957).

Süleymaniye Mosque, which is one of the monumental structures reflecting the characteristics of the Classical Period; It has natural and artificial lighting designs that will provide integrity with the space setup and dome technique. Thanks to the natural lighting design and the daylight taken from the window openings, a very high level of illumination and therefore a spacious space setup is created in the interior of the mosque, while at the same time, these window openings and the occupancy gaps maintained in a rhythmical manner on the facades and the covering system have given the building envelope a more elegant perception. (Ünlütürk, 2021).

3.2. Sultanahmet Mosque

It is in Sultanahmet District, Atmeydanı Street. It was built by the Ottoman Sultan Ahmed I between 1609 and 1617 (Photo 3 and Plan 3). Its architect is Sedefkar Mehmed Ağa. The mosque is called the "Blue Mosque" because it is decorated with blue, green and white colored Iznik tiles, and because its half domes and the inside of the big dome are also decorated with hand-drawn works predominantly in blue. Together with the Blue Mosque complex, it is one of the greatest monuments in Istanbul. This complex consists of a mosque, madrasahs, sultan's pavilion, arasta, shops, Turkish bath, fountain, public fountains, tomb, hospital, primary school, alms-house and rental rooms. Some of these structures have not survived to the present day.

The most important aspect of the building, which is architecturally and artistically noteworthy, is that it is decorated with more than 20,000 Iznik tiles (Dearborn, 1995). Traditional plant motifs in yellow and blue tones were used in the decorations of these tiles, making the building more than just a place of worship. The place of worship of the mosque measures 64x72m. The 43 m high central dome has a diameter of 23.5 meters. The interior of the mosque is illuminated with more than 200 colored glass (Hallam 2009). The main and side domes rise on four elephant feet on which wide pointed arches rest. Half domes covering all four sides of the main dome form a four-leaf clover. The minarets at the four corners of the main space have three balconies, while the minarets at the ends of the courtyard entrance have two balconies. Six minarets symbolize the six conditions of faith and 14 balconies symbolize that I. Ahmed is the 14th sultan of the Ottoman Empire (Ozan, 2022).

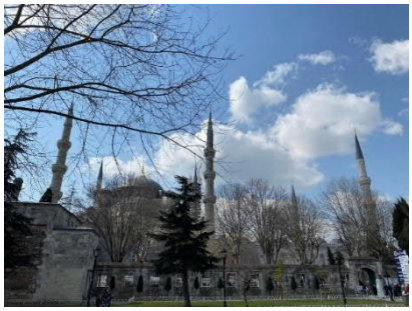
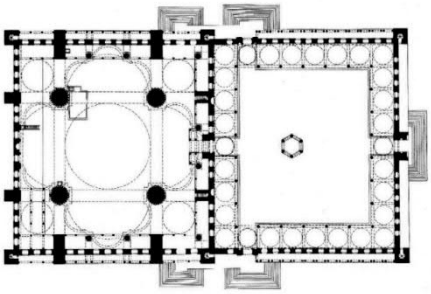


Photo 3. Sultanahmet Mosque



Plan 3. Sultanahmet Mosque Plan (URL-2, 2022)

4. METHODOLOGY

In this study, an examination method based on bioharmological and technical observation was applied. The short name for this method is BUD. In addition, the results obtained in accordance with the BUD method were interpreted. The technical observational review includes the 12 criteria Architectural Features study of the sample. The current situation of the mosques in the face of 221 criterion questions regarding the reflection levels of the spatial qualities has been examined. The data obtained during the examination process were processed into the relevant forms, mathematical calculations were made and the final results were interpreted by comparing them with the BUD criteria.

Fatigue Performance Percentage to be obtained from the BUDBOX Graph used in the BUD Calculation method in the study and given in Chart 2 was accepted as 0.62 (62%) for both structures. Bioharmological Conformity Assessment is a hierarchical structure with two main branches, Architecture and Engineering. The BUD Hierarchy is given in Figure 1, and the basic criteria, general explanations and the number of criteria questions regarding the Architectural Features of the examined structures are given in Chart 1 (Ozan, 2022).

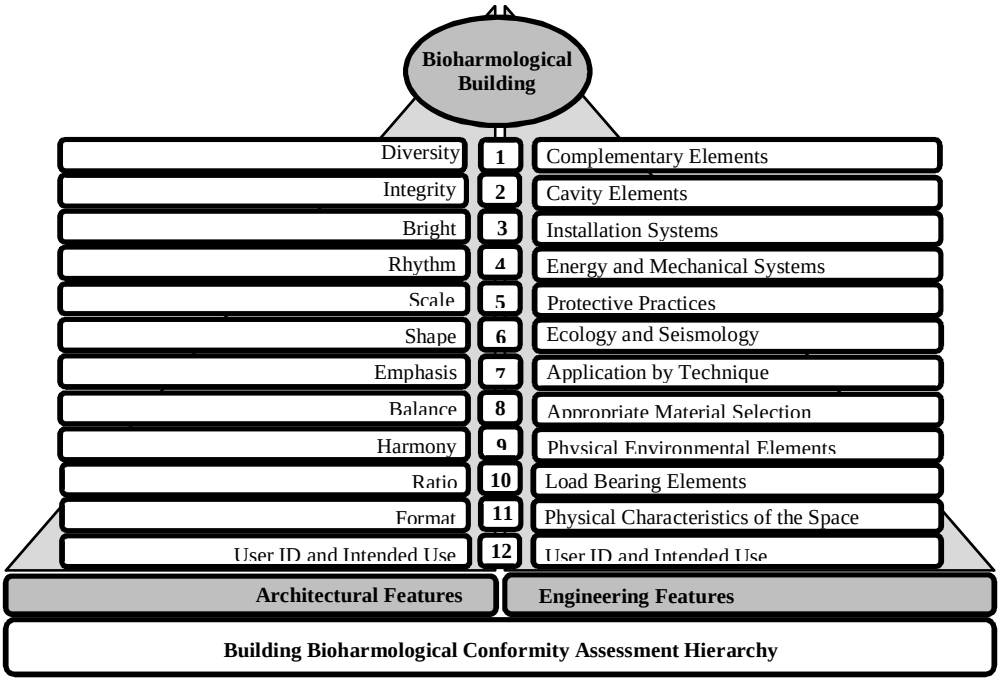


Figure 1. Building Bioharmological Conformity Assessment Hierarchy

Chart 1. Examined Architectural Criteria and Explanation

Criterion	IC	Criteria Description	Number of Criteria Queries
User ID and Intended Use	**12**	Who, Age, Disabled, Education, Gender, Housing, Hospital, School, Office, Greenhouse, Worship, Livestock, Shopping Mall	29

Format	**11**	Composition, harmony, pleasant unity of the building or space	18
Ratio	**10**	The apparent size, relativity of the objects used	17
Harmony	**9**	The harmony or pleasant combination of the parts that make up the space	19
Balance	**8**	The unity of shapes, colors and textures of the objects that complete the space	18
Emphasis	**7**	Presence of dominant elements in the building or space	18
Shape	**6**	The natural, subjective and geometric states that distinguish the elements from each other	17
Scale	**5**	The feeling of smallness or greatness that the space makes its user feel	11
Rhythm	**4**	Continuity of rhythmic motion of objects in the building or space	15
Bright	**3**	The power that illuminates a place, the light, the intensity of the light in the place	20
Integrity	**2**	The harmonious combination of the elements that complete the space, the diversity of the elements used in the space	19
Diversity	**1**	The effect of the light reflected from the objects on the eye, its color, texture, three-dimensional structural quality of the surfaces, appearance	20
Importance Coefficient		Total	221

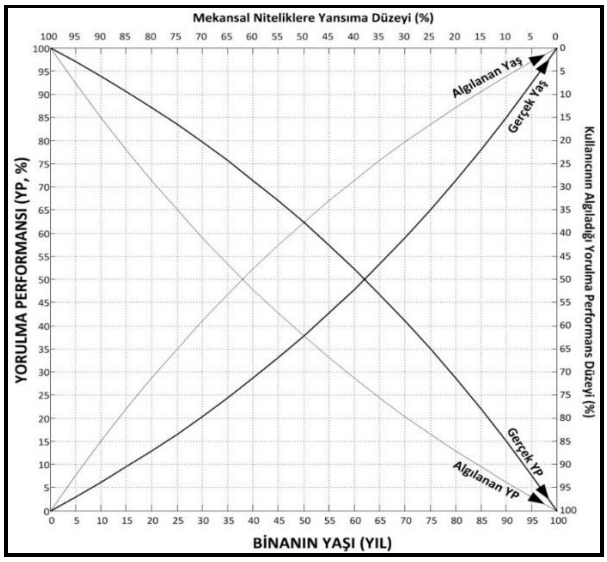


Figure 2. BUDBOX Graphic by Building Age and Fatigue Performance (Ekinci, 2021)

The calculation was made according to the principles outlined below. According to this, the answers as "Suitable-Adequate (+)", "Not Appropriate-Insufficient (-)" or "Not Examined-No Data (±)" are collected in response to each question queried. For each criterion, the answers in the form of

“Appropriate-Adequate (+)” are collected and the Evaluation Score (DP) of the criterion is calculated.

DP= ((9/Number of Criteria Questions) x “Appropriate-Adequate (+)” Number) is calculated with the formula. With this logic, the DP scores of the other 12 criteria are calculated. Then, the BUD values of the building are calculated for each criterion.

Calculated with the formula BUD = ((100/78) x PR x HP x DP).

Here;

78 = Sum of Significance Factors

TC = Significance Factor (According to the criteria examined, → from Figure 1 and/or Chart 1)

FP = Wear Performance (According to the age of the building, from →Figure 2; 0.62 was accepted in the study).

DP = Evaluation Score.

For example; The BUD calculation for the "User Identity and Purpose of Use" and "Diversity" criteria of the Süleymaniye Mosque was made as follows.

For User ID and Intended Use Criteria;

FC = Fatigue Performance = 0.62 (from Figure 2)

TK = User ID and PR = 12 (from Figure 1 and/or Table 1)

DP = Evaluation Score = 26 points out of 29 question questions “Suitable-Adequate (+)”

= (9/29) x 26= 8.07

BUD = ((100/78) x AR x HP x XP) = ((100/78) x 12 x 0.62 x 8.07) = 76.97

For the Diversity Criterion;

FC = Fatigue Performance = 0.62 (from Figure 2)

TK = User ID and NA = 1 (from Figure 1 and/or Table 1)

DP = Evaluation Score = 20 points out of 20 question questions “Suitable-Adequate (+)”

= (9/20) x 20= 9

BUD = ((100/78) x AR x HP x XP) = ((100/78) x 1 x 0.62 x 9) = 7.15

In this way, the BUD values of 12 criteria are calculated in the same way. Thus, the BUD values of the 12 criteria are added together to find the "Overall Score" of the building in the Architectural Area. By comparing the obtained "General Score" with the data in Table 2, the certificate class and symbol of the structure examined is determined.

Then, it is started to calculate the Criteria Missing Percentage (KEY) of the examined structure. The purpose of this calculation is to determine the prominent deficiencies of the structure and to calculate the impact percentage. It is calculated as follows, using the "Number of Detected Deficiency Queries" and "Number of Unexamined Queries" data obtained as a result of the examination.

The Criteria Deficiency Percentage (KEY) should be calculated as follows.

KEY= Number of Detected Deficiency Queries/ (STSS- ISP) x100

STSS= Total Number of Queries Queried

ISP = Number of Unreviewed Queries.

In the structures suitable for the user identity and purpose of use, the average of deficiencies-inadequacy should be at most 25%. At the end of the examination, a general table is prepared

including the percentage of deficiencies and inadequacies found in the building and the questions that could not be examined.

Chart 2. BUD Certificate Class Determination Table (Ekinci, 2021)

Certificate Point		Symbol	Certificate Class	Explanation	
751-900		A^{+++}	**Gold**	"Gold" Certified Bioharmological Building	
601-750		A^{++}	**Silver**	"Silver" Certified Bioharmological Building	
451-600		A^{+}	**Bronze**	"Bronze" Certified Bioharmological Building	
301-450	376-450	A^{-}	**Should be improved**	Building Close to Standards	Needs Minor Changes
	301-375	A^{--}		Building Far From Standards	Needs Major Changes
000-300		A^{---}	Not Enough		

5. FINDINGS AND DISCUSSION

The results obtained in the Süleymaniye Mosque field study are given in Tables 3 and 4, and the results obtained in the Blue Mosque field study are given in Chartes 5 and 6. According to this;

• According to the data obtained for the Süleymaniye Mosque, the "Sum of Evaluation Scores" was found to be 104.59 and the "Total of BUD Points" as 534.9. By comparing the aforementioned BUD Points Total with Table 2, it was concluded in Table 3 that the building could be classified and certified as a "Bronze Certified Bioharmological Building". The Table of Percentages of Criterion Deficiency-Inadequacy of the data obtained after the relevant evaluation is presented in Table 3. The Deficiency-Inadequacy Percentage average of the Süleymaniye Mosque was found to be 3.62%. The Total Deficiency-Inadequacy number of the Süleymaniye Mosque was evaluated as 8.

• According to the data obtained for the Blue Mosque, the "Sum of Evaluation Scores" was 97.44 and the "Sum of BUD Points" was 496.72. By comparing the total of the aforementioned BUD Points with Table 2, it was concluded in Table 5 that the building can be classified and certified as a "Bronze Certified Bioharmological Building". The Table of Percentages of Criterion Deficiency-Inadequacy of the data obtained after the relevant evaluation is presented in Table 5. The Deficiency-Inadequacy Percentage average of the Sultanahmet Mosque was found to be 10.45%. The Total Deficiency-Inadequacy number of the Sultanahmet Mosque was evaluated as 18.

Chart 3. BUD Architectural Feature Results of the Süleymaniye Mosque

Criteria	NCQ	IQ	FP (%)	Evaluation Score (ES)									ES Result
				Weak			Medium			Good			
				1	2	3	4	5	6	7	8	9	
User ID and Intended Use	29	12	0,62								8,07		*76,97*
Format	18	11	0,62								8,50		*74,32*
Ratio	17	10	0,62									9,00	*71,54*
Harmony	19	9	0,62								8,53		*61,00*
Balance	18	8	0,62								8,50		*54,05*

Emphasis	18	7	0,62								9,00	*50,08*
Shape	17	6	0,62							8,47		*40,40*
Scale	11	5	0,62								9,00	*35,77*
Rhythm	15	4	0,62								9,00	*28,62*
Bright	20	3	0,62								9,00	*21,46*
Integrity	19	2	0,62							8,53		*13,55*
Diversity	20	1	0,62								9,00	*7,15*
Total	221	78		Evaluation Score Total								***534,90***
BUD Certificate Symbol		**A^+**										
BUD Certificate Class		**Bronze Certified Bioharmological Building** (451 < 534,90 > 600)										
PS	TC= Significance Coefficient (It is a constant value for each criterion and is the 1st column of the above table) YP= Fatigue Performance (The BUDBOX graph is selected according to the age of the building and the percentage (%) value is taken.) DP=Evaluation Score ((9/Number of Criteria) x Number of Conformity Responses) (Experiment, observation and inspection opinion score on the building) BUD= Bioharmological Compatibility Value (Calculated by the formula (100/78) x MR x HP x DP) BUD= (100/78) RC x HP x DP=76.97											

Chart 4. Suleymaniye Mosque Criterion Deficiency Percentages

Criteria	NCQ	Total Number of Queries Queried (STSS)	Detected Deficiency (TEE)	Number of Unreviewed Questions (ISS)	Percentage Missing Criterion ~(%)(KEY)
User ID and Intended Use	29	29	3	0	10,34
Format	18	18	1	0	5,56
Ratio	17	17	0	0	0,00
Harmony	19	19	1	0	5,26
Balance	18	18	1	0	5,56
Emphasis	18	18	0	0	0,00
Shape	17	17	1	0	5,88
Scale	11	11	0	0	0,00
Rhythm	15	15	0	0	0,00
Bright	20	20	0	0	0,00
Integrity	19	19	1	0	5,26

Diversity	20	20	0	0	0,00
Total	221	221	8	0	
Architectural Deficiency-Inadequacy Average (%)					3,62

Chart 5. BUD Architectural Feature Results of the Sultanahmet Mosque

Criteria	NCQ	IQ	FP (%)	Evaluation Score (ES)									ES Result
				Weak			Medium			Good			
				1	2	3	4	5	6	7	8	9	
User ID and Intended Use	29	12	0,62							7,76			*74,01*
Format	18	11	0,62								8,00		*69,95*
Ratio	17	10	0,62							7,94			*63,12*
Harmony	19	9	0,62							7,58			*54,22*
Balance	18	8	0,62								8,50		*54,05*
Emphasis	18	7	0,62								8,00		*44,51*
Shape	17	6	0,62							7,41			*35,35*
Scale	11	5	0,62									9,00	*35,77*
Rhythm	15	4	0,62									9,00	*28,62*
Bright	20	3	0,62								8,05		*17,17*
Integrity	19	2	0,62							7,20			*12,80*
Diversity	20	1	0,62									9,00	*7,15*
Total	221	78		Evaluation Score Total									***496,72***
BUD Certificate Symbol		**A^+**											
BUD Certificate Class		**Bronze Certified Bioharmological Building** (451 < 534,90 > 600)											
PS	TC= Significance Coefficient (It is a constant value for each criterion and is the 1st column of the above table) YP= Fatigue Performance (The BUDBOX graph is selected according to the age of the building and the percentage (%) value is taken.) DP=Evaluation Score ((9/Number of Criteria) x Number of Conformity Responses) (Experiment, observation and inspection opinion score on the building) BUD= Bioharmological Compatibility Value (Calculated by the formula (100/78) x MR x HP x DP) BUD= (100/78) RC x HP x DP=74,01												

Chart 6. Sultanahmet Mosque Criterion Deficiency Percentages

Criteria	NCQ	Total	Detected	Number of	Percentage

		Number of Queries Queried (STSS)	Deficiency (TEE)	Unreviewed Questions (ISS)	Missing Criterion ~(%)(KEY)
User ID and Intended Use	29	28	3	1	11,11
Format	18	18	2	0	11,11
Ratio	17	17	2	0	11,76
Harmony	19	19	3	0	15,79
Balance	18	18	1	0	5,56
Emphasis	18	18	2	0	11,11
Shape	17	17	3	0	17,65
Scale	11	11	0	0	0,00
Rhythm	15	15	0	0	0,00
Bright	20	20	4	0	20,00
Integrity	19	19	2	0	10,53
Diversity	20	20	0	0	0,00
Total	221	220	22	1	
Architectural Deficiency-Inadequacy Average (%)					10,45

6. CONCLUSION AND RECOMMENDATIONS

In this study, in which the architectural features of the Süleymaniye and Sultanahmet Mosques, which are classical Turkish-Islamic religious buildings, were examined from a bioharmological point of view, the following conclusions were reached. As can be seen in Tables 3 and 5, the fact that the mosques built five centuries ago are still BRONZE certified is a magnificence of the classical Ottoman period. It is possible to say that the Suleymaniye Mosque is in a better condition than the Blue Mosque in terms of its architectural features, especially in terms of user identity and purpose of use. In addition, the deficiencies and inadequacies identified in the mosques in question in Chartes 4 and 6 are given below comparatively.

It has been concluded that, if the issues stated in the deficiency-inadequacy comparison, which are listed below, are eliminated, both the architectural features of the mosques can be improved and the certificate class can also be increased.

Süleymaniye Mosque	Sultanahmet Mosque
The wet space design of the building is not suitable for disabled use. Materials suitable for recycling were not used in the arrangement of the building and/or space. An integrity could not be achieved in terms of disabled use in the building. The layout plan for each floor of the building is not hung in the visible part of the floor.	• The wet space design of the building is not suitable for disabled use. • Recyclable materials are used in the arrangement of the building and/or space. • An integrity could not be achieved in terms of disabled use in the building. • Taking into account the effects of sun, humidity and wind, natural heating, cooling, ventilation and lighting facilities have been utilized to the maximum extent.

It does not meet the heating-cooling requirements of the space user efficiently. Stair pier heights and landings are not compatible with the user ID. The building is not compatible with the technological developments foreseen in the near future.	• It is not an economic structure in proportion to the need. • Common areas are not sufficient compared to the number of users and the number of independent volumes. • No feature was given to improve the sense of belonging in the user. • The natural lighting of the place is not sufficient. • The venue is also not compatible with disabled users. • The place cannot benefit from daylight sufficiently. • It does not meet the heating-cooling requirements of the space user efficiently. • There is no flexibility in space designs. • Stair pier heights and landings are not compatible with the user ID. • With the application of wide openings such as windows, the integrity of the exterior landscape could not be achieved in the space. • The number of toilets is not enough. • The structure is not compatible with the regional demographic. • The building is not compatible with the technological developments foreseen in the future. • From time to time, sharp-edged elements were used in furnishing.

Note

This study was carried out by Sadık Sezgin OZAN, Under the academic supervision of Dr. Cevdet Emin EKİNCİ, F.Ü. Compiled from the Graduate School of Natural and Applied Sciences Structural Design PhD Thesis. Because the number of questions regarding the BUD basic criteria is 221 and the number of pages is limited in this international paper, questions were not given. Readers who are interested in the subject are recommended to reach the first author's PhD thesis for related questions.

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ON THE COVERING RADII OF CYCLIC CODES OVER BINARY FINITE FIELDS

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ABSTRACT

Let $\mathbb{F}_2$ denote the finite field of two elements. An $[n, k]$ binary linear block code C is a k-dimensional subspace of $\mathbb{F}_2^n$. For $u, v \in \mathbb{F}_2^n$, let $d(u, v)$ denote the number of coordinate places where u and v differ, which is called the Hamming distance between u and v. The covering radius of a block code C of length n is the smallest integer $R = R(C)$ such that all vectors in the containing space are within Hamming distance R of some codeword of C. Equivalently, the covering radius of C is the smallest integer R such that every q-ary $(n - k)$ tuple can be written as a linear combination of at most R columns of the parity-check matrix of C. There has been an intense interest in covering radius since a paper of Delsarte in 1973. It has applications to problems of data compression, testing, and write-once memories etc. Computing the covering radius of a given code is a hard task. Cyclic codes are one of the most commonly used class of linear block codes, where the circular shifts of each codeword gives another word that belongs to the code. They have a rich algebraic structure which are useful for efficient error detection and correction. In this talk, we will mention from some results regarding the computation of the covering radii of cyclic codes over binary finite fields.

Keywords: Finite field, Covering radius, Cyclic code.

MEŞE KÜLÜNÜN ASFALT KAPLAMALARIN STABİLİTESİNE ETKİSİ

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ÖZET
Bu çalışmada, bir biyokütle kaynağı ve ormansal atık olan meşe külünün (MK) asfalt kaplamaların stabilitesi üzerindeki etkisi araştırılmış ve bu katkının yol mühendisliğinde bir iyileştirici olarak kullanılabilirliği değerlendirilmiştir. Bu amaçla, ilk olarak, penetrasyon sınıfı B 70/100 olan saf asfalt bağlayıcı ile kırmataş kalker agregasının çeşitli fiziksel özellikleri belirlenmiştir. Daha sonra, saf asfalt ile agrega kullanılarak Marshall karışım tasarım yöntemine göre karışımın optimum asfalt içeriği oranı tespit edilmiştir. Belirlenen bu asfalt içeriği oranı sabit tutularak saf (katkısız) ve MK katkılı (ağırlıkça %1, 2, 4 ve 6) sıcak karışım asfalt (HMA) numuneleri hazırlanmış ve bu numuneler Marshall stabilite deneyine tabi tutulmuştur. Ayrıca, saf ve MK katkılı karışım numunelerinin Marshall oranı (MQ) değerleri hesaplanarak HMA kaplamaların sertliği ve kayma gerilmelerine karşı direnci de değerlendirilmiştir. Deney sonuçlarına göre, en yüksek stabilite değeri %2MK katkılı numunelerden elde edilmiş ve bu orandaki stabilite değerinin katkısız numunelere kıyasla %5,9 kadar artış gösterdiği görülmüştür. Elde edilen bu sonuç, MK katkısının HMA kaplamaların kalıcı deformasyonlara karşı gösterdiği direnci üzerinde önemli bir etkiye sahip olduğunu göstermektedir. Bununla birlikte, MK katkısı ile sıcak karışımların MQ değerlerinin yine %2MK oranında %11,6 kadar artış gösterdiği tespit edilmiştir. Bu durum, MK katkısıyla karışımların kayma gerilmelerine karşı direncinin arttığını ifade etmektedir. Sonuç olarak, biyokütle kaynağı ve ormansal bir atık olan MK'nın asfalt kaplamaların stabilitesi ve kaplamanın maruz kaldığı kayma gerilmelerine karşı gösterdiği direnç üzerinde olumlu bir etkiye sahip olduğu görülmüştür.

Anahtar Kelimeler: Asfalt, Meşe külü, Sıcak karışım asfalt, Marshall stabilite, Marshall oranı.

THE EFFECT OF OAK ASH ON THE STABILITY OF ASPHALT PAVEMENTS

ABSTRACT
In this study, the effect of oak ash (OA), which is a biomass source and forest waste, on the stability of asphalt pavements was investigated and the usability of this additive as an improver in road engineering was evaluated. For this purpose, firstly, various physical properties of pure asphalt binder and crushed stone limestone aggregate with penetration class B 70/100 were determined. Then, the optimum asphalt content ratio of the mixture was determined according to the Marshall mixture design method using pure asphalt and aggregate. By keeping this determined asphalt content ratio constant, pure (without additives) and OA added (1, 2, 4 and 6% by weight) hot mix asphalt (HMA) samples were prepared and these samples were subjected to Marshall stability test. In addition, the Marshall quotient (MQ) values of the pure and OA added mixture samples were calculated, and the

hardness and resistance to shear stress of the HMA pavements were evaluated. According to the test results, the highest stability value was obtained from the samples with 2%OA additive and it was seen that the stability value at this rate increased by 5.9% compared to the samples without additives. This result shows that the OA additive has a significant effect on the resistance of HMA pavements to permanent deformations. However, it was determined that the MQ values of the hot mixes with the OA additive increased by 11.6% at the rate of 2%OA. This indicates that the resistance of the mixtures against shear stresses increases with the addition of OA. As a result, it has been seen that OA, which is a biomass source and a forest waste, has a positive effect on the stability of asphalt pavements and the resistance of the pavement to shear stresses.

Keywords: Asphalt, Oak ash, Hot mix asphalt, Marshall stability, Marshall quotient.

1. GİRİŞ

Sıcak karışım asfalt (HMA) kaplamalar, belirli orandaki asfalt bağlayıcının ve belirli bir gradasyona sahip olan agrega ile belirli sıcaklıkta karıştırılmasıyla meydana gelmektedir. Kaplamayı meydana getiren her iki malzemenin çeşitli fiziksel ve kimyasal özellikleri kaplama performansını doğrudan etkilemektedir [1-3].

HMA kaplamalarda çeşitli ağır trafik yükleri, sıcaklık ve diğer çevresel koşullar sebebiyle zamanla kalıcı deformasyon, yorulma çatlağı ve düşük sıcaklık çatlağı gibi bozulmalar meydana gelmektedir [1-3]. HMA kaplamalarda oluşan bozulmaları ortadan kaldırmak ve kaplamanın performansını arttırma amacıyla asfalt veya sıcak karışımlara (asfalt+agrega) çeşitli katkı malzemeleri eklenerek kaplamanın hizmet ömrü arttırılmaya çalışılmaktadır. Kullanılan katkı malzemelerinin başında ise başta polimerler (PE, PET, PVC, PS, PP gibi) olmak üzere çeşitli yağlar, filler malzemeler, nano ve mikro boyuttaki malzemeler, elyaflar, kauçuk, çeşitli çözücüler ve biyokütle kaynakları (tarımsal, ormansal, endüstriyel, evsel vb.)kullanılmaktadır [4-7].

Bu çalışmada ise, bir biyokütle kaynağı ve ormansal atık olan meşe külü (MK) katkısının, HMA'ların stabilitesi üzerindeki etkisi araştırılmış ve elde edilen tüm sonuçlar değerlendirilmiştir.

2. MATERYAL VE METOT

2.1. Materyal

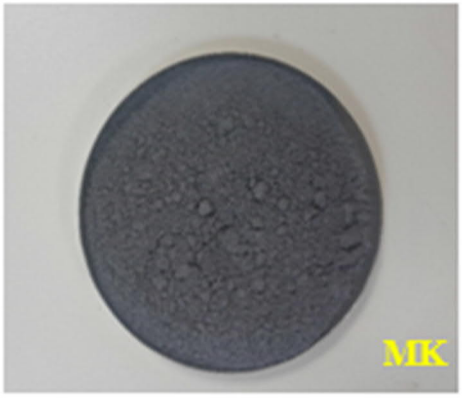
Çalışmada, B 70/100 penetrasyon sınıflı olan saf asfalt bağlayıcı kullanılmıştır. Asfaltın fiziksel özellikleri Tablo 1'de verilmiştir.

Tablo 1. Asfaltın fiziksel özellikleri

Özellik	**Standart**	**B 70/100**	
		Limit	**Sonuç**
Penetrasyon (0,1mm)	ASTM D5	70-100	88
Yumuşama Noktası (°C)	ASTM D36	43-51	46,75
Düktilite (cm)	ASTM D113	min.100	>117
Parlama Noktası (°C)	ASTM D92	min.230	238
Özgül Ağırlık (gr/cm³)	ASTM D70	1,0 - 1,1	1,038
Kütle Kaybı (%)	ASTM D2872	maks.0,8	0,23
Viskozite (135 °C)	ASTM D4402		487,5
Viskozite (165 °C)		-	150
Karıştırma Sıcaklığı (°C)	-	-	162

Sıkıştırma Sıcaklığı (°C)		-	149,5
Penetrasyon İndeksi (PI)	-	-	-0,64

Modifiyer olarak kullanılan Meşekülü (MK)'nün (Şekil 1) genel özelikleri Tablo 2'de verilmiştir.



Şekil 1. Meşekülü (MK)

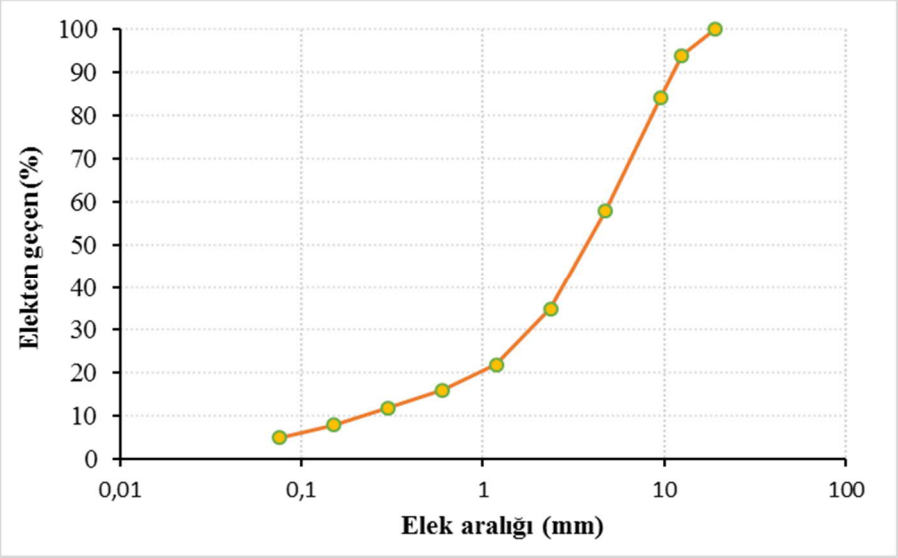
Tablo 2. MK'nin özellikleri

Özellik	**MK**
Form	Powder
Renk	Koyu gri
Yapı	Bazik
Ph	12
Özgül ağırlık	1,04 g/cm^3

Sıcak karışım tasarımı, Marshall karışım tasarım yöntemine göre yapılmış ve karışımda kullanılan kırma taş kalker agregasının fiziksel özellikleri Tablo 3'de, agrega gradasyon eğrisi ise Şekil 2'de verilmiştir.

Tablo 3. Agreganın fiziksel özellikleri

Deney	**Standart**	**Limit**	**Sonuç**
Kaba agrega zahiri özgül ağırlık (gr/cm^3)	ASTM C127	-	2,70
Kaba agrega hacim özgül ağırlık (gr/cm^3)	ASTM C127	-	2,67
Kaba agrega su emme yüzdesi	ASTM C127	maks.2	0,47
İnce agrega zahiri özgül ağırlık (gr/cm^3)	ASTM C128	-	2,75
İnce agrega hacim özgül ağırlık (gr/cm^3)	ASTM C128	-	2,63
İnce agrega su emme yüzdesi	ASTM C128	maks.2	1,66
Filler zahiri özgül ağırlık (gr/cm^3)	ASTM D 854	-	2,85
Aşınma kaybı, Los Angeles (%)	ASTM C131	maks.30	27
Donma kaybı (%)	ASTM C88	maks.10	2

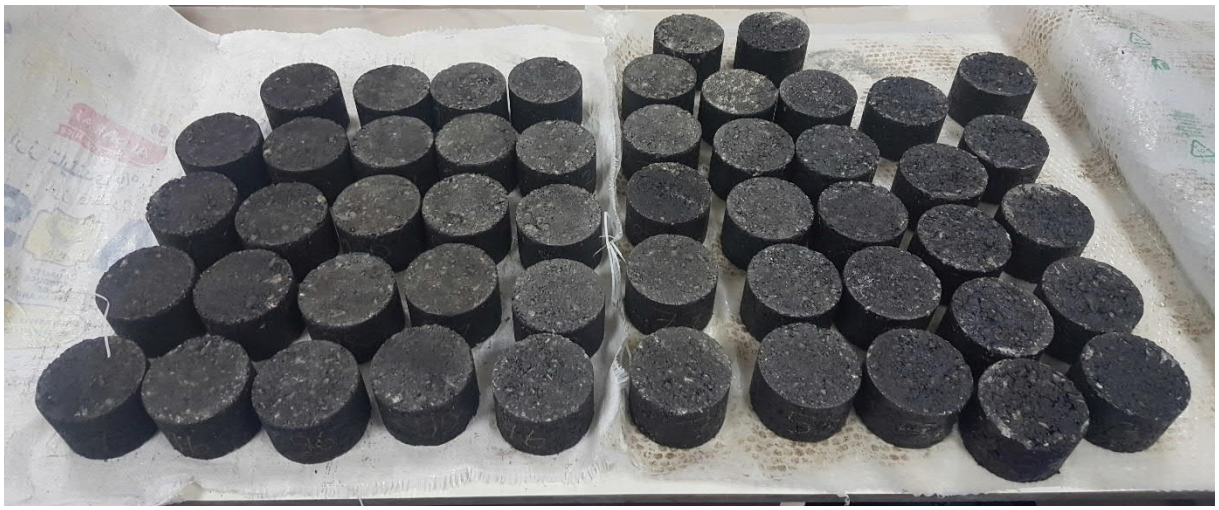


Şekil 2. Agrega gradasyon eğrisi

2.2. Metot

2.2.1. MK Katkılı Karışım Numunelerinin Hazırlanması

Asfalt karışımların performans özellikleri üzerinde MK'nın etkisi, ASTM D 1559'a göre Marshall dizayn yöntemi yardımıyla saf ve MK katkılı sıcak karışım numuneleri hazırlanarak belirlendi. Bunun yüzden, öncelikle saf bitüm kullanılarak karışım tasarımı için gerekli olan optimum asfalt içeriği (OAİ) belirlendi. Bu OAİ, esas alınarak katkısız ve MK katkılı sıcak karışım numuneleri hazırlandı. Her bir katkısız sıcak karışım numunesinin hazırlanmasında, asfalt ve 1200 gr agrega sırasıyla 162 ^{o}C ve 165 ^{o}C sıcaklıkta ısıtıldı. Asfalt+agrega harmanı karıştırma sıcaklığında karıştırıldıktan sonra, 457 mm yüksekten serbest düşen tokmak ile her bir yüzeyine 75, toplamda 150 darbe uygulanarak sıkıştırma sıcaklığında sıkıştırıldı. Aynı prosedürle, MK katkılı sıcak karışım numuneleri de hazırlanmıştır (Şekil 3).



Şekil 3. Performans Deneyleri İçin Hazırlanmış Olan Sıcak Karışım Numuneleri

Çalışmada, saf ve modifiye karışımlar yine sırasıyla B, B+%1MK, B+%2MK, B+%4MK ve B+%6MK olarak kodlanmıştır.

3. DENEYSEL YÖNTEM

3.1. Sıcak Karışımların Marshall Stabilite Deneyine Tabi Tutulması

ASTM D 1559 standardına göre gerçekleştirilen Marshall stabilite deneyinde stabilite kavramı,

kaplamaların kalıcı deformasyonlara karşı gösterebildiği maksimum dayanımı ifade ederken, akma maksimum yüke ulaştığı anda numunede meydana gelen düşey deformasyonu ifade etmek için kullanılmaktadır. Deneyde önce, sıcak karışım numunelerinin çeşitli yükseklikleri ve ağırlıkları belirlenir ve daha sonra numuneler 60±1 °C sıcaklıktaki su banyosunda yaklaşık 35 dakika bekletilir. 35 dakika sonunda numuneler Marshall cihazına yerleştirilir ve numune üzerine 50±2 mm/dakika hızla yükleme yapılarak numunenin kırıldığı andaki stabilitesi ve akma değeri cihaz tarafından otomatik kaydedilir. Deneyde standart numune yüksekliği 63,5 mm kabul edilmektedir ancak farklı yükseklikere sahip numuneler için denklem (1) yardımıyla stabilite düzeltme katsayıları hesaplanır [8,9].

$c = 5.24 \times e^{(-0.0258xh)}$

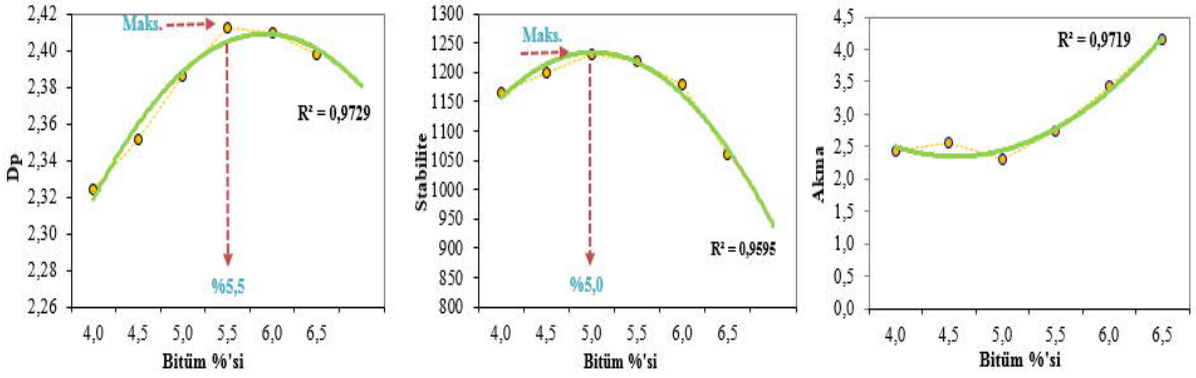
(1)

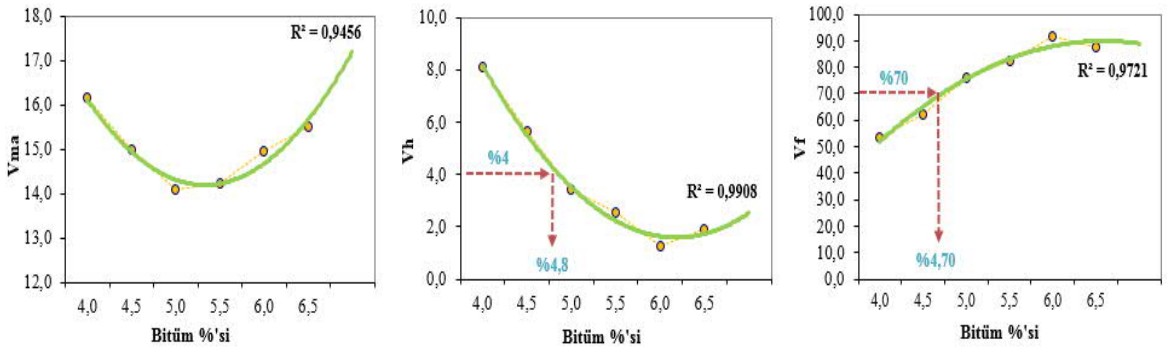
Denklem 1'de yer alan c; düzeltme katsayısı, h; numune yüksekliğini göstermektedir. Ayrıca, HMA'ların kayma gerilmelerine karşı direncinin bir göstergesi olarak kabul edilen Marshall oranı (MQ) değeri de hesaplanabilmektedir. MQ, stabilite değerinin akma değerine oranlanmasıyla elde edilmektedir [8,9].

4. BULGULAR

4.1. Marshall Stabilite ve Akma Deney Sonuçları

Saf B70/100 bağlayıcılı sıcak karışım numunesinin OAİ oranını belirlemek için, sıcak karışımda kullanılacak olan agrega miktarı sabit tutularak, agrega ağırlığının %4 - %4,5 - %5 - %5,5 - %6 - %6,5 oranlarında saf asfalt eklenerek toplam 18 adet sıcak karışım numunesi hazırlanmıştır. Karışım numunelerinin çeşitli fiziksel özellikleri (yükseklik ve ağırlık gibi) tespit edildikten sonra, çeşitli hacimsel özelikleri (hacim özgül ağırlıkları (Dp), boşluk oranları (Vh), agregalar arası boşluk oranları (VMA) ve asfaltla dolu boşluk oranları (Vf) gibi) de belirlenerek numuneler Marshall stabilite deneyine tabi tutulmuştur. Katkısız sıcak karışım numunelerinin tespit edilen çeşitli hacimsel ve mekanik özelliklerinin bitüm içeriği ile değişimi Şekil 4'de verilmiştir.





Şekil 4. OAİ için hazırlanan numunelerin hacimsel ve mekanik özellikleri

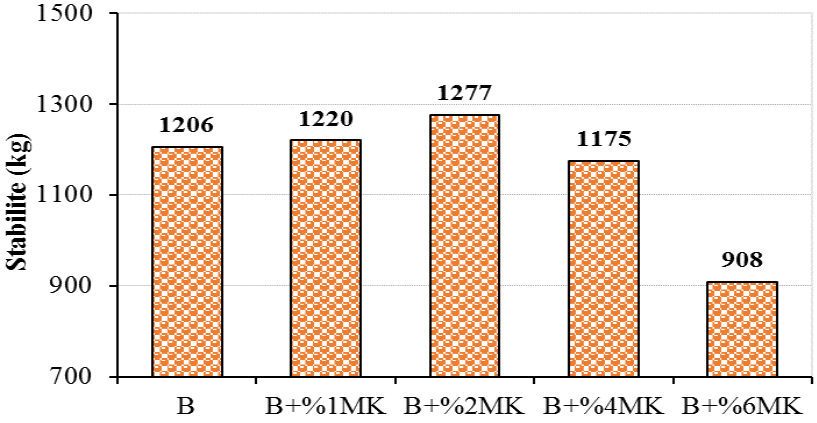
Elde edilen bu grafiklerden boşluk oranının %4'e, bitümle dolu boşluk oranının %70'e, stabilite ve hacim özgül ağırlığın ise maks. değere karşılık geldiği yüzdeler alınmış ve bu değerlerin aritmetik ortalaması alınarak karışımın optimum bitüm içeriği %5 olarak belirlenmiştir (Şekil 4).

Elde edilen bu OAİ oranında üç adet kontrol numunesi hazırlanarak bu numunelerin de aynı hesaplamaları yapılmış ve elde edilen değerlerin uygunluğu Karayolları Teknik Şartnamesi (KTŞ) [10] değerleri ile karşılaştırılmıştır. Kontrol numunelerine ait elde edilen sonuçlar Tablo 4'de verilmiştir. Sonuçların KTŞ asfalt betonu aşınma için verilmiş olan sınır değerleri sağladığı görülmüştür.

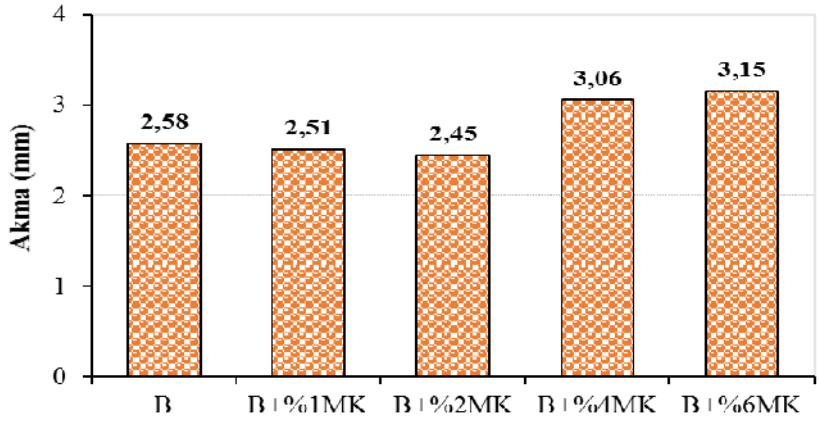
Tablo 4. Kontrol Numunesine Ait Sonuçların KTŞ Limitlerine Göre Kıyaslaması

% Bitüm	Dp (gr/cm^3)	Vh (%)	VMA (%)	Vf (%)	Stabilite(kg)	Akma(mm)
5	2,42	3,62	14,27	72,85	1206	2,58
KTŞ	-	3-5	14-16	65-75	>900	2-4

Saf ve MK katkılı sıcak karışım numunelerinin Marshall stabilite ve akma değerleri sırasıyla Şekil 5 ve Şekil 6'da, MQ değerlerinin MK artışı ile değişimi ise Şekil 7'de verilmiştir.

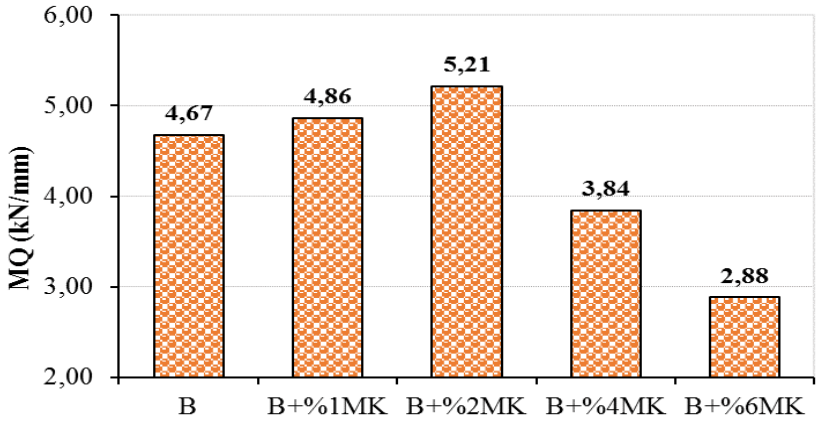


Şekil 5. Karışım numunelerinin stabilite değerleri



Şekil 6. Karışım numunelerinin akma değerleri

Şekil 5 incelendiğinde, MK katkısıyla karışımların stabilite değerlerinde saf karışıma (B) kıyasla değişimler meydana gelmiştir. Saf karışıma kıyasla bu değişimler sırasıyla %1,2 ve %5,9 artış; %2,6 ve %24,7 azalış şeklindedir. Elde edilen bu sonuca göre, en yüksek stabilite değerine %2MK katkılı karışımda ulaşılmıştır, bu durumda kalıcı deformasyonlara karşı direnci en yüksek karışım numunesinin %2MK katkılı karışım olduğunu ifade etmek mümkündür. Benzer şekilde karışımların akma değerleri incelendiğinde (Şekil 6), saf (B) karışıma kıyasla MK ilavesi ile değişimler meydana gelmiştir. Bu değişimler sırasıyla %5,1 ve %2,7 azalma; %18,6 ve %22,1 artış şeklindedir. Sıcak karışımların akma değeri, yol kaplamasının trafik yükleri altında plastik veya esnek davranışını simüle etmektedir. Bu sonuca göre, akma değerlerinin önce azalma daha sonra artış göstermesi, MK katkı artışı ile HMA kaplamanın giderek esnek davranış sergileyeceğini göstermektedir.



Şekil 7. Karışım numunelerinin MQ değerleri

Şekil 7 incelendiğinde, karışımların MQ değerleri incelendiğinde ise MK katkı oranı ile MQ değerlerinin saf karışıma kıyasla değişiklik gösterdiği görülmektedir. Meydana gelen bu değişimler saf karışıma kıyasla %4,1 ve %11,6 artış; %17,8 ve %38,3 azalma şeklindedir. MQ, HMA kaplamanın kayma gerilmelerine karşı gösterdiği direnci ifade etmektedir. Bu sonuçlara göre, en yüksek MQ değerinin %2MK katkılı karışım numunelerinde görüldüğü ve bu sebeple kayma gerilmelerine karşı en dirençli karışımların %2MK katkılı karışımlar olduğu ifade edilebilir.

5. SONUÇLAR

Meşe külü (MK) katkısının asfalt kaplamaların stabilitesi üzerindeki etkisinin araştırıldığı bu çalışmada elde edilen sonuçlar aşağıda verilmiştir:

- Marshall stabilite deney sonuçlarına göre, MK katkısıyla karışımların kalıcı deformasyonlara karşı gösterdiği direncin %5,9 kadar artış gösterdiği ve en yüksek direncin %2MK katkılı karışımlardan elde edildiği görülmüştür.
- Akma sonuçlarına göre, MK katkı artışıyla karışımların akma değerlerinin artış gösterdiği ve bu sebeple asfalt kaplamaların kırılma anında esnek davranış sergileyeceği görülmüştür.
- MQ sonuçları değerlendirildiğinde ise, MK katkısıyla karışımların kayma gerilmelerine karşı direncinin %11,6 kadar artış gösterdiği ve en yüksek direncin %2MK katkılı karışımlardan elde edildiği görülmüştür.

Sonuç olarak, MK katkısının asfalt kaplamalarda kullanılmasıyla, kaplamaların stabilitesinin ve kayma gerilmelerine karşı direncinin arttığını söylemek mümkündür.

TEŞEKKÜR

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BETON YOL YÜZEY HASARLARININ HIZLI ONARIMI

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ÖZET
Karayolu olarak kullanılan beton yollar çok fazla çevresel etkilere maruz kalmaktadır. Beton yolların diğer yapı elemanlarında olduğu gibi dayanıklılık (durabilite) çok önemlidir. Yol kaplamalarında kullanılan betonun görevi, trafikten dolayı gelen yükleri taban zeminine ileterek oluşacak deformasyonları engellemektir. Bunu yapabilmek için beton yolların rijit olmasından faydalanılır. Bazen beton yollarda deformasyon ve çatlaklar oluşmaktadır. Bu çatlakların bakım ve onarımı yapabilmek için trafiğin akışını olumsuz yönde etkisini azaltarak tamamlanması gerekmektedir. Bu çalışmada, yüzeyi hasar görmüş beton yol kaplamalarının hızlı onarımı için çimento esaslı tamir harcı ve sülfür esaslı harcın kullanımı deneysel olarak araştırılmıştır. Her iki harcının katılaşma süresi, katılaşma sürecindeki dayanım kazanması, beton yüzeyle olan aderansı deneysel olarak belirlenmiştir. Ayrıca harçların 2 sa, 4 sa, 24 sa ve 28 gün gibi farklı zamanlardaki dayanımları da belirlenmiştir. Sonuç olarak, hasarlı beton yolların yüzey hasarı onarımı sonrasında 2 saat gibi kısa sürede kullanıma açılabileceği elde edilmiştir.

Anahtar kelimeler: Beton yollar, yüzey hasarı, hızlı onarım

ABSTRACT
The choice of road pavement type is of great importance in both new highway construction and pavement renovation works. While making the selection; pavement types should be compared technically and economically, taking into account regional characteristics and country conditions, and a decision should be made as a result of these (Ağar et al., 1996; Akkaya et al., 2007). It is possible to divide the road pavement into two groups as flexible and rigid. In flexible superstructures, bituminous coating is built on the foundation and sub-base. Base and subbase are generally made with granular material (Agar et al., 1998). In rigid superstructures; The pavement layer is a type of superstructure that is poured in one or two layers, consisting of a mixture of sand, coarse aggregate, portlant cement and water, and a granular under-coating layer can be used if necessary. In a rigid pavement, the load is largely covered by the plate resting on the elastic foundation (De Nicola et al., 1994). Concrete road known as rigid pavement; In terms of both material performance and reliability of the construction method, it is a type of superstructure that will provide the most efficient engineering service on highways with medium and high traffic volumes, especially on highways where an environment suitable for speed is provided. The most distinctive feature of concrete roads, which should be considered compared to other building elements, is the surface structure. Roads are exposed to severe environmental effects, in this respect, durability (durability) is important in concrete roads, as in all other structures. The design of concrete roads should be based on durability

rather than strength (Erdoğan, 2003; Ergün and Öztaş, 2004; Karpuz, 2008). Today, there are many additives that can increase concrete performance. These naturally cause an increase in the cost of concrete. However, this increase is acceptable because it contributes positively to concrete performance. The same situation is thought to be valid for concrete road construction (Ghafoori and Sukandar, 1995). Concretes with high fluidity allow the formation of high performance (performance) concrete due to their easy settling, no need for a compression tool (vibrator), high segregation resistance, and high durability. In addition to the effective superplasticizer, it differs from conventional concrete in terms of parameters such as total fine material amount, use of viscosity increasing additives, water/binder ratio, maximum aggregate size, sand/total aggregate ratio and total coarse aggregate amount. Thanks to this feature, it is thought that it can provide resistance against the abrasive effects of traffic. The task of concrete as a road pavement is to transmit the heavy single loads from the traffic to the base and to ensure that the base is not deformed in the meantime. This results in taking advantage of the rigidity of the concrete. In some cases, deformation and cracks may occur. In order to repair these damages, they must be completed in a very short time without causing too much negativity in the traffic flow. Cement-based mortars such as fast-setting repair mortars are used in current applications. If these mortars are used, the opening time of the road for use is approximately 2 hours. In this thesis proposal, it is aimed to provide by using sulfur mortar in order to make maintenance and repair in less than 30 minutes.

Keywords: Repair of Concrete Roads, Concrete Roads, Sulfur Mortar

GİRİŞ

Ülkemiz, ulaşımda ve taşımacılık yönteminde tercih edilen yol ağı genel olarak karayoludur. Karayollarının yeni yapım aşamasında ve üst yapı yenileme aşamasında yolun üstyapısının seçim faktörü önem arz etmektedir. Seçim yapılırken üst yapıların teknik tip özellik ve ekonomisi açıdan ülke koşulları ve bölge özellikleri de göz önünde bulundurularak projelendirilmelidir [1].

Karayollarında üstlenilecek trafiğin araç tipi, hacim yoğunluğu değerleri gibi unsurlar dikkate alınarak uygun iklim şartlarında ve bölgenin gereklilik durumlarında göz önünde bulundurularak projelendirme çalışmaları yapılır. Trafikte gelen yükleri taban zeminine aktarmak için yapılan tabakalı yapıya üstyapı denilmektedir [2], [3]. Üstyapılar üç şekildedir. Bunlar; rijit üstyapı (beton yol), esnek üstyapı (asfalt yol) ve kompozit üstyapı şeklindedir [4]. Rijit kaplamalı yollar en iyi mühendislik hizmeti veren karayolları ağında kullanılan malzemenin cinsi ve yapım aşamasındaki güvenlik etkenleri göz önünde bulundurulursa trafik yoğunluğu fazla olan yollarda en iyi hizmet verecek yol üst yapı cinsidir [5]. Beton yollarda dikkat edilmesi gereken özellik diğer üstyapı kaplamalarına kıyasla yüzey yapısının iyi olmasıdır. Yollar çevre koşullarına maruz kalmaktadır. Bu maruz kalmaları mimimize etmek için durabilite yani dayanıklılık son derece önemlidir. Beton yolların tasarımı bu özellikler dikkate alınarak yapılmaktadır [6]. Yol kaplaması sınıfına giren betonun görevi, trafikte maruz kalınan şiddetli olarak yüklere maruz kalarak betonda oluşacak bozulmaları engellemektedir. Bu durum ise betonda rijit olmasından kaynaklanmaktadır. Beton kaplamadaki davranış durumu, dökülen beton tabakalarının özellikleri ile birlikte kaplama altındaki serilen malzemenin cinsine bağlı olarak değişiklik göstermektedir [7]. Bu nedene bağlı olarak projelendirilme aşamasında betondaki davranış özelliklerini etkileyen, zemin yüzeyi, temel ve alt temel malzemesinde, betonda oluşturacak agregada, çimento ve betonarme malzemeleri gibi fiziksel özelliklerinden iyi bir şekilde yararlanılması gerekmektedir [8].

Betonu oluşturan bileşenler mineral agrega, çimento, su, beton kıvam arttıran maddeleri ve prizlere

etki eden kimyasal katkılardır [9]. Bu maddelere ilave olarak betonun bakımı için gereken malzemeler ve derz oluşması için dolgu malzemeleri de eklenebilir. Belirlenen beton bileşenlerinde amaçlanacak özeliklerin elde edilebilmesi için katkısı önem arz etmektedir. Bu yüzden tüm bileşen için karışım yüzdeler göz önünde bulundurulmalı, ilgili kurallar ve sınırlar dahilinde kullanım sırasındaki koşulların belirtilmesi gerekli olmaktadır [10].

Bu çalışmanın temel amacı, beton yollarda oluşacak her türlü olumsuz etkiye karşı kullanılabilecek beton tamir harçları ve sülfürün kıyaslanması yapılmaktadır. Sülfürün geleneksel beton tamir harcı ile karşılaştırılması yapılarak incelenmiştir. Sülfürün beton yol inşaatında kullanılabilmesi araştırılmıştır.

Deneysel Çalışmalar

Kullanılan Malzemeler

Çimento ham maddesi olarak kullanilan hizli priz alma özelliğine sahip yüksek akicilik, büzülmesi olmayan ve uygun iklim şartlarina dirençli su geçirime özelliği olmayan zemin harçlaridir. Weber (w) hizli katilaşan harç beton yüzeyinde kullanilarak daha hizli katilaşma sağlamaktadir. Tamir harçlari inşaatlarin montaj işlerinde, bakim/onarim işlerinde, havaalani ve yollarin onariminda, trafiğe maruz beton zeminlerin onariminda, kaldirim ve bordür taşlari yapim ve onarim işlerinde kullanilmaktadir. Tamir harçlari zeminlere hizli priz almalari için uygulanir. Uygulama sicakliği +5°c ile +30°c arasinda yapilmaktadir. Hava şartlarinin kötü olduğu rüzgar veya güneşli zamanlarda uygulamadan kaçinilmalidir. Hava şartlari soğuk olan donmaya maruz birakilacak zamanlarda yüzeylerde uygulanmamalidir. Kullanilma süresi 10 dakikadir. Uygulama kalinliği minimum 10 mm maksimum 40 mm'dir. Servise açilma süresi ise 1 saattir.

Kimyasal formülü S ile gösterilen sülfür 25 kg çuvallarda toz halinde sarı renkte bulunur. Özgül ağırlığı 2.07 (gr/cm^3) ve erime noktası 140°C de eritilerek kullanılır. Kristalleri sekiz yüzeyli (oktaedrik) kükürttür.

Kuvars kumu(K)'nun yapısı kuvarsça zengin bileşeni olan magmatik ve metamorfik kayaçlarından ayrışarak 2 mm'den küçük oluşan kuvars (SiO_2) tanecikleri ile meydana gelmektedir. Kuvars kumunun rengi beyazdır. Eğer kuvars kumu demir oksit içeriyorsa, rengi pembeden kızıla veya kahverengiye kadar değişebilmektedir. Silisten (SiO_2) yapısından oluşturulan kuvars kumunun ise az miktar kil, feldspat, demir oksit ve karbonat bulunabilir. Doğada saf ve saf olmayarak da karışmış olarak bulunabilir. Kuvars kumlarının istenen özelliklere getirilebilmeleri için kullanılma amaçlarına göre gerek fiziksel, gerekse kimyasal açıdan cevher hazırlama işlemlerine tabi tutulurlar. Kuvars kumunun özgül ağırlığı 2.68 (gr/cm^3) dür.

Harç üretimleri ve deneyler

Referans olarak kullanılan hızlı katılaşan harç, 25 kg'lık çuval için 3,75-4,25 kg su kullanılarak karışım oranı hazırlandı. Kullanılan su/çimento (s/ç) = 0,16 olarak kabul edildi. Seçilen bu oranlar cam beherlere koyularak hassas terazide tartılarak hazırlanmıştır. Sülfür harçları ise saf sülfür, %50 S-%50 K ve %25 S-%75 K olmak üzere dökülmüştür. Sülfürün yoğunluğu 2,07 gr/cm^3 ve kuvars kumunun yoğunluğu 2,68 gr/cm^3 alınarak sülfür 140°C de eritilerek sıvı halde cam behere koyularak hassas terazilerde tartılarak hacimsel olarak belirlenen karışım oranlarında dökülmüştür (Tablo 1).

Tablo 1. Sülfür harcı karışım oranları

Malzeme	sülfür(gr)	kuvars kumu

	(gr)	
%100 sülfür	207	X
%50 sülfür-%50 kuvars kumu	103,5	134
%25 sülfür-%75 kuvars kumu	51,75	201

Kıvam deneyleri için kullanılan ekipmanlar sırası ile mekanik Vicat aleti, sonda, Vicat kalıbı, Vicat iğnesi ve cam plakasından oluşmaktadır (TS EN 196-3+A1, 2010). Vicat kalıbının derinliği (40±0,2) mm, üst iç çapı (70±5) mm ve alt iç çapı (80±5) mm olan kesik koni biçimindedir (Şekil 1).



Şekil 1. Tamir harçlarının priz süresi tayini deneyi

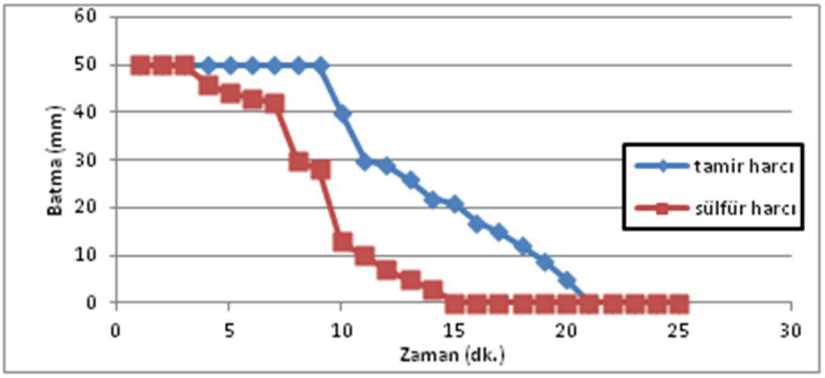
Birim şekil değişimlerini bulmak için 25x25x285 mm boyutlarındaki kalıplardan hızlı dayanımlı tamir harcı, saf sülfür harcı , %25S-%75K harcı ve %50S-%50K harcı karışımları numuneleri kalıplardan çıkartılmıştır. Çıkarılan numuneler numaralandırılmıştır. Numune kalıplarının her iki ucundaki genleşme çivileri boy değişim cihazındaki yuvalara oturtularak boy değişimleri zamana bağlı olarak dijital boy ölçer cihazında kayıt altına alınmıştır. Boy değişimleri ölçülürken ön ve üst yüzeylerine işaret konularak hep aynı yüzeyde okuma sağlanmıştır. Numuneler 7. yaşına kadar her gün okuma yapılmıştır. 7. yaşından sonra haftalık okuma yapılarak kayıt edilmiştir. Numuneler pürüzlü ve pürüzsüz olmak üzere tamir harçlarının her iki yüzeyine de yapışacak şekilde yuvarlak beton numuneleri 2 saat, 4 saat, 24 saat ve 28 günlük aderans gerilmesi deneyi yapılmıştır (Şekil 2).



Şekil 2.Tamir harçları aderans gerilmesi

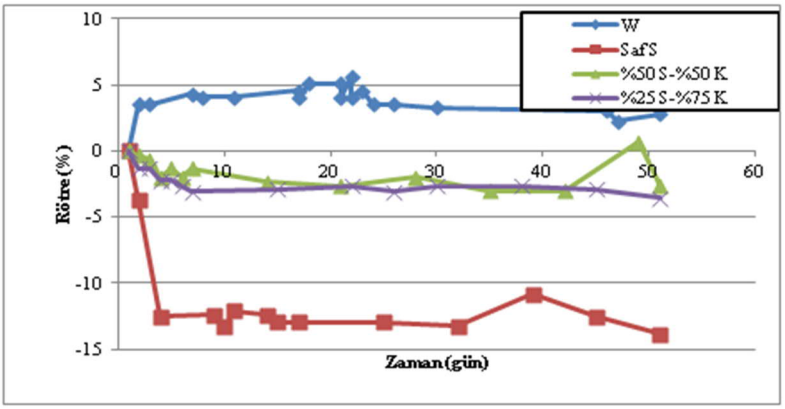
DENEY SONUÇLARI ve DEĞERLENDİRME

Tamir harcının 10. dakikada priz almaya başladığı 21. dakikada tamamladığı, sülfür harcının 4. dakikadan itibaren priz aldığı 15. dakikada priz alması durmuştur. Vicat iğnesinin batma (mm) değerleri Şekil 4.'de zamana (dk.) bağlı olarak gösterilmiştir.



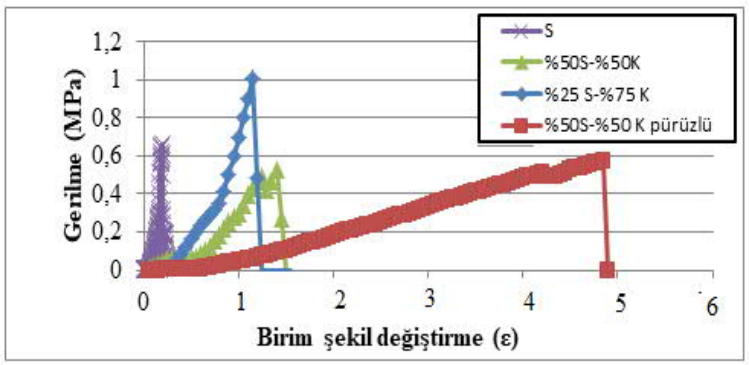
Şekil 4. Tamir harçlarının batma (mm)-zaman (dk) grafiği

25x25x285 mm boyutlarındaki kalıplarına dökülen tamir harçlarının 51 günlük birim şekil değişimleri incelenmiştir. Tamir harcının 51 günün sonunda %3 gibi uzama miktarı, saf sülfür harcının %12 gibi kısaldığı, %50 S-%50 K karışımının %3 gibi kısaldığı ve %25 S-%75 K karışımının %4 gibi kısaldığı görülmektedir. Zamana bağlı olarak boy değişim yüzdeleri (rötre) ölçülmüş ve grafikte gösterilmiştir (Şekil 5).



Şekil 5. Tamir harçlarının birim şekil değişimi- zaman grafiği

Sülfür tamir harçları 70 mm çapındaki 20 mm yüksekliğindeki plastik numunelere iki yüzeyine de temas edecek şekilde beton numuneleri pürüzlü ve pürüzsüz yüzeyler olmak üzere aderans dayanımı deneyleri yapılmıştır. Kuvars kumunun oranının ve yüzey pürüzlülüğünün etkisi görülmektedir. Bulunan aderans gerilmelerinin uzama miktarlarına göre grafiği çizilmiştir.



Şekil 6 Sülfür tamir harçlarının aderans deneyi

SONUÇLAR ve ÖNERİLER

Bu tez çalışmasında beton yollarda oluşan bozulmalardaki onarım için kullanılacak susuz harç betonu daha hızlı bakım ve onarımını yapabilmektir. Tamir harcı betonlarının prizi alıp sertleşmesi için uygun hava sıcaklığına ihtiyaçları vardır. Donma sıcaklık değerleri altına inen beton tamir harçları sıcaklıkları sertleşme için birkaç saat kadar sürmektedir. Sıcaklık değerleri 37ºC ve üzerinde olduğu zaman tamir harçlarındaki katılaşma süreleri 30 saniyeye kadar düşmektedir. Bu da bakım ve onarım esnasında yollardaki oluşan trafik aksaklıklarını minimize etmektedir.

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KARBON LİFLERİN 3D YAZICI EKTRÜDE HARÇLARA ETKİSİ

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Özet
İnşaat sektöründe 3D yazıcıların kullanımı günden güne yaygınlaşmaktadır. 3D yazıcılarda kullanılan harçların yazdırılabilmeleri için özel olarak tasarlanmaları gerekir. Yazdırılabilir harçların tasarımı, geleneksel betonlardan farklıdır. 3D harçlardaki gereksinimler harcın sertleşmiş özelikleriyle sınırlı değildir. Bu harçlarda ekstrüde edilebilirlik ve şeklini koruma gereksinimleri de karşılanmalıdır. Bu çalışmada, 3D yazıcı için tasarlanan harçların ekstrüde edilebilirliğine karbon lif kullanımının etkisi araştırılmıştır. Bağlayıcı olarak çimento kullanılan harçlar, maksimum tane boyutu 0.4 mm olan agregalarla ve 0.33 su/çimento oranlarında hazırlanmıştır. Harç karışımlarına 3 mm uzunluğunda %0.1 ve %0.2 oranında karbon lifler ilave edilmiştir. Harçlar ekstrüzyon cihazında 50-200 mm/dk hız aralıklarında ve dairesel ve dikdörtgen çıkış ucu kullanılarak ekstrüde edilmişlerdir. Çalışmada, RAM tipi ektrüzyon kullanılmıştır. Harçların ekstrüzyon cihazından çıkış yaptıktan sonra kesintisiz bir şekilde akabilme uzunlukları ölçülmüştür. Elde edilen sonuçlara göre, ekstrüzyon hızının artmasıyla birlikte harçların kesintisiz bir şekilde akabilmeleri sağlanmıştır. Diğer yandan, karbon lif kullanımıyla harçların daha kesintisiz ekstrüde edilebilmesi sağlanmıştır.

Anahtar kelimeler: 3D yazıcı, harç, ekstrüzyon, karbon lif

ABSTRACT
The use of 3D printers in the construction industry is increasing day by day. The mortars used in 3D printers must be specially designed in order to be printed. The design of printable mortars differs from conventional concrete. The requirements for 3D mortars are not limited to the cured properties of the mortar. Extrudability and shape retention requirements must also be met in these mortars. In this study, the effect of using carbon fiber on the extrudability of the mortars designed for 3D printing was investigated. Mortars using cement as binder were prepared with aggregates with a maximum particle size of 0.4 mm and a water/cement ratio of 0.33. Carbon fibers of 0.1% and 0.2% in 3 mm length were added to the mortar mixes. The mortars were extruded in the extruder at speeds of 50-200 mm/min and using circular and rectangular spouts. RAM type extrusion was used in the study. After exiting the extruder, the lengths of the mortars to flow uninterruptedly were measured. According to the results obtained, it was ensured that the mortars could flow uninterruptedly with the increase in the extrusion speed. On the other hand, with the use of carbon fiber, mortars can be extruded more continuously.

Keywords: 3D Printer, mortar, extrusion, carbon fiber

GİRİŞ

3D yazıcı teknolojisi, günümüzün en önemli gelişmelerinden biridir. Tıp dünyasından gıda endüstrisine, havacılık mühendisliğinden evlerdeki kullanım alanlarına kadar uygulama potansiyelini ortaya koymuştur. Yapı endüstrisinde bu teknoloji benimsenmekte ve büyük ölçekte üretimlerde kullanması hedeflenmektedir [1]. Çimentolu malzemeler için yeni katkı üretim yöntemleri, inşaat

endüstrisinde otomasyonu artırmak için yüksek bir potansiyele sahiptir. Bununla birlikte, bu yöntemler, imalat işleminin belirli özelliklerine ilişkin performans gereksinimlerini karşılayan yeni malzemeler geliştirilmesini gerektirmektedir [2]. Endüstriyel alanda birçok olumlu gelişmeye imza atan 3D baskı yazıcılar inşaat sektörüne de yeni bir boyut kazandırmıştır. Gelişen bu teknolojiyle beraber imalat işleri için performans gereksinimlerini karşılayan yeni malzemeler üretilmesi gerekmektedir [3]. Bu malzemelerin uygun karakterizasyon yöntemleri halen birçok araştırmacı tarafından araştırılmaktadır . Bu yöntemlerden birisi de harçların ekstrüzyon yöntemiyle yazdırılmasıdır. Ekstrüzyon harçları günümüz teknolojisinde üç boyutlu yazıcılarda baskı harcı olarak kullanılmaya başlanmıştır [4],[5]. Bu harçların sahip olması gereken en önemli özelikleri ise baskı sonrası tiksotropik davranış sergilemeleri ve bu davranışı üst katmanlar altında korumaya devam etmeleridir. Ekstrüzyon baskı, çimento esaslı malzemeleri basmak için en başarılı yöntemdir, ancak yine de malzemelerin pompalanabilirliği, inşa edilebilirlik, malzemelerdeki tutarlılık, akışkanlık ve işlenebilirlik gibi önemli zorluklarla karşı karşıyadır [6]. Ekstrüzyon baskı tekniği, katmanlı bir yapıyı basmak için bir çerçeveye bağlı bir nozülden çimentolu bulamacı ekstrüde eden bir ekstrüderden oluşur [5]. Ekstürderde farklı şekil ve boyutlarda nozullar kullanılabilir (Şekil 1).



Şekil 1. Farklı çap ve şekillerdeki nozul tipleri

Harçların 3D yazdırılabilirliği için henüz tam olarak bir işlenebilirlik ölçütü belirlenememiştir. Yazdırılabilir harçların tasarımı, geleneksel betonlardan farklıdır [7]. Harcın ekstrüzyondan akışı sırasında aşırı baskı kullanmadan ve kopmalar ve/veya boşluk oluşmadan baskı sisteminden geçebilecek kadar işlenebilir olmalıdır. Bir diğer önemli nokta da yazdırıldıktan sonra mümkün olduğunca üzerine gelen katmanları taşıyabilmeli ve katman sayısı istenilen kadar yükseltilebilmelidir. Altta kalan katmanlar deformasyon yapmadan stabilitesini koruyabilmelidir [8]. Dolayısıyla her iki gereksinim de karşılandığında, harcın yazdırılabilir olduğu düşünülebilir. Buswell vd. [5], dairesel, oval ve dikdörtgen şeklinde kullanılan farklı ekstrüzyon nozullarından bahsetmişler, ancak nozüller arasındaki farklılıklar için pek fazla ayrıntı vermemişlerdir. Mümkün olan en yüksek katmana ve gerekli şekle ulaşmak için uygun bir nozüle sahip olmanın gerekli olduğu belirtilmiştir. Dairesel nozulun, harcı yazdırırken nozul açısını değiştirmek için daha fazla kolaylık sağladığını savunmuşlardır [9]. Kwon [10] tarafından yapılan çalışmada kare şekilli nozülün elips tipinden daha iyi bir yüzey kalitesine sahip olduğu sonucuna varılmıştır. Lim ve ark. [11], çapları 4–22 mm olan dairesel nozul kullanmışlar ve yapılan çalışmalar sonucunda optimum nozul çapının 9 mm olması sonucuna ulaşmışlardır.

Bu çalışmada, 3D baskı harcı tasarımında yazdırma esnasında kopma/deforme olmadan daha uzun katman oluşturulabilmesi için literatürde verilen çalışmalardan farklı olarak karbon lif katkılı harçların farklı baskı hızlarında ekstrüde edilebilirliklerinin araştırılması amaçlanmıştır.

Deneysel Çalışmalar

Kullanılan Malzemeler

Deneysel çalışmalar harçlar üzerinde gerçekleştirilmiş olup, bağlayıcı olarak TS EN 197-1 standardına uygun olan çimento CEM I 42.5 Portland çimentosu kullanılmıştır. Çimentonun özgül yüzey alanı 3320 cm^2/g olup, özgül ağırlığı 3.1'dir. Çimentonun kimyasal özelikleri Tablo 1'de sunulmuştur.

Tablo 1. Çimentonun kimyasal bileşenleri

Bileşen, %	CaO	SiO_2	Al_2O_3	Fe_2O_3	MgO	Na_2O	K_2O	SO_3	KK
Çimento	63.6	19.6	4.72	3.27	1.91	0.34	1.06	4.72	2.69

Harç üretimlerinde agrega olarak da 0.5-400 mikron aralığında silis kumu kullanılmıştır. Kumun özgül ağırlığı da 2.64'tür. Yine harcın oluşturulabilmesi için şehir şebeke suyu kullanılmıştır. Lif olarak 3 mm uzunluğunda kesilmiş karbon lif kullanılmıştır (Şekil 2). Karbon lifin yoğunluğu 1.9 olup, elastisite modülü 400 GPa ve kopma dayanımı 2500 MPa değerindedir.



Şekil 2. Kısa kesilmiş karbon lif görünümü

Harç üretimleri ve deneyler

3D yazıcılar için harç tasarımı ve ekstrüde edilebilirliği için çimento, kum ve su bileşenler olarak karıştırılmış ve harç elde edilmiştir. Harçlar, 0.33 su-çimento oranlarında hazırlanmışlardır. Harç içerisine ayrıca %0.1 ve %0.2 oranlarında karbon lif ilavesi yapılmıştır. Agrega:çimento oranları her lif içeriği için için ağırlıkça 0.75:1.0 olarak seçilmiştir (Tablo 2). Özellikle agrega miktarı bu oranın üzerinde kullanıldığında harçlar ekstrüde edilememiştir. Her üç bileşen (agrega, çimento, su) bir kap içerisinde homojen hale gelinceye kadar spatula ile karıştırılmıştır.

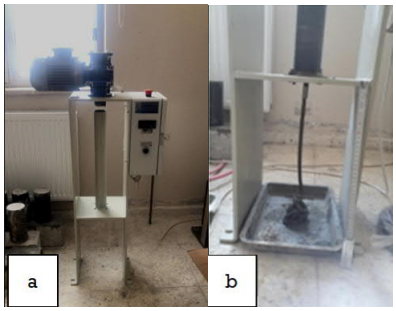
Tablo 2. Harçların birim hacimdeki (1 dm^3) bileşenleri

Hacimce Elyaf Oranı	Karbon Elyaf	
	1/1000	2/1000
Elyaf Miktarı (gr)	1,24	2,48
Çimento(g)	750	750
Agrega (gr)	450	450
Su (gr)	278	278
Su/Çimento Oranı	0,37	0,37

Harç karışımları yapıldıktan sonra öncelikle işlenebilirlik kontrolü amacıyla yayılma tablasında harçların yayılma özelikleri belirlenmiştir. Bunun için harçlar yayılma tablası üzerinde tablanın bir bölümü olan mini koni içerisine yerleştirilmiştir. Koni yukarı doğru çekildikten sonra, tablanın altındaki kol vasıtası ile 15 vuruş yaptırılarak harca darbe uygulanmış ve bu sarsıntıyla tabla üzerinde yayılması sağlanmıştır. Yayılan harcın birbirine dik doğrultuda yayılma çapları ölçülerek aritmetik ortalaması alınmıştır

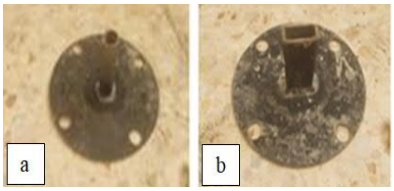
Harçlar üretimlerini ve işlenebilirlik testlerini takiben ekstrüde edilebilirlik için ekstrüder cihazına konmuştur (Şekil 3). Bu kapsamda, ekstrüzyon cihazında tıkanma yapmadan ve kopmadan akabilen

uygun kıvamlı harçların tasarımı üzerinde durulmuştur. (Ekstrüzyon cihazı olarak RAM tipi ekstrüzyon kullanılmıştır). Hazırlanan harç cihazın haznesine konduktan sonra 50-300 mm/dk arasında altı farklı hız değerlerinde harca piston ile itme kuvveti uygulanmış ve daha küçük çaplı çıkıştan sürekli akması hedeflenmiştir.



Şekil 3. Harçların baskılanmasında kullanılan ekstrüder

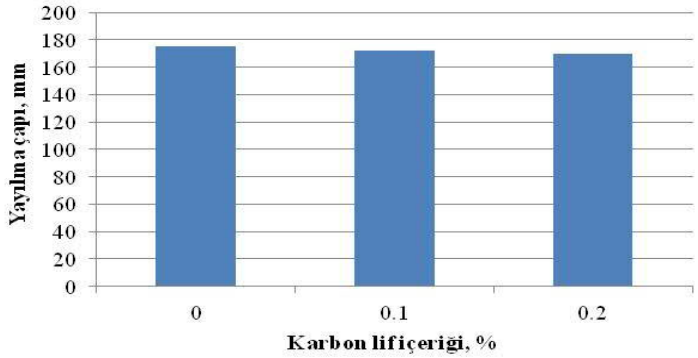
Ekstrüder cihazında harcın çıkış ucu olarak Ø10 mm dairesel uç ve 10x15 mm dikdörtgen şekilli nozul kullanılmıştır (Şekil 4). Her bir nozulla harçlar farklı baskı hızlarında ekstrüde edilmişlerdir.



Şekil 4. Ekstrüderde kullanılan nozullar

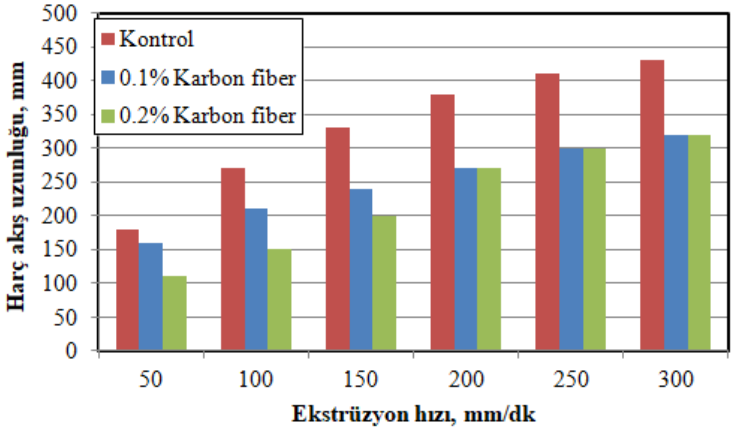
DENEY SONULARI ve DEĞERLENDİRME

Harçların taze halde işlenebilirliğinin göstergesi olan yayılma çaplarının değişimi Şekil 5'te lif içeriğine oranına bağlı olarak verilmiştir. En düşük içeriğindeki harcın yayılma değeri 175 mm iken, %0.1 ve %0.2 lif içeriğindeki harçların yayılma değerleri sırasıyla 172 mm ve 170 mm yayılma elde edilmiştir. Harç bileşimindeki lif miktarının artmasıyla harç bileşenleri arasındaki iç sürtünme artarak harcın işlenebilirliği azalmış ve bu da yayılma tablası üzerinde daha düşük yayılma değerlerinin alınmasını sağlamıştır.



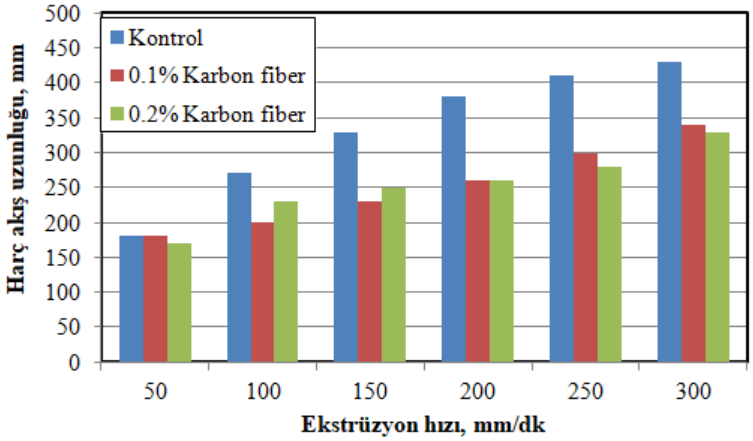
Şekil 5. Ekstrüde harçların işlenebilirliği

Ekstrüzyon cihazında nozul şekli olarak dairesel nozul kullanıldığında, hız değerlerine bağlı olarak harçların akış uzunluğu Şekil 6'da görülmektedir. Hazne çıkış ucunun yerden yüksekliği 450 mm olduğu için harçların bu uzunluk değerinde akabilmeleri hedef alınmıştır. Ekstrüzyon hızı değerlerinin artmasıyla tüm lif oranlarındaki harçların akış uzunluğu da düzenli bir şekilde artmıştır. Ancak lif kullanımıyla tüm hız değerlerinde kontrol harcına göre bir azalma görülmüştür. Karbon lif kullanımı harçların ekstrüde edilebilirliklerini kısıtlamıştır.



Şekil 6. Daire kesitli nozuldan ekstrüde edilen harçların akış özelikleri

Nozul olarak dikdörtgen uç kullanıldığında da dairesel uzun uçtaki gibi hız değerlerinin arttırılmasıyla akış uzunluklarında artışlar elde edilmiştir (Şekil 7). Ancak benzer şekilde, lif oranının %0.1 ve %0.2 oranında kullanılmasıyla ekstrüzyon hız değerlerindeki harçların akış uzunluğu kontrol harçlara göre belirgin bir şekilde daha az olduğu görülmektedir.



Şekil 7. Daire kesitli nozuldan ekstrüde edilen harçların akış özelikleri

Genel olarak değerlendirildiğinde, karbon lif kullanımı sonucunda ekstrüder içerisinde liflerin tıkanıklığa neden olmaları sonucunda akış uzunluklarının azaldığı görülmüştür. Baskı hızı arttırıldığında, akış uzunlukları da tüm harçlarda artmıştır. En yüksek baskı hızında karbon lifli harçlarda 300 mm üzerinde akış uzunlukları elde edilmiştir.

SONUÇLAR

Bu çalışmada, çimento esaslı 3D harç yazıcılar için farklı tipte nozullardan ekstrüzyon yöntemiyle yine farklı lif içerklerinde hazırlanan harçların kopmadan akabilme yetenekleri araştırılmış ve elde edilen bulgular aşağıda özetlenmiştir.

- Harçların lif içeriği arttırıldığında, iç sürtünme etkisinin artmasından dolayı yayılma tablasında daha az işlenebilirlik elde edilmiştir.
- Ekstrüzyon hızı arttırıldığında, çıkış ucundan bağımsız düşünüldüğünde, tüm harçların akış uzunlukları artmıştır.

- Dikdörtgen uçlarda dairesel uçlara göre kesit alanının daha fazla olmasından dolayı, daha düşük harç akışları elde edilebilmiştir.
- Harçların lif kullanım oranı daha az iken kohezyonun yüksek olmasından dolayı yer çekimi etkisi altında bile yüksek ekstrüzyon hızlarında 300 mm üzerindeki mesafede yer çekimi etkisi altında kopmadan sürekli akış sağlanabilmiştir. Karbon lif artmasıyla harçların sürekli akışı kaybolmaya başlamıştır.

Sonuç olarak, 3D yazıcılar için hem uygun işlenebilirliğe sahip hem de kohezyonu yüksek olup yazdırıldıktan sonra üste gelen katmanlar altında deforme olmaması için mümkün olduğunda düşük oranında karbon lif katkılı harçların üretilmesi gerekmektedir. Böylece hem akış sırasında kopmadan harç yazdırılması işlemi gerçekleşecek hem de alt tabakalardaki deformasyon sorunu en aza indirilecektir.

TEŞEKKÜR
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EFFECT OF USAGE OF POROUS AGGREGATE ON WATER HOLDING CAPACITY OF GREEN ROOF

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ABSTRACT
Green roofs constitute an essential part of the areas in sustainable buildings. Green roofs contribute to the increase and improvement of the natural environment in cities. It is not easy and cheap to determine the green roof system, which can hold water for the longest time and contribute to the plant's growth. For this reason, studies should be carried out to see and diversify the benefits of green roof system applications, develop the technology and material properties that will improve the system, and determine the materials for the green roof system that can hold the most water. This study it is aimed to measure the water retention performance by using porous aggregate in the green roof system to the flow rates of the surface runoff that may occur due to rainwater. In this direction, a green roof model was created using basalt stone as a porous aggregate of constant thickness in the part that forms the lower layer of the green roof without the surface and soil layer in the green roof system. The effects of the materials on the outlet flow rate were measured under a constant water flow for surface slopes of 3, 6, 9, and 12% of the model roof. Measurements were made with digital water flow sensors. With the data obtained, it was observed that the water flow was delayed using porous aggregates, the surface flow coefficients (C) depending on the slope were determined, and their water retention performances were revealed.

Keywords: Keywords: Green roof; water retention; porous aggregate

Introduction
Permeable surfaces are becoming impermeable as population grow in cities. Coupled with increased precipitation due to climate change, cities are experiencing stormwater management issues such as sewage floods [1], [2], [3]. These factors indicate that city stormwater management must be done quickly and effectively [4], [5].

Buildings could be a large portion of the impermeable surfaces of cities. As a result, research into sustainable building construction should be increased fast [6]. One of the essential elements of sustainable buildings is the development of building roofs that properly manage rainwater, such as green roof applications [7],[8]. On the other hand, green roofs allow existing impermeable roof surfaces to become permeable without requiring new land [9]. A waterproof membrane, root retention, drainage, filter layers, a plant development medium, and a top layer of vegetation compose a green roof [10], [3]. The green roof's vegetation layer allows some of the rain to be absorbed by the plants, while the remainder is collected in the drainage channel by penetrating the bottom layer [11].

It is difficult and expensive to select the green roof system that can store the most water for the most extended period while also contributing to plant development. As a result, studies should be conducted to determine the materials for the green roof system that can hold the most water, as well as to see and diversify the benefits of green roof system applications, develop the technology and material properties that will improve the system, and determine the materials for the green roof system that can hold the most water**.**

For all of these reasons, the water holding capacity of the drainage materials utilized in green roofs must be determined. This research aims to compare the water retention performance of porous aggregate in a green roof system to the flow rates of surface runoff caused by rainwater.

Methodology

First and foremost, a model green roof was developed for this research. A green roof model was built in this way by employing basalt stone as a porous aggregate of constant thickness in the component of the green roof system that forms the lower layer of the green roof without the surface and soil layer. Figure 1 shows the green roof system. The dimension of the system is (46X46X38 cm (height)) (Figure 1a).



Figure 1. (a) the empty ground of green roof system. (b) Porous Aggregate (Basalt)

For surface slopes of 3, 6, 9, and 12 percent of the model roof, the impacts of the materials on the outlet flow rate were studied under a constant water flow. Digital water flow sensors were used to make the measurements (Figure 2).



Figure 2. Digital water flow sensors

The employment of porous aggregates slowed the water flow, the surface flow coefficients (C) depending on the slope were measured, and their water retention capabilities were disclosed using the data acquired (Figure 1b) Permeable Aggregate (Basalt). The porous aggregate was put in the container with a thickness of 50 mm. The experiments employed a porous aggregate (basalt) with the greatest particle size of 8 mm.

The slope-dependent surface flow coefficients (C) for the drainage plate were computed using the flow data, and therefore the water-holding performance was disclosed.

$C = Qo/Qi$ (1)

Output Flow = Qo

Inlet Flow = Qi

The precipitation conversion coefficient, C, was determined in this study by dividing total output flow (Qo) by total precipitation entering the system (Qi) per unit time [12].

Results And Discssions

The outcomes of this study can be seen between figure 3 and figure 7. These figures indicate that the differences of the time lag and discharge from empty and porous aggregate surfaces for different slopes.

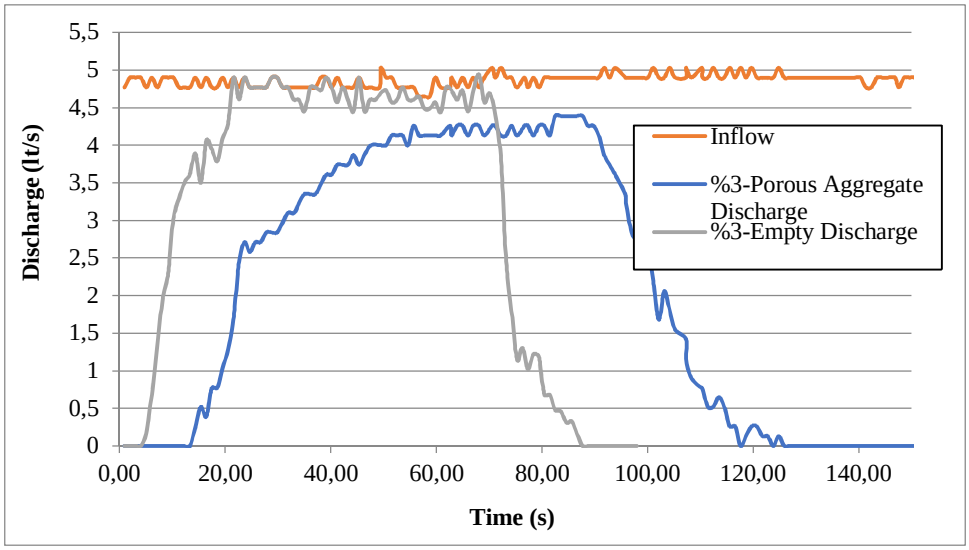


Figure 3. the time lag and discharge from empty and porous aggregate surfaces with 3% slope.

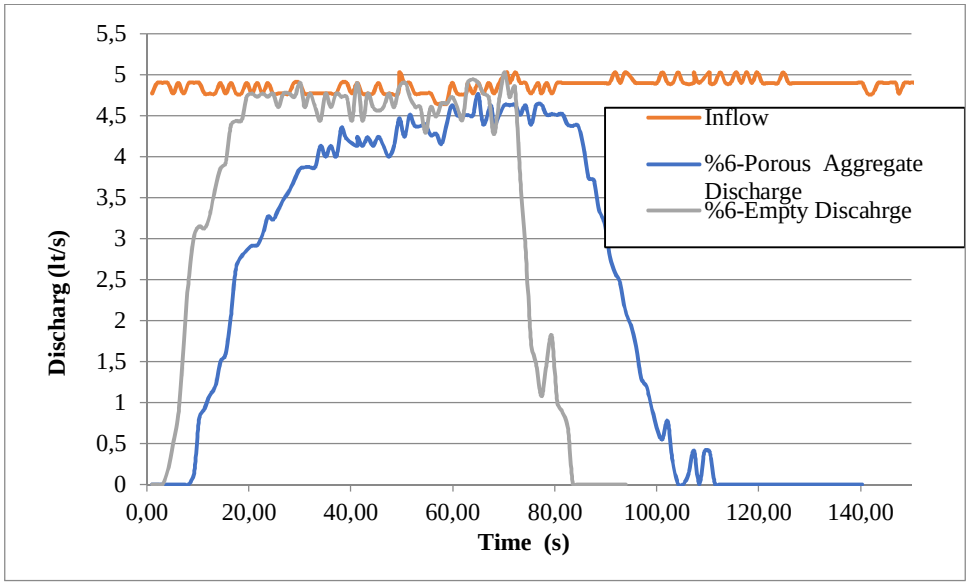


Figure 4. the time lag and discharge from empty and porous aggregate surfaces with 6% slope.

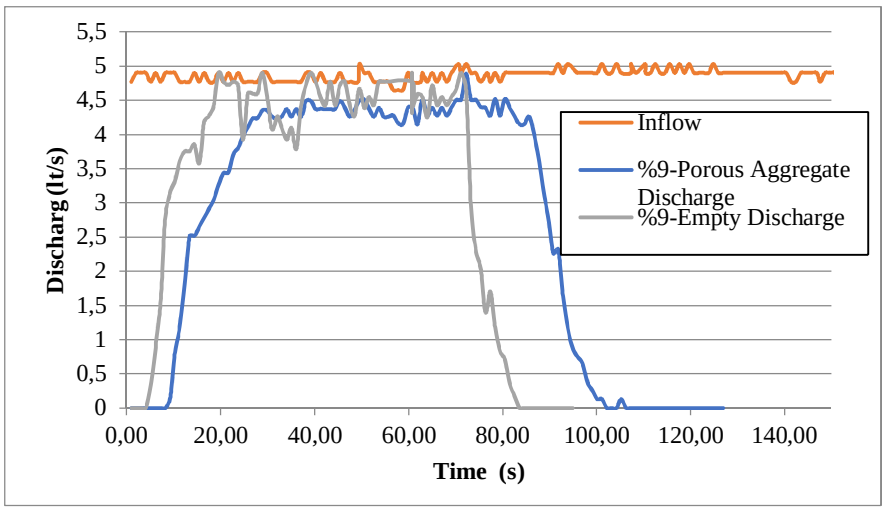


Figure 5. the time lag and discharge from empty and porous aggregate surfaces with 9% slope.

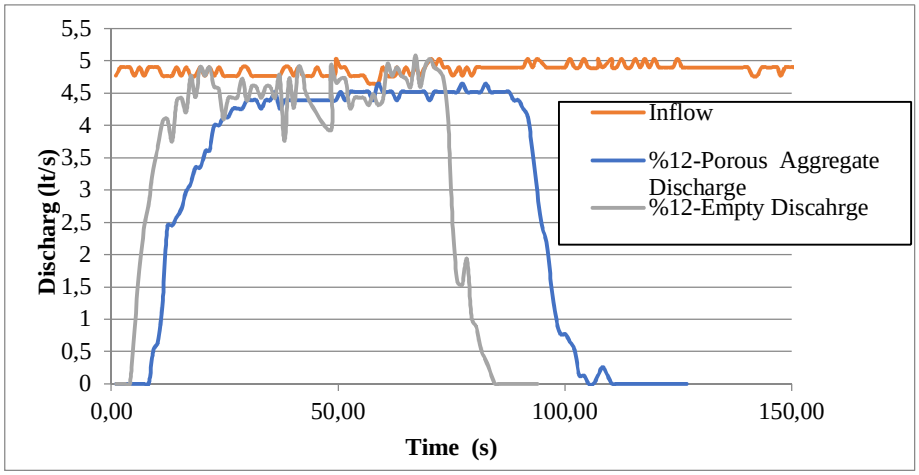


Figure 6. the time lag and discharge from empty and porous aggregate surfaces with 3% slope.

The above figures show that the impact of the bottom surface on the discharge magnitude and lag time. It was found that the porous aggregate surface has an impact, it makes longer discharge seen time at the outlet and decrease the amount of the discharge against the empty surface.

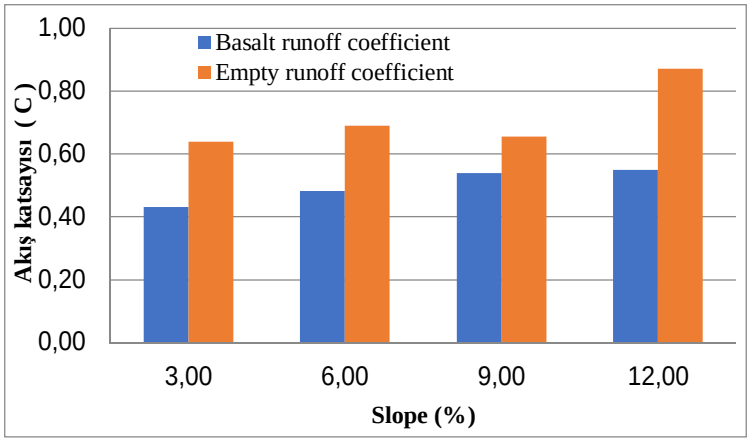


Figure 7. Runoff coefficient against slope (3,6,9 and 12%) for both empty and with pervious basalt

Runoff coefficients (C) can be seen in figure 7 for both empty surface and porous aggregate surface. When the slopes become greater from 3 % to 12%, C becomes closer to the 1 but porous surface makes it becomes lower.

Conclusions

In terms of rainwater management and producing a permeable surface, the utilization of green roofs in cities is exceptional. When porous aggregate is used layer of green roof systems, it slows the flow of water and allows it to flow at a lower rate. The drainage coefficients of green roofs reduced at all slopes when porous aggregates were used compared to vacant regions. The volume and duration of water that exits the roof can be affected by porous aggregate. On the other hand, its slope has a substantial impact on the output flow. Weight, durability (wind, bird), installation, and repair costs of the material as a substrate in green roofs should all be considered.

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USE OF INTEGRATED IRON STEEL BY-PRODUCT STEEL SLAG AS ROAD CONSTRUCTION MATERIAL

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ABSTRACT

Slags are produced in huge quantities in pyrometallurgical processes and are a major source of waste if not properly recycled and used. With the increase in industrialization, sanitary landfills are required for metallurgical slags and disposal costs increase. Fields filled with waste materials have become a source of pollution that creates air, soil and water pollution. These, in turn, affect human health and plant growth. The goal of slag recycling efforts is both environmental and economic. The liquid raw iron produced in the blast furnace is taken to the converter, and by blowing oxygen on it, unwanted elements in the steel composition are oxidized and removed from the environment. In our study, the steelwork slag; it has been observed that it has high fatigue-bending strength, good wear resistance, etc. qualities that are important for its use on highways. It has been stated that the steelwork slag can be used for highways and airport runways either directly or mixed with lime and cement in appropriate proportions to improve its performance. In recent years, with the rapid depletion of raw material reserves and the increase in costs, it is important to use more substitute materials in road construction. It has become an important necessity to provide a product with added value by working on the steel mill slag, which is waiting in an idle state in the iron and steel plants, where the enterprises have difficulty in finding a suitable place for stocking, and which poses an important problem in terms of the environment in the factories recently. The use of steelwork slag in road construction will provide significant economic, environmental and technical advantages, especially to the iron and steel and highway sectors.

Keywords: Iron Steel, Steelmaking Slag, Backfill Material, Asphalt, Recycling.

1. Introduction

The iron and steel industry is the basis for the economy of many countries [1]. World steel production in 2021 was approximately 1,95 billion tons [2]. Steel slag is a serious problem in terms of both quantity and discharge, and the formation of steel slag continues to increase with the increase in the production amount of iron and steel factories in our country and in the world. As reported in the Turkey Slag Report, 125-150 kg of steel slag is produced per tonne of crude steel produced [3]. Turkey's annual steel slag production reached 1.8 million tons by 2021. Iron and steel products; It provides essential materials for the maintenance and improvement of cars, buildings, industrial facilities, infrastructure and many other daily needs[4]. By adding slag-forming materials to the liquid raw iron, oxygen is blown in the converter, and steel slag is formed in the form of metal oxides. Steel slag, which is collected on the surface in the converter and taken into the slag pot by scraping, is unevenly discharged to the open ground in the factory. World steel slag production is estimated to be 181-271 million tons in 2018 [5, 6]. It is usually stocked within the factory site, dust formation during transportation and harmful components such as chromium (Cr) may mix with groundwater where it is spilled [7, 8].

Considering locally and globally, the need for steel production to use in some low-value-added sectors. These applications are; It includes their use as a filler in road construction [9], as an additive in cement production [10], in railway ballast production [11], glass production [12], and in thermal insulation wool production [13].

The fact that the steel slag material has an angular geometry and a clampable structure will make an important contribution to solving the problem of rutting on highways. Since the steel slag can interact strongly with bitumen, it will contribute to the production of asphalt concrete that will prevent the peeling problem. Asphalt material to be produced with steel slag will increase road safety on highways by reducing risks such as slipping and friction. For these reasons, this study will provide an important advantage for the use of steel slag in highway construction and asphalt production. Today, it has become an important necessity to provide a product with added value by working on steel slag, which is a by-product in iron and steel plants, waiting in an idle state, where businesses have difficulty in finding a suitable place for stocking, and which has recently created an important environmental problem for factories.

2. Steel Slag

Steel slag is a complex by-product of metal oxides and silicates formed by the oxidation of non-ferrous residues in liquid mine production. It has a dark gray-brown color, angular grain shape and a protruding surface. The slag consists mainly of a molten mixture of oxides of iron, silica, calcium, magnesium and alumina, and is very hard and durable. Its average density varies in the range of 3.0-3.2 gr/cm3. The general flow chart of iron and steel production is shown in Figure 1.

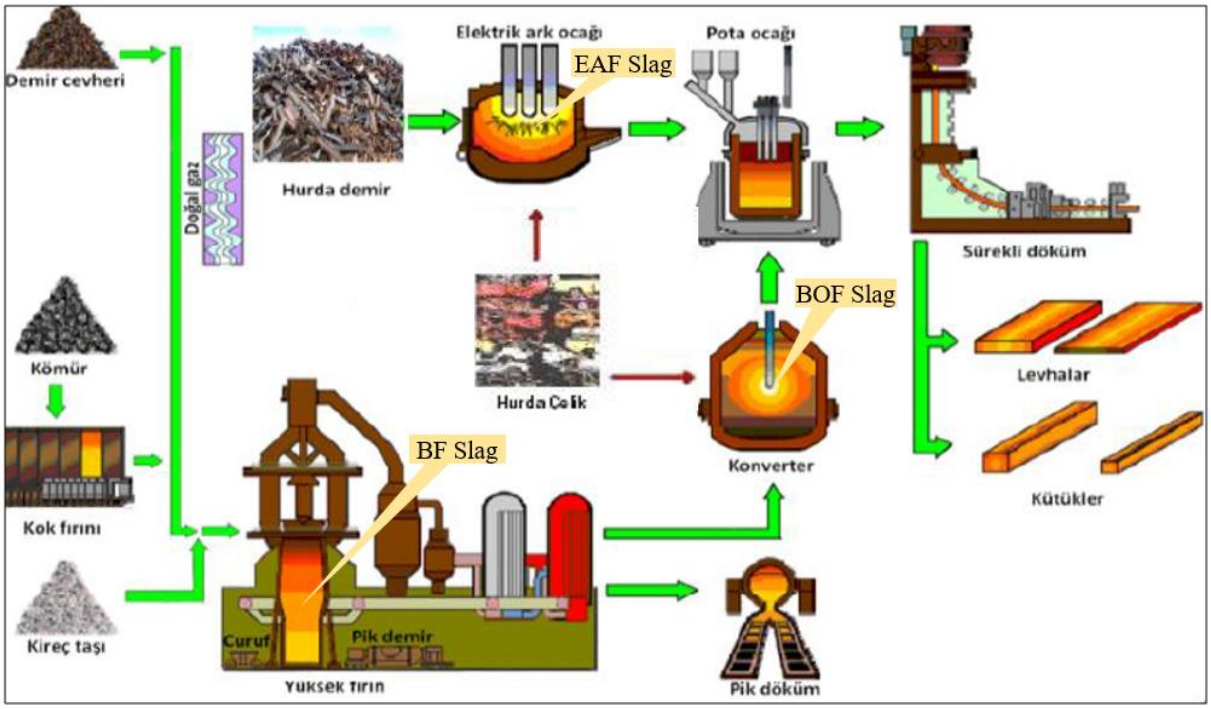


Figure 1. Iron and steel production general flow chart [32]

The main components of steel slag are CaO, Fe, SiO_2, MgO and MnO. Steel slag has a calcium silicate structure and contains approximately 38–48% CaO and 11–20% SiO_2. Fe in steel slag; It is in the form of FeO and iron-containing minerals [14]. Steel slag content (% by weight) is shown in Table 1.

Table 1. Steel slag content (% by weight) in different countries [15].

Country	CaO	SiO_2	Al_2O_3	MgO	MnO	P_2O_5	Fet	S
Turkey (Alanyalı et al., 2006)	38.62	19.28	2.71	8.05	7.52	–	22.61	0.28
Japan (Gao et al., 2015)	45.8	11.0	1.9	6.5	5.3	1.7	17.4	0.06
Brazil (Oliveira et al., 2004)	45.2	12.2	0.8	5.5	7.1	–	18.8	0.07
Sweden (Tossavainen et al., 2007)	45.0	11.1	1.9	9.6	3.1	0.23	23.9	–
France (Waligora et al., 2010)	47.71	13.25	3.04	6.37	2.64	1.47	24.36	–
China (Rao et al., 2014)	42.92	11.51	1.4	4.36	4.04	0.83	23.74	0.07

Iron and steel slags generally have similar chemical composition with respect to simple oxides calculated from elemental analysis on the basis of X-ray fluorescence. In the iron and steel production process, the cooling of the slag affects the mineralogical form and usage area of the slag [16-17]. Figure 2-a shows the tubing of the steel slag to the field and the stock areas formed in Figure 2-b.

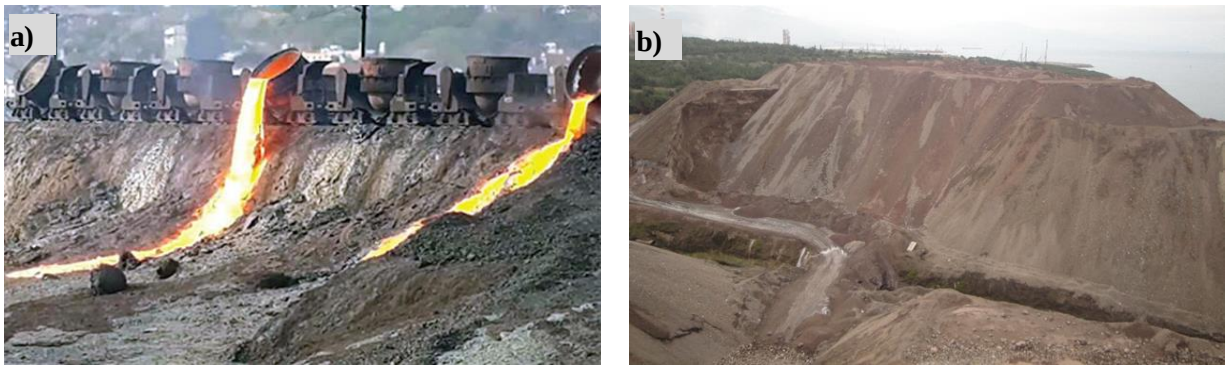


Figure 2-a) indicates the steel slag being pumped into the field **[18]** and **b)** demonstrated the stockpiles.

In the iron and steel plants, the slag of the steel mill, which is transported from the steel plant to the slag collection facility with crucibles, is recycled and cooled here. In the slag screening and evaluation facility, the ferrous material in the steel shop slag is separated to be used as scrap in the Steel Shop by means of magnetic separators, and the steel shop slag is sieved in various sizes. In the current situation, the slag of the steelworks is poured onto the heaps of steelworks slag. Slag is eliminated in the Slag Screening and Evaluation Facility. The 0-20 mm under-sieve part of the sifted steelwork slag is stocked, while the larger part is used as filling material in various areas at the factory site. A portion of 0-20 mm sifted steel slag is used in the Sinter Factory. A part of the sifted steelwork slag with a grain size of over 20 mm is taken from the fields by the regional municipalities with their own means (loading and transportation) to be used as filling material.

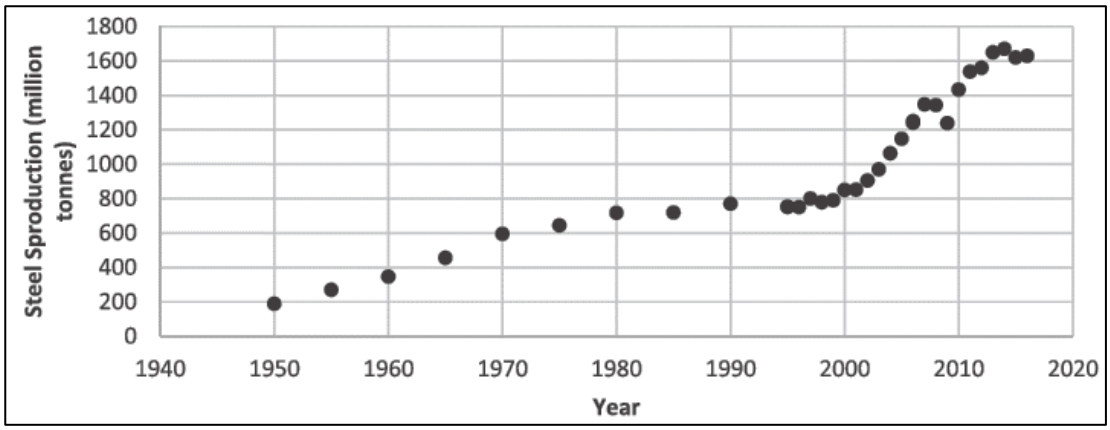


Figure 3. World total steel production million tons (1950-2016) [19, 20].

World total steel production million tons (1950-2016 is given in Figure 3. Worldwide steel production has shown an average growth rate of about 5% per year over the past 10 years.

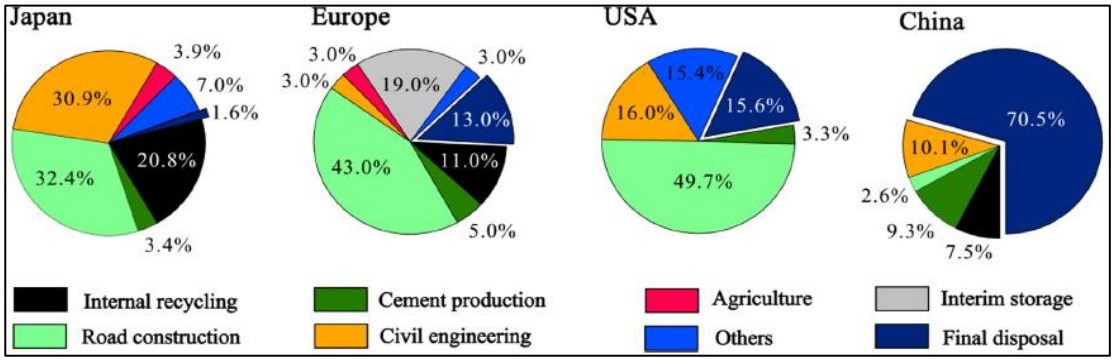


Figure 4. Usage areas of steel slag [20].

Figure 4 shows the main usage areas of steel slag by country. China, Europe, Japan and the United States account for 71.7% of the world's crude steel production.

The change in the usage area of steel slag with time can be explained in Figure 5 with the example in China. A mountain of slag has formed in every steel mill, and the pollution created by these mountains of slag has begun to threaten businesses and the environment. In this first stage, the use of steel slag was determined according to the steel efficiency. At that time, the low productivity of steel and the difficult financial situation translated into an almost 0% utilization rate of steel slag.

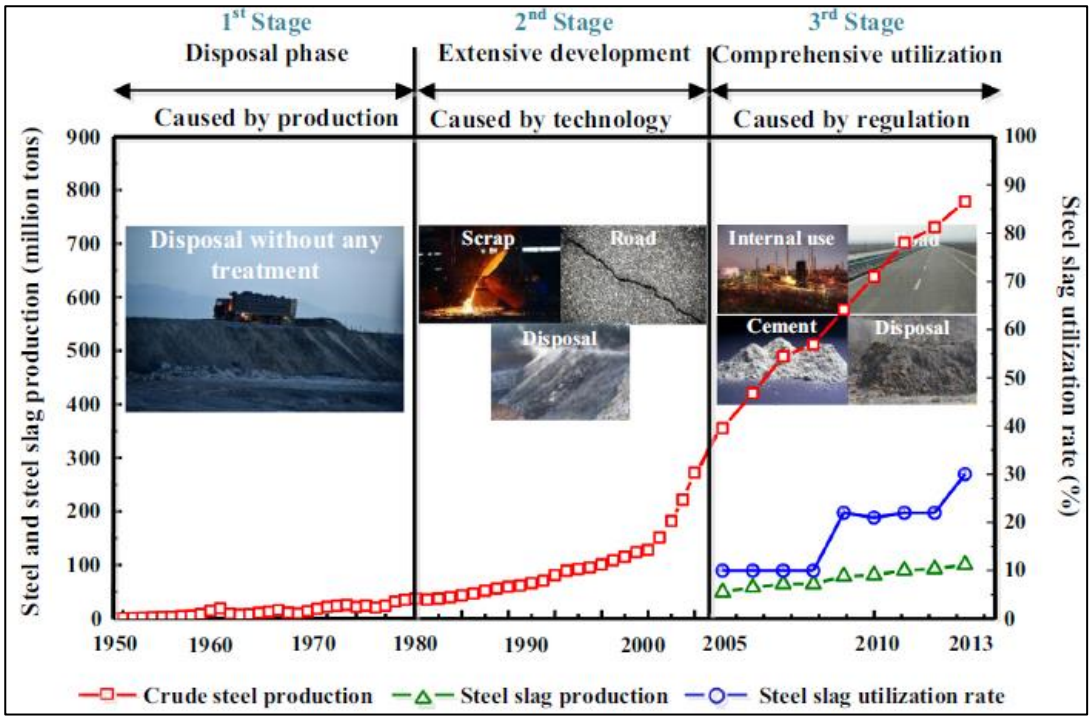


Figure 5. Usage areas of steel slag in China by years [20].

It occurred from the 1980s to 2005. In this second stage, the use of steel slag was determined according to the treatment technology. Due to the rapid increase in iron and steel production after 2005, an increase was observed in steel slag production. The massive emissions of steel slag caught the attention of environmental groups and the public. increased social pressure; Enforcement of laws, policies, regulations and standards related measures have been the main compelling factors for the use of steel slag. Steel slag has started to be used in areas such as cement production, civil engineering projects, road construction and agriculture.

Steel Slag Physical Properties: Steel slag has similar physical properties to natural aggregate. It is resistant to adverse effects such as heating and freezing due to traffic density and seasonal conditions. A comparison of the physical properties between steel slag and two types of natural aggregates basalt and granite is given in Table 2.

Table 2. Physical properties of steel slag, EAF slag, basalt and granite [14].

Property	Unit	BOF slag	EAF slag	Basalt	Granite
Bulk density	g/cm^3	3.1–3.7	3.2–3.8	2.8–3.1	2.6–2.8
Resistance to impact determined on crushed aggregates (8–12 mm)	wt.%	10–26	10–26	9–20	12–27
Absorption of water	wt.%	0.2–1.0	0.2–1.0	<0.5	0.3–1.2
Freeze/thaw resistance (particle size <5 mm)	wt.%	<1.0	<1.0	<1.0	0.8–2.0
Los Angeles test (test aggregates: 8–12 mm)	wt.%	9–18	8–15	–	15–20
Polished stone value (PSV)		54–57	58–63	45–55	45–55
Compressive strength	N/mm^2	>100	>100	>250	>120

In the literature reviews, it has been seen that the steel slag has similar strength and properties with natural aggregate in terms of its physical properties. Some values determined for the physical properties of steelwork slag are given in Table 6 in comparison with the values in the Highways Technical Specification (HTS) [14].

Table 3. Physical properties of steel slag [21].

Test	**Granite**	**Steel slag**	**ASA**	**HTS**	
				Sub-base	Base
Los Angles Value	9.8	9.8	12-18	≤45	≤35
Flatness index %	19.0	4.0		≤30	≤25
Resistance against weather effects %	5.2	ND	<4	≤25	≤20
Gloss/polish value %	52.7	56.6	58-63		
Water absorption %	0.5	1.2	1-4	≤3.5	≤3
Peeling test %		>95			

HTS: Highways Technical Specification [22], ASA: Australasian Slag Association Inc. [23]

When Tables 2 and 3 are evaluated together, it shows that the steel slag can be used as a basic and sub-base material, providing the values determined for the Highways Technical Specification in terms of physical properties such as abrasion, resistance to weather effects, water absorption.

Use of Steel Slag as Base and Sub-base: Tests have been made in which steel slag is used as a base and sub-base material together with other binders. The steel slag should be brought to a suitable size in order to provide suitable properties for the application and aging process should be applied if needed. It meets the physical and structural needs of steel slag in the construction of foundation and sub-base on highways. Its use in road construction has become attractive because it appears as a by-product in the iron and steel industry and is cheaper than the raw materials used. Figure 6 shows the use of steel slag as foundation and sub-base.



Figure 6. The use of steel slag as foundation and sub-base [24].

3. Use of Steel Slag in Asphalt Construction

The transportation and road industry can use steel slag as a sustainable and recyclable material to solve a global problem. Steel slag can replace conventional aggregates because it has similar properties to conventional aggregates as a by-product of the steel industry. Therefore, the use of steel slag in road construction reduces landfill, conserves natural resources, extends the life of the road, and can provide road construction that can be used by heavier and higher volume vehicles [25]. The use of steel slag in superstructure and asphalt construction is shown in Figure 7.



Figure 7. The use of steel slag in the construction of upper foundation and asphalt [26].

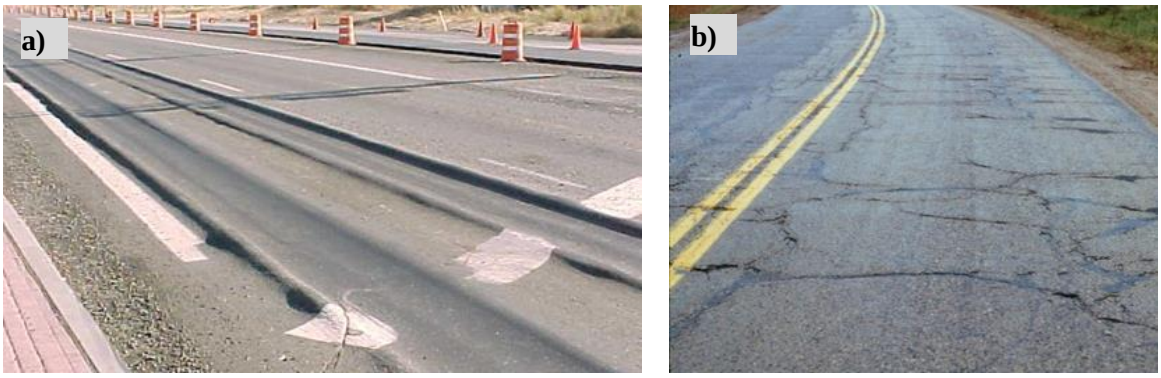


Figure 8-a). Rutting on the road, and **b)** surface cracks [27].

In Figure 8-a, rutting and surface cracks in Figure 8-b are seen on the highways. Aggregates obtained from steel slag show many positive technical and environmental properties, especially compared to natural stone aggregates. These properties make them potentially valuable road construction materials. Bitumen mixtures with steel slag showed better structural and flexible properties than mixtures with natural aggregates [28, 29]. These properties reduce rutting resistance, surface cracks, and adhesion and moisture damage resistance and peel resistance and increase the life of the road [30, 36].

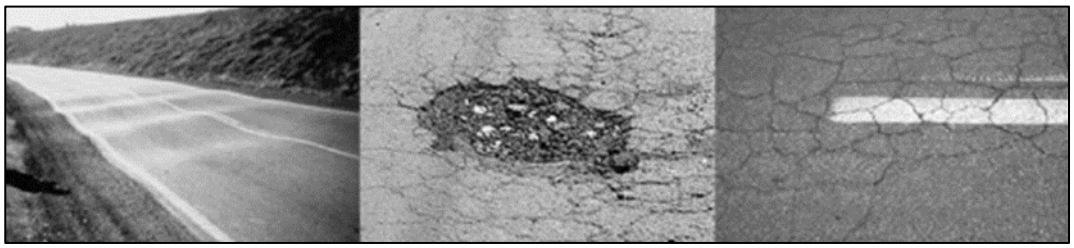


Figure 9. Deformations in the road pavement [31].

Figure 9 shows the deformations in the road superstructure. For high-speed traffic, the road is affected by recycling and alternating stress in its service life, which causes fatigue destruction [32]. Steel slag has been shown to improve the properties of asphalt mixtures in terms of fatigue life and stability [28].

Due to the strong bonding feature of steel slag with bitumen, it will contribute to the production of asphalt concrete with high peel resistance. Asphalt material to be produced with steel slag will also increase traffic safety on highways due to its shear-friction resistance.

It is seen that steel slag has high density and crushing results and high resistance and strength against degradation under heavy construction, continuous and heavy traffic conditions [33]. It provides the formation of a locking and integrating structure with its angular shaped aggregate feature. Steel slag has a high affinity for pitch since its pH is around 11. The durability of bituminous mixtures is related to the binder film thickness. Some naturally acidic aggregates tend to peel off the bitumen. Therefore, they are ideal aggregates for porous asphalt type materials [34, 35].

In the light of these evaluations, it is revealed that steel slag can be used at important intersections, traffic signals and pedestrian crossings with lower risks. Steel slag has been accepted to the standards by many countries in the world as bound or bitumen coated products. The superior properties of steel slag used as aggregate in hot mix asphalt such as good friction properties, peeling resistance, high stability and rutting-plastic deformation resistance have been determined.

4. Results

Steel slag provides a higher internal friction than natural stones with perfect angular and cubic shapes. What is desired is a good and integrated asphalt. It provides high friction resistance, especially in humid conditions, in abrasions caused by weather and traffic. Today, all developed countries accept steel slag as a by-product, not a waste material. This conclusion is based on the fact that steel slag is economically utilizable and can be converted into products with a very large market share as a high value-added material. Above all, if the steel slag is not used or made useful, the construction, especially the highway industry; it will not bring a material with high quality and features to the country's economy, leaving the national wealth idle, moreover, it will cause visual and environmental pollution. For these reasons, this study will provide an important advantage for the use of steel slag in highway construction and asphalt production.

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LIKENLERIN TARIHI TAŞ YAPILAR ÜZERINDEKI ETKILERI
LICHENS' EFFECTS ON HISTORICAL STONE STRUCTURES

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ABSTRACT

Archaeological sites, historical structures, ruins, and monuments are examples of cultural heritage assets that not only reflect different civilisation periods, but also have a favorable impact on a country's tourism sector and economic prosperity.These artistic heritages have completely different morphological, chemical and physical characteristics, making them a unicum (a unique example) that characterizes them with a certain sensitivity.Although stone has been used as a construction material since ancient times because it is a robust and long-lasting material, it is vulnerable to climatic and atmospheric conditions that cause wear and degradation over time. This degradation is caused by a combination of physical, chemical, and biological forces that cause the stone to distort and disintegrate, increase porosity, and degrade the structure overall. Biodegradation is an important problem for the conservation of cultural heritage materials. In the urban environment, natural stone is subjected to extensive biological invasion. Different biological agents can colonize stone artifacts and monuments in archaeological sites, causing biodegradation. Bacteria (chemolithoautotrophic and chemoorganotrophic), cyanobacteria, algae, fungus, lichens, mosses, and even vascular plants in the later phases of colonization are common biological agents. Lichens' role as biological agents in soil development was previously thought to be limited to geological contexts, but new study has revealed that they are capable of biodegrading stone substrata in a short amount of time.The presence of lichens on ancientstonework is viewed differently by experts from diverse fields.A lichen mosaic, for example, might be visually beautiful as well as taxonomically and ecologically interesting to a lichenologist.The invasion of lichens, on the other hand, is seen as a disfiguring threat by those interested in preserving ancient structures, as it obscures inscriptions and fine details, while also causing physical damage.Lichens are symbiosis of fungi and algae. The fungus (mycobiont) and the alga (phycobiont) form a thallus, which is a basic structure. Where the alga and fungus could not live on their own, the lichen thallus develops.This explains why lichens may be found on a wide range of surfaces, including trees (epiphytes), the ground (terricolous lichens), stone (epilithic lichens), and even glass.Both contribute to vital activity. Algae chemically fix atmospheric carbon and manufacture organic stuff such as carbohydrates, amino acids, and vitamins, while fungi give structural support, mineral nutrients, and a growth medium for the algae. Lichens also have a substantial impact on rock chemical erosion by removing different organic acids, particularly oxalic acid, which may dissolve minerals and chelate metallic cations. The amount of calcium oxalate dihydrate produced by thalli, a measure of a lichen's ability to biodegrade its substrate, affects the chemical and physical properties of the substrate as well as microclimatic factors such as air temperature and humidity.Such evidence may explain why, in addition to the obvious difficulties caused by air pollution, monuments that had

been unaffected for centuries now appear to be prone to lichen attack in recent years.Lichens may be found on granite, sandstone, slate, marble, and limestone, among other materials. Lichen development in monuments is encouraged by humidity, sunshine, suitable pH levels, pollution, degradation, and aging walls.The pH of the substrate determines the initial lichen flora on stone artifacts.Wind disperses reproductive structures, which are then carried by birds and insects across the sky. New growth may emerge if they fall into water-retaining fissures, holes, or cavities.Lichens are known to degrade stone both chemically and mechanically. The dissolving of some minerals occurs during the growth of lichen thallus (i.e. the vegetative tissue of lichens), resulting in the loss of a few millimeters of mineral substrate and the weakening of mineral grain cohesion. This study provides an overview of understanding the effects of lichen community on stone structures.

Keywords: Biodegradation, historical structures, lichens, stone, weathering

GİRİŞ

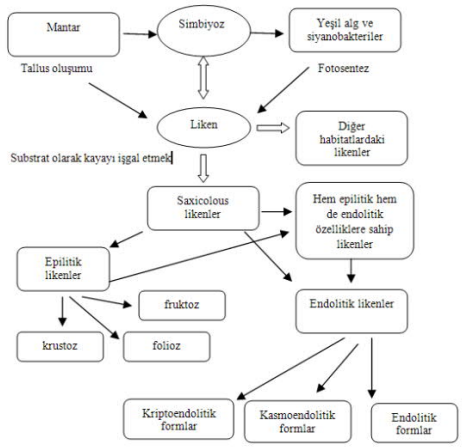
Taş kültür mirasımız, yıllar içinde aşınmaya maruz kalmaktadır [1]. Son yarım yüzyılda, taş işçiliğinin biyolojik olarak bozunmasına ilişkin araştırmalarda önemli bir artış olmuştur [2, 3]. Taş, sıcaklık, su mevcudiyeti, UV radyasyonu ve besinler gibi çevresel parametrelerde önemli dalgalanmalar ile biyolojik açıdan aşırı bir yaşam alanı sağlar [4]. Litobiyontlar (kayada yaşayan organizmalar), taş işçiliğinin estetik ve fiziko-kimyasal bozunmasının ajanları olarak kabul edilmiştir [5]. Taş yüzeylerdeki başlıca biyolojik bozunma ajanları, mantar, alg, siyanobakteriler ve fotosentetik olmayan bakteriler gibi serbest yaşayan mikroorganizmaların yanı sıra likenler, mantarlar ve algler/siyanobakteriler arasındaki simbiyotik birliktelikleri içerir [6]. Fiziksel ve kimyasal ayrışma, meydana gelebilecek iki tür ayrışmadır. Kayalar daha küçük parçalara ayrılır ve bazen fiziksel bozunmanın bir sonucu olarak oluşum katmanları boyunca kırılır. Likenler, taş substratlar, özellikle karbonatlar için en iyi bilinen ve agresif biyolojik bozunma ajanlarından biridir. Yıkıcı etkileri, tarihi ve kültürel miras anıtlarına ciddi zararlar verebilir [7, 8]. Farklı ortamlarda, farklı taş türleri üzerinde farklı liken türleri gelişir. Bitki örtüsü, açık havaya maruz kalma, suya yakınlık, taş yönelimi ve yüzey topografyasının tümü liken oluşumunu etkiler. Kimyasal ayrışma, taşlar aracılığıyla çevreden nemin emilmesiyle başlar, ardından alternatif ıslanma ve kuruma koşulları ve taş yüzeylerde karbonik asitlerin gelişimi izler [9, 10]. Mikroorganizmaların taş ve anıtlar üzerindeki çoğalması nem oranındaki değişikliklere bağlıdır [11]. Sıcak iklimin bağıl nemi arttıkça çevredeki eski yapıların bozunması kaçınılmaz olarak hızlanacaktır [12]. Daha yağışlı bir iklimin olduğu bölgelerde, miras varlıklarında da biyolojik büyümede artış öngörülmektedir [13]. Likenlerin dağılımı ve miktarı ile liken türlerinin zenginliği, sıcaklık ve yağıştaki değişikliklerden etkilenir [14, 15]. Kimyasal bozunma da kaya bozunmasında önemli bir faktördür. Esas olarak likenler tarafından üretilen asitlerin ve ikincil metabolitlerin aktivitesinden kaynaklanırlar ve bunlar hidrasyon, oksidasyon, çözünme (örneğin karbonatlar) ve element çözünürlüğü ile mineral korozyonuna veya değişikliğine neden olur [16].

LİKENLER

Likenler ilk olarak Erken Devoniyen Dönemi'nde (400 – 600 milyon yıl önce) evrimleşmiştir [17, 18]. Likenlerin gezegenin ilk kolonistleri arasında oldukları ve karasal ekosistemin %6'sını kapladığı tahmin edilmektedir [19, 20, 21]. Bu nedenlepaleontolojik kanıtlar, biyosfer gelişiminin erken evrelerinde, hem suda hem de nemli karasal ortamlarda bir dizi ortakyaşamın ortaya çıktığını göstermektedir. Bugün likenler, kurak karasal ortamlardan tatlı su ve deniz ortamlarına kadar bilinen hemen hemen her ekolojik nişte yaşamaktadır [22]. Likenler dünyanın biyolojik çeşitliliğinde önemli

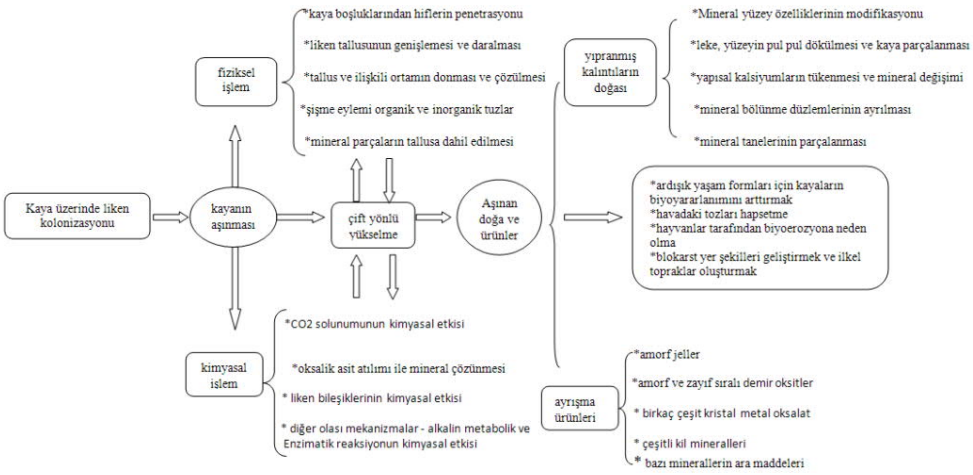
bir rol oynamaktadır. Bazı yerlerde tür zenginliği, damarlı bitkilerinkine eşit veya daha fazla olabilir [18]. Likenler, son yıllarda büyük ölçekli ekosistemlerde görülenlere benzer madde ve enerji alışverişi mekanizmalarına sahip, kendi kendini idame ettiren küçük ölçekli ekosistemler olarak tanımlanmıştır [22, 23, 24].

Çıplak ve açıkta kalan anıtlar ile eski arkeolojik alanların kalıntıları, çekici renk ve morfolojiye sahip olan likenlerin istilası ve kolonizasyonu için mükemmel bir ortam sağlar [25, 26]. Anıtlarda farklı liken türlerinin yetişmesi tesadüf değildir.Her tür yalnızca belirli bir pH, nem, parlaklık ve azot kaynağı aralığında yaşayabilir;bazı türler yalnızca çok dar bir değerler aralığında (stenoik) yaşayabilirken, diğer türler daha geniş bir koşul aralığında (euroik) büyür [27]. Likenler, yosunlardan farklı olarak beyaz, siyah, turuncu, yeşil, kırmızı, sarı ve kahverengi gibi çeşitli tonlarda bulunur ve daha sert ve kırılgandır [28]. Likenler, fotobiyont hücreler veya mikrokoloniler ile iç içe geçmiş mantar hücreleridir [22]. Likenlerin çoğu süngerimsi veya mukuslu bir dokuya sahiptir [22]. Likenler, mantar ve alglerle simbiyotik olduklarından, yüksek sıcaklık dalgalanmaları, kuruma ve tuz dahil olmak üzere çok çeşitli dış streslere dayanabilir [26]. Islak durumda kuruma, nem tutma ve thallus esnekliğine karşı direnç, hücre duvarı polisakkaritlerinden kaynaklanır [22]. Likenlerin substratları üzerindeki fiziksel etkileri, kuşkusuz, liken hiflerinin kayalardaki çeşitli boşluklara nüfuz etmesiyle başlar.Liken mantarının kaya içinde oluşturduğu hifal tabakası, kaya yüzeyinde görülen simbiyotik thallustan on kat daha kalın olabilir [29]. Ayrıca, bazı endolitik likenler, raporlara göre, kolonizasyonun farklı aşamalarında chasmoendhololitik ve endolitik fazlar sergiler [30] (Şekil 1).



Şekil 1. *Likenler ve habitat çeşitliliğine göre sınıflandırılmaları* [31].

Ayrıca likenler poikilohidrik organizmalardır; bu nedenle, thallus, suyun mevcudiyetine veya donma ve eritme işlemlerine bağlı olarak genişleyebilir veya büzülebilir [16]. Genel olarak, likenler tarafından kayaların fiziksel aşınması aşağıdaki mekanizmalarla ilerler: 1. hiflerin taneler arası boşluklar ve mineral yarılma düzlemleri yoluyla nüfuz etmesi; 2. mikroklimatik ıslanma ve kurutma ile thallusun genleşmesi ve büzülmesi; 3. liken thallusunun ve ilgili mikro ortamın dondurulması ve çözülmesi; 4. liken aktivitesinden kaynaklanan organik ve inorganik tuzların şişme hareketi ve 5. mineral parçalarının thallusa dahil edilmesi [31] (Şekil 2).



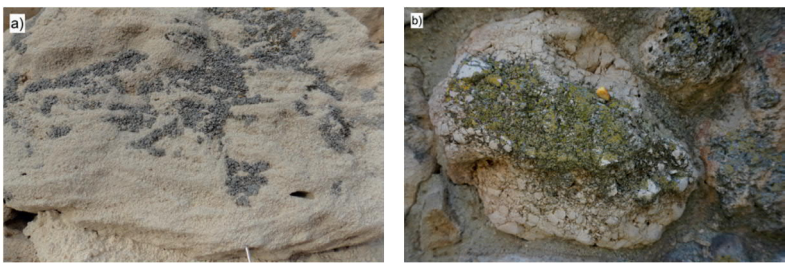
Şekil 2. *Likenlerin substrat kayaları üzerindeki etkilerini gösteren akış şeması* [31].

Liken topluluğu, çeşitli yüzeylerde ve çeşitli ortamlarda, genellikle başka hiçbir organizmanın hayatta kalamayacağı yerlerde bulunabilir. Aşırı sıcaklık ve nem değişimleri ile yaşanılmaz nişleri kolonize edebilirler ve bu nedenle yeni alanların kolonizasyonunda öncü olarak kabul edilirler [32]. Likenler, özellikle kayaların yüzeyinde yaşayanlar, yavaş gelişirler ve binlerce yıl çürümeden yaşayabilirler [33].

ÖNCEKİ ÇALIŞMALAR

Birkaç çalışma, taş yüzeylerin aşınmasında rol oynayan likenleri tanımlamış ve bunların iyi bilinen aktiviteleri, tarihsel olarak önemli yapıların yok edilmesiyle ilişkilendirilmiştir [34].
Bazı yazarlara göre, bazı durumlarda liken gölgeliği, alt tabakayı atmosferik ajanlar ve kirleticiler gibi diğer bozunma faktörlerinden bile koruyabilir [16]. Likenler ve kaya alt katmanları arasındaki temas üzerine yapılan çok sayıda çalışma, en azından belirli liken türlerinin gelişiminin mineral bozunmasını hızlandırabileceğini açıkça göstermektedir.

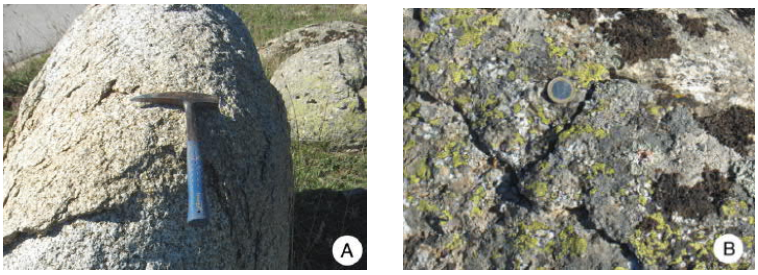
Orta Macaristan'da kısmen yıkılmış bir Orta çağ kilisesinin, yığma duvarın farklı kısımlarında çeşitli tiplerde bozunma formları gözlenmiştir. Biyolojik ayrışma tüm litotiplerde görülür. Açık gri likenler ve yeşil alglerin kolonizasyonu ile yeşil likenler de yaygındır [35] (Resim 1).



Resim 1. *Biyolojik ayrışma formları: likenler taş yüzeyleri kolonize etmiştir: (a) kireçtaşı üzerinde gri likenler (b) açık yeşil liken tabakası ile dolomite-breccia* [35].

Tipik bir dağlık Akdeniz ortamı olan İtalya Calabria Sila yaylalarında açığa çıkan granodiyorit (bileşiminde granit ve diyorit arasında kuvars ve plajiyoklaz içeren iri taneli plütonik bir kaya) küresel

kayaları kaplayan beş epilitik liken türlerine rastlanmıştır. Her türün liken-kaya ara yüzeyi üzerinde, karşılıklı olarak ve liken içermeyen granodiyorit örnekleriyle karşılaştırılarak detaylı bir araştırma yapılmıştır. Kayalar genellikle soğan benzeri bir yapıya sahiptir, orta derecede yıpranmış bir dış kabuk ve bazen liken toplulukları tarafından yoğun bir şekilde kaplanmış milimetre ila santimetre kalınlığında pul pul dökülme tabakaları veya pulları ile çevrili yıpranmamış bir iç çekirdeğe sahiptir [36] (Resim 2A, B).



Resim 2. *Sila Masifi yaylalarında likensiz (A) ve liken kaplı (B) küresel granodiyorit kayalar üzerinde ince pul pul dökülme tabakaları* [36].



Resim 3. *Kumtaşı (Pietra Serena) yontulmuş bir yüzeyin liken kolonizasyonu ile ilişkili kaya dökülmesi* [5].



Resim 4. *Alp köyü Gressoney-la- Trinité'nin Walser mezarlığındaki granit mezar taşı üzerindeki likenler, İtalya* [5].



Resim 5. *Federal Hall Ulusal Anıtı'nın çatısında Candelariella aurella ve biyofilm. Kabuklu liken karbonat kristallerini kaplar* [37].



Resim 6. *Memorial Amfitiyatrosu'nun parapetinde Lecanora dispersa ve biyofilm. Kabuklu liken, kristaller arasında mikro kırıklara nüfuz eden hiflerle karbonat kristallerini kaplar* [37].

Saint Petersburg'daki Tarihi nekropol anıtlarında canlı organizmalar tarafından oluşan biyolojik tortularda liken kolonizasyonuna rastlanmıştır [38] (Resim 7).



Resim 7. *Likenlerin baskın olduğu biyofilmler* [38].

Mantar ve fototrofik mikroorganizmaların (algler veya siyanobakteriler) fotosentetik olmayan bakterilerle simbiyotik ortaklıkları olan likenler, muhtemelen en görünür taş biyofilmlerdir ve genellikle görsel olarak çekici olarak görülürler [39, 40] (Resim 8 a,b).



Resim 8. ***a****) Birleşik Krallık'ta bir taşra mezarlığında bir mezar taşında büyüyen beyaz ve sarı likenler (ve yeşil yosun), (b) Avustralya'da aborjin sanatına yakın bir kayaya dönüşen mavi liken* [39, 40].

2010 yaz aylarında Mores belediyesi tarafından Sassari Üniversitesi Doğa ve Çevre Kaynakları Bilim Departmanına danışılarak dolmen üzerinde büyüyen liken üzerine çalışmalar yapılmış ve çeşitli liken türlerine rastlanmıştır [16] (Resim 9).



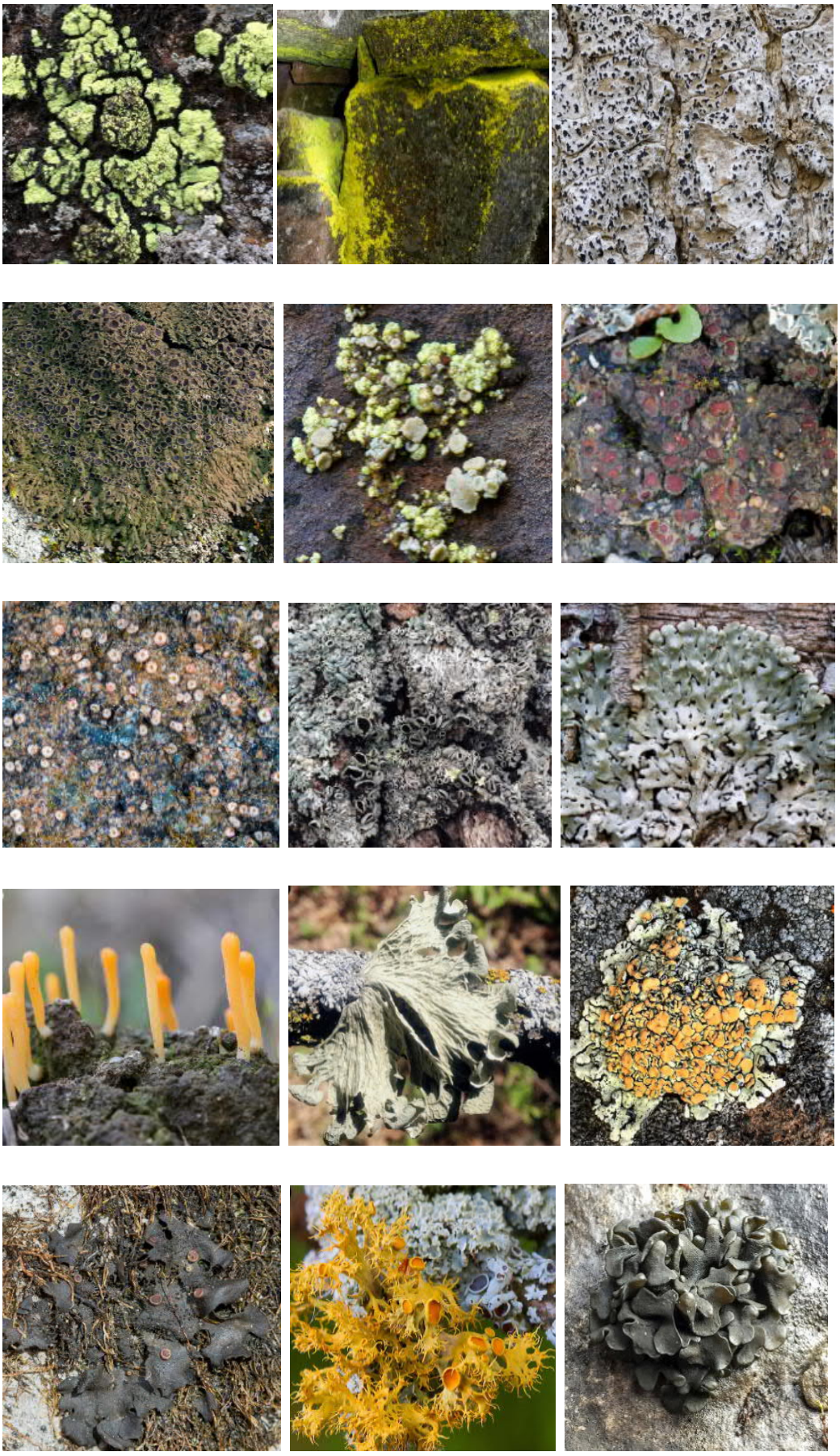
Resim 9. *Sa Coveccada'nın (Mores, Sardinia) megalitik Dolmenlerinde keşfedilen liken kolonizasyonu* [16].

Hatay, Türkiye'deki tarihi St. Simon Manastırı'nda yaygın olarak liken topluluklarına rastlanmıştır [41] (Resim 10).



Resim 10. *Hatay St.Simon Manastırı'ndaki taş yapılarda görülen liken toplulukları, Türkiye* [41].

Son yıllarda yapılan detaylı çalışmalarda, Kanada Ontario'nun liken florasında yeni ve ilginç türler belgelenmiştir [42, 43, 44] (Resim 11).



Resim 11. *Kanada'nın Ontario şehrinde çeşitli yerlerde tespit edilen liken örnekleri* [45].

SONUÇ

Likenler, aşınmış tarihi anıtların hazır sömürgecileridir. Yüzeyleri lekeleseler de, bu yüzeylerin dejenerasyonunda veya korunmasında nasıl bir rol oynadıkları belirsizdir [37]. Liken kolonizasyonunun çifte rolü geniş çapta araştırılmış ve çeşitli deneysel çalışmalarla gösterilmiş olsa da, bir liken türünün veya liken topluluğunun bir biyolojik bozunma veya biyolojik koruyucu etkiye sahip olup olmadığının belirlenmesi hala bir sorundur [46, 47, 48, 49, 50]. Bunun nedeni, likenlerin oynadığı rolün hem kolonize taşın türünden hem de çevresel koşullardan etkilenmesidir. Bulgular, çeşitli likenler ve taş arasında önemli bir etkileşim olduğunu ortaya koymuştur [51]. Açık hava anıtlarında liken kolonizasyonunun çevre, oryantasyon, substrat tipi ve nitrojen bileşeni mevcudiyeti dahil olmak üzere çeşitli koşullara bağlı olduğu yaygın olarak kabul edilmektedir [52].

Liken toplulukları, gözlemlenen yıkıcı etkiye dayalı olarak, ılıman ve Akdeniz bölgelerinin yanı sıra yarı kurak bölgelerdeki taş işçiliğinin korunması için potansiyel bir tehlike olarak düşünülmelidir [53]. Bu nedenle, likenler ne kadar güzel görünürse görünsün, işgal ettikleri taşlara tartışmasız geri dönüşü olmayan hasarlar vermektedirler. Diğer bir nokta da likenlerin mezar anıtlarının görsel kalitesini bozarak yazıtların okunmasını zorlaştırabilmesi veya imkansız hale getirebilmesidir. Liken, yapılan araştırmalara göre taşı hem kimyasal hem de mekanik olarak bozmaktadır [54]. Likenin endolitik bileşeni, epilitik liken thallus'tan daha sağlam ve iyi korunmuş bir mikro yaşam alanı sağlar ve kayaların içinde kendi ekolojik gradyanını yaratır. Aşırı güneş radyasyonu, sıcaklık değişiklikleri, rüzgar ve kuruma, endolitik mikro habitat tarafından korunur. Mineral besinler, kaya nemi ve büyüme yüzeylerinin yanı sıra liken simbiyozundan karbonhidratlar sağlanır [26]. Mantar ve alg arasındaki simbiyozun zayıf noktaları olduğu için likenler atmosferik kirliliğin doğal sensörleri gibi davranırlar.Yüksek kirlilik, özellikle kükürt dioksit, liken thallusuna zarar vererek yavaşlamasına ve sonunda ölmesine neden olur [55]. Sürekli ayrışma süreçleri nedeniyle, endolitik ekosistem ise sık ve yavaş gelişir. Kalsiyum, fosfor ve magnezyum gibi temel besinlerin miktarı ayrışma devam ettikçe azalırken, artan gözeneklilik nedeniyle endolitik yüzey alanı büyür [56].

Biyojeofizik ve biyojeokimyasal gibi süreçler nedeniyle taş yüzeylerde önemli değişiklikler ile daha ciddi zararlara neden olma potansiyeline sahiptirler. Likenler salgıladıkları karbondioksit, karmaşık özelliklere sahip liken bileşikleri ve oksalik asit karbon sonucunda kimyasal değişiklikler meydana getirirler [57]. Rigamonti'ye (2008) göre likenler, bazı türlerin neden olduğu kimyasal-fiziksel bozunma ve kromatik modifikasyon nedeniyle yok edilmesi gereken bir rahatsızlık olarak düşünülebilir [58].

Modern elektron mikroskobu ve kimyasal teknikler, birçok likenin, fiziksel ve/veya kimyasal süreçlerin bir sonucu olarak, özellikle kayalar ve taş işçiliği gibi çok çeşitli malzemelerin bozunmasına katkıda bulunduğunun anlaşılmasını mümkün kılmıştır [20]. Birçok liken türü, özellikle su tutma açısından, thallus/alt tabaka temasında mikroiklimsel etkiler üretir, bu da kuşkusuz on yıllık veya daha kısa bir zaman ölçeğinde taş yapıda mekanik hasara neden olur.Likenlerin taş anıtlar üzerinde neden olduğu bariz hasara rağmen, diğer tüm bozunma süreçleri kapsamlı bir şekilde araştırılmalı ve analiz edilmelidir.Bu tür araştırmalar, hava kirliliğinin neden olduğu bariz zorluklara ek olarak, binlerce yıldır zarar görmemiş olan anıtların neden son yıllarda liken saldırısına meyilli göründüğünü açıklayabilir.

Likenlerin yıkıcı etkileri olsa da, bazı durumlarda diğer abiyotik bozunma nedenlerine karşı bir miktar koruma sağlayabilirler. Likenlerin, en azından bazı durumlarda, özellikle abiyotik ayrışma

süreçlerinin önemli ölçüde daha yoğun olduğu bölgelerde, kayaların hava koşullarına karşı korunmasında rol oynadığı varsayılmıştır. İlk olarak, yoğun bir liken örtüsü, kaya alt tabakasını dış ortamlardan koruyan ve rüzgar aşınması, yağmur damlası etkisi, su akışı, sıcaklık değişimi, tuz birikimi ve hava kaynaklı kirlilik gibi fiziksel ve kimyasal aşınma ajanlarının etkilerini tamponlayan bir bariyer oluşturabilir. Likenlerin mineral substratlarının ayrışmasını her zaman hızlandırmadığı göz önüne alındığında, etkileri koruyucu işlevlerini de içermelidir. Herhangi bir ekosistemde, hangi türlerin fiziksel ve kimyasal ayrışmaya neden olduğunu ve hangi türlerin zararsız olduğunu ve abiyotik ayrışmaya karşı koruma sağladığını ayırt etmek büyük önem taşımaktadır [31].

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ROAD NETWORK DEVELOPED ASSIGNMENT TO IMPROVE TRAFFIC FLOW

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ABSTRACT
This study was conducted to analyze and implement a new traffic assignment for a road network. In many urban areas, in which mobility activities are increasing and the road network is under severe traffic conditions there is an urgent need to apply an improvement in the traffic flow. The new traffic assignment plan in this study that was started in 2012 was to change a number of particular road links from two-way to one-way aimed to add more capacity. To apply the proposed methodology, many traffic stream data were collected using the well-known Moving Car Method such as directional volumes, speeds, travel times, ideal driving, legal speeds, and other network geometric characteristics such as link length and width to understand how they were working during 2012, and with what levels of service (LOS). GIS Software was utilized to select the shortest distance paths of the different tested networks during different strategic stages of planning from the 2012 up to the 2027. In addition, Python programming language was used to analyze and generate graphs. Three strategic steps were selected to test the different loading alternatives on the selected road network of the studied area. Each step included five years of traffic demand and volume growth starting from 2012 horizon year up to 2027 goal year. The study area was in Duhok city, which is located in northern Iraq in the Kurdistan region. The study findings showed a significant improvement in traffic flow, speed, travel time, and level of service after the new plan has been implemented.

Keywords: Road network optimization, Traffic congestion, Traffic flow.

Introduction
Nowadays, with the increase in traffic demand, Traffic Jams occur frequently when people need to use the common infrastructures with limited capacity at the same time, especially during rush hours. Traffic congestion might give rise to traffic delays, traffic costs, economic losses, traffic pollution, and even a lower degree of safety. Traffic congestion has a direct effect on the quality of life. It includes considerable costs for the community. The results of this study will help to formulate policy recommendations to improve the road traffic and obtain a peaceful, comfortable, sustainable, and economical traffic system. Worldwide cities are confronting rising traffic congestion issues. This circumstance is getting worse and becoming a major concern for the public. Traffic congestion is a condition of traffic delay since the number of vehicles on a street surpasses the operational capacity of the road to handle it [1].

Traffic congestion gets to be a global phenomenon on numerous roads in urban regions due to the requirement for mobility, which probably results from the fast population growth rate and economic activities. This situation has led to a massive increase in transportation costs because of longer driving periods and additional fuel consumption [3]. Measuring traffic congestion is a primary step toward a reliable traffic management framework as it helps to take essential steps in moderating congestion within a shorter period [4]. In a given traffic volume in a particular traffic network, each origin-destination (OD) pair is assigned to the network according to certain criteria, which is called a traffic assignment task issue. According to the two principles of optimality of Wardrop, the model of building up and understanding the traffic assignment problem has been widely studied and discussed, such as the user equilibrium model, and stochastic user equilibrium model. In recent researches, more studies were conducted considering the demand or supply uncertainty in the transport network [5].
The main aim of this study is to perform spatial and temporal analyses of traffic flow to provide the following objectives,

- Developing and testing alternative transportation systems or scenarios.
- Establishing short-range for every five years strategic periods priorities for implementing different transportation facilities.
- Providing design volumes, travel time delays, and v/c ratios for road links according to network assigned road system for facility sizing.

The relationship between the speed ratio and volume ratio is used for computing the effect of volume level on operating speeds. When this formula is converted to an equation expressed in terms of travel time, the relationship is of the following form:

$$T = To\,[1 + 0.15 * \left(\frac{Assigned\ Volume}{Practical\ Capacity}\right)^4] \quad (1)$$

T = Travel time at which assigned volume can travel on the subject link.
To = Base travel time at zero volume.
It can be seen that even at very low volumes, the equation assumes that speeds will be no greater than 15 percent above the speed at capacity. At high volume/capacity ratios, the speed falls asymptotically to zero. Assignment using capacity restraint is an iterative process when using the Bureau method. The first assignment is made on assumed or ideal travel times. This is known as an "unrestrained" assignment. Following an assignment, new travel times are computed for each link based on the assigned volume/capacity ratio for that link. These recomputed travel times are used for the calculation of new minimum time trees and the traffic is again assigned. The process is reiterated as many times as the analyst desires. The accepted assigned volume on a link is the average value of assignments [6]. The capacity restraint procedure explicitly recognizes that as traffic flow increases the speed of traffic decreases. In this procedure, several assignments are made based on the “all or nothing” concept. At the end of each assignment, however, the assigned volume on each link is compared with the respective capacity and the travel time is adjusted according to a given formula. A new set of minimum time routes is computed for the next assignment [7].
Level of Service (LOS), its formal introduction in the Highway Capacity Manual (HCM) was in 2000 [8]. In this version of the manual, LOS was defined by six levels (A to F) in relation to several traffic conditions like a combination of travel time and the ratio of traffic flow rate to capacity. LOS are qualitative measures of congestion that describe operational conditions within a traffic stream and take into consideration such factors as volume, speed, travel time, and delay. LOS is represented by letter grades, A through F. LOS A through C imply traffic flows with minimal delay, while LOS D and E imply conditions that approach capacity, and LOS F implies unstable flow with potential for substantial delays. In General:

A – Traffic flowing freely
B – Generally unimpeded traffic flow
C – Slower but stable flow with minor delays
D – Reduced speeds and increased delays
E – Slow speeds and significant delays
F – Stop and go traffic, high level of delay

Materials and methods

The study area includes all intersections and sections of streets linking intersections which included more than 30 cross-sections of optical traffic signals. These intersections operate in two, three, or four phases to serve the traffic trends in various directions. Some of them take a large area, while the others take less space, and this depends on the width of the street section. Most of the streets that connect intersections are separated by four paths (lanes) with a median barrier of (60-150) cm, which is expected to be removed in the sections that would work in one direction only. In this study, the focus was on the measurement, and analysis of the two main factors that lead to addressing the problem of the existing traffic congestion in the city of Duhok including network intersections, and streets. These two items considered in this study used to describe the actual service conditions of the traffic flow on the city road network, are volume/capacity ratio (V/C), travel and delay time Measures of Effectiveness (MoE). In the analysis of this network, the principles proposed by Wardrop, 1952 are used to achieve the principles of balance to move from one point to another point in the networks of different ways are taken into consideration which are:

1. Road users always tend to follow paths that provide a less amount of time when navigating from the beginning of the journey (origin) to the end of the journey (destination). This desire may be due to the less expensive level or higher speed or shortest distance according to the researcher's requirements, and this is called the **user equilibrium.**
2. Road users can be distributed; therefore, the time required for the trip is equal for all when moving from origin to destination and this leads to **system equilibrium.**
3. Motorists that use roads have a limited possibility to understand the information guidelines while driving across the network or type of vehicle used, productivity, a vehicle for other purposes and the class of road user in the movement, is a highway, or through arterial service-passes from the city center when moving from the source to the target area, and this principle called **Stochastic Equilibrium.**

This capacity was calculated by the number of vehicles per hour, on the basis that each track within the city can accommodate (840pcu/hr). Under maximum speed (50 km/hr) and the analysis method would be carried out according to the following steps:

1. Determine the journey time as a beginning of the solution on the basis of giving the driver to choose the top legal speed by a (50 km/hr) from the equation (L/50) as the value of (L) is the length of road section from intersection to other intersection measured by kilometers.
2. Use the following equation to calculate the actual travel time from the ideal travel time as explained below:

$$T = T_o (1+0 .15 (v/c)^4) \quad (2)$$

Where:
T= Actual travel time in min.

To= Ideal travel time from 50km/hr.
V= Traffic volume from the all-or-nothing method in vph.
C=Practical capacity of the road link in (pcu/hr).
This method assumes that the actual speed in the way can be lower than real speed by (15%).

3. New travel time is calculated to do more new attempts to find short tracks from the following equation, and given by the Bureau of Public Roads:

$$T1=To-1/4(To-T) \quad (3)$$

4. Depending upon the time T1, the shorter tracks are selected in the network in the same way as (All or nothing), and get a new traffic volume in the first round.

Calculations of this type were continued with different iterations in order to install the new traffic volumes for the new network depending on four strategic scenarios from 2012 up to 2027 with five years as a level of strategic period. Geographic Information Systems (GIS) can give transportation planners fast, and effective tools for analyzing travel patterns, and travel network characteristics. GIS is a powerful tool in the analysis, and design of transport routing networks. Its graphical display capabilities allow the understanding of the logic behind the routing network design. In this study, the road network had to be investigated for the minimum path route considering all the possibilities from each of the external nodes entering the city study area to all other nodes exiting fromt he same area.

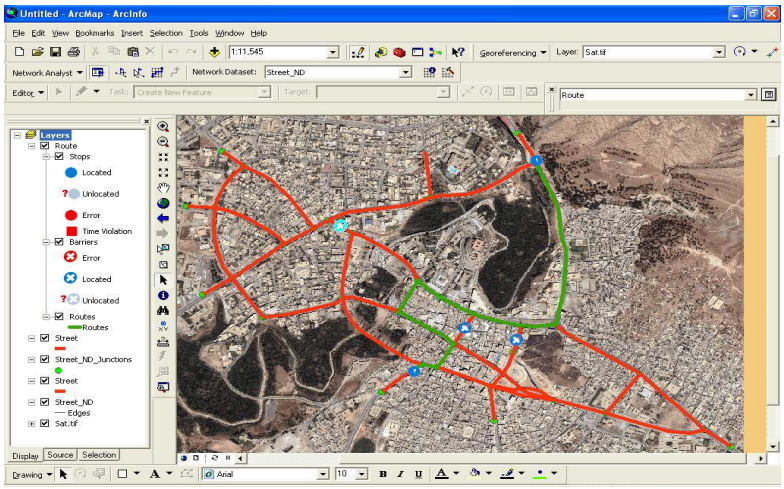
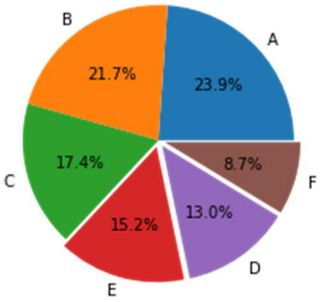


Figure 1. GIS software example of selecting a minimum path road for a certain node entrance in the study area

RESULTS AND DISCUTIONS

Computation of the shortest paths for all exterior nodes located on the territories of the studied road network was done, and minimum path networks were drawn by GIS to compile the accumulated traffic volumes generated on each of the links included within the road network of 2012 up to 2017. Different trials were tried for other strategy year volumes for minimum route paths for the Capacity-Restraint Method.

In the 2012 existing network, in some links were noticed that the LOS is extremly low, which means that LOS is equal to F as shown in figure 2(a) while in the 2012 improved network showed in figure 2(b) the LOS in most of the links is well accepted, and there is no LOS equal to F.



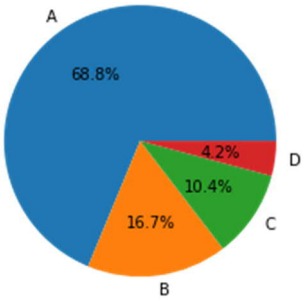
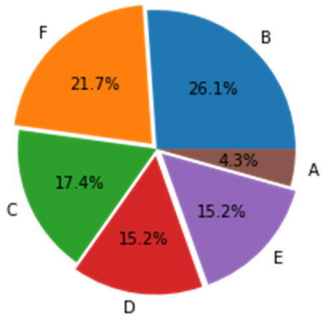


Figure 2 (a). Old Network 2012 LOS *Figure 2 (b). Improved Network 2012 LOS*

In the 2017 old network, if the existing network remained as it was, the traffic situation would have been worsening in terms of the level of service as presented in figure 3(a), more road links with LOS marked with F. However, in 2017, improved network the LOS in most of the links is still acceptable; furthermore, there is no LOS equal to F as shown in figure 3(b).



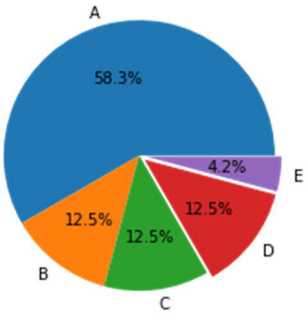


Figure 3 (a). Old Network 2017 LOS *Figure 3 (b). Improved Network 2017 LOS*

In the 2012 old network, the delay time is relatively high for almost all links; for example, in many links, the delay time is over 50 seconds/vehicle and in some other road links the delay was exceeding 200 seconds/vehicle. However, in the 2012 improved network as clarified in figure 4 the delay value is much lower than the previous one as well as in 11 links the delay value is zero and only in 4 links are about 50 seconds/vehicle.

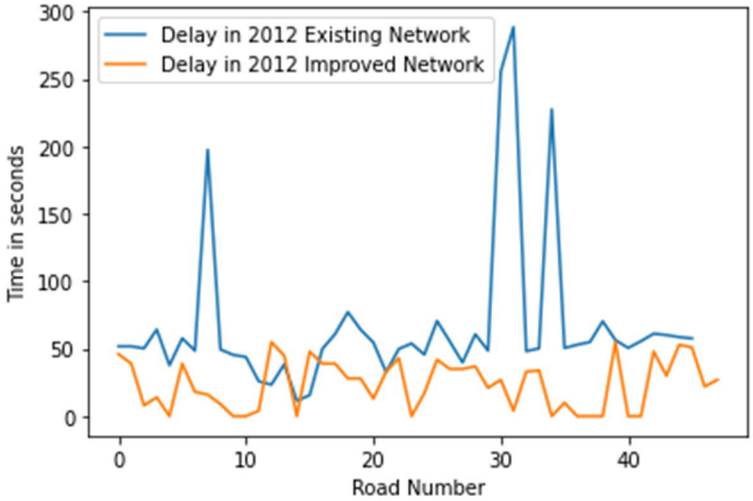


Figure 4. A comparison between old network and improved network delay time in the year of 2012

The final stage in this study was to test the traffic operation and performance for the remaining strategic planning period. This stage was to examine how the new predicted (2022 up to 2027) road network would function. A detailed 2022 and 2027 road network analysis was implemented in order to test the loaded network using the same assignment process with the same algorithm with the assistance of the GIS technique in order to select the shortest distance path along with the new improved network plan. The execution of the Capacity-Restraint Method on the plan after considering the traffic growth from 2022 up to 2027 fiscal year, it was showed a better performance than the old road network in 2012. Figure 5 revealed the percentages of the LOS.

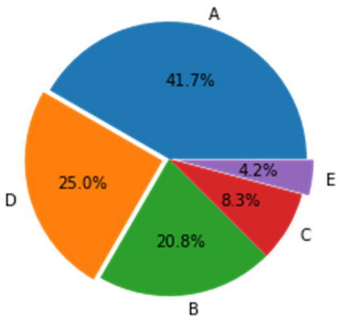


Figure 5. Improved network 2022 – 2027 LOS

CONCLUSIONS

Minimum path assignment solutions resulted in this study are completely decided to satisfy the road user's desire to reach his/her destination comfortably and with a high degree of convenience. This goal is performed by the proposed method dependent upon the minimum distance criteria recommended by transportation engineering literature. After the developed assignment has been applied, the level of service (LOS) in the new road network has become substantially improved. There were no LOS equal to F. In the 2012 improved network, the travel delay time value is much lesser than the previous network as well as in 11 links travel delay values were zero, and only in 4 links were about 50 second/vehicle. In the 2017 old network hypothetical scenario, the average travel delay time in all links was 67 seconds/vehicle but the average travel delay time value in all links in new network 2017 was 30 seconds/vehicle. In the 2022 new network, the average delay time in all links

was 35 seconds. In the 2027 new network, the average travel delay in all links was 39 seconds/vehicle.

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OCCUPATIONAL HEALTH AND SAFETY IN THE TRANSPORTATION SECTOR

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ABSTRACT
Today, all companies have to compete to maintain their continuity due to the difficulty of the market. While companies continue their basic activities, they should see working as a part of business life, depending on the principle of occupational health and safety. In order to reduce occupational accidents, it is necessary to adopt occupational health and safety practices and to establish an occupational health and safety culture within the enterprise. This understanding is also very important for the prestige of the companies. The transportation sector includes the work related to occupational health and safety logistics and has to keep up with all the practices in the company. In today's world, where information sharing on occupational health and safety of companies is extremely limited, it is desired that the safety and operating costs be at a minimum level. Occupational health and safety studies carried out for companies doing business in the transportation sector reduce the number of work accidents and provide an advantage for the company by preventing incidents that result in death. It is foreseen that the cost analysis will be carried out appropriately in the logistics sectors that including occupational health and safety. We know that the shipping companies in our country are advanced in logistics, but they have some deficiencies in terms of occupational health and safety practices. The application of the occupational health and safety system is based on the satisfaction of the employees and the protection of the health of the workers. In this study, information is given about the causes of workplace accidents and occupational diseases encountered in basic logistics activities, occupational health and safety measures, and risk analyses that are recommended to be applied. In addition, it was carried out in order to obtain information about what the work done in terms of occupational health and safety in the enterprises serving in the transportation sector and what kind of dangers and risks exist.

Keywords: Occupational Health and Safety, Transport, Logistics, Storage

1. Introduction
In order to maintain the customer's satisfaction in the best possible way, logistics is the job of carrying out the shipment in accordance with quality standards by making all the planning until the requested materials are purchased according to the order, stored, and then classified and delivered to the relevant place [1]. In the transportation sector, it is aimed to present the products to the customer at the most affordable price without being damaged. Consumers shop by paying attention to the price, packaging, and packages of the products, regardless of the physical and chemical properties of the products when purchasing products. It covers all operations carried out from the production to the consumption of logistics products [2]. The logistics sector has such a large working area that they cooperate with distributors, owners, warehouses, and suppliers [3]. The logistics sector was used for the first time in history to provide all the equipment necessary for military service and war [4]. An example of material stocking is shown in Figure 1.



Figure 1. Storage, pallet trucks, and packaging [5].

Physical environment and unsuitable working conditions are among the causes of occupational diseases or work accidents that happen to people. Age, gender, family relations, and living conditions of the person are given as examples of personal characteristics. Physical environmental conditions; can be mentioned as the external environmental conditions of the environment in which the person lives. Among these, living conditions such as heat, light, and noise are shown [6].

In order to avoid occupational health and safety (OHS) problems that may occur in the field of logistics, a disciplined and reliable occupational health and safety environment should be provided in business conditions. There may be factors that cause occupational health and safety during shipment. When OHS is mentioned, we think of accidents that occur in the workplace or careless work done. In order to prevent these accidents, we need to implement OHS well. The aim of OHS is to provide the most reliable working environment both in the working areas and in the living area [7].

The logistics industry is essentially an aggressive, dangerous working environment and a fast activity ring. For this reason, accidents are inevitable if the necessary precautions are not taken. The company acts with the aim of carrying out the necessary studies in accordance with the occupational health and safety policy in order to prevent work accidents, occupational diseases, work, and labor losses and financial losses [8].

The human being is the main factor in providing products and businesses that want to achieve success must be in today's competitive conditions. Occupational health and safety in this sector includes logistics-related work and has to keep up with all the practices in the company. In this study, it is aimed to determine the dangers and risks in terms of possible occupational health and safety and to implement the measures to be taken in order to prevent work accidents and occupational diseases that may occur and share the results as a result of the application.

2. Occupational Health and Safety (OHS) in Transportation

The company has to correctly apply OHS in its transportation activities and take the necessary precautions. The employer must lay the groundwork for an occupational safety environment that will protect the employees from the dangers that may arise in the use of machinery and equipment. Dangerous situations in the workplace result from not taking the necessary safety precautions [9]. Figure 2 demonstrates the machines used in the transportation sector.



Figure 2. Machines used in the transportation sector [10]

The most important applications for occupational safety measures in logistics activities are stacking, storage and transportation processes. In this process, ensuring health and safety is among the duties of all institutions and employees. Accidents become inevitable when the fast pace of work in the logistics sector, the undetermined traffic rules in the workplaces, and irregular workflows come together. For this reason, the determination of workflows, traffic rules, and general warehouse layout is the most important measures to be taken in this sector.

The following situations should be reviewed in workplaces used in transportation works that are in the "very dangerous" class in the workplace hazard classes list;

Chemicals and equipment used in workplaces,

• Production processes,

• Working forms and methods,

• Current statistical information on OHS,

The main method of protecting workers against hazardous situations is to control their exposure to occupational hazards. A control hierarchy should be implemented to determine how to implement effective control solutions.

This control hierarchy can be as follows:

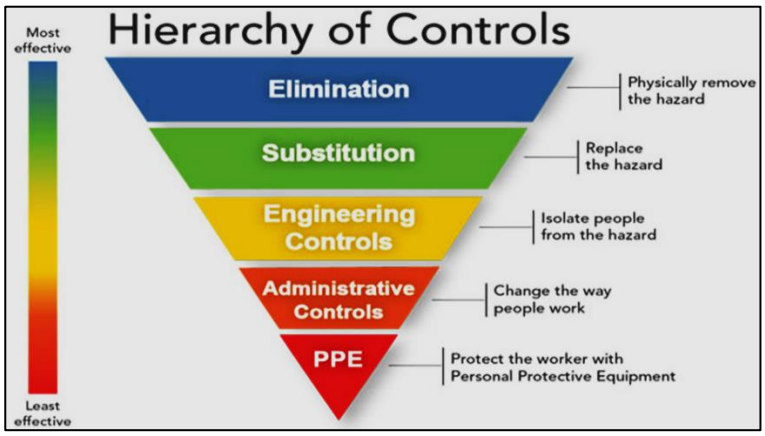


Figure 3. OHS control hierarchy triangle [11]

OHS control hierarchy triangle is given in Figure 3.The desired situation in this graph is that the control methods at the top are potentially more effective and protective than those at the bottom. Following this hierarchy leads to the implementation of safer systems.

The values specified in the figure above have been formed within the framework of the safety culture of the institution, and the practical application of the values is ensured and controlled by the leadership and participation, design and installation, operation and maintenance, training and procedures, behavior feedback, prevention, and development activities specified in the occupational health and safety program. Despite this, accidents can occur within the company due to behavior and conditions, which are divided into four categories. In the later stages of the study, the dodge, first aid and significant accidents experienced during a certain period in the company will be analyzed. The point that should not be forgotten is that precautions should be taken in every matter, but it should be kept in mind that negativities can still be experienced.

3. Risk Analysis Used in the Logistics Industry

Considering the risk analysis, the data of the accidents that occurred must be recorded in the records. It is desired to see the place where the occupational accidents took place, the time period that passed, where the incident took place and by whom it was witnessed. With the new occurrence of these occupational accidents, they should immediately start new risk analysis reports in the workplace. If the reasons for work accidents are paid, it is considered whether the problem will be created within the scope of occupational safety and outside the workplace. Probability is handled under the name of reviewing all the reasons that occur with risk analysis, ranking all possibilities, and probability ranking. If we count these probabilities, it consists of very small, small, medium, and very high probabilities. The Risk Situation Analysis is shown in Figure 4.



Figure 4. Risk Situation Analysis [5].

Logistics service employees contribute financially, economically and financially to their own business by providing service to the other party during their work. Prevention policies to be made just behind all risks should be at the forefront.

How is risk analysis done in logistics?

• In which environments are detection systems used in order to follow up the risk analysis so that the vehicles do not cause an accident?

• Are fire extinguishing systems available in workplace warehouses and stocks?

• Are the hydrate and extinguishing systems provided by the fire system provided at the desired capacity?

• Are the electrical connections fully controlled?

• Is there a switch in electrical panels to protect them from the fire?
• Are the warning signs regarding the smoking ban observed in all areas?
• Is there a camera recording system throughout the warehouse?
• Is there a fire protection switch in the panels?
• Are the warning signs regarding the smoking ban observed in all areas?

Table 1. Risk groups of companies in the logistics sector [4].

RISKS AND HAZARDS		
Processes	**Substances**	**Environmental Factors**
	Chemicals (Detergents, etc.)	
Charging placed on the battery	Power tools (Braun products)	• Internal factors
• Transport by a pallet truck	Explosive substances (Aerosols)	• Pest control
Unloading vehicles with forklift	Cutting agents (Gillette products)	• Dust
• material handling	Combustible materials (Paper products)	• Heat Humidity
	Flowing agents (Shampoo, ACE)	• Noisy
• Working in the table area		• Slippery ground
•	**Machinery and Equipment**	• uneven ground
	• Using a forklift	• Insufficient lighting
• Transport by a pallet truck	• Use of a stringing machine	• Security and alarm system
	• Cutting machine	• Ventilation
• Pallet stacking		• Warning signs
•	• Using a forklift	• Work-related stress
• Working at height	Making electrical connections	• Lack of space
• Counting	• Parking a vehicle	• Working at height
• Types of warehouses		• Forklift traffic
	• Battery energy usage	• External factors

Risk groups of companies in the logistics sector are shown in Table 1. As seen in the table, risk analysis has been considered for each unit. Workflow, which is used as an auxiliary element in the loading, unloading, and stacking of materials in the transportation sector, is provided. The use of these forklifts in transportation poses risks and analyzes are required to determine these risks. Creating these analyzes is done with tables. While creating the risk analysis, it is necessary to be inspired by work accidents and case studies. Statistics of previous risk assessment, health surveillance of employees, and material safety data sheets, if any, should be reviewed in the workplace. Basic features of transportation services are indicated in Figure 5.

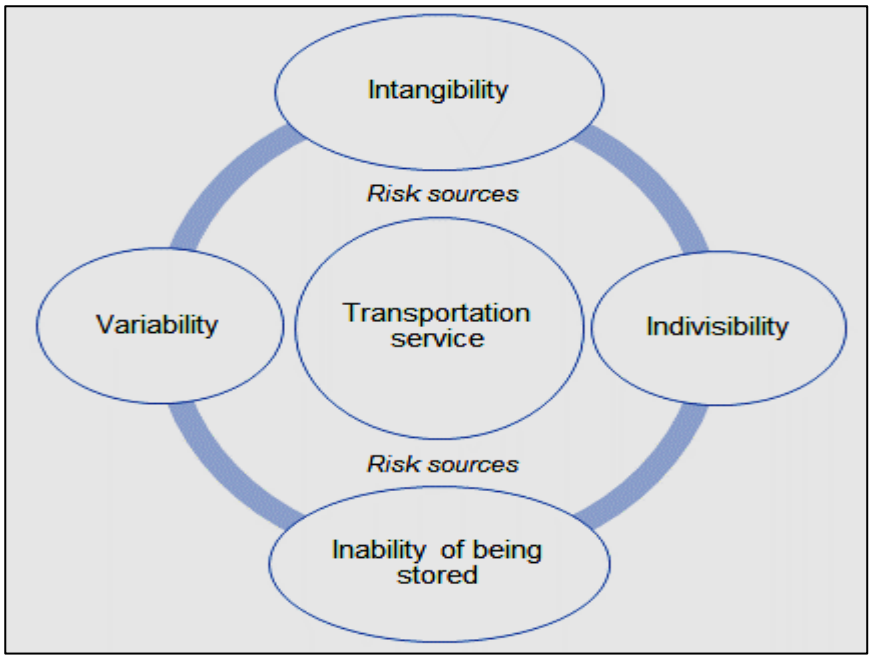


Figure 5. Basic features of transportation services [14]

Logistics is a process in which purchasing, storage and transportation of raw materials and products, and even all kinds of marketing channels that can make the company more profitable, are managed according to the structure of the company. Logistics is the process of planning, implementing and controlling the efficient, effective, and cost-effective storage and flow of raw materials, semi-finished products, finished products, and related information from the point of origin to the point of consumption in order to meet customer needs.

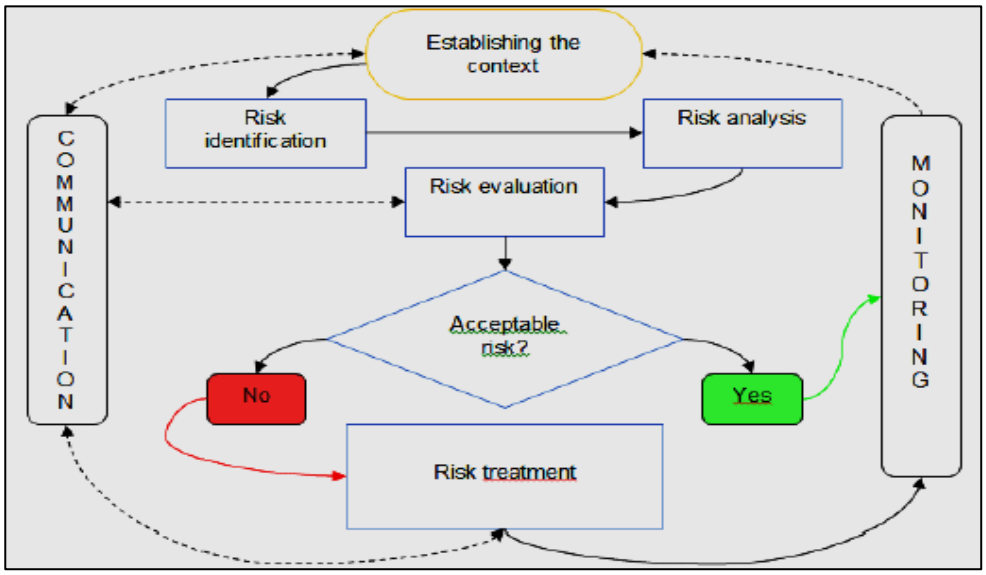


Figure 6. Risk management process [15].

The risk management process is given in Figure 6. This standard can be used by any public, private or community organization, association, group or individual. This standard provides a common approach to identifying risks related to industries but does not replace these standards. It can be applied to any risk with positive or negative consequences, whatever their nature.

As shown in the table, it is not possible to prevent risk assessment no matter how many precautions and practices are taken. In order to prevent these risks, it is necessary to carry out a risk assessment at the desired level. One of the major goals of risk analysis is to try to eliminate the risk or to bring it

to a level that can be destroyed. In order to prevent these risks, it is only to minimize the experienced risks or to bring them to an acceptable level. Examples of work accident pictures are presented in Figure 7.

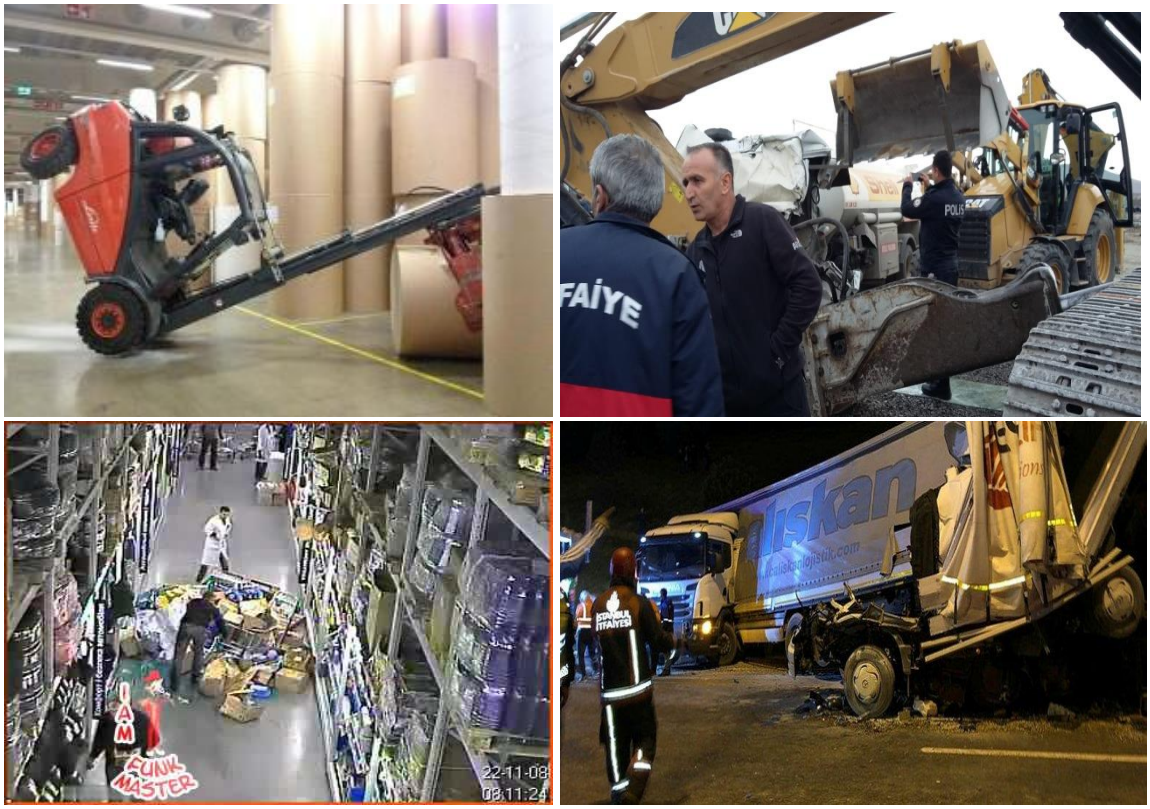


Figure 7. Examples of work accident pictures [16].

4. Occupational Safety Practices in the Logistics Sector and Its Impact on Work Accidents

With occupational safety practices, all occupational health and safety accidents that may happen to workers and the increase of risks that may affect employees are prevented. Occupational health and safety policy of a logistics company should be based on the ideal of working with the aim of providing a safe and healthy environment for its employees and preventing all kinds of losses, accidents that result in human or machinery, which will prevent normal working order [17]. Company; It should aim to create a safe and healthy work environment for its employees, and it should be adopted that the responsibility of achieving this goal belongs to the manager, employees and everyone.

It is aimed to reflect the deep-rooted occupational health and safety culture of a company that carries out all logistics functions and to present its practices in the study, to offer a solution to the inadequacies of practice and culture creation in the sector. In this way, it is thought that a resource will be created that new companies can benefit from in their businesses, especially in the rapidly developing sector for the last ten years. Especially in a sector that can be considered as new, thanks to the opinion that the competitive advantage can be achieved with occupational health and safety, it is stated that the appropriateness of human life, health and working conditions is in favor of the employer, and it is predicted that it will contribute to the reduction of work accidents and occupational diseases.

5. Occupational Health and Safety Procedure in Transport

Safety in Traffic: People who use the vehicle in all transportation vehicles must have a driver's license and SRC documents. It must have a psycho-technical analysis document. Drivers must comply

with the tachograph rules while driving. Drivers must have fire extinguishers.

Personal Protective Clothing: In case the vehicle breaks down while driving, the driver has to wear reflective clothing that can be easily noticed when he gets out of the vehicle. While shoes such as slippers and sandals cause danger, they are more durable than safety shoes.

Occupational Safety While Driving: The vehicle must move smoothly in the traffic flow, in a way that does not create danger, in case of a loaded road. Vehicle height must not exceed 4 m and must comply with other traffic rules. It is necessary to prepare a report of any malfunctions that may occur with the vehicle, such as a tire burst or window glass malfunction, and the vehicle maintenance officer should be informed. In case of being involved in an accident, the damage to the vehicle is reported by the driver or the police with the preparation of a report and transferred to the relevant parties. Traffic accidents should be reported first to the traffic police and then to the vehicle maintenance officer. No one should move until the police arrive, and actions that may cause an accident should be avoided. If there is a possibility of fire in the vehicle, the ignition should be turned off and you should move away from the scene. If possible, the caps should be removed to avoid electrical contact with the battery cables.

Occupational Health and Safety at Destination: As soon as the loads arrive at the place where they will be unloaded, the rear view mirrors should be used carefully to park the vehicle. The people who will make this park must have passed the driving training. While the vehicles are approaching, the person to be guided should pay attention to the hand and warning signs.
Employees should wear reflective uniforms so that they can be viewed at night. Security measures should be taken at the unloading and unloading points where the cargo reaches. Before the vehicle is unloaded, the axles must be brought to the appropriate position and the wedges must be securely placed on the car tires for the stop. Care must be taken when unloading heavy pallets and rolls.

General Safety Precautions: The vehicle maintenance officer must notify the driver about safety at the stop, taking a break out of the blue may cause risks. These places should be well lit and safe places. The vehicle should not be parked in unsafe places. An accident should not be caused. Only uniformed police officers have the authority to stop the vehicle. If anyone wants to be stopped, it should be disregarded.

Hypotheses of the Research: It is imperative to conduct the necessary occupational safety and risk analyzes in order to prevent occupational accidents. All necessary studies should be carried out to carry out these studies. Improvements to be made in occupational safety should be completed and the risk level should be minimized.

In order to reduce the number of occupational accidents, it is necessary to regulate occupational health and safety activities and to create an occupational health and safety culture within the enterprise. The acquisition of elements such as training the employees, raising awareness, applying the feedback system by giving importance to the opinions of the employees, identifying the dangers and risks in the work area and taking preventive and protective measures, and operating an inspection system in a way that will ensure continuity will limit the occurrence of occupational accidents. In this way, by preventing the losses in the workforce, protecting the prestige of the company, motivating the

personnel and increasing the instinct of ownership, both the employee's loyalty to the enterprise and the increase in success-productivity will occur. This will result in the judgment of delivering the products to the customers in the right quantity and within the right time, at the lowest cost, in a more competitive environment..

6. Conclusion

In the logistics sector, it is necessary to make the necessary accident and risk analyzes in order to reduce occupational accidents and to spread the safety culture within the enterprise. It is necessary to carry out all the works for the training and awareness of the workers and to implement the necessary practices in order to minimize the accidents.

In order to reduce occupational accidents, it is necessary to adopt occupational health and safety practices and to establish an occupational health and safety culture within the enterprise. Providing factors such as training the employees, raising awareness, operating the feedback system by valuing the opinions of the employees, taking protective and preventive measures by determining the risks and dangers in the work area, and operating a control mechanism in a continuous manner will reduce the occurrence of occupational accidents. In this way, workforce losses will be prevented, the prestige of the company will be protected, employee motivation and ownership will be increased, and employee loyalty to the company will be ensured and performance-productivity increases will occur. This will result in the delivery of the products to the customer in the right quantity and at the right time with minimum costs in more competitive conditions.

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ATIK PET'İN SICAK KARIŞIMLARIN MARSHALL STABİLİTESİ ÜZERİNDEKİ ETKİSİ

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ÖZET

Bu çalışmada, atık bir plastik çeşidi olan polietilen tereftalat (PET)'ın sıcak karışım asfalt (HMA) kaplamaların Marshall stabilitesi üzerindeki etkisi araştırılmıştır. Bu amaçla, önce, bağlayıcı olarak kullanılan B 70/100 saf asfaltı ve karışımda kullanılacak olan kırmataş kalker agregasının çeşitli fiziksel özellikleri belirlenmiştir. Daha sonra, saf asfalt ile agrega kullanılarak Marshall karışım tasarım yöntemine göre karışımın optimum asfalt içeriği tespit edilmiştir. Ardından, belirlenen bu asfalt içeriği kullanılarak katkısız Marshall briket numuneleri hazırlanmıştır. Daha sonra, PET'in bağlayıcı olarak karışımda kullanılabilirliğini tespit etmek amacıyla karışımdaki optimum asfalt miktarı ağırlıkça %5, 10, 20, 30 ve 35 oranlarında azaltılarak bunun yerine aynı oranlarda PET ikame edilmiş ve PET katkılı sıcak karışım asfalt (HMA) numuneleri hazırlanmıştır. Saf ve PET katkılı bütün sıcak karışım numuneleri Marshall stabilite ve akma testine maruz bırakılmıştır. Elde edilen deney sonuçlarına göre, en yüksek stabilite değeri %80 saf asfalt+%20PET katkılı sıcak karışım numunelerinden elde edilmiş ve bu orandaki stabilite değerinin saf karışım numunesine kıyasla %14 kadar artış gösterdiği görülmüştür. Bu sonuç, PET katkısının karışımdaki asfalt miktarında azalmaya sebep olmasına rağmen HMA kaplamalarda yük etkisiyle oluşan kalıcı deformasyonlara karşı gösterdiği direnç üzerinde önemli bir etkiye sahip olduğunu göstermektedir. Sonuç olarak, bir atık plastik çeşidi olan PET'in sıcak karışımlarda asfaltın yerine ikame edilerek kullanılabileceği ve bu şekilde kullanılmasıyla HMA kaplamaların stabilitesi üzerinde olumlu bir etkiye sahip olabileceği görülmüştür. Ayrıca PET'in çevreye ve canlılara vermiş olduğu zarar göz önüne alındığında karayolu mühendisliğinde bu şekliyle kullanımının bu zararları etkileri en aza indirebileceği ve bir katma değer oluşturarak ekonomiye katkı sağlayabileceği değerlendirilmektedir.

Anahtar Kelimeler: Sıcak karışım asfalt, PET, Marshall stabilite, Kalıcı deformasyon.

EFFECT OF WASTE PET ON MARSHALL STABILITY OF HOT MIXES

ABSTRACT

In this study, the effect of polyethylene terephthalate (PET), a type of waste plastic, on the Marshall stability of hot mix asphalt (HMA) pavements was investigated. For this purpose, firstly, various physical properties of B 70/100 pure asphalt used as binder and crushed stone limestone aggregate to be used in the mixture were determined. Then, the optimum asphalt content of the mixture was determined according to the Marshall mixture design method using pure asphalt and aggregate. By using this determined asphalt content, pure Marshall briquette samples were prepared. In order to

determine the usability of PET in the mixture as a binder, the optimum amount of asphalt in the mixture was reduced by 5, 10, 20, 30 and 35 wt%, and instead of it, PET substituted at the same proportions and PET added hot mix asphalt (HMA) samples were prepared. All pure and PET added hot mix samples were subjected to Marshall stability and flow test. According to the test results obtained, the highest stability value was obtained from 80% pure asphalt+20%PET added hot mix samples, and it was observed that the stability value at this rate increased by 14% compared to the pure mix sample. This result shows that although PET additive causes a decrease in the amount of asphalt in the mixture, it has a significant effect on the resistance of HMA pavements to permanent deformations caused by load. As a result, it has been seen that PET, which is a type of waste plastic, can be used as a substitute for asphalt in hot mixes and can have a positive effect on the stability of HMA pavements by using it in this way. In addition, considering the damage of PET to the environment and living things, it is evaluated that the use of PET in this form in road engineering can minimize the effects of these damages and contribute to the economy by creating an added value.

Keywords: Hot mix asphalt, PET, Marshall stability, Permanent deformation.

1. GİRİŞ

Ağırlıkça %5-7 oranındaki asfalt bağlayıcının ve belirli bir gradasyona sahip olan agrega ile belirli sıcaklıkta karıştırılmasıyla sıcak karışım asfalt (HMA) kaplamalar meydana gelmektedir. Karışımda büyük oranda bulunan agrega; karışımın içsel sürtünme direncini ve stabilitesini sağlarken, asfalt bağlayıcı ise agrega tanelerinin arasını doldurarak tanelerin birbirine bağlanmasını ve trafik yükleri altında kaplamanın dağılmasını önlemekte, ayrıca düzgün bir yüzey sağlayarak sürüş konforunu arttırmaktadır [1-3].

HMA kaplamalarda zaman içerisinde çeşitli çevre ve trafik koşulları sebebiyle tekerlek izi (kalıcı deformasyon), çatlaklar (yorumla ve düşük sıcaklık), sökülmeler ve ayrışmalar gibi bozulmalar meydana gelmektedir [1-3]. Kaplamalarda oluşan bozulmaları ortadan kaldırmak ve kaplamanın performansını arttırma amacıyla asfalt veya karışımlara çeşitli katkı malzemeleri eklenerek modifikasyon işlemi gerçekleştirilmektedir. Bu sayede, kaplamanın hizmet ömrü arttırılmaya çalışılmaktadır. Modifikasyonda kullanılan katkı malzemelerinin başında ise polimerler (SBS, EVA gibi) olmak üzere çeşitli yağlar, filler malzemeler, elyaflar, kauçuk, çeşitli çözücüler ve atık malzemeler (plastikler gibi) gelmektedir [4-7].

Bu çalışmada ise, bir atık plastik çeşidi olan PET'in, HMA'ların stabilitesi üzerindeki etkisi araştırılmış ve elde edilen tüm sonuçlar değerlendirilmiştir.

2. MATERYAL VE METOT

2.1. Materyal

Çalışmada, B 70/100 penetrasyon sınıflı olan saf asfalt bağlayıcı kullanılmıştır. Asfaltın fiziksel özellikleri Tablo 1'de verilmiştir.

Tablo 1. Asfaltın fiziksel özellikleri

Özellik	**Standart**	**B 70/100**

		Limit	**Sonuç**
Penetrasyon (0,1mm)	ASTM D5	70-100	88
Yumuşama Noktası (°C)	ASTM D36	43-51	46,75
Düktilite (cm)	ASTM D113	min.100	>117
Parlama Noktası (°C)	ASTM D92	min.230	238
Özgül Ağırlık (gr/cm³)	ASTM D70	1,0 - 1,1	1,038
Kütle Kaybı (%)	ASTM D2872	maks.0,8	0,23
Viskozite (135 ºC)	ASTM D4402		487,5
Viskozite (165 ºC)		-	150
Karıştırma Sıcaklığı (ºC)	-	-	162
Sıkıştırma Sıcaklığı (ºC)		-	149,5
Penetrasyon İndeksi (PI)	-	-	-0,64

Modifiyer olarak kullanılan PET'in (Şekil 1) genel özelikleri Tablo 2'de verilmiştir.



Şekil 1. PET

Tablo 2. PET'in genel özellikleri

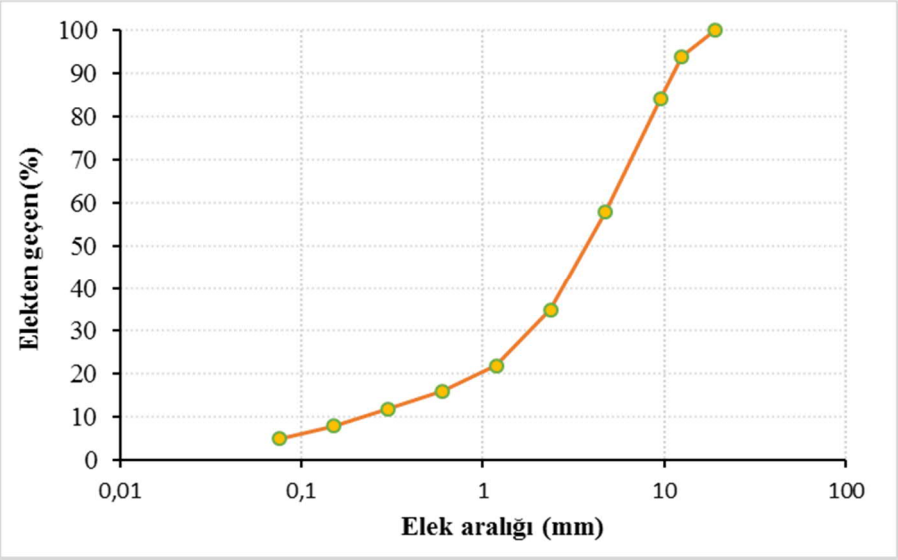
Özellik	**PET**
Yoğunluk	1,33 – 1,38 gr/cm^3
Renk	Açık renkli
Erime sıcaklığı (ºC)	250
Sertlik	Orta

Sıcak karışım tasarımı, Marshall karışım tasarım yöntemine göre yapılmış ve karışımda kullanılan kırma taş kalker agregasının fiziksel özellikleri Tablo 3'de, agrega gradasyon eğrisi ise Şekil 2'de verilmiştir.

Tablo 3. Agreganın fiziksel özellikleri

Deney	**Standart**	**Limit**	**Sonuç**
Kaba agrega zahiri özgül ağırlık (gr/cm^3)	ASTM C127	-	2,70
Kaba agrega hacim özgül ağırlık (gr/cm^3)	ASTM C127	-	2,67
Kaba agrega su emme yüzdesi	ASTM C127	maks.2	0,47
İnce agrega zahiri özgül ağırlık (gr/cm^3)	ASTM C128	-	2,75
İnce agrega hacim özgül ağırlık (gr/cm^3)	ASTM C128	-	2,63
İnce agrega su emme yüzdesi	ASTM C128	maks.2	1,66
Filler zahiri özgül ağırlık (gr/cm^3)	ASTM D 854	-	2,85
Aşınma kaybı, Los Angeles (%)	ASTM C131	maks.30	27

Donma kaybı (%)	ASTM C88	maks.10	2



Şekil 2. Agrega gradasyon eğrisi

2.2. Metot

2.2.1. PET Katkılı Karışım Numunelerinin Hazırlanması

HMA'nın performans özellikleri üzerinde PET'in etkisi, ASTM D 1559'a göre Marshall dizayn yöntemi yardımıyla saf ve PET katkılı sıcak karışım numuneleri hazırlanarak belirlendi. Bunun yüzden, öncelikle saf asfalt kullanılarak karışım tasarımı için gerekli olan optimum asfalt içeriği (OAİ) belirlendi. Ardından, belirlenen bu asfalt içeriği kullanılarak katkısız Marshall briket numuneleri hazırlandı. Daha sonra, PET'in bağlayıcı olarak karışımda kullanılabilirliğini tespit etmek amacıyla karışımdaki optimum asfalt miktarı ağırlıkça %5, 10, 20, 30 ve 35 oranlarında azaltılarak bunun yerine aynı oranlarda PET ikame edildi ve PET katkılı sıcak karışım asfalt (HMA) numuneleri hazırlandı. Sıcak karışım numunelerinin hazırlanmasında, asfalt ve 1200 gr agrega sırasıyla 162 ^{o}C ve 165 ^{o}C sıcaklıkta ısıtıldı. Asfalt+agrega harmanı karıştırma sıcaklığında karıştırıldıktan sonra, 457 mm yüksekten serbest düşen tokmak ile her bir yüzeyine 75, toplamda 150 darbe uygulanarak sıkıştırma sıcaklığında sıkıştırıldı.

Çalışmada, saf ve PET katkılı karışımlar yine sırasıyla B, B+5P, B+10P, B+20P, B+30P ve B+35P olarak kodlanmıştır.

3. DENEYSEL YÖNTEM

3.1. Sıcak Karışımların Marshall Stabilite Deneyine Tabi Tutulması

ASTM D 1559 standardına göre gerçekleştirilen Marshall stabilite deneyinde stabilite kavramı ile, HMA kaplamaların kalıcı deformasyonlara karşı gösterebildiği maksimum dayanım, akma kavramı ile maksimum yüke ulaştığı anda numunede meydana gelen düşey deformasyon ifade edilmek için kullanılmaktadır. Deneyde önce, sıcak karışım numunelerinin çeşitli yükseklikleri ve ağırlıkları belirlenir ve daha sonra numuneler 60±1 °C sıcaklıktaki su banyosunda yaklaşık 35 dakika bekletilir. 35 dakika sonunda numuneler Marshall cihazına yerleştirilir ve numune üzerine 50±2 mm/dakika hızla yükleme yapılarak numunenin kırıldığı andaki stabilitesi ve akma değeri cihaz tarafından otomatik kaydedilir. Deneyde standart numune yüksekliği 63,5 mm kabul edilmektedir ancak farklı yüksekliklere sahip numuneler için denklem (1) yardımıyla stabilite düzeltme katsayıları hesaplanır [8,9].

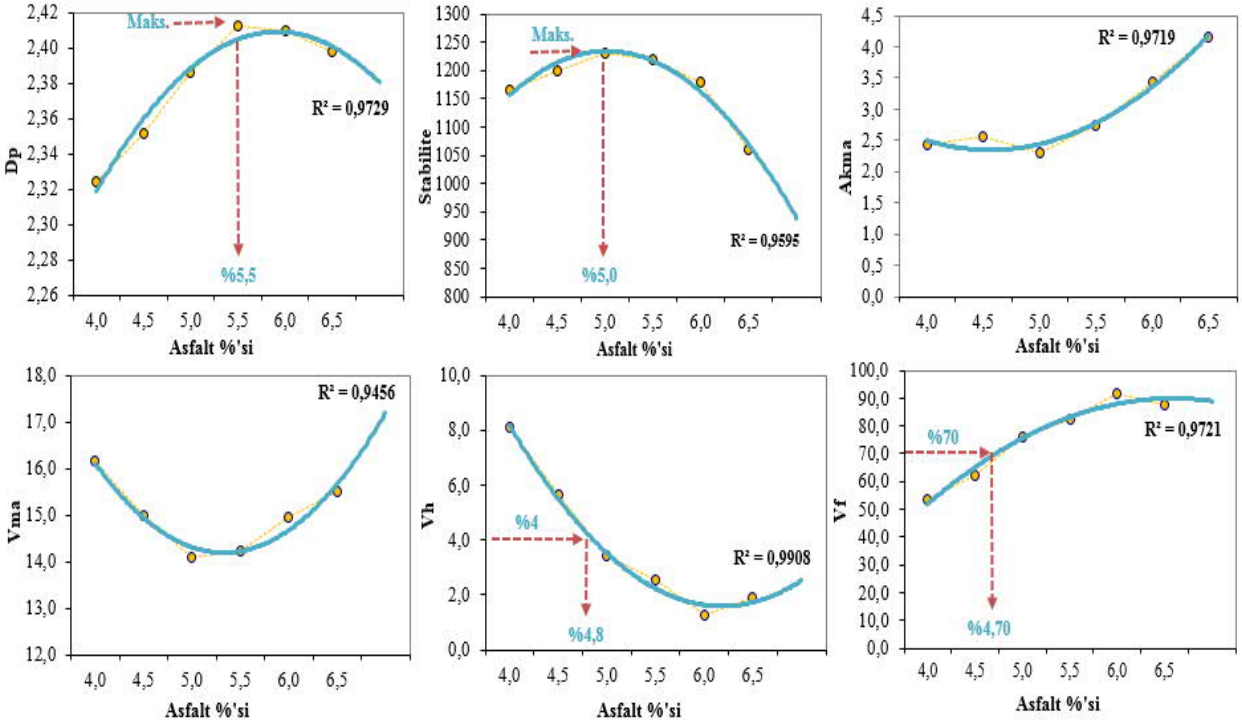
$c = 5.24 \times e^{(-0.0258xh)}$ (1)

Denklem 1'de yer alan c; düzeltme katsayısı, h; numune yüksekliğini göstermektedir. Ayrıca, HMA'ların kayma gerilmelerine karşı direncinin bir göstergesi olarak kabul edilen Marshall oranı (MQ) değeri de hesaplanabilmektedir. MQ, stabilite değerinin akma değerine oranlanmasıyla elde edilmektedir [8,9].

4. BULGULAR

4.1. Marshall Stabilite ve Akma Deney Sonuçları

Saf B70/100 bağlayıcılı sıcak karışım numunesinin OAİ oranını belirlemek için, sıcak karışımda kullanılacak olan agrega miktarı sabit tutularak, agrega ağırlığının %4 - %4,5 - %5 - %5,5 - %6 - %6,5 oranlarında saf asfalt eklenerek toplam 18 adet sıcak karışım numunesi hazırlanmıştır. Karışım numunelerinin çeşitli fiziksel özellikleri (yükseklik ve ağırlık gibi) tespit edildikten sonra, çeşitli hacimsel özelikleri (hacim özgül ağırlıkları (Dp), boşluk oranları (Vh), agregalar arası boşluk oranları (VMA) ve asfaltla dolu boşluk oranları (Vf) gibi) de belirlenerek numuneler Marshall stabilite deneyine tabi tutulmuştur. Katkısız sıcak karışım numunelerinin tespit edilen çeşitli hacimsel ve mekanik özelliklerinin bitüm içeriği ile değişimi Şekil 3'de verilmiştir.



Şekil 3. OAİ için hazırlanan numunelerin hacimsel ve mekanik özellikleri

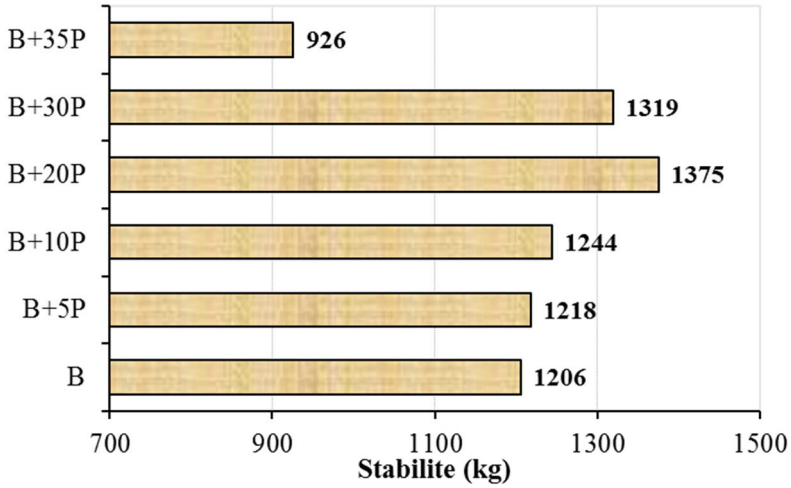
Elde edilen bu grafiklerden boşluk oranının %4'e, bitümle dolu boşluk oranının %70'e, stabilite ve hacim özgül ağırlığın ise maks. değere karşılık geldiği yüzdeler alınmış ve bu değerlerin aritmetik ortalaması alınarak karışımın optimum bitüm içeriği %5 olarak belirlenmiştir (Şekil 3).

Elde edilen bu OAİ oranında üç adet kontrol numunesi hazırlanarak bu numunelerin de aynı hesaplamaları yapılmış ve elde edilen değerlerin uygunluğu Karayolları Teknik Şartnamesi (KTŞ) [10] değerleri ile karşılaştırılmıştır. Kontrol numunelerine ait elde edilen sonuçlar Tablo 4'de verilmiştir. Sonuçların KTŞ asfalt betonu aşınma için verilmiş olan sınır değerleri sağladığı görülmüştür.

Tablo 4. Kontrol Numunesine Ait Sonuçların KTŞ Limitlerine Göre Kıyaslaması

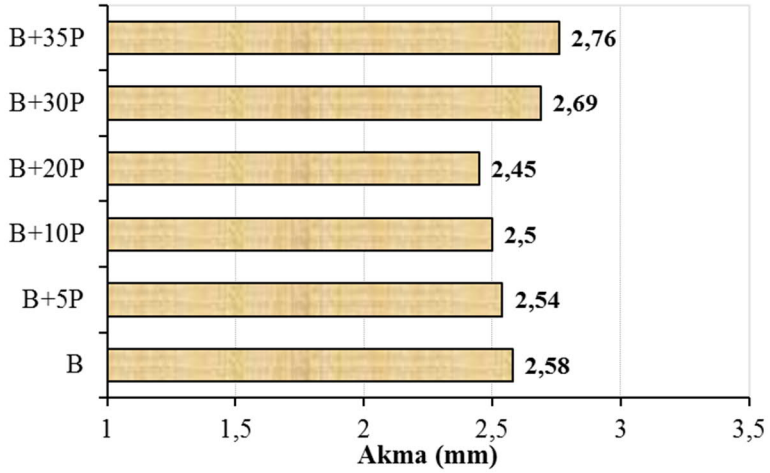
% Asfalt	Dp (gr/cm^3)	Vh (%)	VMA (%)	Vf (%)	Stabilite(kg)	Akma(mm)
5	2,42	3,62	14,27	72,85	1206	2,58
KTŞ	-	3-5	14-16	65-75	>900	2-4

Saf ve PET katkılı sıcak karışım numunelerinin Marshall stabilite ve akma değerleri sırasıyla Şekil 4 ve Şekil 5'de, MQ değerlerinin PET artışı ile değişimi ise Şekil 6'da verilmiştir.



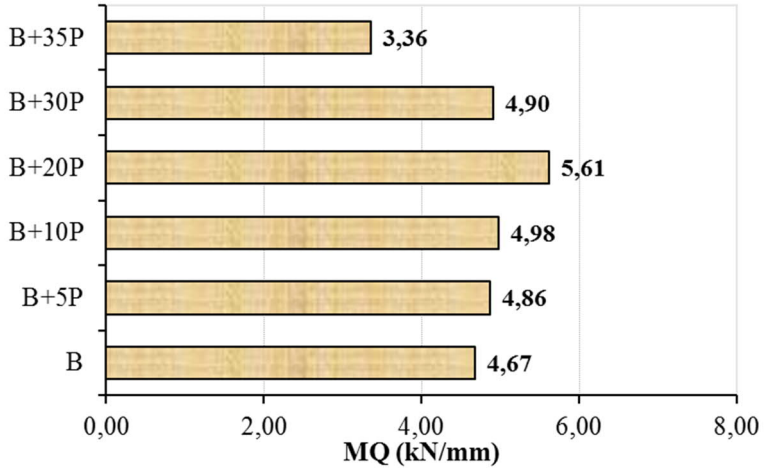
Şekil 4. Karışım numunelerinin stabilite değerleri

Şekil 4 incelendiğinde, PET katkısıyla karışımların stabilite değerlerinde saf karışıma (B) kıyasla değişimler meydana geldiği görülmektedir. Saf karışıma kıyasla bu değişimler sırasıyla %0,4; %3,2; %14,0; %9,4 artış ve %23,2 azalış şeklindedir. Elde edilen bu sonuca göre, en yüksek stabilite değerine %20PET katkılı karışımda ulaşılmıştır, bu durumda kalıcı deformasyonlara karşı direnci en yüksek karışım numunesinin %20PET katkılı karışım olduğunu ifade etmek mümkündür.



Şekil 5. Karışım numunelerinin akma değerleri

Benzer şekilde karışımların akma değerleri incelendiğinde (Şekil 5), saf (B) karışım ile PET katkılı karışımların akma değerlerinin hemen hemen aynı seviyelerde kaldığı görülmektedir. PET katkısıyla akma miktarının aynı düzeyde kalması, kaplamanın kırılma anındaki davranışının fazla değişmediğini göstermektedir.



Şekil 6. Karışım numunelerinin MQ değerleri

Şekil 6 incelendiğinde, karışımların MQ değerleri incelendiğinde ise en yüksek MQ değerinin %20 PET katkılı karışım numunelerinde görüldüğü ve bu sebeple kayma gerilmelerine karşı en dirençli karışımların %20 PET katkılı karışımlar olduğu ifade edilebilir.

5. SONUÇLAR

PET katkısının sıcak karışımların Marshall stabilitesi üzerindeki etkisinin araştırıldığı bu çalışmada elde edilen sonuçlar aşağıda verilmiştir:

- Marshall stabilite sonuçlarına göre, PET katkısıyla karışımların kalıcı deformasyonlara karşı gösterdiği direncin %14 kadar artış gösterdiği ve en yüksek direncin %80 saf asfalt+ %20PET katkılı karışımlardan elde edildiği görülmüştür.
- Akma sonuçlarına göre, PET katkı artışıyla karışımların akma değerlerinin aynı seviyelerde kaldığı ve bu sebeple kırılma anındaki davranışının fazla değişmediği görülmüştür.
- MQ sonuçları değerlendirildiğinde ise, PET katkısıyla karışımların kayma gerilmelerine karşı direncinin %20,0 kadar artış gösterdiği ve en yüksek direncin yine %80 saf asfalt+ %20PET katkılı karışımlardan elde edildiği görülmüştür.

Sonuç olarak, PET katkısının asfalt kaplamalarda bağlayıcı olarak kullanılmasıyla, HMA'ların stabilitesinin ve kayma gerilmelerine karşı direncinin arttığını söylemek mümkündür.

TEŞEKKÜR

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GREEN CONCRETE PRODUCTION BASED ON THERMAL BEHAVIORAL DEVELOPMENT FROM RECYCLED AGGREGATE

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ABSTRACT
In this paper, the development of concrete thermal behavioral through recycled aggregate from demolition and construction waste composed from numerous places is presents. By means of thermal conductivity test, a total of more than 15 concrete mixes were examined to provide enough data tables and curves. Numerous chemical and physical test of aggregate composition from recycled and natural concrete is used to investigate the new production characteristics. Afterward, to assess the thermal behavior of the mix, many tests were carrying out the results on fresh and hardened states. The examination of thermal behavior illustrate that the employment of recycle aggregate improve the thermal behavioral of concrete mixes. The alteration amounts shows fairly variations depend on the innovation of recycled aggregates use in the experiments. The result treatments show that the hard nibbled concreted can be compress and recycle as coarse aggregated in new concrete constructions which provide practical type of green concretes.

Keywords: Green concrete, Thermal behavioral, recycled aggregate

Introduction
In previous century, the construction of services and goods has greater than before excessively because of the strong demography augmentation, development of urban areas and great expanded of industrial [1]. In a part from certain settlement in term of enhanced income principles, this occurrence also results in rising stress on natural balances and earth resources [2]. Thought, this process could lead to outstanding rising in waste generation in all over the planet. The recycled concrete aggregate (RCA) state of the art processing could be mainly explained and defined by demolition, sieving, material separation, cleaning process, size reduction and material homogenization [3, 4, 5, 6]. Obviously, the demolition process is the initial stage of concrete recycling techniques. Numerous methods solution is probably obtainable for demolishing presented concrete elements which will implemented depending on many factors. These factors involved in the building site, materials and the purpose of demolition [7, 8, 9, 10]. The basic classifications of demolition are general and selective types [11]. The general demolition is extensive to all building and its components dismantle and brought down to debris which resulting in production of waste heterogeneously made out many materials [12]. On the other hand, the choosy destruction permits to enhanced divide materials for promising recycling and recycle [13]. The general and selective demolition in nature could be execute by take on many techniques such as high reach procedure, implosion and top down methods [14]. The waste sources are various and there is no consistent accepted categorization across all planets often adapted to industrial, construction, municipal and demolition wastes [15-20]. Furthermore, the waste could be classified as dangerous or non dangerous depend on their chemical composition and management for their removal [21-25]. A credible appraisal making of whole waste manufacture in all over the world is not easy duty due to both absent of dependable information in developed area and the diverse waste classification in accessible global [26-30]. On the other hand, according to

current studies, three billion of plenty in concrete manufacturing and civic waste are producing globally yearly [31]. Addition than one half of such waste is composed and then reused as civic waste include marketable and household with manufacturing industrial [32-40]. The current global depression is considerably affected the financial system of Western areas leading to drop production, significantly growth of emerging areas [41]. Many researchers introduce that RAC is sustainable advanced more porous than the corresponding size grading. The porosity of RCA mostly depend on two variables include the work of the unique concrete combination and the dispensation methods executed for converting concrete debris into aggregate for concrete [42]. In addition, the high porosity of RCA resulting in high absorption capacity of water in aggregate which will affects the real quantity of gratis water in the combination [43].

1. Methodology and Investigational Procedure

During this examination many test were carried out on the concrete and aggregate in the hardened and fresh conditions. The requirements properties involved in the EN-12629, 1744-1 and EN-1097 [44-45] standards of aggregate and concrete consist the natural aggregate, recycle aggregate, mechanical processed and aggregate mix to be use to production of concrete is illustrated in Table 1and Table 2. This standard covers the parched thickness over two thousand (kg/m3) for employ with every kinds of existing mix which provide as conduct for the use of uncouth recycle aggregate in material.

Table 1**:** Chemical characteristics' of aggregates according to EN12629 standards

Characteristics	**Standards**
chloride salts of water-soluble	1744-1 part 7
sulphates of water-soluble	= part 10
sulphates of acid soluble	= part 12
whole sulphur substance	= part 11
Contaminator lightweight	= part 14.2
potential presence of humus	= part 15.1
water solubility	= part 16

Table 2**:** Physical characteristics of aggregates according to EN12629 standards

Characteristics	**EN Standards**
density and absorption of water	1097-6
voids and bulk density	1097-3
index of Shape	933-4
determination of confrontation to fragmentation	1097-2

The fresh condition specifications of the concrete mixes examined through EN 12350-2 standards and the density examined through EN 12350-6, air content was examined through EN 12350-7. The thermal behavior of solid mix with RA and compressive potency at standard days is calculated depend on EN 12390-3 in order to complete the investigation of proposed concrete. The test of thermal conductivity was done by mean of ISOMET 2114 device which directly measured among other properties of conductivity coefficient in the probes surfaces. The obtained results show the thermal reaction of examined material to the warmth fluctuation impulse which produces the electrical energy dissipated via probe contacted with material. Two samples for each kind of concrete be use in this test and every sample has analyzed twice. The sample tested size is 10x10x50 cm and cured in dry chamber with 20 °C, 50% comparative dampness for standers days pending examine time.

2. Design and Materials Mixes

The seventeenth concrete mixes were generated with replacement of 100%, 50%, 25% and 10% of the whole quantity of coarse NA and RA. Some elements passing and other retained by 4 mm net sifter were measured as fine and coarse aggregates samples and the utmost particles size use is 21.5mm. The NA and RA replacements is prepared by quantity portion by portion to keep all concrete mix with RA elements bulk allocation of NA used in NAC designed mixes without admixture or additions. The slump of 125 mm is used as all mixes production requirement to permits the correct comparison among them. The water amount used in the production was adjusted in preliminary experiment to comply as necessary requirements. Table 3 illustrates the mixing proportions of the materials used in the natural aggregate concrete (NAC).

Table 3: Mixing proportions and materials used in the NAC

Cement	**Amount L/L**	**Weight Kg/m^3**
Fine aggregate 0-0.06	0.000	0
= 0.06-0.12	0.01	40
= 0.12-0.25	0.04	115
= 0.25-0.5	0.05	133
= 0.5-1	0.06	145
= 1-2	0.07	175
Coarse aggregate 2-4	0.08	190
= 4-5.5	0.04	110
= 5.5-8	0.05	125
= 8-11	0.06	126
= 11-15	0.1	320
= 15-21	0.12	320
Water	0.180	180
Voids	0.02	-------
Overall	1.00	1979

The cement type used in this investigation is I42.5R which has a clinker content of 90% and 10% extra materials. Four plants of Iraqi recycled were considered with respect to RA sources depends on their biological position in order to accumulate recycled aggregate from many building type and technology. Concerning to natural aggregate, crush sandstone 1 and 2 coarse aggregate and roll

stream sand were used in these investigations.

3. Specifications of Recycled Aggregate

The recycle aggregate was selected randomly from every recycling plant that produces many kind of construction and demolition waste in this investigation. To recognize the mixing of RA use in the suggested creation of concrete mix, a chart investigation was considered and Table 4 illustrates the four type's mixing of RA. The used recycle aggregate samples consist of elevated proportion of concrete, natural stone and mortar which is predictable to be 70% and 85% of their whole content. Many sources were analyzed in the composition of CDW with conducting of existing earthenware resources which are the major static resources basis. Table 5 and Table 6 observe the outcome of physical characteristics carry out on many aggregate while compared to NA, the RA display higher water absorption, lesser density and high porosity from the natural conditions.

Table 4: Recycled Aggregates composition

Composition	**Coarse RA 1**	**Coarse RA 2**	**Fine RA 1**	**Fine RA2**
Natural stone, mortar and Concrete	75	66	82	72
Clay material and masonry	24.4	26.6	1.0	12.3
Glass	0.5	3.1	13.2	1.7
Bituminous materials	0.0	0.0	0.0	11.5
Others	0.1	4.3	3.8	2.5
Total	100	100	100	100

Table 5: Physical characteristics of Coarse aggregates product

Physical characteristics	**CRA 1**	**CRA2**	**Limestone 1**	**Limestone 2**
dry density kg/m3	2100	2140	2610	2600
Absorption of Water (%)	8.9	8.6	1.4	1.6
Density kg/m3	1100	1239	1340	1355
Index of shape %	24	24	15	17

Table 6: Physical characteristics of fine aggregate product

Physical characteristics	**FRA1**	**FRA2**	**Coarse sand**	**Fine sand**
Dry Density kg/m3	2110	2065	2580	2582
Absorption of Water %	13	10	0.6	0.33
Density kg/m3	1430	1330	1545	1540

From above results illustrated in Table 5 and Table 6, one could observe that all RA shows high index of shape which lead to low workability of the concrete compared with NAC. In addition, the RA show high shatter compared with NA because of their composition. The achieved outcome in chemical test carry out on many reused aggregate illustrated in Table 7 perform the aspire to recognize which

chemical machinery in the aggregate could be calculated to the concrete mixing in this methods.

Table 7: Recycled aggregates chemical characteristics Results

chemical characteristics	**FRA1**	**FRA2**	**CRA1**	**CRA2**	**Maximum Limit**
chloride salts of Water-soluble	0.01	0.016	0.010	0.010	0.010
sulphates of Water-soluble	0.11	0.18	0.04	0.04	0.20
sulphates of Acid soluble	0.2	0.8	0.2	0.3	0.8
content of Sulphur	0.1	0.3	0.1	0.1	1.0
Lightweight contaminators	1.8	1.7	1.5	0.1	0.5
solubility of Water	0.5	2.1	1.0	1.2	10.00

From Table 6 one can observe that the chemical characteristics indicate that FRA2 have water soluble chloride salts more than limited conditions. The most contributed chlorides presents in the aggregate and mostly affected percentage concretes is the potassium and sodium chloride. To reduce the danger of oxidization in the steel rebar, the chloride amount should be limiting in reinforced concrete constituent. Additionally, the chloride presents in other materials used in concrete composition should be considered as more important conditions. The concrete chloride content could be articulated as proportion of chloride ions per collection of cement resulting in soaring mass of cement in the aggregate concrete. The obtained results in the residual chemical test performs on RA are surrounded by the higher limitations compulsory excluding the sculpture satisfied of the fine FRA2 that be close to highest boundary. Other chemical test results illustrate that the FRA2 have a numeral of damaging rudiments which is lie over those create in the residual RA. Therefore, one of probable solution to use these RA in the concrete is to clean them formerly.

4. Fresh Concrete Characteristics

In order to classify the concreter mixes produced from this examination, it was proposed that all concrete had same slump within standards ranges. Hence, many concrete mixing be created with the goal of charging the efficient ratio of water cement toward use in this work. The effective water to cement ration should clarify only consider quantity of available water for hydration of cement at materials mixing time. All slump values obtained from test permitting to terminate the workability of many mixes continue surrounded by standards consistency. Figure 1 shows the essential allowing for of suitable proportional investigation of all residual characteristics of the production mixes.

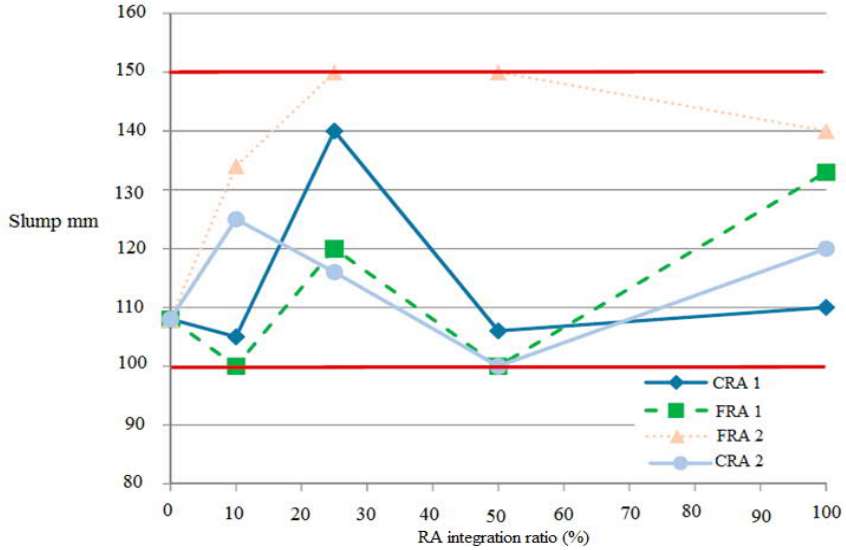


Figure 1: CRA, RA and FRA slump measure characteristics

The values of effectual water to concrete ration used in the suggested production for numerous concrete mixes are explained in Table 8. It is not important to increase the effectual water to concrete ration for two types of RA as the ration of aggregate substitute augmented.

Table 8: Effectual water to cement ration of NA & RA concrete mixes

Aggregate type	**NA & RA**	**NA & RA**	**NA & RA**	**NA & RA**	**NA & RA**
	0%	**10%**	**25%**	**50%**	**100%**
FRA 1	0.52	0.54	0.56	0.58	0.63
FRA 2	0.52	0.52	0.52	0.52	0.52
CRA 1	0.52	0.52	0.53	0.52	0.52
CRA 2	0.52	0.52	0.52	0.53	0.53

Though, the increasing of effective water to cement ration with fine RA increasing from plant 1 have to emphasize because of high content in these RA clay. This fine element adsorb a big quantity of water which results in high effective water to cement ratio required in the mix with this RA to keep the objective work ability in this case. The effective water to cement ration variety is not identical for all RA relatives. As showing by the results of shape index investigation, the workability of many RA mix have been prejudiced to the diversity basis by the RA collection. The clean condition density standards calculated for diverse concrete mixing be exposed in table 9 with the deviation of this possessions in every concrete mixing by comparing with mixing of NAC. As clear from these results, by using of 100% fine and 100% coarse and fine of RA, highest reduction of about 7% and 6% are funded.

Table 9: The concrete mixes density at fresh state conditions.

Aggregate Type	Density of RA Kg/m^3 0%	Density of RA Kg/m^3 10%	Density of RA Kg/m^3 25%	Density of RA Kg/m^3 50%	Density of RA Kg/m^3 100%
FRA 1	2360	2340	2314	2306	2215
RA 2	2360	2363	2358	2342	2209
CRA 1	2360	2361	2340	2290	2240
CRA 2	2360	2339	2310	2270	2292

The achieved results in this investigation have been compared with other studies as illustrated in Figure 2. In order to prevent the affected of concrete mechanical strength, another examination has been performed on fresh concrete which determine the air content whose percentage should be limited. The air content of concrete mixes production has been calculated and examines properly as illustrated in Table 10.

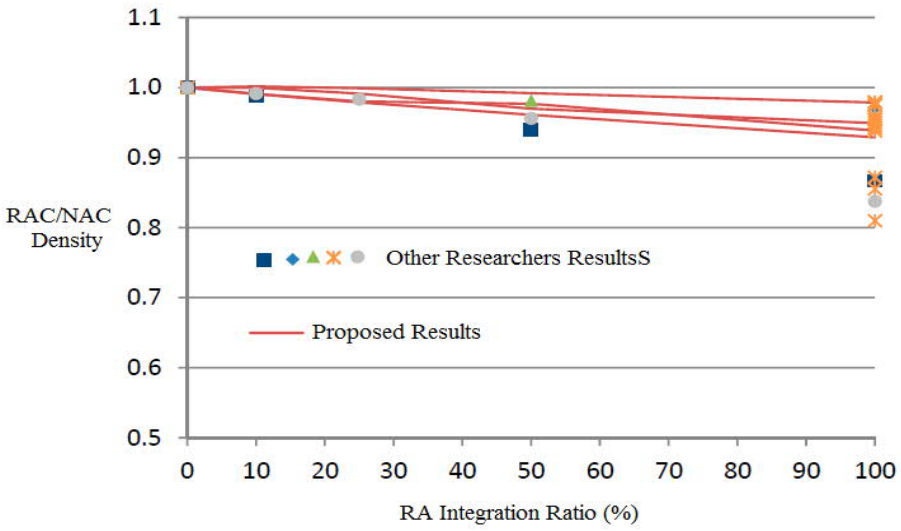


Figure 2: The proposed density results of the concrete mixes with other researchers

Table 10: The calculated of air in concretes

Recycle aggregate percentage	Air in FRA 1 (L/m^3)	Air in FRA 2 (L/m^3)	Air in CRA 1 (L/m^3)	Air in CRA 2 (L/m^3)
0% RA	14.2	14.2	14.2	14.2
10% RA	20.9	20.9	19.2	19.4
25% RA	24.7	22.6	20.3	20.3
50% RA	26.2	23.8	22.2	22.1
100% RA	27.3	25.1	23.3	23.1

5. Conductivity of Thermal

The thermal conductivity of every material is definite property and strongly depends on the material temperature. There are two equations proposed by (Eurocode 2) used to approximate the thermal factors (λ) since a purpose of warmth (θ) for compactness concrete standardization. Equation 1 and Equation 2 represent the standards formula to calculate the thermal conductivity. Therefore, the thermal conductivity (λ) varies between (1.3 to 1.9) W/m.K for (θ=20 °C) according to Equation 1 and Equation 2. In this work, the value of thermal conductivity = 2.05 W/m.K has been fined intended by NAC which be alike a higher boundary calculated by mean of above Equations. With respect to this property, the yield results by numerous mixes are illustrated in Table 11 and Figure 3 with at least three results was averaging. From this results, the substitute of NA with RA was reduced the standard of λ which improve the thermal conductivity and energetic performance in the building applications as important insulation. In concrete mixes, this development is fairly important in 100% of the fine and coarse NA are reinstated to decrease λ by approximately (40 - 20) %. Unusual types of RA have diverse mixing with much content of concrete, glass, wood and ceramics between other materials. This waste has unlike thermal conductivity and the concrete mix with unlike thermal behavioral been predictable.

Table 11**:** Thermal conductibility (*λ*) with variation of FRA and CRA

Recycle aggregate	**λ of FRA 1 (W/m.K)**	**Deviation %**	**λ of CRA 1 (W/m.K)**	**Deviation %**
0%	2.09	-----	2.09	-----
10%	2.07	-0.3	2.11	1.3
25%	2.02	-2.6	2.06	-1.3
50%	1.90	-8.1	1.92	-5.00
100%	1.63	-21.4	1.74	-16.2

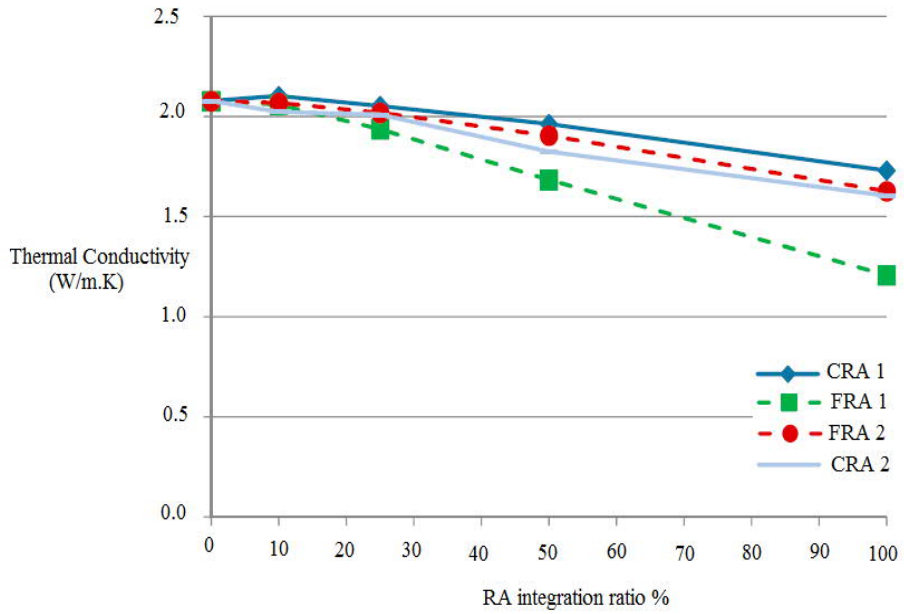


Figure 3: Thermal conductivity of the concrete mixes under test

6. Conclusion

The thermal behavioral of concrete mixes and recycle aggregate from four demolition plants has been intended and investigated in this research. The rate of 2.05 W/m.K of thermal conductivity was achieved for suggestion concrete with normal aggregate. At 20 °C temperature degree, the thermal conductivity of concrete density has a 1.3 and 1.9 W/m.K values which conclude that the achieved results in this paper for the RC mixes is like to highest standards values. The factor (λ) of concrete mix by RA as of demolition plants be investigated with examine and fulfilled the utilize of RA could minimize the thermal conductivity of the concrete. The obtained outcome in the strength investigation at standards day which established that the diverse work of RA used powerfully authority the stability of concrete mixes construction with these aggregate. The conclude results prove that the selection size of RA used does not appear to important power excellence of concrete mix concerning to their thermal presentation.

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PERFORMANCE OF SATELLITE-DERIVED DATASET OF SOLAR IRRADIANCE IN MOROCCO

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ABSTRACT
Prior knowledge of solar radiation potential is essential for the analysis and the design of the energy systems. Due to the difficulties in the solar radiation measurements, as this parameter has not been measured in everyplace, the Copernicus Atmosphere Monitoring Service (CAMS) Radiation data that contain hourly values of solar radiation at horizontal surface, have been established for several locations over the world.
In this work, by using the CAMS Radiation data, several solar radiation models and measurements data, we present a comparative study on the estimating of global solar radiation intensities at given locations on the Earth's surface, case study: Moroccan city. In addition, we evaluate the performance of the study by using various statistical indicators proposed by several researchers in the field. These statistical tests are normal root mean square error (NRMSE), relative mean absolute error (rMBE), statistical test (TS) and correlation coefficient (r).
The obtained results are found to be of a good approximation between predicted and measured values. Thus, the solar radiation intensities predicted in this study can be recommended for use by energy researchers, in the design and estimation of solar energy systems suitable in Morocco and in other locations of similar climate conditions with an absence of solar radiation measurements.

Keywords: Solar energy; Performance; Statistical analysis; Morocco

RAYLI SISTEMLERDE KULLANILAN CER KANCASI EKIPMANININ MEKANIK ÖZELLIKLERININ İNCELENMESI

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ÖZET

Çeken ve çekilen araçların birleştirilmesi ile oluşturulan raylı sistem setleri, araçların boş ağırlıkları ve hamuleleri nedeni ile yüksek kuvvetlere maruz kalmaktadır. Raylı sistem setleri oluşturulurken çeken ve çekilen araçlar tam otomatik, yarı otomatik ve cer kancası olarak sınıflandırılan koşum takımları ile birleştirilirler. Cer kancası koşum takımı aparatı özellikle yük vagonlarından oluşturulan setlerde sıklıkla kullanılmaktadır. Yapılan çalışmada, yük vagonunda kullanılmış olan cer kancası koşum takımının mekanik özellikleri incelenecektir. Cer kancası ekipmanından TS EN ISO 6892-1 standardına göre çekme testi numunesi çıkartılmıştır. Test uygulanırken; test hızı 0,0067 1/s ve test boyu 30 mm olarak uygulanmıştır. İlgili standarda göre uygulanan testler sonucunda; akma mukavemeti 608,4 MPa, çekme mukavemeti 855,8 MPa, uzama değeri %13,3 ve maksimum yükleme 16,8 kN olarak tespit edilmiştir. Uygulanan çekme testi sonrası, kopan numuneler makro yapı incelemesi gerçekleştirilmiştir. Makro yapı incelemesi elektron mikroskobu altında 5x ve 10x yakınlaştırma yapılarak gerçekleştirilmiştir. Yapılan testler sonrasında cer kancası koşum takımının, yük vagonlarında kullanılmış olmasına rağmen, mekanik olarak dayanımına devam ettiği tespit edilmiştir.

Anahtar Kelimeler: Cer Kancası, Çekme Testi, Sertlik Testi

INVESTIGATION OF MECHANICAL PROPERTIES OF DRAW HOOK EQUIPMENT USED IN RAIL SYSTEMS

ABSTRACT

Rail system sets formed by combining towing and towed vehicles are exposed to high forces due to the empty weights and loads of the vehicles. When creating rail system sets, towed and towed vehicles are combined with coupling set classified as fully automatic, semi-automatic, and draw hooks. Draw hook coupling set apparatus is frequently used especially in sets formed from freight wagons. In the

study, the mechanical properties of the draw hook coupling set used in the freight wagon will be examined. The correlation between hardness and tensile strength values will be examined. It will be evaluated whether the material is suitable for the working conditions. In the literature, most studies of railway components and draw hook assembly have been on broken or badly damaged equipment. For this reason, the mechanical properties of the examined fatigued materials were generally below the values given in the standard. From this, we can conclude that maintenance and repair activities in railway equipment are a very important and sensitive issue that can lead to serious accidents, as mentioned in many studies. A tensile test sample was taken from the draw hook equipment in accordance with the TS EN ISO 6892-1 standard. While applying the test; the test speed was 0.0067 1/s and the test length was 30 mm. The engineering stress-strain values obtained in the calculations performed according to Hook's law were calculated. In addition, the Brinell hardness test (HB) was applied under 5 mm ball diameter and 750 kg load. Surface preparation was carried out with 2500 numbered sandpaper on the test sample, which was removed before the hardness test application. The hardness test was completed by taking tests from 6 different points on the material surface. The relationship between Brinell hardness and tensile strength was calculated.

As a result of the tests applied according to the relevant standard; yield strength was 608.4 MPa, tensile strength was 855.8 MPa, elongation value was 13.3% and peak load 16.8 kN. Values between 224.45 and 234.95 were measured in Brinell hardness measurements made by measuring from 6 different points. The HB hardness value, 228.61, which is the average of 6 measurements, was detected. This value provides 800.1 MPa according to the tensile test calculation equation given in the literature. In the literature, especially when studies on similar equipment are examined, it has been observed that heavy damages such as breakage occur during the operation. It has been determined that these damages are generally caused by corrosion formation, exposure to loads in different axes, and exposure to sudden loads. Tests on these equipments have shown that they have substandard mechanical properties. In this study, a modified drawbar hook assembly has been investigated as it has completed its service life without any damage. In this study, a modified draw hook assembly has been investigated as it has completed its service life without any damage. After the tests, it has been determined that the draw hook coupling set has high mechanical properties and continues to be mechanically resistant, although it has been used in freight wagons.

Keywords: Draw Hook, Tensile Test, Hardness Test

1. Giriş

Raylı sistem taşımacılığı gelişen endüstrileşme, ulaşım metotları içerisindeki güvenliği ve taşıma maliyeti etkinliği benzeri sebepler ile gelişmekte olan bir taşıma metodudur. Raylı sistem taşıtları yük ve yolcu taşımak amacı ile birleşik setler ve birden fazla çeken, çekilen taşıtlardan oluşan setler olarak hizmet vermektedir. Diziler halinde çalışmayı sağlaması, cer ve fren kuvvetlerinin taşıtlar arasında iletilmesi için koşum takımları kullanılmaktadır. Gerekli bağlantıların sağlanabilmesi için, sıklıkla kanca kavramalı, yarı otomatik ve tam otomatik koşum takımları kullanılmaktadır. Tüm benzer yapılarda olduğu gibi raylı sistem yapılarında da mekanik sistem elemanları yoğun şekilde yorulma ve aşınmalara maruz kalabilmektedir. Mekanik yorulma ömürleri ve aşınma dayanımları dışında üretim yöntemi kriterleri ve malzeme miktarları sistemlerin tasarımlarında önemli parametreler

olarak karşımıza çıkabilmektedir (Özarpa, C., Botsalı, H., Kınacı, B.F , 2022).

Literatürde yapılmış çalışmalar üç grupta incelenmiştir. Bunlar demiryolu taşıt bileşenleri üzerine yapılmış deneysel çalışmalar, nümerik çalışmalar ve cer kancası hakkında yapılmış çalışmalardır. Literatürdeki çalışmalarda cer kancası tertibatı ile ilgili elde edilmiş test sonuçlarında 690 Mpa, 725 Mpa ve 788 Mpa maksimum çekme dayanımı değerleri gözlemlenmiştir (Mohammadi vd., 2019; Nový vd., 2019; Ulewicz vd., 2019). Zucarelli vd. tarafından yapılan çalışmada, bir tren tekerleği üzerinde çekme, darbe ve kırılma tokluğu testleri gerçekleştirmişlerdir. Kırılan numunelere mikro yapı incelemesi yapmış ve çatlak oluşumunun termal olarak etkilenen temas yüzeyinden başladığını tespit etmişlerdir. Bunun neticesinde güvenliğin sadece mekanik özellikler ve üretim yöntemi ile ilgili olmadığı, aynı zamanda çalışma şekli ve dış etkenlere de bağlı olduğu sonucuna ulaşmışlardır (Zucarelli vd., 2016). Yin tarafından yapılan çalışmada, kırılmaya uğramış bir tren aksının kırılma bölgesini manyetik parçacık incelemesi, optik mikroskop, taramalı elektron mikroskobu ve konfokal lazer tarama mikroskobu yardımıyla deneysel olarak incelemiştir. Sonuç olarak abrazif aşınma ve sürtünme yorulmasının kırılmaya sebebiyet veren çatlak oluşumuna yol açtığını tespit etmiştir (Yin, 2019). Odanovic tarafından yapılan çalışmada, demiryolu yük vagonu aksının kırılma nedenlerini araştırılmıştır. Mekanik özellikleri tespit etmek için çekme, darbe ve brinell sertlik testleri uygulanmıştır. Kırık bölgesindeki incelemeyi ise enerji dağıtıcı X-ışını analizi, ışık optik mikroskobu ve taramalı elektron mikroskobu ile gerçekleştirmiştir. Çalışma sonucunda kırık oluşumuna korozyon çatlağının yol açtığı ve incelenen numunenin yeterli periyodik bakımının ve korozyon koruma işleminin yapılmadığı sonucuna varılmıştır (Odanovic, 2017).

Popovic vd. tarafından yapılan çalışmada, iki farklı arıza modu veren demiryolu koşum takımı bağlantılarını deneysel ve nümerik olarak kıyaslanmıştır. Fraktografi sonucunda bir modelin sünek diğerinin gevrek kırıldığını bunun nedeninin ise birinin temperlenmiş diğerinin ise normalize edilmiş olması olduğunu tespit edilmiştir. Modellere çekme testi uygulanmış ve elde edilen veriler ile FEM analizleri gerçekleştirilmiştir. Analizler sonucunda modellerin standartlara uygun olduğu ancak izin verilen sınırların üzerinde yüklemelere maruz kalmaları sebebiyle kırıldığı tespit edilmiştir (Popović vd., 2021). Guang-Jun vd. tarafından yapılan çalışmada, ağır yük trenlerinin maruz kaldığı boyuna koşum takımı kuvvetlerinin çalışma güvenliğine etkilerini incelemişlerdir. Bir treni çoklu cisim dinamiğine göre her lokomotifi kütle parçacığı, koşum takımlarını ise doğrusal olmayan kuvvet fonksiyonu ile sistemsel olarak modellemiş ve simüle etmişlerdir. Düşük hızda acil fren yapmaktan kaçınılması, lokomotiflerin tepki sürelerinin azaltılması ve koşum takımı rijitliklerinin uygun şekilde azaltılması gibi çalışma güvenliğine olumlu etki edebilecek sonuçlar ortaya çıkartılmıştır (Gao vd., 2017). Cernessu vd. tarafında yapılan çalışmada, cer tertibatında kullanılan hasara uğramış bir koşum takımı FEM analizi ile incelemişlerdir. Farklı varsayımlar ile çeşitli hata senaryoları ortaya koymuşlardır. Sonuç olarak kırılmaya sebep olan yorulma çatlağı gelişiminin yaklaşık bir ay sürdüğü ve koşum takımlarının kırılmadan önceki son bir ayda yeterli şekilde kontrol edilmediği belirlenmiştir (Cernescu vd., 2013).

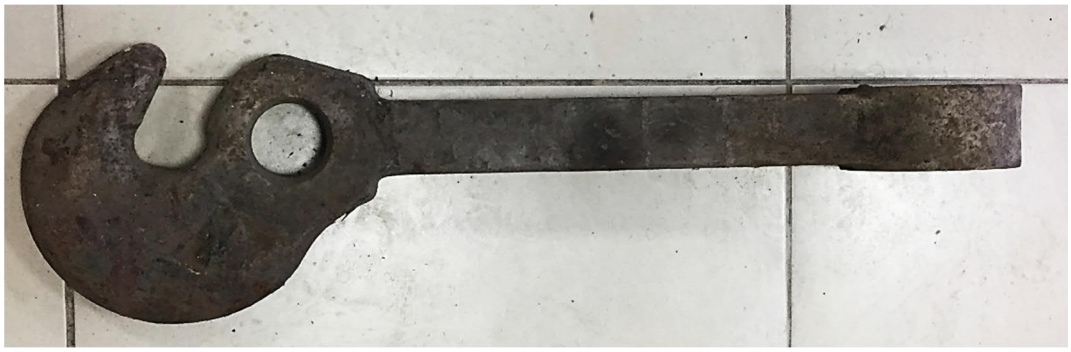
Nový vd. tarafından yapılan çalışmada, gevrek kırılmaya uğramış bir cer kancası araştırılmıştır. Numuneleri optik mikroskop ile mikro yapı incelemesi, çekme ve darbe dayanımı testleri ve bu testlerde oluşan kırılma bölgelerini gözlemlemek için SEM incelemesine tabi tutmuşlardır. Buldukları sonuçları FEM analizi yaparak desteklemişlerdir. Yapılan deneyler ve analizler sonucunda yapının hiçbir yerinde yorulmaya uğramadan kırıldığı buna da koaksiyel yüklemelerin sebep olduğu

bulunmuştur. Netice olarak, yapının bu tür yüklere maruz kalmasının normal olduğu bu nedenle daha dayanıklı malzemeden yapılması gerektiği ve standartta yer alan malzemenin yetersiz olduğu vurgulanmıştır (Nový vd., 2019). Mohammadi vd. tarafından yapılan çalışmada, demiryolu cer kancasının hasar analizi yapılmıştır. Bazı hasara uğramış bileşenlere tahribatsız muayene uygulanmış ve farklı bağlantı tiplerinin bileşenin dayanımına etkisini araştırmıştır. FEM kullanarak doğrusal statik ve yorulma analizleri gerçekleştirmişlerdir. Yorulmanın baskın arıza mekanizması olduğu ancak cer tertibatının sadece hızlanma kuvvetlerine uğraması, darbe veya yapısal kusurlara maruz kalmaması halinde sonsuz ömür sağlayabileceği sonucuna varılmıştır (Mohammadi vd., 2019).

Yapılan çalışmada, yük vagonlarında kullanılmış olan cer kancası koşum takımı tertibatının gerilmeye en fazla maruz kaldığı tahmin edilen kanca bölümünden alınan test numuneleri üzerinden çekme testi ve sertlik incelemeleri gerçekleştirilmiştir.

2. Materyal Metot

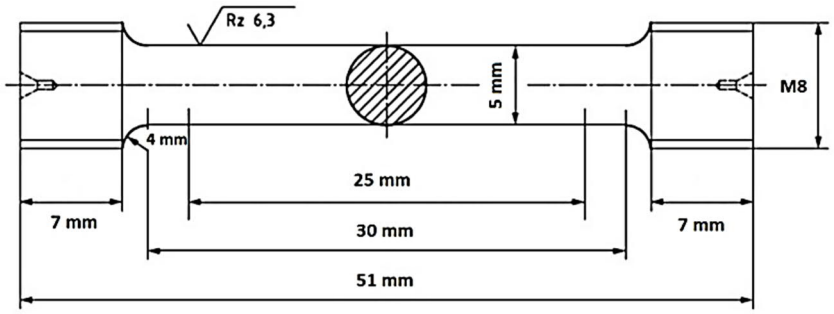
Bu bölümde, yük vagonlarında kullanılmış olan cer kancası tertibatından ilgili standartlara göre alınan numuneler ile gerçekleştirilen çekme testi ve sertlik testi incelemeleri aktarılacaktır. Şekil 1'de testlerde kullanılan cer kancası tertibatı gösterilmiştir.



Şekil 1. *Testlerde Kullanılan Cer Kancası Tertibatı*

2.1. Çekme Testi

Yapılan çalışmada TS EN ISO 6892-1 standardına göre hazırlanan numune teste tabi tutulmuştur. Test işlemi 30 mm test boyutundaki malzeme ile 0,0067 1/s test hızında gerçekleştirilmiştir. Şekil 2'de test numunesinin boyutları verilmiştir.

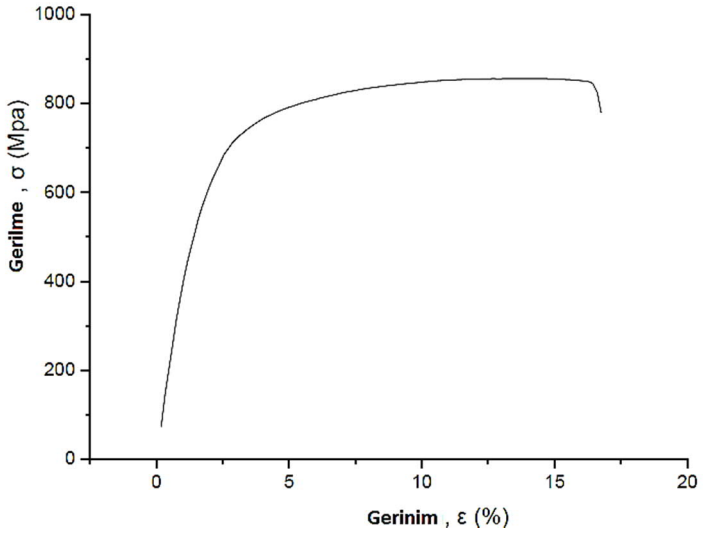


Şekil 2. *Test Numunesi Boyutları*

Test sonucunda, maksimum yükleme 16,8 kN, uzama miktarı %13,3, akma mukavemeti 608,4 MPa ve çekme mukavemeti 855,8 MPa olarak tespit edilmiştir. Hook kanununa göre gerçekleştirilen hesaplamalarda elde edilen mühendislik gerilme – gerinim değerleri hesaplanmıştır. Denklem 1'de mühendislik gerilme, denklem 2'de mühendislik gerinim, denklemleri verilmiştir (Marciniak, Z. Duncan, J.L. Hu, S.J, 2002). Şekil 3'te mühendislik gerilme – gerinim grafiği verilmiştir.

$$\sigma = \frac{P}{A_0}\frac{l}{l_0} \qquad (1)$$

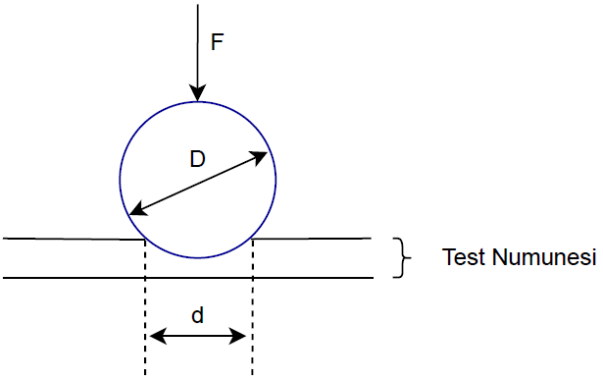
$$\mathrm{d}\varepsilon = \frac{\mathrm{d}l}{l} \qquad (2)$$



Şekil 3*. Mühendislik Gerilme – Gerinim Grafiği*

2.2. Sertlik İncelemesi

Yapılan çalışmada, 5 mm bilye çapı ve 750 kg yük altında Brinell sertlik testi (H_B) uygulanmıştır. Sertlik testi uygulaması öncesi çıkartılan test numunesine 2500 numaralı zımpara ile yüzey hazırlığı gerçekleştirilmiştir. Şekil 4'te Brinell sertlik testi uygulaması, denklem 3,4 ve 5'te Brinell sertlik testi hesaplama detayları verilmiştir (Sonmez, F.O., Demir, A, 2007).



***Şekil 4**. Brinell Sertlik Testi Uygulama Yapısı*

$$H_B = \frac{F}{A} \qquad (3)$$

$$A = \frac{\pi \cdot d}{2} (D - \sqrt{D^2 - d^2} , (mm^2) \qquad (4)$$

$$H_B = \frac{2F}{\pi . d (D - \sqrt{D^2 - d^2})}, (kg / mm^2) \qquad (5)$$

Malzeme yüzeyinde 6 ayrı noktadan test alınarak sertlik testi tamamlanmıştır. Şekil 5'te test sonrası numune görüntüsü ve Tablo 1'de sertlik değeri sonuçları verilmiştir.

***Tablo 1.** Brinell Sertlik (H_B) Testi Sonuçları*

Uygulama Sırası	***H_B***
1	243,61
2	246,55
3	244,49
4	244,95
5	248,27
6	241,59
Ortalama	**244,91 *H_B***



***Şekil 5**. Brinell Sertlik Testi Sonrası Numune Görüntüsü*

Literatürde yapılan çalışmalarda Brinell sertlik testi ile çekme dayanımı (σ_T) arasındaki ilişkisi tespit edilmiştir (Pavlina, E., Van Tyne, C, 2008). Denklem 6'da Brinell sertlik değeri ile çekme dayanımı

arasındaki ilişki verilmiştir.

$$\sigma_T = 3.45\ H_B \qquad (6)$$

Denklem 10'a göre tespit edilen ortalama H_B değerine göre hesaplama gerçekleştirildiğinde;

$$\sigma_T = 844{,}9\ \text{MPa}$$

olarak hesaplanmıştır. Yapılan çekme testinde elde edilen 855,8 MPa değerine yakın olması nedeniyle çekme testi ve sertlik testi uygulamaları arasında tutarlılık olduğu tespit edilmiştir (International Standard, 2010).

3. Sonuç

Demiryolu taşıtlarının kritik parçalarından olan cer kancası tertibatı üzerine yapılmış çalışma neticesinde, ekipmanın standartlara uygun mekanik özelliklere sahip olduğu tespit edilmiştir. Çekme mukavemetinin brinell sertlik değeri ile orantısında ve standartlarda verilen değer aralığında üst sınırda yer alması, ekipmanın yüksek mukavemetli ve ağır hasarlara karşı dayanıklı olduğunu göstermektedir. Yoğun saha şartları altında, ani hızlanma ve frenleme gibi çeşitli yüklemelere sürekli maruz kalabildiği için bu oranda mukavemetli bir malzeme kullanılması anlaşılabilmektedir. Literatürde, demiryolu bileşenleri ve cer kancası tertibatı ile ilgili yapılmış çoğu çalışma kırılımş veya ağır hasara uğramış ekipmanlar üzerinedir. Bu nedenle incelenen yorulmuş malzemelerin mekanik özellikleri standartta verilen değerlerin genellikle altında çıkmıştır. Buradan çoğu çalışmada sözü edildiği gibi demiryolu ekipmanlarında bakım ve onarım faaliyetinin oldukça önemli ve ağır kazalara yol açabilecek hassas bir konu olduğu sonucunu çıkarabiliriz.

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AKRİLİK ESASLI KAPLAMALARIN FOSFAT BAZLI ALEV GECİKTİRİCİLER İLE ALEV GECİKTİRİCİ ÖZELLİĞİNİN GELİŞTİRİLMESİ

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ÖZET

Sanayileşmenin doğal bir sonucu olarak endüstriyel yangın riski artmıştır. Bu riski en aza indirmek için aleve dayanıklı malzemelerin üretimi hızla ön plana çıkmaktadır. Günlük hayatta kullanılan malzemelerin çoğu akrilik bazlı polimerlerle kaplanmaktadır. Bu nedenle son kat kaplamaların alev geciktiricilik özelliklerinin geliştirilmesi beklenmektedir. Bu çalışmada akrilik bazlı reçinelerin yanmazlık özelliğinin iyileştirilmesi için çalışılmıştır. Bunun için, Tris(2-kloro-izopropil) fosfat (TCPP) ve trietil fosfat (TEP) alev geciktirici ve duman bastırıcı olarak seçilmiştir. Bu maddeler akrilik esaslı kaplamalara eklenmiş ve kaplamaların karakteristik özellikleri incelenmiştir. Ürünlerin performansının karşılaştırılabilmesi için katkısız kaplama reçinesi kontrol numunesi olarak kullanılmıştır. Hazırlanan tüm numunelere renk, katı miktarı, viskozite, asit değeri, yoğunluk ve hidroksil değeri testleri de uygulanarak seçilen alev geciktirici katkıların kaplama özellikleri üzerine olumsuz etkilerinin olup olmadığı araştırılmıştır. Reçinelerin, ısıl özelliklerinin belirlenmesi için termogravimetrik analiz (TGA) ve kaplama yüzeylerinin karakterizasyonu için taramalı elektron mikroskobu (SEM) kullanılmıştır. Yanma özelliklerinin belirlenmesi için ise limit oksijen indisi (LOI) ve UL-94 Dikey Yanma Testi gerçekleştirilmiştir. Yapılan testler sonucunda alev geciktirici katkıların renk, yoğunluk, asit sayısı ve hidroksil sayısı uygunluğuna olumsuz bir etkisinin olmadığı gözlenmiştir. TEP alev geciktiricinin akrilik polimer viskozitesini, TCPP alev geciktirici katkı maddesine göre daha fazla azalttığı görülmüştür. LOI ve UL-94 Dikey Yanma Testi sonuçlarından, TCPP ve TEP katkılı akrilik polimer numunelerinde çok iyi bir alev geciktirici etki gösterdiği görülmüştür.

Anahtar Kelimeler: Akrilik polimer, alev geciktirici, Trıs-2- kloro izo propil fosfat, trietil fosfat

IMPROVEMENT OF FLAME RETARDANT PROPERTY OF ACRYLIC BASED COATINGS BY PHOSPHATE-BASED FLAME RETARDANTS

ABSTRACT

As a natural result of industrialization, the risk of industrial fire has increased. To minimize this risk, the production of flame-resistant materials rapidly comes to the fore. Most of the materials used in daily life are coated with acrylic-based polymers. Therefore, it is expected that the flame retardancy properties of topcoats will be improved. In this study, it was studied to improve the flammability of acrylic-based resins. For this, Tris-2-chloro isopropyl phosphate (TCPP) and triethyl phosphate (TEP) were chosen as flame retardant and smoke suppressant materials. These substances are added to acrylic-based coatings and the characteristics of the coatings were investigated. Pure coating resin

was used as a control sample to compare the performance of the products. Then, color, solid amount, viscosity, acid value, density, and hydroxyl value tests were applied to all prepared samples, and it was investigated whether these additives had negative effects on the coating properties. Thermogravimetric analysis (TGA) was used to determine the thermal properties of the resins and scanning electron microscopy (SEM) was used for the characterization of the coating surfaces. Limit oxygen index (LOI) and UL-94 Vertical Combustion tests were performed to determine the combustion characteristics. As a result of the tests, it was observed that the flame retardant additives did not have a negative effect on the suitability of color, density, acid number, and hydroxyl number. It has been observed that TEP flame retardant reduces acrylic polymer viscosity more than TCPP flame retardant additive. The addition of TCPP to the acrylic-based polymer has been observed to reduce the thermal stability of the resin. When TCPP and TEP usage are compared, it was determined that TEP usage affects thermal stability less. The effects of two different flame retardants used in acrylic-based resin were evaluated with the UL-94 vertical combustion test. The pure acrylic coating showed a burning behavior for more than 4 minutes, did not drip, and entered the flammable substance category. Additions of 2% and 5% by weight of TCPP and TEP flame retardant chemicals did not change the flammable substance category. The burning degree of V1 was obtained for the sample containing 10% by weight TCPP and V0 for the sample containing 15% by weight TCPP. On the other hand, TEP added to the acrylic resin was found to reach the V-0 degree in addition to 10% by weight. LOI values increased with the increase in phosphorus element amount. From the results of the LOI and UL-94 Vertical Combustion test, it has been seen that it has a very good flame retardant effect on acrylic polymer samples with TCPP and TEP.

Keywords: Acrylic polymer, flame retardant, Tris-2-chloro isopropyl phosphate, triethyl phosphate

GİRİŞ

Gündelik yaşamın hemen hemen her anında ve yaşanılan çevrede akrilik polimerden yapılmış en az bir malzeme ile karşılaşılabilir. Polimerik malzemeler bir veya daha fazla monomer biriminin kovalent bağlarla oluşturduğu makromoleküllerdir. Kaplamalar için akrilik polimerler, poliakrilik adıyla bilinen polimerler ailesinin temel üyeleri olan akrilik ve metakrilik asit esterleri içeren ve polimerizasyon tepkimeleri ile elde edilen polimerlerdir. Akrilik asit kimyasal formülü CH2=CHCOOH ile gösterilen organik bir asit olup, IUPAC sistematik adı prop-2-enoik asit, metakrilik asittin ise 2-metilpropenoik asittir (Poth ve Baumstark 2014).

Akrilik polimerler çözelti polimerizasyonu, süspansiyon polimerizasyonu, emülsiyon polimerizasyonu veya kütle polimerizasyonu yöntemleri ile üretilirler. Akrilik polimerler en önemli ticari polimerlerden biridir ve gerekli katkıların ilavesiyle, otomobil sektörlerinde, ambalaj sektöründe, inşaat, elektrik ve elektronik donanımları, tarım, beşeri ilaç ve destek sektörleri gibi çok geniş alanlardaki uygulamalarda tercih edilen malzemelerdir. Polimerik malzemelerin bu kadar yaygın kullanılmalarının nedenleri çok yönlü kullanıma yatkın, hafif, güvenli, dayanıklı ve düşük maliyetli olmalarıdır. Bunun yanında, kopolimerleşme ile farklı özellikte olan bir polimer ile bir diğer bir polimerin sahip olduğu özellikleri birleştirilerek istenilen amaca uygun hale getirilen malzemeler elde edilebilir (Gezgin, 2012, Aslankılıç, 2008).

Bu çalışmada, akrilik kaplamalarda literatürde kullanılmamış alev geciktirici kimyasalların kullanımı ile akrilik esaslı kaplamaların yanmazlık özelliğinin geliştirilmesi için çalışılmıştır. Alev geciktirici ve duman bastırıcı olarak Tris(2-kloro-izopropil) fosfat ve trietil fosfat kullanılmıştır. Bu maddeler akrilik esaslı kaplamalara fiziksel olarak eklenmiş ve seçilen alev geciktirici kimyasalların kaplamalar

üzerindeki fiziksel, ısıl, morfolojik ve alev geciktirme özellikleri üzerine etkileri incelenmiştir.

DENEYSEL

Akrilik esaslı kaplamalarda yanmazlık özelliğinin geliştirilmesi için kullanılan akrilik esaslı reçine ve alev geciktirici katkıların özellikleri ve tedarikçi firmalar Tablo 1.'de verilmiştir.

Çalışmada, alev geciktirici içermeyen akrilik esaslı polimer numuneleri kontrol numunesi olarak kullanılmıştır. Daha sonra iki farklı alev geciktirici, akrilik reçinenin sahip olduğu polimer oranına göre üç farklı oranda eklenerek alev geciktiricili akrilik kaplamalar elde edilmiştir. Alev geciktirici katkı eklendikten sonra karışımlar, mekanik karıştırıcı ile 150 rpm de ve 30 dakika süre ile karıştırılmıştır. Homojen karışım sağlandıktan sonra akrilik polimer numunelerine, fiziksel testler, ısıl özelliklerinin belirlenmesi için termogravimetrik analiz (TGA) ve kaplama yüzeylerinin karakterizasyonu için taramalı elektron mikroskobu (SEM) kullanılarak analizler gerçekleştirilmiştir. Yanma özelliklerinin belirlenmesi için ise limit oksijen indisi (LOI) ve UL-94 Dikey Yanma Testi yapılmıştır.

Tablo 1. Deneysel çalışmada kullanılan malzemelerin kimyasal ve fiziksel özellikleri

Malzeme	**Firma Adı**	**Özellikleri**
Akrilik esaslı polimer (P)	Kempro Kimyasal Maddeler ve Dış Tic. A.Ş.	Renk: ≤ 100 Apha Katı Miktarı: %50-52 Viskozite (23 °C):3.500-8.500 mPas Asit değeri: 5-8 mgKOH/g OH: 65 mgKOH/g Yoğunluk (23 °C):0,96-0,10 g/cm3
Tris(2-kloro-izopropil) fosfat (TCPP)	Flokser Tekstil San. Ve Tic. A.Ş.	Bozunma sıcaklığı: >200ºC Viskozite (25 °C):60-70 mPas Yoğunluk (20 °C): 1.285-1.295 Asit değeri: ≤0.1 mgKOH/g Renk: ≤ 50 Apha
Trietil Fosfat (TEP)	Flokser Tekstil San. Ve Tic. A.Ş.	Yoğunluk (20 °C): 1.071±0.005 Parlama noktası: ≥ 115 °C Renk: ≤ 50 Apha Asit değeri: ≤0.1 mgKOH/g

SONUÇLAR VE TARTIŞMA

Termogravimetrik Analiz (TGA)

Farklı oranlarda alev geciktirici içeren akrilik esaslı polimerin ısıl kararlılığı termogravimetrik analizler ile değerlendirilmiştir. T_{d5} (%5 ağırlık kaybının yaşandığı sıcaklık), T_{d50} (%50 ağırlık kaybının yaşandığı sıcaklık), T_{max1}, T_{max2} (maksimum ağırlık kaybının yaşandığı sıcaklıklar) ve 655 °C sonundaki % kalıntı miktarları Tablo 2'de özet olarak verilmiştir.

Akrilik esaslı polimere TCPP eklenmesinin, saf polimere kıyasla reçinenin ısıl kararlılığını azalttığı görülmüştür. TCPP ve TEP kullanımları kıyaslandığında ise TEP kullanımı ısıl kararlılığı daha az etkilediği belirlenmiştir. Saf akrilik polimerin kalıntı miktarı %3,4 olarak tespit edilirken, TCPP 'nin artan oranlarda kullanımı ile 655 °C'de kalıntı miktarının çok fazla etkilenmediği ve %3,2 ile %4,0 arasında değiştiği görülmüştür. Alev geciktirici olarak TEP kullanıldığında ise kalıntı miktarı %3,4'ten %2,0 'ye azalmıştır. Xu ve arkadaşları tarafından yapılan bir çalışmada ise aramid elyaf

içerikli sert poliüretan köpüklerine Tris(1-kloro-2-propil) fosfat alev geciktiricisi eklenmiş ve termal özellikleri kontrol numunesiyle karşılaştırıldığında, oluşan kömür kalıntısının artığı görülmüştür.

Tablo 2. Hazırlanan kaplamaların TGA'da ısıl bozunma sıcaklıkları

Örnek	T_{d5} (°C)	T_{d50} (°C)	T_{max1} (°C)	T_{max2} (°C)	Kalıntı $_{655°C}$ (%)
Polimer (P)	268,7	356,3	381,9	301,2	3,4
P/TCP-2	236,7	354,8	212,5	302,6	3,2
P/TCP-5	232,2	346,9	215,0	301,7	3,4
P/TCP-10	255,4	356,8	206,1	298,2	4,0
P/TEP-2	255,9	352,9	222,4	302,6	2,0
P/TEP-5	246,0	343,0	238,6	301,7	2,5
P/TEP-10	244,5	347,4	244,0	301,2	3,1

UL-94 Dikey yanma testi

Akrilik esaslı reçinede kullanılan iki farklı alev geciktiricinin etkileri UL-94 dikey yanma testi ile değerlendirilmiştir. Bu test ile ayrıca kaplamaların yanma hızı ve damlama özellikleri de belirlenmiştir. Tablo 3'te numunelerin UL-94 test sonuçları verilmiştir. Kontrol numunesi olan, saf akrilik kaplama 4 dk.'dan fazla yanma davranışı göstermiş, damlama olmamış ve yanıcı madde kategorisine girmiştir. Alev geciktirici kimyasalların ağırlıkça %2 ve %5 kullanımlarında da yanıcı madde kategorisi değişmemiştir. Akrilik esaslı polimer numunesine ilave edilen artan oranlarda TCPP ile %10 eklemede V1, %15 eklemede ise V0 yanma derecesi elde edilmiştir. Akrilik reçinede TEP kullanıldığında ise UL-94 V-0 derecesine daha az miktarlarda, ağırlıkça %10 kullanımda ulaşıldığı görülmüştür. TCPP kullanıldığında ise ağırlıkça%15 TCPP içeren, P/TCP-15 kodlu numune de V0 yanma derecesi elde edilmiştir. Mei ve arkadaşları tarafından yapılan bir çalışmada Stiren akrilonitril kopolimerinin TEP/PMMA kompozitlerine TEP alev geciktiricisi eklenmiş ve UL-94'ün V-0 seviyesine ulaştığı görülmüştür.

Tablo 3. UL-94 dikey yanma testi

Örnek	t_1 (sn)	t_2 (sn)	V_0	V_1	UL-94	Damlama	Pamuğun alev alması
Polimer (P)	240	240	<10	<30	Yanıcı	Hayır	Hayır
P/TCP-2	123	129	<10	<30	Yanıcı	Hayır	Hayır
P/TCP-5	62	69	<10	<30	Yanıcı	Hayır	Hayır
P/TCP-10	30	26	<10	<30	V_1	Hayır	Hayır
P/TCP-15	9	9	<10	<30	V_0	Hayır	Hayır
P/TEP-2	123	119	<10	<30	Yanıcı	Hayır	Hayır
P/TEP-5	36	38	<10	<30	Yanıcı	Hayır	Hayır
P/TEP-10	9	7	<10	<30	V_0	Hayır	Hayır
P/TEP-15	2	2	<10	<30	V_0	Hayır	Hayır

Limit (Sınırlayıcı) Oksijen İndeksi (LOI)

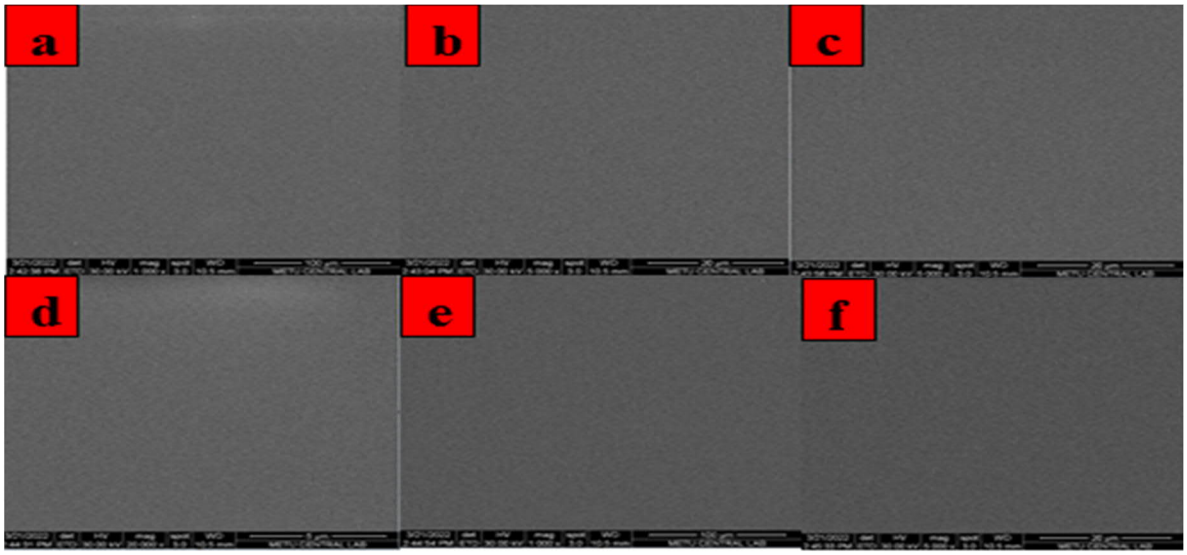
Farklı oranlarda farklı türde alev geciktirici içeren akrilik esaslı polimerlerin LOI yanma testleri sonuçları Tablo 4'te verilmiştir. Bu çalışmada, fosfor elementindeki miktar artışı ile LOI değerleri artmıştır. P/TCP-15'e karşılık gelen örnek en yüksek LOI değeri yaklaşık %34,1'de, P/TEP-15'a karşılık gelen en yüksek LOI değeri ise yaklaşık %32,9'da ulaşmıştır. Mei ve arkadaşları tarafından yapılan bir çalışmada Stiren akrilonitril kopolimerinin TEP/PMMA kompozitlerine TEP alev geciktiricisini eklenmiş ve UL-94'ün V-0 seviyesine ulaştığı görülmüştür. Akrilik esaslı polimere eklenen TCP ve TEP miktarları artıkça numunelerin alev dayanıklılığını arttırdığı belirlenmiştir. Ayrıca akrilik esaslı numunelerinin her biri standartta belirtilen 180 s yanma süresi sınırını aşmamıştır ve akrilik esaslı polimerlerle kaplanan metallerdeki 50 mm yanma sınırını geçmemiştir.

Tablo 4. LOI ve yanma miktarı değerleri

Örnek	LOI (% O2)	Yanma Süresi (s)	Yanma Miktarı (Sınır:50 mm)
Polimer (P)	31,1	52	Geçmiyor
P/TCP-2	32,1	49	Geçmiyor
P/TCP-5	33,1	45	Geçmiyor
P/TCP-10	33,6	32	Geçmiyor
P/TCP-15	34,1	22	Geçmiyor
P/TEP-2	32.0	51	Geçmiyor
P/TEP-5	32.3	47	Geçmiyor
P/TEP-10	32,6	36	Geçmiyor
P/TEP-15	32,9	27	Geçmiyor

SEM

Farklı oranlarda alev geciktirici içeren akrilik esaslı polimerin görüntüleri SEM analiz ile elde edildi. Şekil 1'de farklı oranlarda alev geciktirici içeren akrilik esaslı kaplamaların yüzey görüntüleri gösterilmiştir. Ricciardi ve arkadaşları tarafından yapılan bir çalışmada polyester reçineye fosfat bazlı inorganik yangın geciktirici eklenmiş ve polyester reçinenin morfolojisini degiştirmemiştir. Bu çalışmada da, TCPP ve TEP alev geciktiricilerin akrilik esaslı kaplama bileşiminde homojen olarak dağıldığı tespit edilmiştir. Görüntüler karşılaştırıldığında, TCPP ve TEP alev geciktiricileri kaplamaların morfolojisini degiştirmemiştir.



Şekil 1. a) P, b) P/TCPP-5, c) P/TCPP-10, d) P/TCPP-15, e) P/TEP-5, f) P/TEP-15

SONUÇ

Bu çalışmada, akrilik bazlı reçinenin yanmazlık özelliğinin iyileştirilmesi için reçine bileşiminde farklı oranlarda Tris(2- kloro-izopropil) fosfat (TCPP) ve trietil fosfat (TEP) alev geciktiricileri kullanılmıştır. TCPP ve TEP içerikli akrilik esaslı reçinenin, ısıl kararlılık davranışı, morfolojik özellikleri ve yanma özelliklerinin belirlenmesi, TGA, SEM, limit oksijen indisi (LOI) ve UL-94 Dikey Yanma Testi ile değerlendirildi. TCPP ve TEP ilavesinin akrilik esaslı reçinenin fiziksel özelliklerine olumsuz bir etkisinin olmadığı görülmüştür. TGA sonuçları, artan TCPP ve TEP miktarı ile ısıl bozulma sıcaklığının azaldığını ve % kalıntı miktarının çok fazla değişmediğini göstermiştir. SEM analizleri ile TCPP ve TEP alev geciktirici kullanıldığında akrilik esaslı kaplamaların homojen bir dağılım gösterdiğini görülmüştür. LOI ve UL-94 Dikey Yanma Testi sonuçlarından, Tris(2- kloro izo propil) fosfat (TCPP) ve trietil fosfat (TEP) katkılı akrilik polimer numunelerinde yanmazlık özelliğinin geliştirildiği görülmüştür.

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PROPOSED OF BALANCING AND LEAK MONITORING SYSTEM IN SMART WATER DISTRIBUTION NETWORKS

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ABSTRACT

While establishing water networks, sustainable network installation becomes difficult because it is affected by external factors such as geographical location during the construction phase and develops over the years. With such negativities and developments, destructions occur in the city water distribution networks depending on time. According to the research, 10% - 55% of the water is lost in the water networks and leaks into the ground. Efficient use of resources has become mandatory due to global warming and the difficulty of accessing water resources. So digital methods have been used to detect losses in water networks and efficient models are being created. In the work to be done, it is aimed to prevent the increase in the amount of network water leaking from the cracks in the lines and the increase in the amount of leakage due to the increase in the pressure in the line. By monitoring the pressure data of critical points in the network, high-pressure formation in the water network should be prevented during periods of low consumption. In this framework, by creating a structure that digitally controls the water network, the pumps in the production line can be controlled and production can be made instantly according to the network pressure. In the model proposed in this study, pressure transmitters operating with 4-20 mA loop signal and electrolysis humidity measurement sensors will be placed at critical points in the network. Then the pressure and humidity values obtained from the sensors will be sent to the data control center with communication devices that transmit data via MODBUS communication protocol. After the values coming to the center are read, the control system will evaluate and make the necessary transformations and will allow the pressure values to be kept at the desired range pressure by intervening in the pumps. With this study, the amount of loss due to leakage will be reduced by reducing the pressure of the water in the line, which is at high pressure in the period when the consumption in the city water distribution lines decreases, according to the need. In addition, leakage points will be detected more easily by providing soil moisture level measurements at leakage points with electrolysis measurement sensors.

Keywords: Smart Water Distribution, Leak Monitoring System, Balancing Monitoring System

1. Introduction

Rapid population growth, urbanization, changes in living standards, increase in irrigated agriculture, and changing consumption patterns have increased the water demand. Water management has increasingly become a crisis facing governments all over the world. It is expected that the world population will reach 9.1 billion in 2050, 69% of people will live in cities and 93% of this increase will be in developing countries. These situations are expected to lead to an increase of 55% in water

demand (Connor, 2015). In the last 50 years, water production has tripled and freshwater resources have decreased due to global climate change. By 2030, water supply is expected to decrease by 40% as a result of urbanization and industrial development, thus affecting both the quality and quantity of available water resources (Van Leeuwen, 2013). According to the study conducted by Liemberger and Wyatt in 2019, it has been determined that the water loss from the network is 346 million m3 per day and 126 billion m3 per year worldwide. The economic value of water losses has been calculated to be approximately $39 billion. If the amount of water loss worldwide decreases by 30%, the water needs of 800 million people will be met (Liemberger and Wyatt, 2019). By preventing water losses, protecting water resources, reducing network operating costs, and increasing water quality, therefore, energy costs will also be reduced.

According to the "Regulation on Control of Water Losses in Drinking Water Supply and Distribution Systems" published in the Official Gazette dated 8 May 2014 and numbered 28994 in Turkey, it is aimed to reduce water losses at high levels, to take necessary measures and to establish a certain standard. In article 6(1-b) of the section "Management of Drinking-Double Water Supply and Distribution Systems and Reducing Water Losses" in the regulation, water distribution administrations should determine their water and budget needs, prepare benefit and cost analyses and reduce water losses in their strategic plans. implementation and measures are described. With the entry into force of the regulation, the administrations that distribute water will reduce the water loss rates to 30% within 5 years in metropolitan and provincial municipalities, and to 25% within the following 4 years; In other municipalities, they were responsible for reducing it to 30% in 9 years and 25% in the following 5 years.

The water balance parameters in the water distribution system were defined and standardized with the standards prepared by the American Water Works Association (AWWA) and the International Water Association (IWA) in 2003 (AWWA, 2003). According to these standards, water loss consists of administrative losses and physical losses. Administrative losses include measurement errors in meters and illegal consumption (Davis 2005; Thornton et al. 2008). Administrative losses will be easier to reduce than physical losses with the measures to be taken by the water distribution administrations and the inspections to be made in the field. Physical losses in the water distribution network arise from leaks in transmission, distribution, storage, and subscriber connections. In their study, Kanakoudis and Muhammetoğlu (2014) tried to reduce physical losses by suggesting isolated zones and pressure management system application in the drinking water network systems of Antalya (Turkey) and Kos (Greece). With the said study, by using the pressure management system application, which is called the active leakage control method, the leakages are significantly reduced in the moments when the consumption decreases. Using the water balance table recommended according to AWWA and IWA standards, the amount of income-generating and non-revenue water used in the Izmit water distribution system was calculated as a percentage. In addition, water losses were taken into account as a performance indicator and performance value in the strategic plan, and administrative and physical loss values were calculated (Chandran et al., 2021).

In this study, information about smart grids and city applications will be given. Smart water network applications and architectural structure proposals will be put forward. Due to the cracks in the water lines, it will be tried to prevent the increase of leakage with the increase of the pressure in the line of the leaking mains water. By monitoring the pressure data of critical points in the network, the

formation of high pressure in the network will be prevented, especially during low consumption periods. The digital control system to be used will control the pumps in the production line and it will be possible to produce according to the instantaneous mains pressure.

2. Smart Grid and City Applications

Smart applications have come to an important point with developing technologies and have started to be used in many areas. In this section, smart grid application structures and water network usage will be explained.

2.1. Internet of Things (IoT)

The basic formation of the concept of the Internet of Things is the development of applications to facilitate human life by enabling the objects in the world to communicate with each other. IoT is the ability of objects built on standard communication protocols and capable of addressing to communicating via the Internet. IoT is an ecosystem of smart applications and services that make people's lives easier and raise their living standards. The components that make up the concept of the Internet of Things are Human, the Internet, and Sensor. In addition to these, there is a need for a software application for the systems to work holistically. Along with tools such as computers, phones, tablets, many machines, and even the items, we use in our daily lives will connect and create a larger network than the internet. In 2010, the number of objects connected to the Internet exceeded the number of people. The number of objects connected to the Internet is expected to reach 50 billion in 2020. In general, if an object can get an IP address and MAC address, it is defined as a smart device (Farhan et al., 2018).

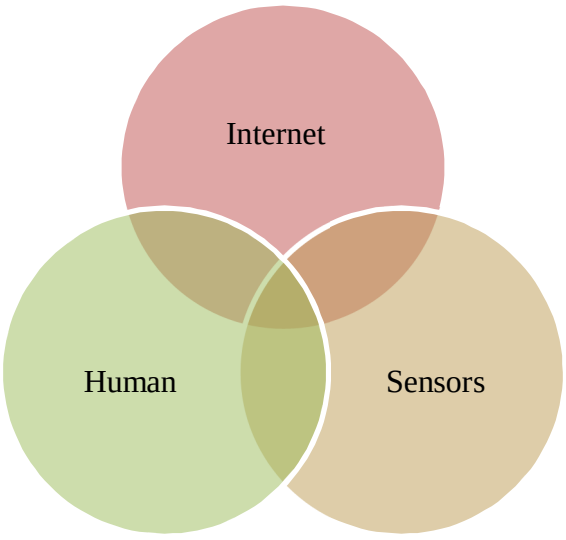


Figure 1. IoT Main Components (Farhan et. al., 2018).

The internet of things has become widespread with the development of technologies in terms of usage areas. It offers a central system opportunity, especially for the management of smart grids, smart cities, and water networks from smart grids. When looking at IoT applications in smart cities, smart transportation, smart grid, smart agriculture, smart industry, smart wholesale, smart health, and smart home are the most used applications.



Figure 2. IoT Applications in Smart Cities (Abaklioğlu, 2019)

2.2. Smart Grid

Infrastructure services have a very important position as an indispensable element of city life. Due to the increase in the urban population, the control of these infrastructure services has become vital. The increasing population has made it impossible to use and control infrastructure without Information Technology (IT) applications.

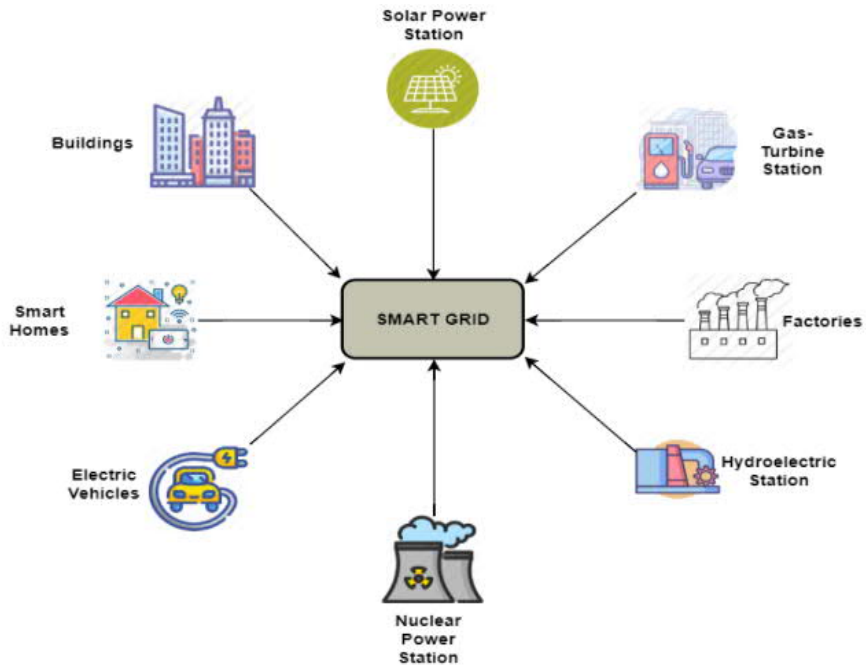


Figure 3. Overview of Smart Grids (Avcı, Özarpa, 2022)

2.3. Smart City

Smart cities are based on the idea of restructuring cities in a way that will reduce their complexity and provide maximum efficiency focused on humans and nature. In addition, smart cities have a management approach that creates and supports people-oriented, strategic, development, change, and environment. Due to these reasons, these cities are urban structures with improved service areas and living standards. These structures are based on creating new living spaces that are comfortable, healthy, human-oriented, and self-sufficient, where resources are consumed effectively and wisely,

respectful to nature, and environmental problems are minimized, using innovative and sustainable methods.



Figure 4. Smart Cities Overview (Channelpostmea, 2017)

2.4. Smart City Technologies

The main purpose of a smart city is to create an urban environment that will offer a high quality of life to the communities living in cities, while at the same time sustaining the economic growth of cities. Therefore, an important advantage of smart cities is to provide more services to society with less cost and less infrastructure. With the increasing population density, it is important to make the infrastructure systems efficient with central management in smart cities. It provides convenience in terms of managing infrastructure and superstructure systems from a single central point in smart cities (Ateş and Erinsel, 2019).

Smart city applications make it possible to make such developments and increase city activities and the quality of life of citizens. In this way, new income methods can be created, operational efficiency can be increased, and this provides more financial gains for both states and citizens. Thus, it is inevitable that the central management of smart cities and the technologies used contribute financially. For this reason, smart cities are expected to provide efficiency and savings in terms of infrastructure systems. Smart city applications are also; waste and hygiene management also aims to monitor and address environmental risks such as climate change and air pollution with smart water technology (Aldemir, 2018).

Emerging trends such as automation, machine learning, and the internet of things (IoT) ensure that smart cities are also adopted by people. Theoretically, any area of city administration can be included in the smart city system. For example, for drivers in big and crowded cities, without wandering for a long time; Smart parking meters that will help them find suitable parking spaces, as well as smart meters that will enable digital payment, can be easily applied in cities. Also in the field of transportation, intelligent traffic management is used to monitor and analyze traffic lights, optimize street lights and avoid too much congestion of the roads according to the time of day or rush-hour schedules. Smart public transport is another aspect of smart cities. Smart transit companies can coordinate services and meet drivers' needs in real-time, thereby increasing efficiency and driver satisfaction (Sevim et. al. 2019).

Energy-saving and efficiency are the main focus of smart cities. Smart street lights using smart sensors; can contribute to savings by getting dark when there are no cars or pedestrians on the roads.

Smart grid technology; can be used to improve maintenance and scheduling, provide power on demand, and monitor power outages. Smart city technology is increasingly being used to improve public safety, from monitoring high crime areas to improving emergency preparedness with sensors. For example, smart sensors; With an early warning system before drought, flood, landslide, or hurricane, necessary measures can be taken promptly (Örselli and Akbay, 2019).

Smart buildings are also often part of the smart city project. Sensors detect wear and tear in buildings and notify authorities when repairs are required. The sensors can also be used to detect leaks in the water mains and other piping systems, helping to reduce costs and increase the efficiency of public workers. Smart city technologies also bring efficiency to urban production and urban farming, including energy efficiency, space management, and fresher produce for consumers. As the population in cities continues to increase, these urban areas need to adapt to the growing population by using their infrastructure and assets more efficiently. Smart city applications can enable these improvements, advance city operations, and improve the quality of life among residents.

2.5. Smart Water Network

Smart water networks are systems in which all technical and operational information required for more efficient and accurate management of water networks feeding cities are collected and evaluated by developing solutions with technological applications. In addition, it is the whole of the systems in which solutions and improvements are proposed following these evaluations. In the management of smart water networks, it is necessary to collect the data from the field in the most appropriate way and evaluate these data and reveal the correct situation determinations. Among the smart grids, the smart water network has a water life cycle and this life cycle is shown in detail below.

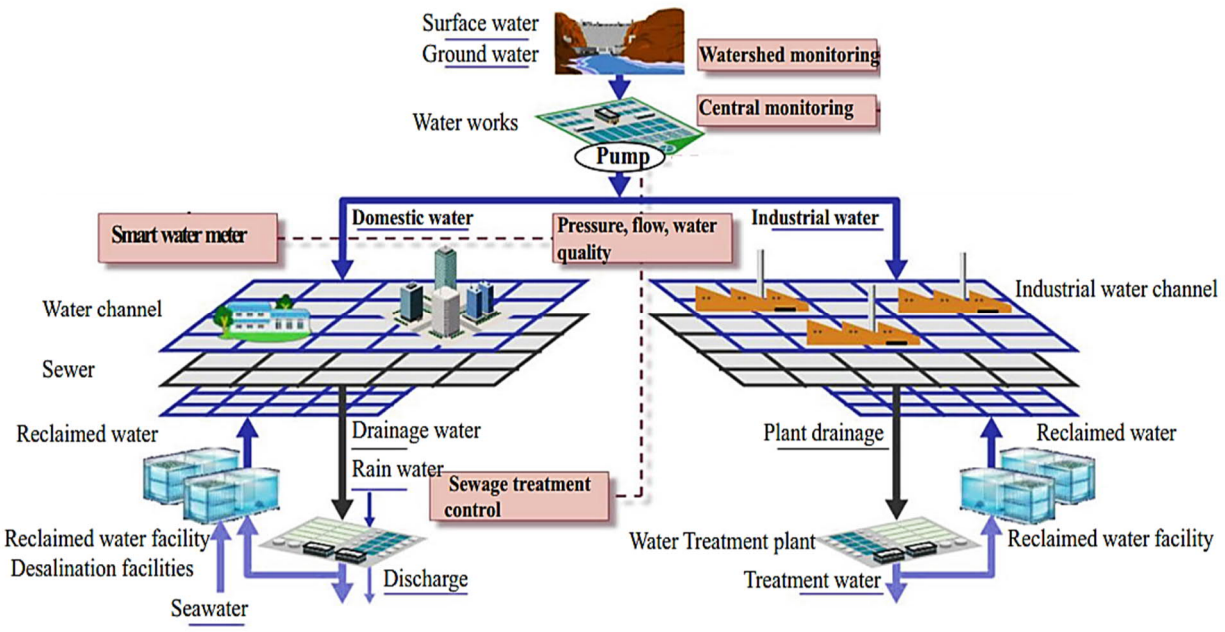


Figure 5. Smart Water Grids (Yin Su, et. al., 2020)

3. Balancing and Leakage Monitoring System in Smart Water Distribution Networks

In water networks, leaks occur due to reasons such as cracks that appear in the lines over time, and separations at the connection points. When the pressure rises, the amount of water leaking from these leaks increases, and the loss rates increase significantly. The pressure monitoring and control system, which is a model that can be used in smart water distribution networks, is controlled by pressure transmitters and electrolysis measurement sensors that work with a 4-20 mA loop signal placed in

critical areas in the field. The received data transmits the data to the communication (RTU) devices that communicate with the Modbus protocol, and the RTU devices transmit the data to the control center. Figure 6 shows the basic data flow structure.

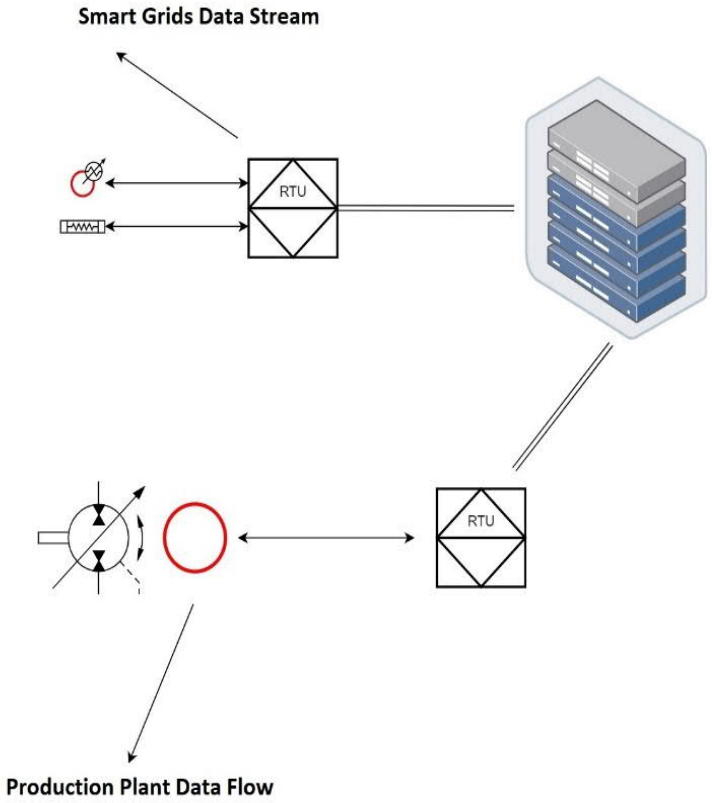


Figure 6. Basic Data Flow Structure

The designed system will balance the pressure in the line by reducing the production of the pumps in the production centers to prevent the pressure values taken from the critical points in the field and the high pressure that occurs during use in the network. In addition, electrolysis measurement sensors placed in areas with data flow will transmit the data to the RTUs and thus to the main control center in case of leakage. An example of a water network application structure is given in Figure 7.

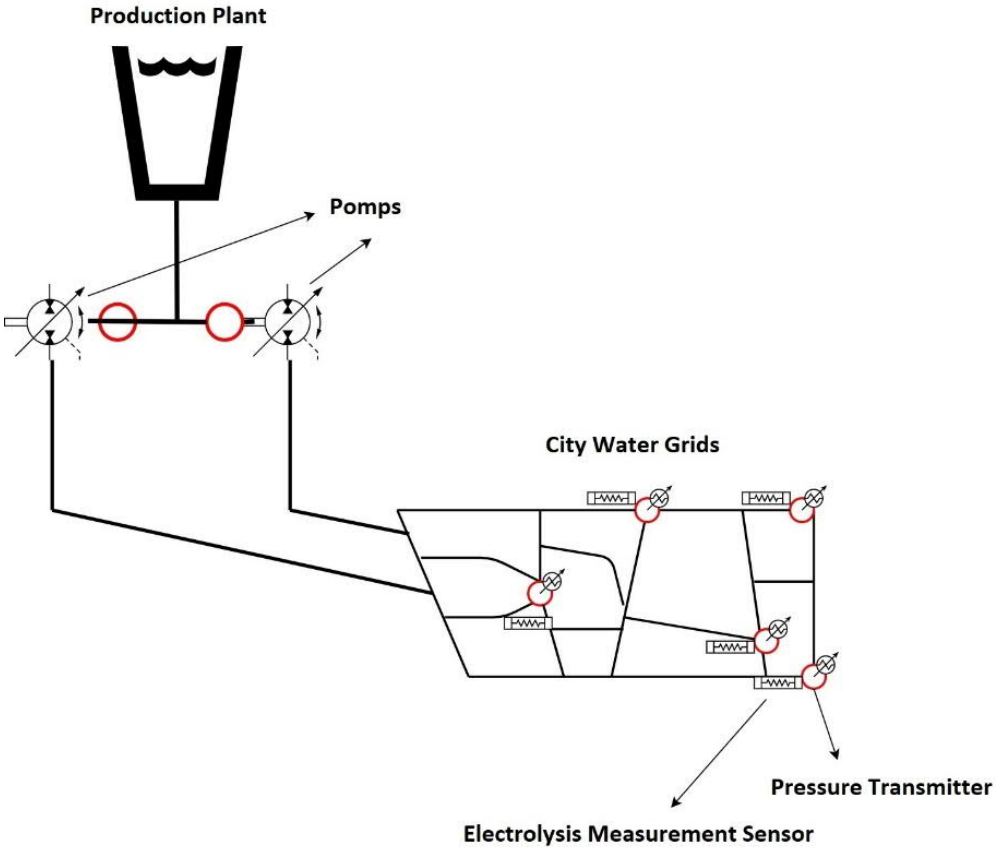


Figure 7. Water Network Application Structure Example

4. Conclusion

In the study, it has been determined that due to the problems experienced in water resources in the world and Turkey and the increase in the amount of lost water, various regulations and obligations have been put forward and studies are needed on this subject. With the developments in smart systems, smart city and smart grid concepts have emerged and efficient management models have been created. With the proposed system, it will be possible to prevent the increase of leaks that occur due to cracks in the water networks as a result of the increase in pressure. Critical areas of the line will be examined with smart grid systems and it will be easier to intervene at the determined points in case of leakage. In this study, the application of the developed model in city networks should be done in a planned manner. It is aimed to reduce water leakages by setting the pressure values in the city water network. It is difficult to intervene in working systems. In addition, it has been seen that academic studies are insufficient research.

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PARAMETRİK DENKLEMLERLE SİKLOİDAL EĞRİ FORM DİŞLİLERİN İNŞASI VE SOLIDWORKS TABANLI TASARIMI

Mehmet Sinan ÇETİN
Mahir UZUN

ÖZET

Bu çalışma, sikloidal eğri form konfigürasyonuna sahip dişlinin inşasında kullanılan eğrilerin parametrik matematiksel denklemleri kullanılarak, eğri diş konfigürasyonuna sahip sikloidal dişlinin parametrik geometrik CAD modelinin gerçek sikloidal eğriler yardımıyla doğru bir şekilde nominal şeklinin tasarımı için gerçekleştirilmiştir. Literatür taramasında, eğri formlu dişliler üzerine gerçekleştirilen bilimsel araştırmalar ve patent tescillerinin eğri diş konfigürasyona sahip evolvent dişlileri kapsadığı görülmüştür. Artan rekabet ve performans talebini karşılamada bazı özellikleri bakımından yetersiz kalan konvansiyonel düz ve helis dişlilere, önemli bir alternatif olma potansiyeli bulunan eğri formlu dişlilerin geometrik avantajları, bu dişlileri araştırmacıların ilgi odağı haline getirmektedir. Bu avantajlardan en önemlileri olan yük taşıma kapasitesinin daha yüksek olması, servis esnasında daha az gürültü üretmeleri ve en önemlisi eğri diş formunun sağladığı geometrik avantaj sayesinde aşınma oranlarının daha az ve ürün yaşam döngülerinin daha uzun olması nedeniyle giderek daha fazla araştırmaya konu olmaktadır. Bu çalışmada, sikloidal diş profilinin aglütinasyon önleyici episikloid ve hiposikloid eğrilerden oluşan eğri diş profili karakteristiği, tribolojik özellikleri bakımından eğri formlu sikloidal dişlilerin, ürün yaşam döngülerinin daha uzun olmasını sağlayabileceği uzgörürüsü çalışmanın motivasyon kaynağı olmuştur. Bu nedenle sikloidal eğri formlu dişlilerin doğru geometrik CAD modellerinin inşası ve tasarımı, gerçek nominal şekle sahip dişlilerin üretilmesinde, bu dişlilerin gerçek performanslarını ve ürün yaşam döngüsünün belirlemesinde ve ticarileşmesini kolaylaştırmak için hayati öneme sahiptir. Bu çalışmada eğri formlu sikloidal dişlilerin nominal şeklinin doğru tasarımı için sikloidal eğrilerin parametrik matematiksel denklemleri SOLİDWORKS programının parametrik eğri oluşturma menüsü yardımıyla, gerçek sikloidal eğrilerle oluşturulmuş ve sikloidal dişlinin doğru tasarımının detaylarının yansıtılmasına özen gösterilmiştir. Bu çalışma sonucunda SOLİDWORKS yazılım imkanları ile eğri formlu sikloidal dişlilerin nominal şekli doğru bir şekilde oluşturulabilmiştir.

Anahtar Kelimeler: Sikloidal Dişli, Sikloidal Eğriler, Eğri Form Diş Konfigürasyonu, Parametrik Tasarım.

SOLIDWORKS BASED DESIGN OF CYCLOIDAL CURVE FORM GEAR WITH PARAMETRIC EQUATIONS

ABSTRACT

This study was carried out for the design of the nominal shape of the parametric geometric CAD model of the cycloidal gear with the curved tooth configuration with the help of real cycloidal curves, using the parametric mathematical equations of the curves used in the construction of the gear with the cycloidal curved form configuration. In the literature review, it has been seen that scientific researches and patent registrations on curved gears cover involute gears with curved tooth

configuration. The geometric advantages of curved gears, which have the potential to be an important alternative to conventional spur and helical gears, which are insufficient in terms of some features to meet the increasing competition and performance demand, make these gears the focus of attention of researchers. The most important of these advantages are their higher load carrying capacity, less noise during service, and most importantly, less wear rates and longer product life cycles thanks to the geometric advantage of the curved tooth form. In this study, the curved tooth profile characteristic of the cycloidal tooth profile, which consists of epicycloid and hypocycloid curves that prevent agglutination, and the prediction that cycloidal gears with curved form in terms of tribological properties can provide longer product life cycles has been the motivation source of the study. Therefore, the construction and design of accurate geometric CAD models of cycloidal curvilinear gears is vital in producing gears with true nominal shape, determining their actual performance and product life cycle, and facilitating their commercialization. In this study, the parametric mathematical equations of cycloidal curves were created with real cycloidal curves with the help of the parametric curve creation menu of the SOLIDWORKS program for the correct design of the nominal shape of the curved cycloidal gears, and care was taken to reflect the details of the correct design of the cycloidal gear. As a result of this study, the nominal shape of curved cycloidal gears could be created correctly with SOLIDWORKS software facilities.

Keywords: Cycloidal Gear, Cycloidal Curves, Curved Form Tooth Configuration, Parametric Design.

THE COMPLEX TREATMENT OF NON-SPECIFIC ULCERATIVE COLITS

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ABSTRACT

The aim of our study is to improve the results by improving the complex treatment in non-specific ulcerative colitis.

Material and methods: Under our observation during from 2008 till 2020 there were 235 patients with the diagnosis non-specific ulcerative colits. 151 of them were women and 84 were male. The age of the patients was 16-64 years. In 41 patients were total colitis, left-sided lesions in 84 patients, proctitis and proctocigmoiditis in 110 patients. In complex treatment of this patients were used inflammatory preparations-aminosalicylates-sulfasalazine or salofalk; corticosteroids; immunodepressants. Salofalk was used during proctitis as suppository, in left-sided as microclisma, in total form as tablet. During complex treatment from corticosteroids were used metipred. During distal injury and I-II activity hydrocortisone was determined by rectal drops or microclismas. In the complex treatment from immunodepressants mainly were used 6-mercaptopurine and azathioprine. In the majority of patients receiving this treatment regimen, the acute period was eliminated and remission was achieved. Due to perforation of the large intestine in 9 patients with left ulcerative colitis, emergency surgery, subtotal resection of the large intestine, colostomy were performed. During the 6 months to 2 years postoperative period, the preserved segment of the large intestine was rehabilitated with hormones in the form of suppositories and microenvironment, local mesalazine, metronidazole, and intestinal antiseptics. Then, in the second stage of the operation, the operation to restore intestinal permeability with the removal of the colostomy was performed. Acute toxic dilatation was observed in 11 patients with left-sided ulcerative colitis. In 5 patients with toxic dilatation, the condition stabilized with conservative treatment, but in the other 6 patients, conservative treatment had no effect, so surgery was performed - subtotal resection of the large intestine, ileostomy. In these patients, hormones, local mesalazine, metronidazole, and intestinal antiseptics in the form of suppositories and microenvironment were administered to the preserved segment of the large intestine for 6 months to 2 years after surgery. Then, in the second stage of the operation, the operation to restore intestinal permeability with the removal of the ileostomy was performed. In 4 patients with total colitis, conservative treatment was ineffective, bloody and mucous defecation continued 14-16 times a day, the disease was complicated by pseudopolyposis, and radical surgery was performed. During the postoperative period of 6 months to 2 years, patients were treated conservatively according to the above scheme, mainly hydrocortisone was prescribed by rectal drip and micro enemas. As a result, the process in the rectum was completely eliminated, and patients underwent surgery to restore intestinal permeability by removing the ileostomy. Positive results were obtained in 100% of patients with proctitis against the background of treatment.

Conclusion: Based on our observations, we obtained positive results in patients with non-specific ulcerative colitis. Thus, complex treatment with the anti-inflammatory aminosalicylic acid sulfosalazine or salofalk, corticosteroids and immunodepressants was a convenient method, which led to rapid activation of patients, rapid elimination of the acute period, early discharge from the hospital, a

significant reduction in relapses. Timely operation during complications, dynamic observation of patients allows patients to achieve a positive result. After the operation, a positive result is obtained in 70-80% of cases. Annual preventive examination is advisable.

Keywords: ulcerative colit, toxic dilatation, surgical treatment

CYTOTOXICITY ANALYSIS OF ONE PRE-HYDRATED VERSUS ONE DRIED ACELLULAR PORCINE DERMAL MATRIX: AN IN VITRO STUDY

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ABSTRACT

Aim: The aim of the present study was to compare the direct and indirect cytotoxicity of a porcine dried acellular dermal matrix (PDADM) versus a porcine hydrated acellular dermal matrix (PHADM) in vitro. Both are used for periodontal and peri-implant soft tissue regeneration.

Materials and methods: Two standard direct cytotoxicity tests—namely, the Trypan exclusion method (TEM) and the reagent WST-1 test (4-3-[4-iodophenyl]-2-[4-nitrophenyl]-2H-[5-tetrazolio]-1,3- benzol-desulphonated)—were performed using human primary mesenchymal stem cells (HPMSCs) seeded directly onto a PDADM and PHADM after seven days. Two standard indirect cytotoxicity tests—namely, lactate dehydrogenase (LTT) and MTT (3-[4,5-dimethyl-2-thiazolyl]-2,5-diphenyl- 2H-tetrazoliumbromide)—were performed using HPMSCs cultivated in eluates from the matrices incubated for 0.16 h (10 min), 1 h, and 24 h in a serum-free cell culture medium.

Results: The WST and the TEM tests revealed significantly lower direct cytotoxicity values of HPMSCs on the PHADM compared with the PDADM. The indirect cytotoxicity levels were low for both the PHADM and PDADM, peaking in short-term eluates and decreasing with longer incubation times. However, they were lower for the PHADM with a statistically significant difference ($p < 0.005$).
Conclusions: The results of the current study demonstrated a different biologic behaviour between the PHADM and the PDADM, with the hydrated form showing a lower direct and indirect cytotoxicity.

Keywords: cytotoxicity; cytocompatibility; acellular matrices; porcine dermal matrices; pre-hydrated matrix; dried form matrix.

TYPES AND USAGE AREAS OF CULTURE MEDIA IN IVF APPLICATIONS

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ABSTRACT
It is generally accepted that mammalian preimplantation embryos are sensitive to their environment and that culture conditions can affect future growth and development potential, both prenatally and postnatally. Evidence suggests that while culture conditions during human in vitro embryo production may somewhat affect the developmental potential of the early embryo, the intrinsic quality of the oocyte is the key factor determining the proportion of oocytes developing to the blastocyst stage. In addition, evidence indicates that post-fertilization embryo culture is the most critical period influencing blastocyst quality, which is evaluated for cryotolerance, gene expression pattern, and ability to induce pregnancy. This article reviews the current literature with an emphasis on the bovine model. Moreover; Providing and maintaining appropriate culture conditions is crucial to minimize the stress applied to gametes and embryos and to optimize the in-vitro environment. One parameter that requires close scrutiny in this effort is pH. Therefore, culture media used in IVF laboratories are of great importance and they eliminate many negative factors that may arise for embryo development and pregnancy. There are very few studies on culture mediums, and many future studies are needed to achieve a better embryo development.

Keywords: IVF, Treatment, cultural mediums, Embryo development

INTRODUCTION
Maintaining optimal embryo viability during human in vitro culture is key to the success of assisted reproductive treatments. Although the culture medium is only one component of the in vitro conditions, its interaction with the surrounding medium has a significant impact in determining the overall yield of viable embryos in a cohort [1]. Since none of the culture media fully mimicked the in vivo environment, it was assumed that human embryos were subjected to sustained stress under in vitro conditions. Adaptation of embryos to stress has consequences such as decreased development due to increased cell death and changes in the expression or repression of key genes. The culture environment has also been

shown to affect fetal development and birth weight [2]. Two views compete on the ideal media composition to create an in vitro culture medium with minimal detrimental effects on embryo development. According to the 'back to nature' approach, the culture system must meet the demands of embryos to simulate their transition from the fallopian tubes to the uterus [3]. During this transition, the physiology of the embryo changes before and after compression, so the components of the environment differ in an ordered system. In the 'allow embryo pick' scheme, simultaneous use of the entire concentration in a mixture (single culture medium) is used with the assumption that the embryo will use whatever it needs. Randomization of groups and brands of culture media used differed significantly among the few comparative studies that evaluated the potential (dis)advantages of these strategies over the other. For example, randomization of fertilized oocytes into two commercially available media preferred single media due to higher day 5 blastocyst yield despite a similar embryo quality at day 3. Clinical outcome figures were inconclusive, as most transfers included embryos from both groups. Other studies are available using a variety of accessible media randomized patients or donors in groups. The results support the single medium approach as the ratio of compressed day3 embryos to zygotes is higher, with higher utilization rate higher morula formation at day 3, higher blastocyst yield at day 5 and higher implantation rate compared to the sequential system. Only one study observed no difference in embryo development and clinical outcome. Estimating the efficacy of culture systems requires comparative studies in which the effect of confounding variables such as patient, cycle and gamete characteristics on embryo development is minimized. It is also recommended to use a brand of culture medium, especially during long-term culture, because under similar conditions, the reaction of various media with the in vitro medium differs depending on the various ingredients, particularly during fertilization and a subsequent effect on embryos that may affect the final pregnancy outcome and fetal health. . Besides the methodological variations mentioned above, one reason for the differences between studies may be due to the traditional static observation technique itself, as it does not allow for accurate timing of embryo morphokinetics. The introduction of accelerated technology into clinical human assisted reproductive therapies has made possible a more precise description of embryo development dynamics and an algorithm is given to select the embryo with the highest implantation potential [4]. A hierarchical classification of embryos selected from weak to best, starting with those that exhibit very poor morphology (i.e., apparently nonviable), cleaving one to three or more cells, showing irregular initial division and multinucleation at the 4-cell stage, and remaining t5, s2, and cc2 presented using parameters. Embryos meeting all criteria (cleavage at predefined time periods) have been reported to have implantation capacities of up to 66%. However, this study was conducted using a sequential system and it is necessary to evaluate whether certain events have an impact on predefined time points during development of various culture systems. The aim of the studies was to compare the morphokinetic parameters of embryo development in a single and sequential medium produced by the same producer in a sister oocyte model and to evaluate the clinical outcomes of the cycles in which transfer embryos were cultured in the relevant media. The results will be expected to contribute not only to the understanding of the differences between these strategies, but also to whether implantation prediction models based on accelerated analysis are applicable to various embryo culture systems.

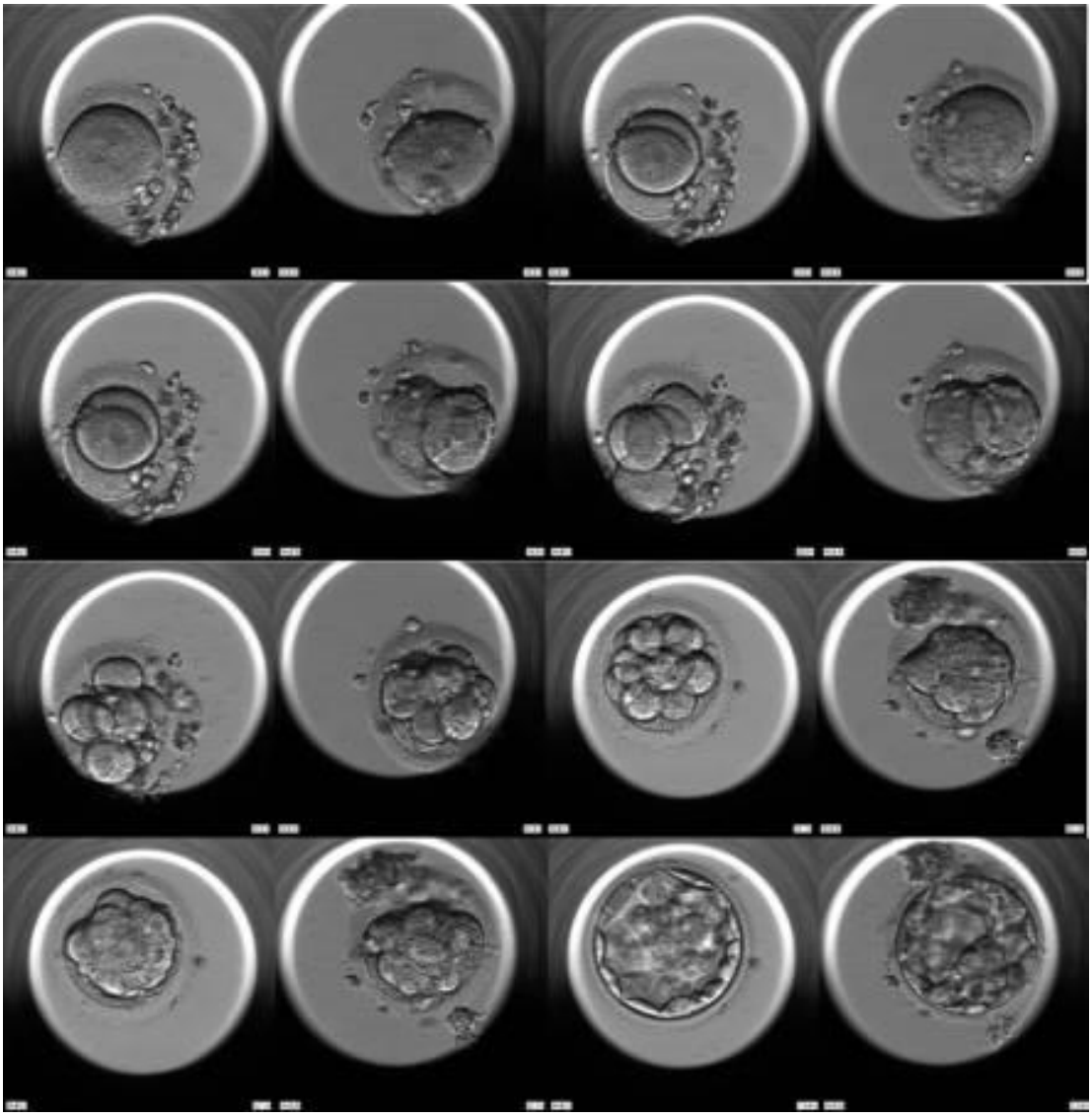


Figure 1: Embryos in culture medium [5].

Also, the need to identify the most viable embryo following in vitro fertilization (IVF) is crucial to increase successful pregnancy rates. Identification and transfer of single embryos with known viability and high developmental potential may prevent multiple pregnancies [6]. The standard method for identifying the best embryos has been morphology [7]. Morphological examination has increased knowledge of the optimal appearance of embryos at different developmental stages, with optimal appearance closely related to success. However, despite the accumulation of valuable morphological data and experience, all these assessment methods are based on the same visual depiction of embryos. Other proposed embryo selection techniques include pre-implantation genetic screening, despite concerns about its invasive nature [8]. Alternative non-invasive methods for determining embryo viability include measurements of factors in the growth medium or imaging of the embryo. In the future, it may allow embryologists to distinguish between viable and non-viable oocytes and embryos. Optimizing the composition of the embryo culture medium and incubation settings is crucial to improve embryo quality during in vitro development. Reactive oxygen species (ROS) in the culture medium may result from

metabolism by the embryo and/or its environment. ROS is thought to play a critical role in the success of IVF [9]. Oxidative stress has been defined as increases in steady-state levels of various ROS that exceed the body's antioxidant defenses. Oxidative stress can not only change many cell molecules, but also block or delay early embryonic development. ROS concentrations in spent culture media have been reported to be associated with advanced embryo fragmentation or blastocyst formation [10]. The precise role of ROS in early embryonic development has not yet been fully established. In contrast, the use of commercial media in culture systems has improved the consistency of embryo culture. The culture medium is often supplemented with antioxidants, thus maintaining the pro-oxidant-antioxidant balance in the embryos. Embryos in commercial culture medium have been found to produce ROS at varying rates depending on the composition of the medium. However, the relationship between oxidative stress parameters in culture media and IVF outcome in qualified, stable embryology laboratories has not been extensively investigated. It remains unclear whether the culture medium can neutralize excessive levels of ROS, thereby protecting cultured embryos and preventing the detrimental effects of ROS. In addition, it has not been determined whether ROS measured in culture media provides information about embryo quality that is not provided by morphology.

Selecting the best embryo to transfer is a crucial step in in vitro fertilization (IVF) cycles. Before reaching this point, selected embryos go through a series of events that can jeopardize their development and viability. One of the most striking is the days spent in the cultural environment. Avoiding multiple pregnancy pregnancies is one of the most complex challenges in assisted reproductive technology treatments; this makes it necessary to expand the culture to the blastocyst stage to increase the probability of selecting good embryos, as early embryo development is inefficient and there are only a few zygotes. eventually reaches the blastocyst stage. In other words, embryos reaching the blastocyst stage undergo self-selection in culture [11]. Evidence suggests that higher pregnancy rates are achieved when embryos are transferred at the blastocyst stage rather than the cleavage stage.

The dynamic nature of early embryo development and changes in the in vivo environment have led to the formulation of sequential culture media approaches designed to support embryos from the zygote to the blastocyst stage [12]. Sequential culture media approaches rely on the use of two sequential culture media to support embryo development. The former contains pyruvate to provide the energy needed in the early stages of embryo development and division, while the latter contains glucose to meet the energy demands of blastocyst formation.

Single culture media approaches provide embryos with all the nutrients they need to grow. The single culture medium produced superior results compared to sequential culture medium, not only in terms of improved pregnancy rates, but also in terms of quality of blastocysts obtained [13]. Comparisons between the two approaches found that a single culture medium yielded better outcomes in assisted reproductive technology treatments in the form of improved pregnancy rates and blastocyst formation [14]. The option not to refresh the culture medium on day 3 has been proposed to avoid manipulation of embryos in culture, but significant differences have not yet been found [15].

Ovarian stimulation and oocyte retrieval

For ovarian stimulation, it is performed using a dose of 150 to 300 IU/day of FSH and/or HMG for the first two to five days of the cycle, based on the patient's age, body mass index, and response to previous stimulation. Dosage is adjusted according to ultrasound examination at two to three day intervals and

patients are given GnRH antagonists and stimulation is continued until the main follicles reach an average diameter of 18 mm. Human chorionic gonadotropin (hCG) or a GnRH agonist was administered to induce ovulation; Ovarian puncture was performed 36 hours later. Each patient received an average of 8.4 donor oocytes. Severe male factor infertility was an exclusion criterion.

Fertilization and embryo culture

After egg retrieval, oocytes are cultured using G-IVF plus or other branded mediums used for fertilization (such as LifeGlobal, vitrolife, orgio, sage® at 37°C and 5.5% CO2) and waiting 2-3 hours in a 5.0% O2 incubator. is provided. The oocytes then go through multiple stages to be processed by conventional IVF or intracytoplasmic sperm injection (ICSI). Before the treatment with ICSI, oocytes are extracted from cumulus cells by pipetting into 80 IU/ml of hyaluronidase (Fertipro). This process is done with the HIYASE process and psychics belonging to many companies are used. After the ICSI tooth, drops are created by using a medium such as HEPES, g-Mops or G-mops plus (LifeGlobal, Vitrolife, sage, etc.) to the ICSI female. In addition, PVP (Fertipro immobilized sperm is injected into the ICSI female) to reduce sperm motility. PVP used is optional in many companies. Then it is covered by using brands such as Global Total, GTL, Orgio, Irvine coated with 10 ml of mineral oil (Fertipro ®). Metaphase II oocytes are then taken into the prepared ICSI tooth. After ICSI, the oocytes are covered with GTL, clivage, It is followed until transfer or vitrification for 3.5 to 6 days in culture medium such as G1, orgio, sage, Irvine, life global.Insemination with classical IVF oocyte fertilization (Keeping in global total medium in LifeGlobal, vitrolife, sage, Irvine or orgio and fertilization evaluation 100,000 sperm per milliliter until at a concentration of 90,000) sperm are injected. Evaluation is made after 18 hours. All cases are evaluated in 3,5 and 6 days. Moreover; Success of in vitro fertilization techniques is defined by a variety of factors, including embryo culture conditions related to the composition of the culture medium [16]. To meet the needs of the embryo at every stage of development and to optimize embryo quality, the sequential medium contains a different composition on different culture days [17]. These "ideal" compositions are based on studies in animal models that report a change in energy requirements as the in vitro culture of pre-implantation embryos evolves over time. Moreover, molecules such as EDTA, glutamine and some amino acids have been reported to have a variable effect on the embryo during development [18].

According to the "embryo free selection / single culture medium" paradigm, the embryo is cultured in a single medium that is stable and contains all the components needed during its development, and the composition of this single medium does not change during embryo culture [19]. Proponents of this paradigm argue that there is no direct empirical evidence that sequential media are necessary for optimal embryo development. It is not clear which type of culture medium (row or single) is associated with the best embryo quality on day 2, day 3 or day 5, or more importantly, the highest implantation rate per transferred embryo. No differences in embryo quality were observed at day 3 and 5 between a single medium and a sequential medium [20]. The best embryo quality has been reported after embryo culture in a sequential or single medium. However, the quality of these studies was limited by the lack of randomization or, in the case of randomization, a specific hypothesis with a power calculation, or not including an adequate number of embryos. It is unclear how the clinical implantation rate per embryo transferred is affected by embryo culture, as only a few studies have evaluated the difference in implantation rate using a single type of medium without any significant advantage. The latter may be due

to not enough embryos transferred. In light of the lack of robust scientific data and the hypothesis that sequential media is superior to single media, a prospective randomized study was conducted to evaluate the difference in embryo quality between a sequential group at day 1, day 2, and day 3. When we look at the mediums used in the studies, the Vitrolife group, the Life global group, (Sydney IVF Cook, Queensland, Australia) and a single medium (Gynemed, Lensahn, Germany).

Embryo culture mediums have a very important place in ensuring embryo development. However, developing embryos 3.5. One-stage culture medium and multi-stage medium are encountered in evaluating embryo quality at day 6 and 6.

If we touch on this issue fully; Adequate embryo culture is one of the most important steps during assisted reproductive therapy (ART). As the number of children born to ART has increased over the years, the question of the safety of ART procedures, including in vitro culture, has become a widespread public health concern. Various culture media protocols have been established until this date [21]. The culture medium is based on a single medium or sequential medium to support the development of zygotes to the blastocyst stage. A single environment can support embryonic growth at all stages of development [22]. These formulations contain all the ingredients required for culture in a fixed concentration. In contrast, the use of sequential culture media, known as the "back to nature" approach, is a two-step formulation designed to accommodate changes in embryo metabolism before and after the compression stage of development [23]. This approach reflects a better understanding of the physiological requirements for the growing embryo in vivo . Arguments in favor of a single-media culture include the practical advantages of reducing the number of media required in the ART lab, less manipulation and, as a result, less chance of error [24]. Both culture strategies have shown excellent clinical results. However, there is no consensus among clinical programs about which approach is optimal, and both are widely used [23]. There has been much discussion in the literature about the most suitable embryo culture medium [25]. However, studies have compared the same culture medium [26]. There are many media currently commercially available, each with different and often unknown compositions; On the other hand, it is unclear whether medium composition affects embryo quality and success rates of in vitro fertilization (IVF) or intracytoplasmic sperm injection (ICSI). Maintaining optimal embryo viability during in vitro culture is critical to the success of ART. When examining which culture medium is optimal, it is practical not only to examine a culture system's ability to produce a given implantation rate or clinical pregnancy rate (CPR), but also to determine how many embryos (both fresh and frozen) are present. the entire cohort is capable of giving birth to live births. The culture environment affects embryo quality and transfer of poor quality embryos results in a higher miscarriage rate and lower CPR [27].

CONCLUSION

It is generally accepted that mammalian preimplantation embryos are sensitive to their environment and that culture conditions can affect future growth and development potential, both prenatally and postnatally. Evidence suggests that while culture conditions during human in vitro embryo production may somewhat affect the developmental potential of the early embryo, the intrinsic quality of the oocyte is the key factor determining the proportion of oocytes developing to the blastocyst stage. In addition, evidence indicates that post-fertilization embryo culture is the most critical period influencing blastocyst quality, which is evaluated for cryotolerance, gene expression pattern, and ability to induce pregnancy. This article reviews the current literature with an emphasis on the bovine model. Moreover; Providing

and maintaining appropriate culture conditions is crucial to minimize the stress applied to gametes and embryos and to optimize the in-vitro environment. One parameter that requires close scrutiny in this effort is pH. Although embryos have a limited ability to regulate their internal pH (pH(i)), oocytes lack robust mechanisms. Therefore, in IVF it is imperative to pay attention to the external pH (pH(e)) of the culture medium. The ability to withstand deviations in hydrogen ion concentration varies depending on culture conditions and laboratory procedures. Cryopreserved - thawed - thawed embryos as well as stripped oocytes are particularly susceptible to perturbations at pH(e). Therefore, proper adjustment, monitoring and stabilization of pH(e) during IVF laboratory procedures is a crucial component of a rigorous quality control program. Therefore, culture media used in IVF laboratories are of great importance and they eliminate many negative factors that may arise for embryo development and pregnancy. There are very few studies on culture mediums, and many future studies are needed to achieve a better embryo development.

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MOLECULAR AND GENETIC DIAGNOSIS OF DUCHENNE MUSCULAR DYSTROPHY IN AZERBAIJAN POPULATION

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ABSTRACT

For the first time, we studied genetics of inherited Duchenne Muscular Dystrophy disease in the population of Azerbaijan Republic. With this purpose, the material was collected in the field exercises in the regions of Azerbaijan, Ganja, and Baku cities. Blood samples of 79 affected children, between 20 months and 14 years of age, and their family members suspicious for the Duchenne Muscular Dystrophy were studied. To diagnose, the biochemical method of enzyme creatinine phosphokinase quantity in blood serum was used. Increased values of the enzyme were identified in 9 male and 12 female patients.

Three mutation types were identified: deletion in exon 45, deletion in exons 8-20, and deletion in exons 46-48, as well as transversion of exons 03-08 and missense mutation – a substitution of C-T nucleotides in position 4996 of exon 35 in the DMD gene.

Obtained results will help doctors-geneticists provide competent prophylaxis of the disease in the future, including fetus prenatal diagnostics.

The research work was carried out in the laboratory of human genetics of the Institute of Genetic Resources of Azerbaijan National Academy of Sciences and the laboratory of Molecular Biology and Genetics of Western Caspian University.

Keywords: Duchenne muscular dystrophy, dystrophin gene, mutation

INTRODUCTION

As to the World Health Organization (WHO) data, there are more than 6000 inherited diseases that have already been studied. The major part of the identified genetic diseases consists monogenic diseases. It is understood from their names that one gene is mutated, and causes the monogenic inherited disease. There are around 5000 monogenic hereditary diseases (18, 20).

Inherited Duchenne Muscular Dystrophy (DMD) disease is one of the monogenic diseases. For the first time, it was described in 1830 by English anatomist-surgeon Charles Bella (ref). The frequency of the disease is around 1: 3500-4000 for newborn boys (11, 19).

The dystrophin gene is the longest gene in humans and has 2.6mln of nucleotide bases. It

comprises 79 exons and 78 introns (DMD, OMİM:300377). The length of the synthesized dystrophin protein equals 147 kDa (8, 11).

Approximately, 60% of all dystrophin gene mutations are responsible for small and big exon deletions, and 30% - point mutations. 10% of mutations are encountered as duplications and translocations. 98% of all mutations are responsible for the first 27 exons which are called hotspots of the gene. The dystrophin gene is located on the X sex chromosome (locus Xp21.2) with a recessive inheritance type (11, 17, 21).

Clinical manifestation of the disease depends on the mRNA translation degree. A wide clinical polymorphism is observed for the disease. The level of creatinine phosphokinase in patients' blood serums is usually up to 1000 u/l and above (1,15).

It should be mentioned that nowadays genetics of DMD disease has been insufficiently studied in patients from the Azerbaijan Republic.

Hence, the goal of our research is a molecular-genetic study of the DMD gene in members of five families who have clinic manifestations of DMD disease.

MATERIAL AND METHODS

The material was collected during field exercises in the regions of Azerbaijan: Astara, Masalli, Lenkoran, Sheki, Sirvan, Neftchala, Belokan, Qakh as well as in children hospitals in Baku and Ganja cities. Blood samples of 79 children patients between 20 months and 14 years of age and their family members were studied, if suspicious for DMD. The preliminary method of DMD disease was a biochemical method of quantity identification of creatinine phosphokinase enzyme in the blood serum. In male patients, enzyme normal values varied in the range between 38-137 U/L and female patients, between 26-140 U/L.

Creatinine phosphokinase enzyme increased values were revealed in 9 male patients and 5 their mothers as well as in 7 sisters of the said patients who were suspicious for DMD.

The DMD gene(s) was/were analyzed by an amplicon-based next-generation sequencing approach. The amplicons covered the entire coding region and the highly conserved exon-intron splice junctions. We had a minimum coverage of>20x for every amplicon. Missing regions or regions of poor quality were completed with classical Sanger sequencing to achieve 100% coverage. Variants of relevance identified by NGS were continuously and individually in-house validated for quality aspects; those variants which met our internal QC criteria (based on extensive validation processes) were not validated by Sanger. The reference sequence is sequences are: DMD: NM_004006.2

RESULTS AND DISCUSSION

When studying 79 affected children suspicious of DMD with the age of 20 months to 14 years, we found increased values of creatinine phosphokinase enzyme in blood serum of 9 male patients-kids from 4 to 13 years of age. Values creatinine phosphokinase in patients varied in the range between 1189.0 U/L and 2298 U/L, mean 2154 U/L (when the norm is 38-137 U/L). All the boys with increased values of the enzyme were suspicious of hemizygous carriage of the DMD gene.

At the same time, blood samples of 12 sisters of those patient boys were tested. In four of them, increased values of the enzyme were identified, and they varied in the range between 677.5 U/L-853.7 U/L, which witnessed heterozygous carriage of the DMD gene. To confirm the diagnosis genetically, a

molecular analysis of the DMD gene was run with the MLPA method.

Two brothers, 4 and 10 years old, suspicious of the DMD revealed mutation – deletion sized three exons encompassing 46-48 exons of the DMD gene. The results of the molecular analysis are presented in Figure 1.

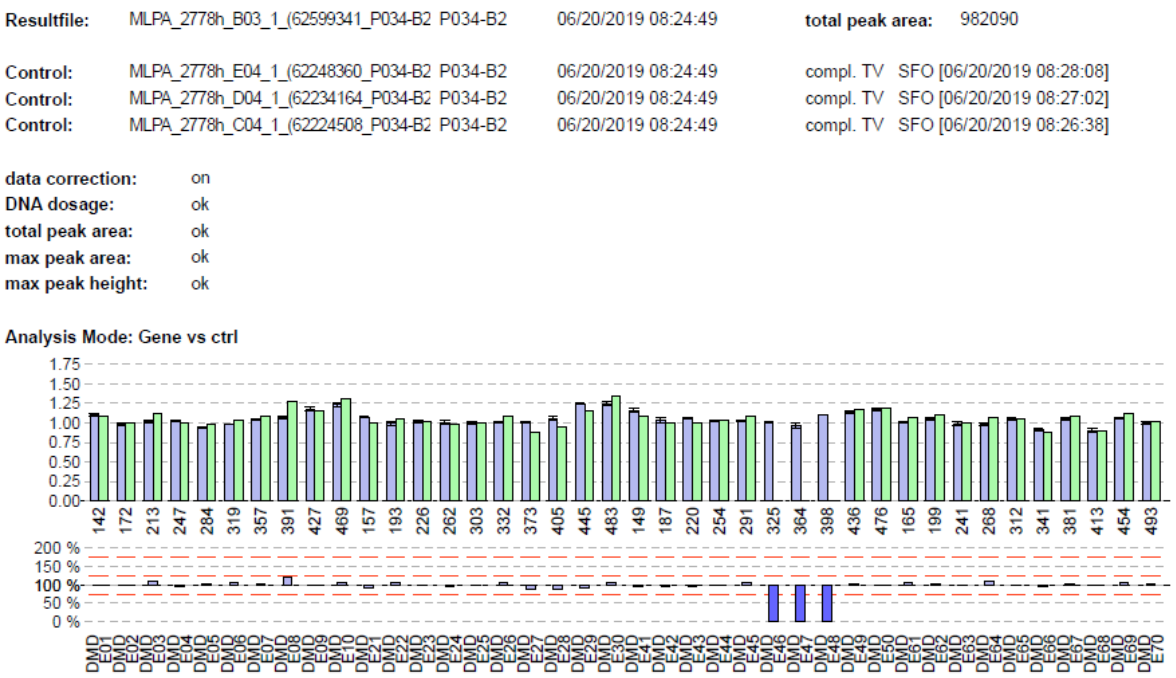


Figure 1. Index patient Kh.M. The DMD gene MLPA analysis results

Patient S.A., a 9-year-old boy with the obvious traits of the DMA disease, is a resident of the Masalli region of Azerbaijan. The Masalli region locates in the south-east foothill of Talysh Mountains in the Azerbaijan Republic. Family members: a mother, a father, and a sister of the index patient S.A. were examined. To diagnose all members of the family for the DMD disease, a biochemical analysis was conducted for quantitative analysis of creatinine phosphokinase in blood serum.

Molecular genetic analysis of the DMD gene identified mutation in mother and sister of the index patient. Mutation type was nonsense and classified as pathogenic class 1.

Results of molecular-genetic analysis of the DMD gene for index patient S.A. are presented in Figure 2.

Pathogenic variants as well as various single/multiple exon deletions in the DMD gene are associated with muscular dystrophy, an X-linked disorder, ranging from the severe DMD (DMD, OMIM: 310200) to the milder Becker muscular dystrophy (BMD; OMIM: 300376). DMD is featured by a progressive proximal muscular dystrophy with characteristic pseudo hypertrophy of the calves (12, 13, 16).

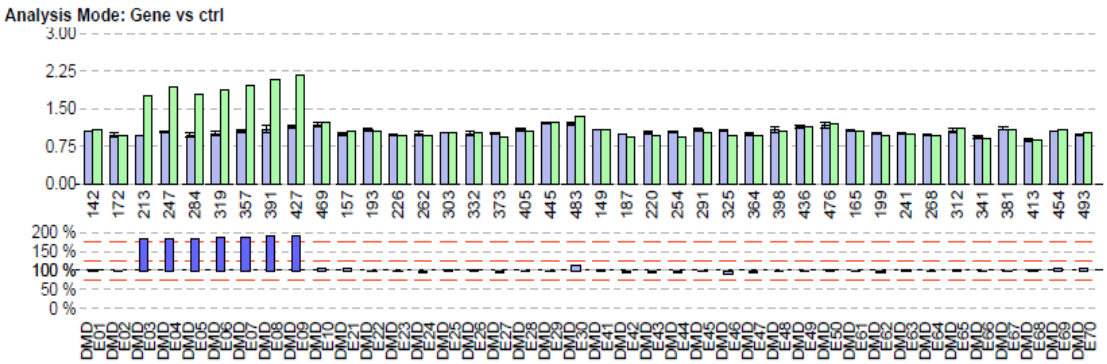


Figure 2. Index patient S.A. The DMD gene MLPA analysis result

The bulbar (extraocular) muscles are spared but the myocardium is affected. There is massive elevation of creatinine phosphokinase levels in the blood, myopathic changes by electromyography, and myofiber degeneration with fibrosis and fatty infiltration on muscle biopsy.

The muscular dystrophy that carries the Becker eponym is similar to the DMD in the distribution of muscle wasting and weakness, which is mainly proximal, but the course is more benign, with age of onset around 12 years; some patients have no symptoms until much later in life. Loss of ambulation also varies from adolescence onward, with death usually in the fourth or fifth decade. In some cases, as in Duchenne muscular dystrophy, a degree of mental impairment is present (PMID: 11879882).

The onset of DMD usually occurs before age 3 years, and the patient is chair ridden by age 12. The onset of BMD is often in the 20s and 30s and survival to a relatively advanced age is frequent (1, 2).

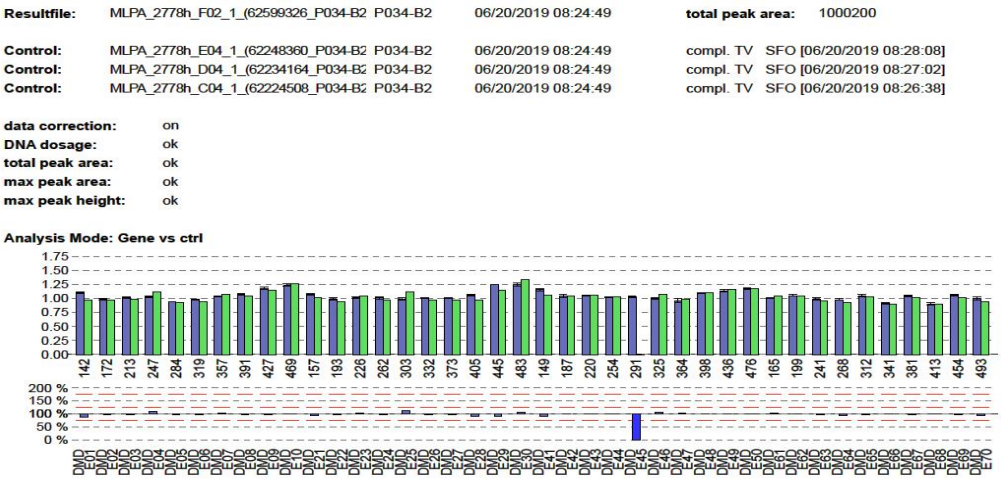


Figure 3. Results of the MLPA analysis of patient A.R.

Deletion of 45 exons out of 78 existing in dystrophin gene exons was identified in patient A.R. with Duchenne muscular dystrophy.

As one can see in the table, there are 5 types of the DMD gene mutations identified. Three of them relate to deletions, one to missense mutations, and one more to transversions. The first mutation – is a deletion encompassing exons between 8 and 20 and is the biggest including 13 exons. For that, we found 2 hemizygotes and one heterozygote.

The second mutation – deletion encompassing 3 exons – from 46 to 48. 3 cases are identified with 2 hemizygotes and one heterozygote.

In the third case, the identified mutation is a deletion of exon 45. Three hemizygous male kids and two

heterozygous women are revealed.

One mutation is a transversion covering from exon 03 to exon 09. The size of this transversion is seven exons. Here we found one hemizygote and one heterozygote. In one with a hemizygous case and two with a heterozygous carriage, we identified a mutation as nucleotide substitution Cytosine with Thymine in position 4996 in exon 35 of the DMD gene. Obtained results will help doctors-geneticists to provide competently prophylaxis of the disease in the future, including fetus prenatal diagnostics

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EFFECT OF MAXIMAL DOSES OF DEXTRAN-POLYACRYLAMIDE POLYMERS AND THEIR AS CARRIERS OF SILVER AND GOLD NANOPARTICLES ON SPLEEN MORPHOLOGY

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ABSTRACT

Problem. In the development of an ideal therapeutic agent the tasks of modern medicine is to create drugs which able to stop pathology at the cellular level. In this regard polymer nanocomposites could be used as nanocarriers for the delivery and release of water-soluble medicines and metal nanoparticles. The experimental data about the use of gold and silver nanoparticles in medicine increases steadily.

Objectives. To study the effect of maximal doses of the dextran-polyacrylamide polymers and their as carriers of silver and gold nanoparticles on spleen.

Research methods. Nanocarriers on the base of branched dextran-polyacrylamide polymers had been synthesized in our laboratory. "Uncharged" star-like polymer matrices (D-PAA) consist of a dextran core and grafted polyacrylamide chains. "Charged" matrices (D-PAA (PE) – dextran-polyacrylamide polyelectrolyte) also consist of a dextran core and grafted partially hydrolyzed polyacrylamide chains. An alkaline hydrolysis changes part of the amide groups to hydroxyl groups, which determines the negative charge of the macromolecule. The hydrodynamic dimensions of both types of macromolecules are 70-80 nm. Spherical shaped gold nanoparticles with size of 2-5 nm were loaded into D-PAA. Silver nanoparticles synthesized in D-PAA also characterized by spherical shape and had a size 8-15 nm. Experiments were carried out using 25 males of white laboratory Albino mice. Age of animals was 10 weeks, weight 25-30 g. The animals were divided into five groups: I – control, II – D-PAA, III – D-PAA (PE), IV – Au-D-PAA, V – Ag-D-PAA. Substances were diluted with 0,3 ml saline and injected intravenously into the tail vein once a day per five days. On the third day after the last (fifth) treatment, the animals were withdrawn from the experiment under etheranesthesia in compliance with the rules of euthanasia. The spleen was removed immediately, forthwith fixed in Bouin's solution for 7 days, embedded in paraffin. Slides were stained with hematoxylin-eosin according to the standard technique.

Results. The spleens of animals of the II group (D-*g*-PAA) characterized by a relative hyperplasia of the

red pulp, expansion of sinusoids, and an increase in number of lymphocytes and megakaryocytes. An even more pronounced hyperplasia of the red pulp had been observed in animals of the group III (D-*g*-PAA (PE). The ratio of white and red pulp in groups IV (D-*g*-PAA/AuNPs) and V (D-*g*-PAA/AgNPs) demonstrated no difference with the control group. The obtained data indicate that the treatment with both D-*g*-PAA and D-*g*-PAA (PE) may cause an increase in blood clotting, hemolysis and initiate inflammation, which resulted in increased erythro-, thrombocyto- and lymphopoiesis in the spleen. The introduction of metal nanoparticles into the D-*g*-PAA matrices neutralized these changes. In our opinion, it reflects the reactivity of spleen and may depend on the matrix charge and the size of NPs.
Conclusion. An increase in erythro-, thrombocyto- and lymphopoiesis has been observed in the spleen after the treatment with D-*g*-PAA and D-*g*-PAA (PE). Polymers with incorporated nanoparticles demonstrate no difference in spleen tissue compare with control group. For deeper understanding of mechanisms which realized in spleen by tested substances further investigations are required, including *in vitro*.

Keywords: dextran-polyacrylamide polymers, silver and gold nanoparticles, spleen, toxicity

EVALUATION AND COMPARISON OF TWO METHODS FOR THE ANALYSIS OF PARAMETERS MEASURING CARDIAC VARIABILITY

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ABSTRACT

Cardiac electrical activity (ECG) is a physiological signal that can be recorded simply, non-invasively and with accessible and widely available means. Heart rate variability (HRV) is The variation in time between two successive beats over a period of time, allows us to explore the influence and communication between the autonomic nervous system and the cardiovascular system. For long periods of time, the evaluation of HRV is a laborious task. Automatic evaluation systems exist and save a lot of time.

The aim of this work is to evaluate the agreement of HRV measurements by an automatic analysis system Acqknowledge (BioPac, USA), and manual assessment by an operator.

Keywords: electrocardiogram, cardiac variability, Acqknowledge

Method: A lead II ECG recording, using the MP 160 acquisition system (BioPac, USA), was performed on 10 volunteers aged 24 to 30 years. A 2-minute recording was made for each subject and analyzed manually and automatically by using Acqknowledge.

Result:

The comparative study shows the measurements by manual and automatic methods of parameters assessing the HRV such as PNN50%, have a good linear regression with a coefficient R^2 =0.997 (Figure

A). The graphical representation of Blond and Altman, also shows a good agreement of automatic and manual measurements (Figure B).

Fig : A

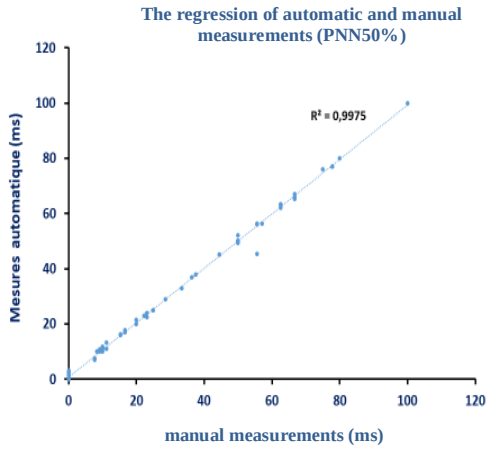
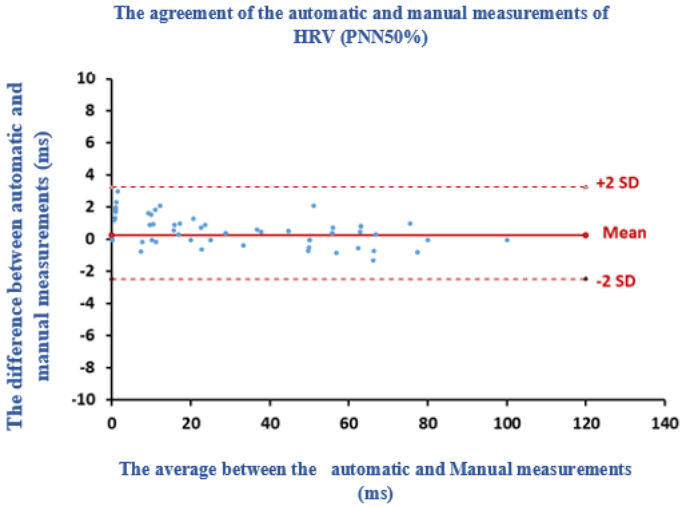


Fig : B



To check the validity of these results, we used the Bland-Atman plot method between the two manual and automatic ways.

Conclusion:

The comparative study shows the evaluation of the two methods is similar and the automatic analysis software Acqknowledge is reliable and can be used for the analysis of long-term recordings in research or even for diagnosis.

SURVEY ON KNOWLEDGE AND PRACTICE OF PALLIATIVE CARE IN HASSAN II PROVINCIAL HOSPITAL IN SETTAT-MOROCCO

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ABSTRACT

Aims and method: We conducted a survey in the Department of Medicine, of Surgery and of Intensive Care Unit of the Provincial Hospital in Settat, Morocco, to assess nursing knowledge and practice in palliative care.

A survey was conducted among 34 nurses, with a participation rate of 89.5%.

Results : This study reveals that whatever the training status of the participants, nursing intervention with patients in need of palliative care remains very limited, due to the feeling of powerlessness that nurses feel in the absence of support from a multidisciplinary team and a clear organization of this care pathway.

This study shows that the technical aspect of care takes precedence over other aspects of care for reasons related to the caregivers, in particular insufficient qualification in palliative care and the difficulty of dealing with the end of life, or to the organization of the service, such as reduced staffing numbers, the absence of specialized structures or of referral persons in palliative care

In this context, we propose suggestions for improving the nursing care of patients in the context of palliative care:

The organization of continuous training for all nurses in palliative care, and particularly in relational care.

Create a real and/or virtual platform for multidisciplinary sharing and discussion on this topic at the local, regional and national levels.

The opening of palliative care units at the local level,

Designation of local palliative care referents.

Conclusion : The present study can be considered as an overview for further more extensive research in this context.

Keywords: Palliative care, nurse, knowledge

PIPELINE NETWORK MODEL FOR ARTERIAL BLOOD FLOW ANALYSIS

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ABSTRACT

It is well known that the blood flow phenomenon in the human arterial system is a complicated mechanism wherein the blood flows through different arteries, elastic to muscular to rigid. Also, as we move down the line from Aorta to the arterioles, the components (arteries) of the system vary significantly in both geometry and mechanical properties. Besides this, the rheological behaviour of blood changes with the type of vessel through which it flows. Its principal constituent, the red blood cells, tend to aggregate into structures called rouleaux that greatly influence its rheology. This effect is more pronounced at low shear rates, where blood behaves as a non-Newtonian or, more precisely, a shear-thinning fluid and is more prominent in small arteries and arterioles than large arteries. At high shear rates, blood is a Newtonian fluid. Moreover, diseases like atherosclerosis, plaque decomposition, and hypertension result in wall modifications in the vessel (artery) that significantly change blood flow patterns. Literature survey on the blood flow models reveals that most of the available models do not reflect the change in the mechanical properties of arteries and the change in characteristics of blood as demanded by the situations mentioned above. A suitable mathematical description of the behaviour of these vessels and the changing blood flow characteristics is the prime objective of this work.

The proposed problem is realized using the concept of fluid flow in pipelines. We know that the mathematical modelling of the fluid flow in pipelines is a challenging division of the pipe flow problems. Unlike in the pipe flow problems, we know that fluid flow in pipelines involves the study of the dynamics in a network of pipes that consists of several pipes (termed component pipes) of different sizes and lengths connected end-to-end. Our study developed a two-component pipeline model for the arterial system with blood described as a Newtonian fluid in the first component and as a non-Newtonian fluid in the other component. We assumed the pipe (artery) to be rigid in both the component pipes and flow as axisymmetric as a first iteration. We developed a mathematical model to study the proposed problem using the Navier Stokes equation to describe the blood- flow with appropriate boundary conditions. Further, we assumed that the outflow from the first component pipe equals the inflow to the second component pipe and derived a semi-analytical solution to the mathematical model. We then obtained an estimate for WSS, a most significant predictor of cardiovascular diseases.

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INTRODUCING A NEW HEURISTIC ALGORITHM-1

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ABSTRACT
Researchers started to attract attention to population-based swarm-based algorithms in optimization due to its simple structure, high optimization performance and ease of adaptation. Swarm-based algorithms solve various optimization problems. These optimization types are grouped as continuous optimization, binary optimization, and discrete optimization. In continuous optimization problems, the search space is expressed with continuously changing integer values, while in discrete optimization problems, the search space is expressed with independent integer variables. In binary optimization, the search space is formed by expressing the variables as {0,1}. This article introduces the proposed Rat Swarm Algorithm (RSA) to solve continuous optimization problems. RSA is an algorithm based on swarm intelligence. RSA was performed by imitating the chasing and attacking behaviors of the rats.

Keywords: RSA, Optimization, Rat, Swarm

1. INTRODUCTION
In general, real world applications and problems in artificial intelligence and machine learning have a discrete, unconstrained or discrete nature (Hajipour et al., 2014). It is difficult to find optimal solutions using traditional mathematical-based programming methods. It is possible to encounter optimization problems in every field of science. In recent years, various optimization algorithms have been proposed to improve the performance of different systems and reduce computational costs. It has been applied to solve various problems. In recent years, metaheuristic algorithms have received wide attention and have been used to solve various optimization problems. In general, we can divide Metaheuristic algorithms into four categories: swarm intelligence (SI) algorithms, Evolutionary Algorithms (EA), Physics-based algorithms (PhA), and Human-based algorithms. In general, all metaheuristic algorithms have standard features such as the search process, which usually consists of two stages, the first called diversification (discovery) and the second stage intensification (exploitation) (Lim et al., 2017; Patil and Pawar, 2015). This paper examines a new bio-inspired meta-heuristic algorithm for global optimization problems, called the Rat Swarm Optimizer (RSA). The Rat Swarm Optimizer (RSA) is inspired by the chasing and attacking behavior of mice. RSA was first described by Dhiman et al. in 2021 (Dhiman et al., 2021). They tested the success of the RSA at low-scale dimensions.

2. RAT SWARM ALGORITHM (RSA)
Mice are long-tailed and medium-sized rodents that differ in size and weight. There are two main types of mice: Black mice and Brown mice. In the mouse family, male mice are called bucks and female mice are called does (Dhiman et al., 2021). Mice are often socially intelligent by nature. They groom each other and participate in various activities such as jumping, chasing, rolling, and boxing. Mice are

territorial animals that live in a group, both male and female. The behavior of mice is very aggressive in many cases and this can result in the death of some animals. This aggressive behavior while chasing and hunting prey is the main motivation of this study. To design the FSA algorithm and perform optimization, the chasing and fighting behaviors of mice were mathematically modeled.

2.1. Mathematical model and optimization algorithm

This subsection describes the behavior of the mouse, namely chasing and fighting. Then the FSO algorithm is summarized.

2.1.1. Chasing the prey

In general, rats are social animals that chase their prey in a group with their social agonistic behavior. To describe this behavior mathematically, it is assumed that the best search agent knows the location of the prey. Other search agents can update their location based on the best search agent ever obtained. The following equations are used in this mechanism.

$$\vec{P} = A.\vec{P}_i(x) + C.\left(\vec{P}_r(x) - \vec{P}_i(x)\right) \quad (1)$$

Here $\vec{P}_i(x)$ indicates the positions of mice, while $\vec{P}_r(x)$ is the best optimum solution. Parameters A and C are calculated with the following equations.

$$A = R - x \times \left(\frac{R}{Mak_{Iterasyon}}\right) \quad (2)$$

$$x = 1, 2, 3, \dots, Mak_{Iterasyon}$$

$$C = 2.rand() \quad (3)$$

R and C are random numbers between [1, 5] and [0, 2] respectively. Parameters A and C are responsible for better discovery and use throughout iterations.

2.1.2. Fighting prey

The following equation has been proposed to mathematically describe the process of mice fighting prey:

$$\vec{P}_i(x+1) = \left|\vec{P}_r(x) - \vec{P}\right| \quad (4)$$

$\vec{P}_i(x+1)$ describes the updated new position of the mouse. It saves the best solution and updates the positions of other search agents relative to the top search agent.

Figure 1 shows the effect of equations (1) and (4) in a three-dimensional environment. This way the mouse(A, B) can update its position relative to the prey position(A*, B*). By adjusting the parameters,

a different number of positions can be reached about the current position, as shown in equations (2) and (3). Also, this concept can be extended in the n-dimensional environment.

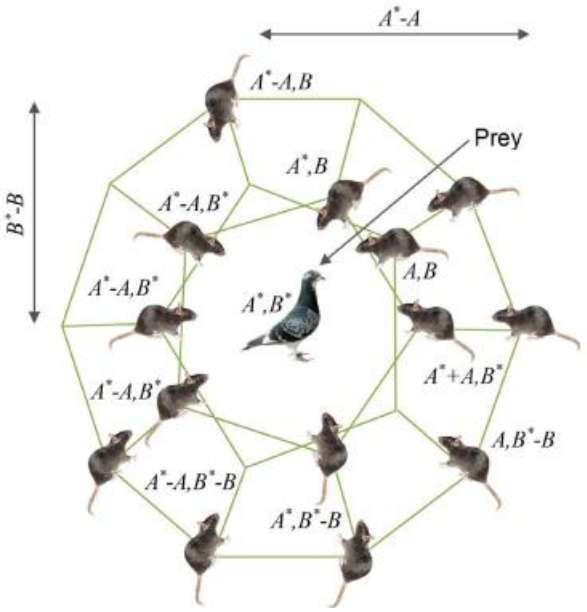


Figure 1. 3D position vectors of mice (Dhiman et al., 2021).

In this algorithm, discovery and exploitation are guaranteed by the adjusted value of parameters A and C. The FSO algorithm records the optimal solution with the fewest operators. The pseudocode of the FSO algorithm is presented in Algorithm 1.

Algorithm 1. Rat Swarm Algorithm

Input: Rat population P_i (i=1, 2, 3, …, n)
Output: Optimal search agent
Procedure: RSO
Initialize parameters A, C, and R
Calculate the fitness value of each search agent
P_r is the best search agent
    While (x< $Mak_{Iterasyon}$) **do**
        for every search agent **do**
            Update current search agent location (according to Equation 4) (Denklem 4 e göre)
        end for
        Update parameters (A, C and R)
        Check search agents
        Calculate the fitness value of each search agent
        Update P_r if there is a better solution than the previous optimal solution
        x ← x+1

14: **end while**
15: Return P_r
16: **end** procedure

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INTRODUCING A NEW HEURISTIC ALGORITHM-2

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ABSTRACT
Heuristic algorithms are algorithms created by imitating various movements of living things existing in nature. They are often preferred in solving various optimization problems. The biggest reason for this is their ability to obtain optimum solution values in a minimum time frame. In recent years, many heuristic algorithms have been proposed. One of these algorithms is the Wild Horse Optimizer (WHO) algorithm. In this study, the working method of the Wild Horse Optimizer (WHO) algorithm is explained.

Keywords: Optimization, Horse algorithm, Swarm

1. INTRODUCTION
The objective of decision-making issues in all application domains, from engineering to economics, is optimization. In the optimization approach, there is a cost function. This function attempts to find the best case out of a list of potential situations. In recent years, optimization techniques have piqued the interest of many reviewers. These algorithms are popular primarily because they are simple and adaptable. These characteristics enabled optimization algorithms to handle difficult high-dimensional problems in the shortest amount of time feasible. Optimization algorithms are frequently motivated by biological, animal behavior, or physics notions. Algorithms for optimization begin with randomly generated candidate solution persons. These people find the optimal solution in the search space after a specified amount of repetitions. Exploration and exploitation are the two steps of the search process. In the literature, optimization algorithms employ a variety of discovery and exploitation strategies. These processes are the primary distinction between algorithms. In the literature, a wide range of heuristic algorithms have been presented. The three most important are Particle Swarm Optimization (PSO), Genetic Algorithm (GA), and Artificial Bee Colony (ABC) (ABC). PSO is a heuristic algorithm that was developed by mimicking the motions of the flocks of birds. GA is one of the earliest heuristic algorithms, having been developed by simulating gene transfer in live life. In GA, there are several significant approaches. These are the operations of selection, crossover, and mutation. ABC is a heuristic algorithm inspired by honey bee foraging behavior (Chong and Żak, 2008; Dréo, 2006; Eberhart and Kennedy, 2002; Holland, 1967; Karaboga, and Basturk, 2008).
In 2021, Naruei and Keynia presented the Wild Horse Optimizer (WHO) for engineering optimization issues (Naruei and Keynia, 2021). WHO was initially designed to handle issues involving continuous optimization. WHO is concentrating on non-terrestrial horses. Stable family groupings or herds of non-terrestrial horses consist of a stallion and one or more mares and cubs. In WHO, group behaviors, grazing, mating, dominance, and leadership behaviors have been copied in order to optimize different issues (Naruei and Keynia, 2021). In this study, the working method of the WHO algorithm is introduced.

2. WILD HORSE OPTIMIZER (WHO)

In 2021, Naruei and Keynia were suggested as Wild Horse Optimizers (WHO). In WHO, group behaviors, grazing, mating, dominance, and leadership behaviors have been copied in order to optimize different issues (Naruei and Keynia, 2021). WHO is made up of five major phases. There are several:

1. Creating an initial population and groups of horses and selecting leaders;
2. Grazing and mating of horses;
3. Leadership and leadership of the group by the leader (stallion);
4. Leader change and selection;
5. Save the best solution.

2.1. Creating an Initial Population

As with many heuristic methods, the starting population is produced at random. During each iteration, each population individual is compared to the best value by computing its value in the objective function. The maximum number of iterations is first defined.

At the beginning of the algorithm, the randomly generated population is divided into several groups. N represents the number of members of the population. The number of groups is calculated as $G = \lceil N \times PS \rceil$. PS is the percentage of stallions in the total population. As a result, if there is a leader G (stallion) according to the number of groups, the remaining members (N-G) are divided equally among these groups. And the number of members of each group is calculated. Population segregation is shown in Figure 1. At the beginning of the algorithm, the leader of the groups is randomly selected, and in the next stages, they are chosen from among the group members on the basis of fitness (best fitness function).

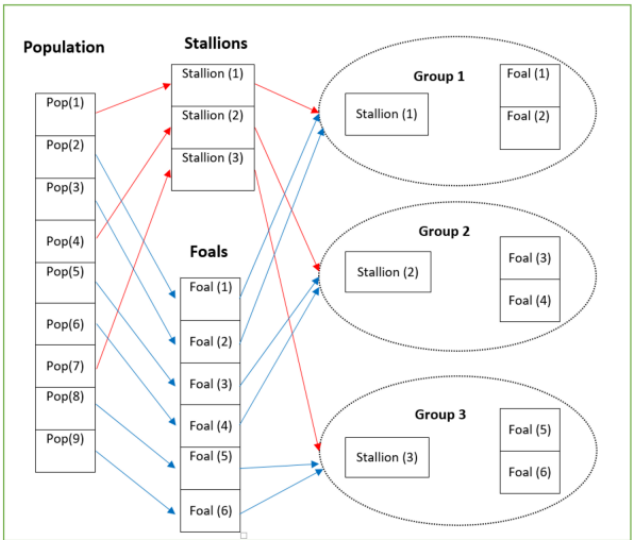


Figure 1. Creating an initial population (Naruei and Keynia, 2021)

2.2. Grazing Process

The majority of the time, foals spend grazing around their herd. The stallion is regarded as the center of the grazing area, and group members search (graze) around it to apply the grazing habit. Equations 1-3

(Naruei and Keynia, 2021) represent a mathematical model of grazing behavior. As a result, group members travel in a varied radius around the leader and search.

$$\overrightarrow{X_{i,G}^{J}} = 2ZCos(2\pi RZ) \times \left(S^{j} - X_{i,G}^{j}\right) + S^{j}, \quad (1)$$

$$P = \overrightarrow{R_1} < TDR; IDX = (P == 0); \qquad Z = R_2 \odot IDX + \overrightarrow{R_3} \odot (\sim IDX) \quad (2)$$

$$TDR = 1 - iter \times \left(\frac{1}{Max_iter}\right) \quad (3)$$

where $X_{i,G}^{j}$ is the current position of the group member (foal or mare), S^{j} is the position of the stallion (group leader), Z is an adaptive mechanism calculated by Equation 2, R is a uniform random number in the range [−2, 2] that causes The grazing of horses at different angles (360 degrees) of group leader, and $\overrightarrow{X_{i,G}^{J}}$ is the new position of the group member when grazing. P is a vector consisting of 0 and 1 equal to the dimensions of the problem, $\overrightarrow{R_1}$ and $\overrightarrow{R_3}$ are random vectors with uniform distribution in the range [0, 1], R_2 is a random number with uniform distribution in the range [0, 1], IDX indexes of the random vector $\overrightarrow{R_1}$ returns that satisfy the condition (P==0). TDR is an adaptive parameter that starts with a value of 1. iter is the current iteration and Max_iter is the maximum number of iterations of the algorithm.

2.3. Mating process

Horses demonstrate yet another characteristic. This is a foal's mating activity. Foals should be separated from the herd before they reach adolescence. The foals quit the group and form a new one. It is presumed that the two foals chosen are male and female and that they do not have a familial link. As a result, they can mate after puberty. The resultant child joins another group, such as k, instead of the temporary group. This scenario is replicated for all horse breeds. This is seen in Figure 2.

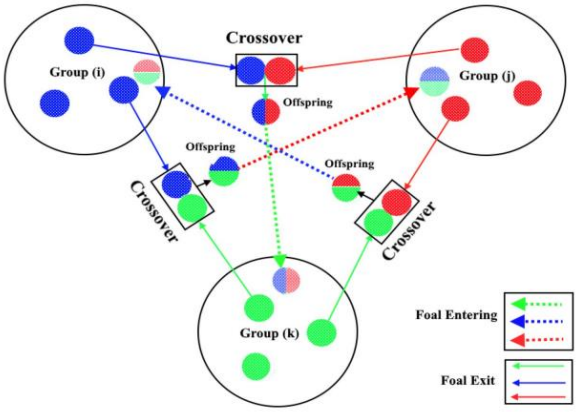


Figure 2. Mating behaviour (Naruei and Keynia, 2021)

The separation and mating behaviors of horses are shown by Equation 4 (Naruei and Keynia, 2021).

$$X_{G,K}^{p} = Crossover\left(X_{G,i}^{q}, X_{G,j}^{z}\right), \quad i \neq j \neq k, p = q = end, Crossover = Mean \quad (4)$$

where $X_{G,K}^{p}$ is the position of horse p from group k and leaves the group and gives its place to a horse whose parents are horses who have to leave group i and j and have reached puberty (Naruei and Keynia, 2021). They do not have family relationships, they mate and reproduce.

2.4. Group Leadership

Group leaders should direct members to the right locations. This appropriate location is known as water well. The gang must proceed to this puddle. Other groups are also making their way to this pond. A race between the leads begins. Equation 5 mathematically depicts this circumstance.

$$\bar{S}_{G_i} = \begin{cases} 2ZCos(2\pi RZ) \times \left(WH - S_{G_i}\right) + WH & if\ R_3 > 0.5 \\ 2ZCos(2\pi RZ) \times \left(WH - S_{G_i}\right) - WH & if\ R_3 \leq 0.5 \end{cases} \quad (5)$$

where $\bar{S}_{G_i}$ is the next position of the leader of the *i* group, *WH* is the position of the water hole, S_{G_i} is the current position of the leader of the *i* group, *R* is a uniform random number in the range [−2, 2].

2.5. Exchange and Selection of Leaders

The algorithm's leaders are picked at random at the start. Leaders are chosen on the basis of convenience in the following rounds. If one of the group members outperforms the group leader, the leader's and related members' positions change according to Equation 6.

$$S_{G_i} = \begin{cases} X_{G,i}\ if\ \cos\ t\left(X_{G,i}\right) < \cos\ t(S_{G_i}) \\ S_{G_i}\ if\ \cos t\left(X_{G,i}\right) > \cos\ t(S_{G_i}) \end{cases} \quad (6)$$

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THERMAL CONDUCTIVITY OF GRINDED ALMOND SHELL PARTICLE BOARDS

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ABSTRACT
Almond is a common fruit/nut worldwide while its shell accounts for about half the weight of the fruit (shell weight is about equal to the edible part). Massive bulk shells are produced as a byproduct of almond production. The primary usage field of the shells is burning as a biomass solid fuel. However, there are applications where shells are used for filtering with or without carbonization, as additives to chemicals or cosmetics products. In the present report, almond shell is evaluated as a main constituent in organic particle board composites. A domestic type of almond shell bulk material was acquired and grinded to obtain granular form of it. Attained granular almond shells were mixed with dark oak chips with different volumetric ratios. The mixture was used in particle board production by means of heated compression molds and formaldehyde as binder. Several geometrical and operational parameters were also changed and tested, such as board thickness. Produced almond shell containing particle boards were tested and experimentally investigated for determining their thermal conductivities. The thermal conductivity tests were done in a branded test setup and facility, built in consistence with an international standard for determining thermal conductivity values. Tests were carried out for fixed temperature difference at different temperature levels, particle board densities, and almond shell volumetric rations in the particle boards. It is seen that density directly increases thermal conductivity while almond shell ratio has a changing effect on thermal conductivity based on particle board density. Also, thermal conductivity of the particle boards increases linearly with increasing temperature. Measured thermal conductivity values change between 0.07 and 0.19 W/m·K.

Keywords: Almond shell, organic composite, particle board, thermal conductivity, insulation.

Introduction
Sustainable life of either a person or whole humankind necessitate constant planning, improvement, and development of all kinds of processes in our world. One specific process, which is in the focus of the current work, is processing almond fruit. This process yields significant amount of hard-shell byproduct as a kind of biomass. Commonly, almond shell biomass is used by burning it as a solid fuel. There are

other minor utilization means, which will be briefly mentioned in the literature review, however, we focus on properties of almond shells as a constituent material for particle boards that can be used in thermal insulation. The introduction part consists of a brief literature review for giving idea about scientific studies on almonds shells, a general assessment and evaluation of the literature review in respect of motivation of the present work, and a frame explanation of the present work. The general evaluation of almond shells as a byproduct or agricultural residue is given in a previous paper of the present authors [1].

When the last 22 years are scanned for scientific works on almond shells, relatively a small number of papers and reports appear. The most significant and important work for the present report is published by Guru, Tekeli [2]. Authors used almond shell particles for particle board production with help of urea-formaldehyde, which are also used in our work. Guru, Tekeli [2] state that the best parameters for almond shell particle boards are 0.2 mm or smaller particle size, 25 min. reaction time, 70 ^{o}C reaction temperature, and 0.92 urea-formaldehyde binder ratio for maximum particle board hardness. The bending stress value for maximum hardness almond shell particle board is 84.52 N/mm^2 in that work. Another very important and significant source in literature is from Ceviz [3], who used wood shaves for producing particle boards towards thermal insulation purposes. Ceviz [3] found 0.06761 W/m·K thermal conductivity value for particle boards. Above mentioned two works are showing examples of almond shell utilization for particle boards and assessing particle boards as thermal insulation materials. Remaining literature works are mainly on particle board production with shells of different fruits or woods. For instance, Gürü, Atar [4] tried wall nut shells in particle boards. Wallnut shell results resembling to that of almond shell results. Pirayesh and Khazaeian [5] show that using almond shells in particle board production reduces water absorption by the particle board. However, authors recommend almond shell particles up to 30% to remain in the mechanical strength limits of international standards. Almond shell particle sizes were between 0.8 and 3 mm. Later, a similar work by Pirayesh, Khanjanzadeh [6] show that almond shell particles in particle boards is useful for water resistance, reduced formaldehyde emission, low thickness swelling. Chaudhary, Gope [7] used almond shell as a bio-filler for epoxy matrix. Authors used micron size almond shell particles with the plastic matrix and studied thermal decomposition properties of the newly obtained bio-composites. Scanning Electron Microscope (SEM) figures showing the 2000 times bigger almond shell surfaces from that study shows the porous structure of almond shells. As the main conclusion of the work, authors state that higher concentrations of almond shell particles increase thermal stability of the bio-composite. The paper of the authors also gives a good reference about almon shell statistic in the world with production, consumption, and distribution numbers dating back to 2009. Barbu, Sepperer [8] tried walnut and hazelnut shells in particle board production. Authors conducted mechanical and physical tests. They conclude that using fruit hard shells as constituents in particle boards leads to more geometric stability, hardness, and water resistance. On the other hand, as expected, bending and tensile strength values and toughness reduce. Authors also recommend polyurethane instead of urea-formaldehyde as binder for low formaldehyde emission targets. In the literature, there are also weakly related works. For instance, Nazerian, Dalirzadeh [9] tested response surface methodology for characterizing effects of almond shell powder as a modifier of physical and mechanical properties of medium density fiberboards. Almond shell powder also used in the work of Taşdemir [10] for the purpose of improving mechanical properties of polymers. Author suggests that almond shell powder improves hardness and elasticity modulus of the tested polymer while maximum

tensile strength is reduced due to the almond shell powder, which is evaluated as a result of the interfacial bonding problem between the powder and the matrix by the author. The author suggesting studying a new coupling agent for bonding lignocellulosic material and the polymer. Liminana, Garcia-Sanoguera [11] tried different compatibilizers, including organic vegetation oils in order to have good bio-composite of almond shell flour/powder and poly butylene succinate (PBS). Authors determined maleinized linseed oil (MLO) as a good compatibilizer for the almond shell flour and PBS bio-composites. Later, Liminana, Quiles-Carrillo [12] tested almond shell powder amount in the PBS almond shell bio-composite and determined that 30% is an important threshold above which the composite becomes brittle. McCaffrey, Torres [13] torrefy almond shells in order to avoid the need for a compatibilizer and tried torrefied almond shells with recycled polypropylene-polyethylene polymers to obtain a low-cost bio-composite. Authors state that they were able to obtain bio-composites with favorable interfacial bonding between torrefied almond shells and the polymers while improved flexural and tensile strength values. However, they also state an issue of brittleness, less strength and elongation. Ibáñez García, Martínez García [14] answers two important questions, i.e., whether the almond type makes a difference for effects of almond shell powder in particle boards or bio-composites and can almond shell particles be used with starch-based bioplastics. Authors clearly state that almond type does not make a significant change in mechanical results. Authors also state that almond shell powder can be used with starch-based plastics.

Materials having thermal conductivity values up to 0.1 W/m·K can be regarded as thermal insulation materials [15]. Also, thermal insulation materials can be grouped into two by considering their air trapping behavior. Closed cell type insulation materials, such as expanded polystyrene is expected to have better thermal insulation properties comparing to open cell type insulation materials such as glass wool [15]. Savio, Thiebat [16] present an interesting example of biomass sourced composites for insulation purposes. Authors focus on recycled wool of sheep as a matrix material for “semi” rigid insulation panels that can be used for thermal or acoustic purposes. Authors reinforce the main matrix with agricultural residue such as almond shells or hemp. Average thermal conductivity is given as 0.05 W/m·K, which is a close value that of particle boards. A similar approach to the present work for organic waste reinforced polyester composites is reported by Büyükkaya, Güler [17]. Authors suggest that thermal conductivity decreases with decreasing particle board densities. Their experimentally detected thermal conductivity values are between 0.14 and 0.2 W/m·K. Lahoori, Rosin-Paumier [18] used recycled or virgin bio-sourced fibers and “geotextiles” to form insulation materials. They obtain thermal conductivities about 0.04 to 0.06 W/m·K. Authors state that water absorption or migration significantly increases thermal conductivity value. The authors proposed using film coating of the insulation material. Liuzzi, Rubino [19] used almond skins (the brown and thin outer skin on the fruit) to make boards with the help of binders. Authors aim hygric, thermal and acoustic insulation applications. They report 0.1 W/m·K thermal conductivity, 9 to 13 water vapor resistance, and sound peaks below expected 1.7 kHz.

Although we mention thermal conductivity of particle boards as if they are pure substances, actually “effective” thermal conductivity is meant. The term “effective” suggest that composite particle board having different constituents in it with possible inhomogeneities and irregularities in it can have a single thermal conductivity value that is resulting from cumulative thermal behavior of the constituents. A recent paper of the third author of the present paper reviews effective thermal conductivity term and gives some numerical instances by using literature models [20].

Literature suggest that considering almond shell as a filler or reinforcing material in bio-composites is

worth studying. Nevertheless, construction of a composite bears numerous parameters. Therefore, there should be case specific recipes for different applications. In the meantime, processibility/machinability of almond shell for various sizes and other aspects such as additional chemical and material needs should be evaluated. Found literature works has a great variety of particle sizes from micron to millimeter. There are different binder and compatibilizer options. Also, mixing almond shell particles with dark oak particles/chips have not been encountered in the literature. In terms of thermal conductivity of almond shells, no bio-composite work has been found by the authors of the present paper.

In this work, almond shells that were milled/grinded to 1-3 mm particles were mixed with dark oak chips/particles with different volumetric ratios in order to produce particle boards for thermal insulation purposes. Urea-formaldehyde was used as binder. Generated particle boards were tested in terms of thermal conductivity by means of a standard heat flow type measurement device. To the best knowledge of the authors, thermal conductivity values of almond shell-dark oak particle boards are introduced for the first time with this paper.

Method

In the present work, almond shells of domestic types were acquired from Adiyaman Hard Shell Fruit Research Institute in 2021. After several prior and benchmarking grinding and milling work were tried on the acquired almond shells, it was decided to send the bulk material to workshops of Duzce University, Faculty of Forest, Department of Forestry Industrial Engineering and Department of Wooden Mechanics and Technology, Duzce, Turkey. There, almond shells were grinded into small granules. After sieves were used, the distribution of the almond shell particle size is given in Figure 1.

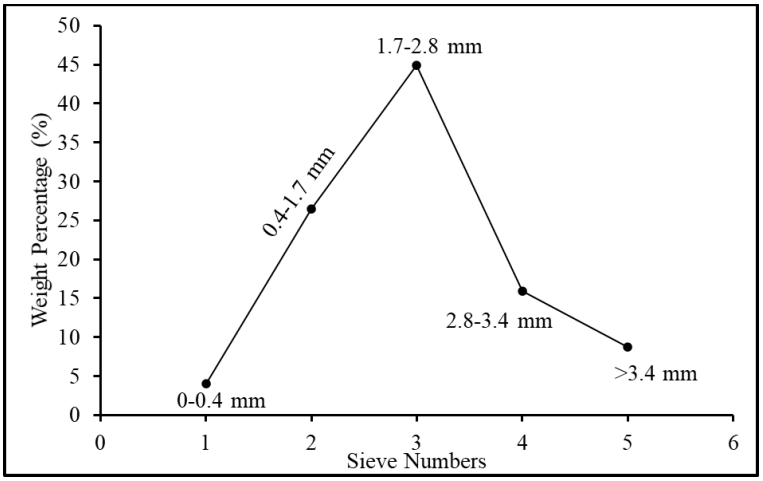


Figure 1. Particle size distribution of almond shells used in particle board production

This particle distribution was then mixed with dark oak particles with different volumetric ratios. Mixing was done in a box by means of a mechanical blender with an electrical motor. Urea-formaldehyde was added as binder and the whole mixture was put in a mold. After the shaping process by the mold, the mixture was compressed and heated. An example figure for the particle board production is shown in Figure 2.



Figure 2. Example particle board production by images

The specifications of the particle boards are given below in Table 1. Also, the samples for thermal conduction measurements are shown in a representative image in Figure 3. Totally 17 particle board types were produced. First, 5 types of particle boards having different almond shell volumetric ratios and constant density (1.2 g/cm^3) were produced. Then, a second production was planned and realized for 12 additional particle boards with different almond shell amounts and particle board densities. During productions, process parameters such as compression pressure, temperature and time were picked according to past experiences. Nevertheless, in the future, more elaborate and systematic approaches are needed for better understanding and knowledge on the obtained results. One can see that particle board densities in the second production phase was arranged by changing amounts of urea-formaldehyde and ammonium sulfide.

Table 1. Variables of almond shell containing particle boards

Almond shell volumetric ratio (***r***)	Particle Board Density (***ρ***) (g/cm^3)	Particle Board Thickness (mm)	Urea-Formaldehyde amount (g)	Ammonium Sulfide (g)	Compression Pressure (Bar)	Compression Temperature (^{o}C)	Compression Time (s)
First Produced Set							
10	1.2	15	400	0	140	140	2040
30							
50							
80							
100							
Second Produced Set							
30	0.6	10	230	30	110	150	600
60	0.7		265	40			
90	0.8		300	50			
	0.9		335	55			



Figure 3. Sample pieces from particle boards containing almond shells. Large circles are for thermal effective conductivity measurement tests.

The heat flow type thermal conductivity measurement device and experimental setup that are used in the present work for measurement of effective thermal conductivities of the almond shell containing particle boards are described in detail by three literature papers [15, 17, 21]. Actually, experiments were conducted by purchasing measurement service from respected department of Suleyman Demirel University that has the experimental setup. The uncertainty of thermal conductivity measurement is given as 3% in above mentioned three literature papers. The measurement device has a compartment for the circular sample particle board. The diameter of the sample is 30 mm. Hot side and cold side of the sample are held at constant temperature that assures 20 ^{o}C constant temperature difference at each test operation. When, for instance, cold side is -10 ^{o}C, the hot side ise 10 ^{o}C. One side, particularly the cold side, temperature is increased ten degrees Celsius at each experimental run and the other side, the hot side, is automatically arrange itself to maintain the 20 ^{o}C temperature difference. In the current investigation, cold side temperature range is between -10 and 55 ^{o}C. This range correspond to a big portion of insulation applications.

There are other experimental apparatus descriptions in the literature [22]. For instance, Jannot, Meulemans [23] describe a method and experimental setup that can be used at relatively high temperatures (600 ^{o}C). The authors named the method as "comparative fluxmeter". The device measures apparent conductivity of two sample block among which are a reference material that has known thermal conductivity. They claim 11% uncertainty for the method. Jannot, Degiovanni [24] then developed another method that they denominated as four-layer method. Four layers have two conductive metal layers and two insulation material layers in a symmetrical manner. Authors claim to perform transient thermal diffusion tests at temperatures up to 1000 ^{o}C. Also, two different algebraic models based on experimental findings are reported. The newly developed method by the authors is said to have about 10% uncertainty. Another common method is known as hot plate method [18]. However, heat flow meter utilization seems more proper for the tested particle board thicknesses with high accuracy.

Thermal conductivity and thermal resistance may intermingle or confuse people. Thermal conductivity is independent from global geometry such as thickness while thermal resistance is dependent on thickness in the main thermal conduction direction [15].

Results

Figure 4 shows thermal conductivity measurements of 0.6 g/cm^3 almond shell containing particle boards for different almond shell ratios and increasing temperature level. This first figure shows thermal conductivity values of organic composite particle boards containing almond shell granules and dark oak chips. The thermal conductivities linearly increase with test temperature level. Temperature difference

for heat transfer is constant at 20 ºC. In this figure, three boards having different amount of almond shells have 0.6 gram per cm^3 density. We see that almond shell ratio decreases the thermal conductivity, which is a positive finding for insulation purposes. Standard deviation bars are quite small. The read thermal conductivities correspond to insulators that are reported in literature for organic composite particle boards. The interesting feature of thermal effective conductivity is it is directly correlated and proportional with temperature level of average temperature which is the arithmetic average of hot and cold sides. Although the temperature difference is constant, temperature level increases thermal conductivity and indicate that higher thermal conduction takes place with a constant temperature difference. The decrease of thermal effective conductivity with increasing almond shell ratio is not monotonical. The decrease is higher for 60% than 90%. The rigid structure of almond shell particles comparing to the dark oak chips may retain air voids in the particle board so that increasing amount of almond shells decreases the thermal effective conductivity of the boards. However, more almond shells may constitute solid contacts and bridges between particles of almond shells leading to an effective thermal conductivity value similar to that of almond shells only situation. Other cases should be viewed for more evaluation.

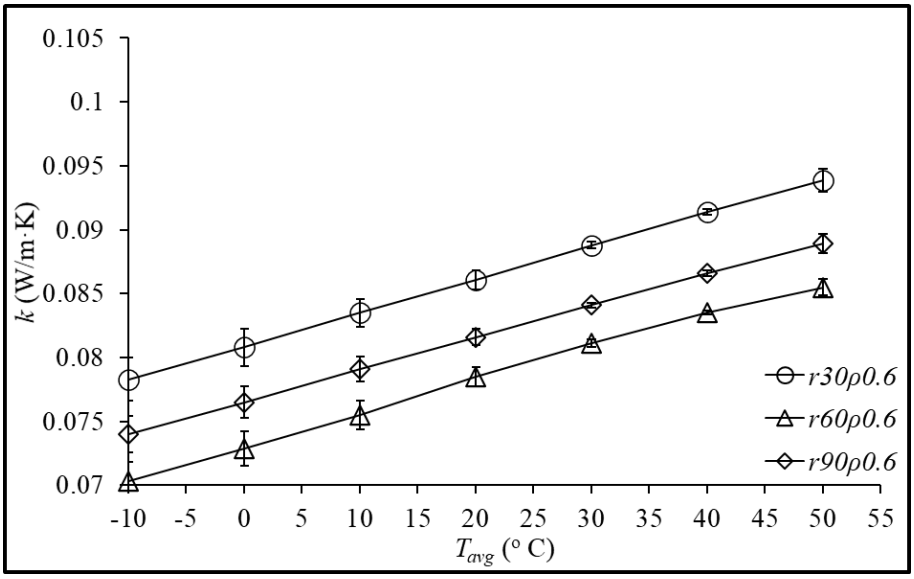


Figure 4. Thermal conductivity values of 0.6 g/cm^3 density particle boards

When board density increases to 0.7 g/cm^3, as it can be seen in Figure 5, thermal conductivity values increase about 10 percent in a similar trend with Figure 4. However, this increase is more apparent for low almond shell containing boards. The thermal conductivity trend of high almond content board is almost unaffected from density change. While temperature level dependent change of effective thermal conductivity is still same, the almond shell ratio dependent changes suggest that 90% almond shell particle board maintains the connections between almond shell particles and its thermal conductivity value. On the other hand, increasing density for lower almond shell containing boards may experience filled air voids due to increasing mass per volume.

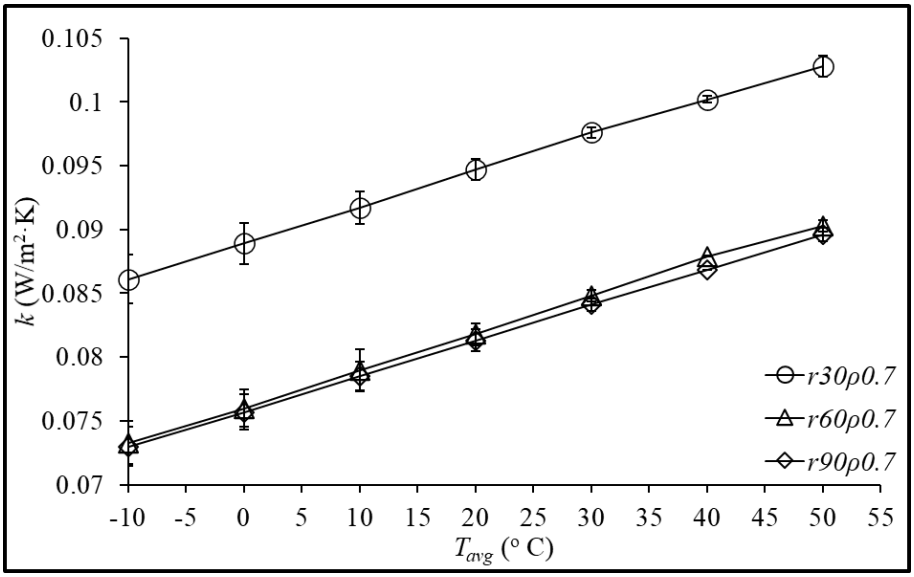


Figure 5. Thermal conductivity values of 0.7 g/cm^3 density particle boards

As board density increases to 0.8 g/cm^3, thermal conductivity values of 30 and 60% almond shll particle containing boards become less feasible in terms of thermal insulation. Since 90% almond shell containing board keep its thermal conductivity value as in lower density boards, our hypothesis about bridges and connections between almond shell particles become more prominent.

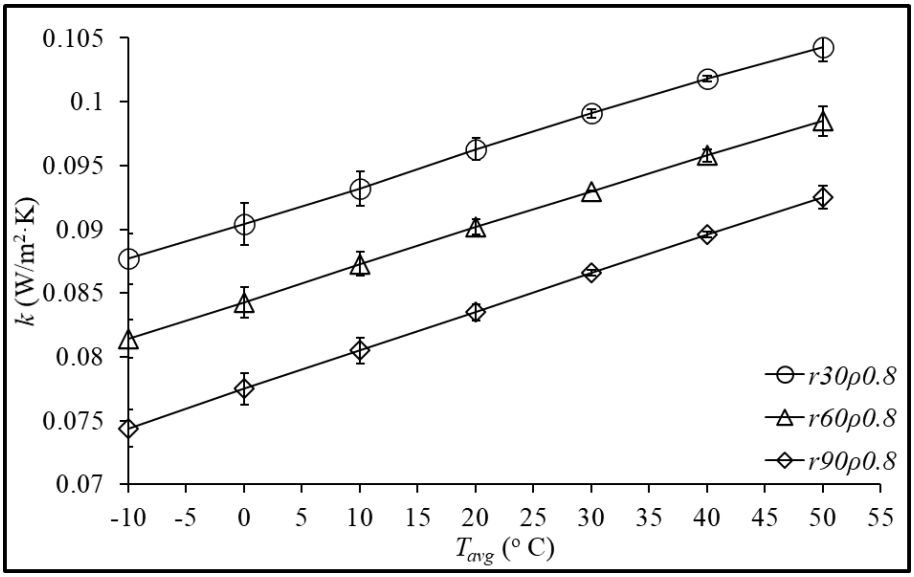


Figure 6. Thermal conductivity values of 0.8 g/cm^3 density particle boards

Figure 7 shows the thermal effective conductivity results of 0.9 g/cm^3 density particle boards. At this density level, a major change becomes visible. First of all, the boards are now not seem feasible in terms of thermal insulation since wood particle boards can have 0.06 W/m·K thermal effective conductivity values. On the other hand, when the board density is 0.9 g/cm^3, the particle board that has 90 percent volumetric ratio almond shells has a jump in its thermal conductivity. We think that at this density level, structural correlation between dark oak and almond shell particles generates a packed and relatively high conductivity filling. In order to justify this result, the last and the highest density level of 1.2 g/cm^3 is

given in Figure 8.

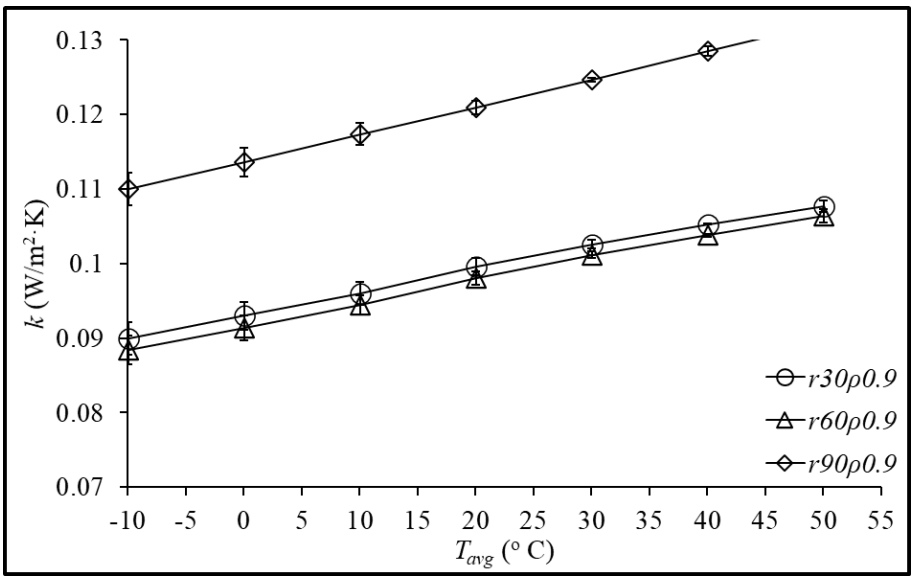


Figure 7. Thermal conductivity values of 0.9 g/cm^3 density particle boards

Figure 8 shows that further increasing the board density result in very high thermal conductivity values for high almond shell content particle boards.

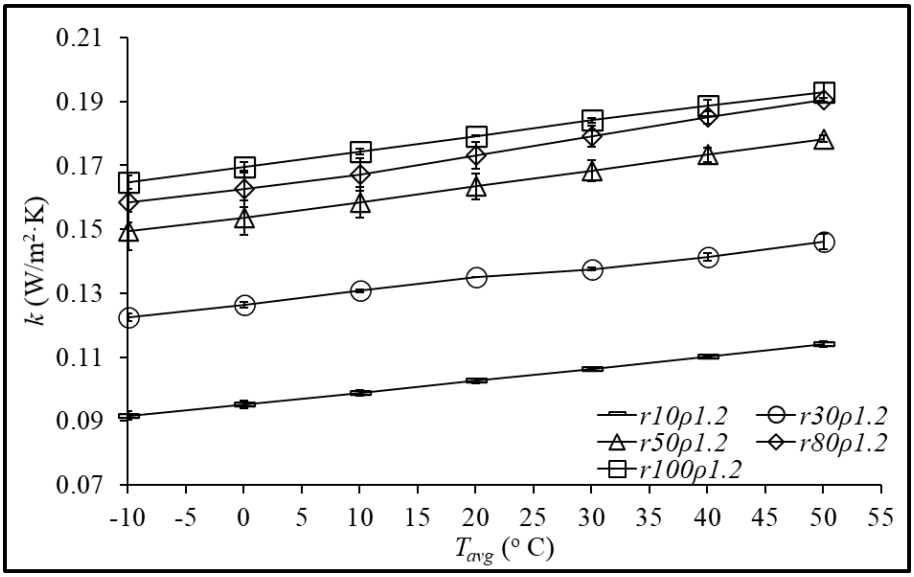


Figure 8. Thermal conductivity values of 1.2 g/cm^3 density particle boards

In the context of the present experimental study, obtained thermal effective conductivity values were gathered in a spreadsheet and then a regression/interpolation expression was obtained. The interpolation equation of our experimental dataset is given in Equation (1). User may better use the parametric values in the present work for obtaining the trend lines. Then user can interpolate the data with high reliability. Though density and volumetric ratio seems independent, they have a weak correlation and therefore using random parametric values may lead to errors. The coefficient of determination (R^2) is 0.95 for the Equation (1).

$$k = 0.000269T + (0.042874\rho^{4.404164} \times 0.101994r^{0.517525}) \quad (1)$$

As a general evaluation of the results, it can be stated that density is a very effective parameter in effective thermal conductivity values of particle boards. For almond shell particle reinforcement, applicants may think to use 60% or lower almond shell volumetric ratio in order to maintain air voids between wood particles and rigid almond shell particles and to avoid bridges and contacts between almond shell particles.

Conclusion

In the current work, almond shells were used as a filler or reinforcement material in particle boards. The main idea or goal is to functionalize and utilize an agricultural residue or by product in an elevated manner instead of burning as a solid biomass fuel. Almond shell particles were mixed with dark oak wood particles with different volumetric ratios. Urea-formaldehyde was used as binder. Different compression pressures and mold temperatures were used alongside with different additives in order to obtain particle boards having different densities, effective thermal conductivities, and material ratios. In this investigation, particle boards containing almond shells are evaluated and assessed in terms of thermal insulation. Following remarks can be proposed.

- The changing behavior (decreasing and then increasing) of thermal conductivity of high almond containing boards according to increasing density is very interesting. Our hypothesis is that rigid structure of almond shell particles ensures air voids in the board in favor of better thermal insulation for low values of densities. However, for high density board production, in the absence of air voids, rigid almond shell particles conduct heat more comparing to dark oak chips.
- Density directly increases thermal conduction while almond shell ratio has a changing effect on thermal conductivity based on particle board density.
- Thermal conductivity of the particle boards increases linearly with increasing temperature.
- Measured thermal conductivity values changes between 0.07 and 0.19 W/m·K.

For future work:

- Almond shell particles/chips can be varied in size.
- Particle mechanical characterization works are needed together with processing feasibility and cost measurements.
- Board geometrical and compositional parameters can be studied further.

Acknowledgement

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HOW TO INCREASE THE EFFICIENCY OF HYDROGEN CHARGING SETUP

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ABSTRACT

Hydrogen charging process in hydrogen embrittlement studies is very important. In this study, electrochemical charging was used to charge specimens with hydrogen. DC power supply was used in this setup. Ammonium thiocyanate, sodium chloride and water solution were used for the electrochemical charging process. The hydrogen charging setup was tested in constant current mode and constant voltage mode. Under constant current mode, the specimens were connected to the DC power supply as serial connection mode and parallel connection mode. Also, single beaker and multiple beaker connection types were tested. At the end of the study, using the connection tricks, we can connect as many samples as the DC power supply can withstand to the charging setup and we can charge the samples equally with hydrogen, which accelerated the experiments and increased the reliability of our work.

Keywords: Hydrogen Embrittlement, Hydrogen Charging, Electrochemical Process

LITYUM İYON SILINDIRIK PIL HÜCRESININ VE PIL TAKIMININ TEORIK VE DENEYSEL METOTLAR İLE ISIL KARAKTERIZASYONU VE PIL MODÜLÜ KAPLAMANIN ISI TRANSFERINE ETKISININ İNCELENMESI

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Gizem Taylan
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ÖZET
Taşınabilir elektronik cihazlarda ve elektrikli araçlarda baskın teknoloji olarak lityum iyon piller, toplumun yaşam kalitesinde önemli bir rol oynamaktadır. Son yıllarda yüksek enerji yoğunlukları ve uzun çevrim ömrü sayesinde bu piller yoğun olarak kullanılmaktadır. Lityum iyon piller uygun sıcaklık aralığında (25°C-45°C) çalıştırıldığı zaman daha verimli olmaktadır. Sistem sıcaklık aralığını koruyabilmek için bir termal yönetim sistemi gereklidir. Bu çalışmada öncelikli olarak 18650 tip li-ion pilin ısıl karakterizasyonu yapılmıştır. Çalışma deneysel ve CFD analiz yoluyla doğrulanmıştır.Daha sonra 18650 tip lityum iyon pil hücresinin, 14'lü pil modülünün ısıl dağılımı incelenmiş ve deneysel metod ile simülasyon sonuçları doğrulanmıştır. Analiz ve testler 1C şarj hızında 25 °C ortam sıcaklığında yapılmıştır. Analizler steady state olarak iletimle ve taşınımla ısı transferi dikkate alınarak yapılmıştır. Modül malzemesinin ısı iletim katsayısı yazılıma tanımlanmıştır. Analizlerde eleman sayısından bağımsızlık çalışması yapılmıştır. Tek pil hücresi için en yüksek sıcaklık değeri analizde 30,47 °C, testte 32,9 °C olarak çıkmıştır. Modül için en yüksek sıcaklık analizde 40,16 °C, testte 40 °C çıkmıştır. Modüldeki yüksek sıcaklığı düşürmek için polimer kaplama yapılmıştır. Kaplama sonrası modüldeki en yüksek sıcaklık analizde 37,71 °C, testte 38,8 °C çıkmıştır. Çalışma sonunda lityum iyon batarya için kurulan ısıl model doğrulanmıştır. Polimer katkılı bir malzeme ile çevrilen pillerde sıcaklık dağılımlarının düzenli olduğu ve li-iyon hücreelrde sıcaklık problemi olmadığı tespit edilmiştir.

Anahtar Kelimeler: Pil ısıl yönetim sistemi, li-iyon pil, CFD, ısıl model

THERMAL CHARACTERIZATION OF LITHIUM-ION CYLINDRICAL BATTERY CELL AND BATTERY PACK WITH THEORETICAL AND EXPERIMENTAL METHODS AND INVESTIGATION OF THE EFFECT OF BATTERY MODULE COATING ON HEAT TRANSFER

ABSTRACT
As the dominant technology in portable electronic devices and electric vehicles, lithium-ion batteries play an important role in the quality of life of society. In recent years, these batteries have been used extensively due to their high energy densities and long cycle life. Lithium-ion batteries are more efficient when operated in the appropriate temperature range (25 °C-45 °C). A thermal management system is required to maintain the system temperature range. In this study, primarily the thermal characterization

of the 18650 type li-ion battery was made. The study was validated experimentally and through CFD analysis. Then 18650 type lithium-ion battery cell and the 14-cell battery module was investigated and the simulation results were verified with the experimental method. A CFD-based software was used to calculate the battery heat flux area data. The studies were carried out at a charging rate of 1C at an ambient temperature of 25 °C. Analyzes were made as steady state. The analyzes were made by considering the heat transfer by conduction and convection. The heat transfer coefficient of the module material is defined in the software. In the analysis, independence from the number of elements was studied.The highest temperature value for a single battery cell was 30.47 °C in analysis and 32.9 °C in test. The highest temperature for the module was 40.16 °C in analysis and 40 °C in testing. Polymer coating is made to reduce the high temperature in the module. The highest temperature in the post-coating module was 37.71 °C in the analysis and 38.8 °C in the test. At the end of the study, the thermal model established for the lithium-ion battery was verified. It has been determined that the temperature distributions are regular in batteries surrounded by a polymer-doped material and there is no temperature problem in li-ion cells.

Keywords: Battery thermal management system, li-ion battery, CFD, thermal model

1. Introduction

Energy storage systems are used in both the transportation and electricity sectors recognized as a technology that provides a critical opportunity to improve sustainability has been done. Batteries are used in portable electronic devices, electric vehicles and electrical widely used in networks (Lu et al., 2014; Lukic et al., 2008; Rahimi-Eichi et al., 2013; Vazquez et al., 2010) Today, society is highly dependent to energy. The availability of energy by many people in developed countries is not difficult. For example, power to electronic devices in modern society easy to give, heat or cool buildings, and drive vehicles. In a recent report from the US Energy Information Administration, world energy consumption. It is expected to increase in the coming years. Economic growth is highcountries, especially Asian countries, are responsible for this increase. Worldwide, coal Scientific studies on fossil fuels such as oil and natural gas and these fuel types. Fossil fuel types are used due to innovations. Although the new fossil fuel. This non-renewable energy will certainly be found with advanced technology. It is inevitable that resources will run out in the future. In addition, fossil fuels cause global warming by producing greenhouse gases that have a great environmental impact (Abas et al., 2015; Höök & Tang, 2013). Greenhouse gas emissions from fossil fuels, nuclear and largely by using alternative sources such as renewable energy sources can be reduced. However, both sources have their challenges. Energy; mechanical, electrical, thermal or it can be stored electrochemically (Raijmakers et al., 2019). Batteries are popular devices that store the energy produced by the renewable sources (Alotto et al., 2014; Scrosati & Garche, 2010; Selman et al., 2001). This battery systems are better known as stationary energy storage devices.Batteries are also used to power mobile devices. Examples of mobile devices are portable phones, laptops, tablets, electric vehicles (H)EV (Egbue & Long, 2012; Rezvani et al., 2015; Steinhilber et al., 2013). Due to its high energy density, long cycle life, and low self-discharge rate, Li-ion batteries are attracting great interest from both industry and government funds institutions and research in this area has been quite abundant in recent years (Diouf & Pode, 2015; Jaiswal, 2017; Opitz et al., 2017). Global Lithium-Ion Battery Market by 2024 It is estimated to reach $56 billion by the end of the year. As can be seen in

Figure 1. The combined annual growth rate (CAGR) from 2016 to 2024 is 10.6%. calculated (Jaiswal, 2017).

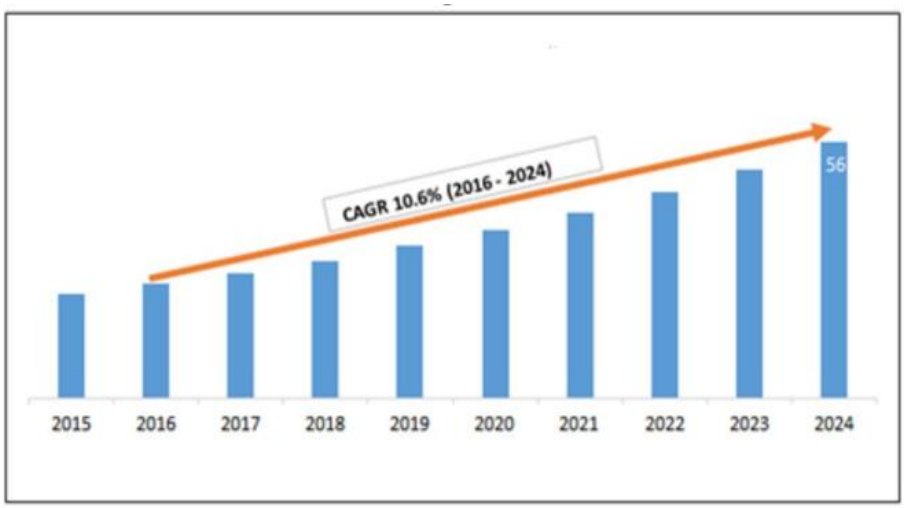


Figure 1: Size and Forecast of the Global Li-ion Battery Market (Billion Dollars).

Temperature as a critical factor, significantly affect the performance of lithium-ion batteries, and also lithium-ion limits the use of batteries. In addition, different temperature conditions have different adverse effects. causes. Accurate measurement of the temperature inside lithium batteries and the temperature. Understanding their effects is important for proper battery management (Ma et al., 2018). Various chemical and electrochemical reactions occur in batteries during charge/discharge (Diouf & Pode, 2015). In particular, it generates more heat than normal at high current levels during rapid charge-discharge and low-to-high voltage batteries Produced.

The optimum operating range for Ni-MH and Li-ion batteries is between 25°C and 45°C. and the temperature difference is maximum 5°C from module to another module shown to be necessary. That is, it is desirable that the temperature be constant so that there are small variations between cells (Wu et al., 2002). , li-ion batteries have a maximum operating temperature of 45°C to 50°C below -10°C in terms of service life and safety, as well as the necessity of temperatures are desired (M. M. M. , S.-B. H.-G. Schweiger, 2020)[20].

In this study, primarily the thermal characterization of the 18650 type li-ion battery was made. The study was validated experimentally and CFD analysis. Then 18650 type lithium-ion battery cell and the 14-cell battery module was investigated and the simulation results were verified with the experimental method.

2. Material and Method

2.1. Heat Transfer

The thermal equilibrium for a lithium-ion battery is given in Eq. 1:

$$Q_p = Q_e + Q_a \quad (1)$$

Here, Q_p is the generated heat, Q_e is the heat exchanged between the battery and its ambient environment,

and Q_a is the heat accumulating due to temperature change (Wang et al., 2017).
Heat exchange between the ambient environment and the battery mainly occurs in three forms of heat transfer, conduction, convection, and radiation. The heat transferred through radiation and convection is lower in comparison to the heat transferred through conduction. This is why heat transfer through convection and radiation can be neglected in a way. After this, the thermal equilibrium equation can be simplified even further as in Eq. 2 (Wang et al., 2017).

$$\rho_k c_{p,k} \frac{\partial T}{\partial t} = \nabla \cdot (k_k \nabla T) + q \tag{2}$$

The left-hand side of the equation represents the increase in the thermodynamic energy of each component. The first term on the right-hand side refers to the increase in energy through conduction, while the second term indicates the rate of heat generation in the battery. The terms ρ_k, $c_{p,k}$, and k_k respectively refer to each battery cell's density, specific heat, and thermal conductivity. Moreover, q is the total value of different heat generation rates.

Some assumptions were made to simplify the calculation of the temperature field of the battery. These assumptions were:

1) The thermal conductivity of each material in one direction is the same.
2) The specific heat and thermal conductivity of each material are not affected by the temperature gradient.
3) During charge/discharge, the heat generation rate is consistent, and the current density is homogeneous.
Based on these assumptions, the three-dimensional heat transfer equation of a battery in cartesian coordinates is formed as in Eq. 3 that sets a basis for the calculation of the temperature field of the battery (Wang et al., 2017).

$$\rho c_p \frac{\partial T}{\partial t} = k_x \frac{\partial^2 T}{\partial x^2} + k_y \frac{\partial^2 T}{\partial y^2} + k_z \frac{\partial^2 T}{\partial z^2} + q \tag{3}$$

Here, T, ρ, and c_p are the temperature, mean density, and specific heat of the battery, respectively. k_x, k_y, and k_z represent the thermal conductivity values of the battery respectively at the x, y, and z coordinates. q is the heat generation rate (Wang et al., 2017).

Eq. 4 is the general heat transfer equation at cylindrical coordinates (Cengel Yunus, 2015). Because computer programs that are used in studies allow a cross-sectional analysis of the temperature gradient of a battery rather than using cylindrical coordinates, the heat transfer equation that was used in the calculations in this study was the general heat transfer equation for cartesian coordinates. This equation was preferred in this study also because similar studies in the literature have included analyses based on a cross-section of the examined batteries.

$$\rho c_p \frac{\partial T}{\partial t} = \frac{1}{r}\frac{\partial}{\partial r}\left(kr\frac{\partial T}{\partial r}\right) + \frac{1}{r^2}\frac{\partial}{\partial \emptyset}\left(k\frac{\partial T}{\partial \emptyset}\right) + \frac{\partial}{\partial z}\left(k\frac{\partial T}{\partial z}\right) + q \tag{4}$$

2.2. Modelling

In this study, cylindrical Li-ion batteries with a capacity of 2.85A were examined. In the cylindrical cell configuration, the layers are rolled inside a metal container and closed. The components from the center to the periphery can be listed as the cathode (positive electrode), separator, and anode (negative electrode) [23]. Figure 2.. It should be noted that positive electrode current collectors are produced out of aluminum, while negative electrode collectors are produced using copper. Additionally, the positive terminal is made out of aluminum (Wang et al., 2017). For a cylindrical cell, the 18650 (18 mm diameter and 65 mm height) form has the most prevalently used battery cell dimensions (Zubi et al., 2018).. In this study, we also used 18650-type cells.

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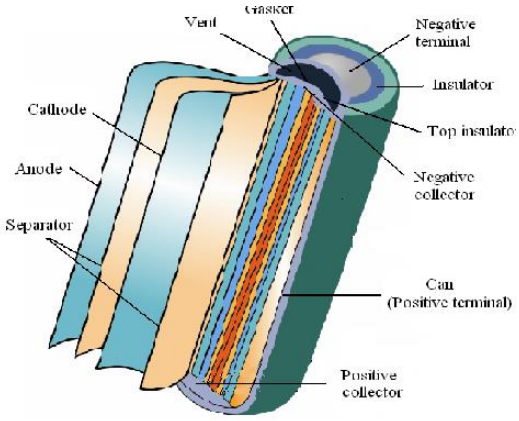


Figure 2: Structure of a cylindrical battery

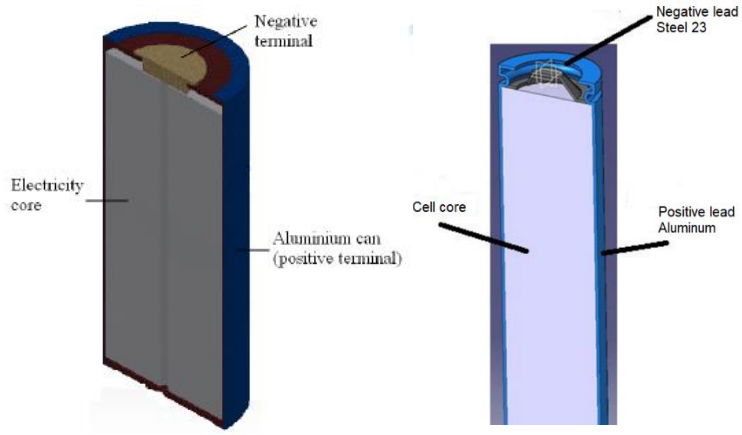
Table 1. shows the materials, density, specific heat and heat conduction of the battery components coefficient is given (Wang et al., 2017). These values were taken as the basis for the analyzes made in this study

Table 1: Material properties of simplified battery geometry

Companent	**Material**	**Density (kg/m^3)**	**Specific Heat (J/kg.^oC)**	**Heat Conduction Coeff. (W/m.K)**
Cell core		2000	900	$k_x=k_z=$ 1,6 $k_y = 3$
Pozitif pole	Al	2710	903	238
Negative pole	Steel	7900	460	20

Insulator film	PVC	920	1000	0,3344

Similarly, in this study, the electrode plates and separators were taken as core components in the simplified three-dimensional model. Other components such as the electrolyte and insulators were not taken into account due to their small effects on the thermal behavior of the battery. Figure 3 shows the 3D model of the 18650 li-ion battery. The model is based on the study of Wang et al. (Wang et al., 2017)



a) **b)**

Figure 3: Structure of a cylindrical battery a) Wang et al b) This Study

The mesh image rendered for a single cell is shown in Figure 3. The structure of a battery is highly complex. If the finite element method is used directly to explain the heat transfer in a three-dimensional battery cell, a large number of elements would be needed, resulting in unacceptable computation requirements. Such a case prevents the practical application of the model. For this reason, to obtain more reliable results in computation, the structure of the battery needs to be simplified (Wang et al., 2017).



Figure 4. Mesh

The mesh image rendered for a single cell is shown in Figure 4. As a result of the analysis carried out in the FLOEFD software, the finite element model of the cylindrical Li-ion battery consisting of 52384 elements as seen in Figure 1 was created. To achieve mesh-independence, the analyses were repeated with different numbers of elements, and the most suitable mesh size with almost unchanging results was selected (Table 2).

Table 2: Mesh independences study

Mesh Number	Max.Temp.on Battery (^oC) Results
21053	30,3
27943	31,7
32531	32,4
45218	33,9
52384	34,02
62145	34,06

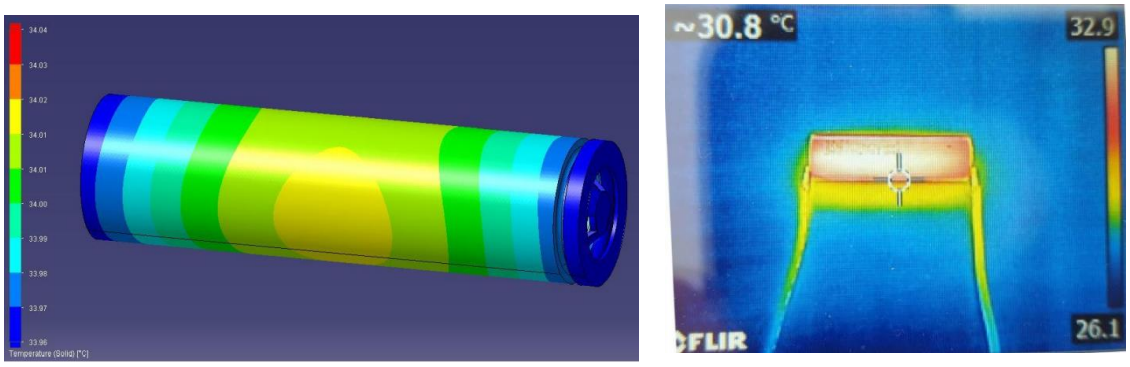
In this study, the heat dissipation in a Li-ion battery cell was examined, and preliminary data were provided for the design of a battery pack with more consistent heat dissipation among the cells for the future. While conducting this study, the mathematical modelling process and chemical structure used in the study by Wang et al. [21]. were taken as a reference. Using a Samsung 18650 Li-ion battery, the finite volume model that was used in the reference study in the literature was confirmed. As the temperature distribution of the battery cells would be examined in the CFD analyses conducted with the FLOEFD software. As the effects of heat transfer through radiation and conduction were negligibly small, the calculations in the analyses were made only for heat transfer through convection. The initial temperature of the battery cell was taken as 20°C. The temperature of the ambient air was taken as 25°C. The effects of gravity were taken as 9.81 kg/m^2 in the negative z-axis direction. The analyses were carried out at a charge/discharge rate of 1C. The cell that was used in the study was given a current of 2.85A at a voltage of 3.6V. Thus, a volumetric power of 10.26W was applied to the cell. With the assumption of natural convection, the analyses were carried out. The convective heat transfer coefficient was taken as 5 W/m^2K. In the study, the Flir E8 model thermal camera was used in the tests. The specifications of the camera are given in the Table 3..

Table 3: Flir E8 Thermal camera measuring range and precision

Temperature measuring range	(-20 ^oC)-(+250 ^oC)
Thermal sensitivity	0,06 ^oC

3. Results and Discussion

After the necessary boundary conditions were applied, meshing was performed, and then, the analysis was run. Test and anaylsis results were compared to each other. Figure 5 shows the analysis and experimental result. While the temperature value reached a maximum of 34.02°C analysis, whereas the experimental test results reached a maximum value of 32.9°C. The results of the comparison of the test and analysis values are shown in Table 3.



a) b)

Figure 5. Cell surface temperature change: (a) steady-state simulation result, (b) experimental test result

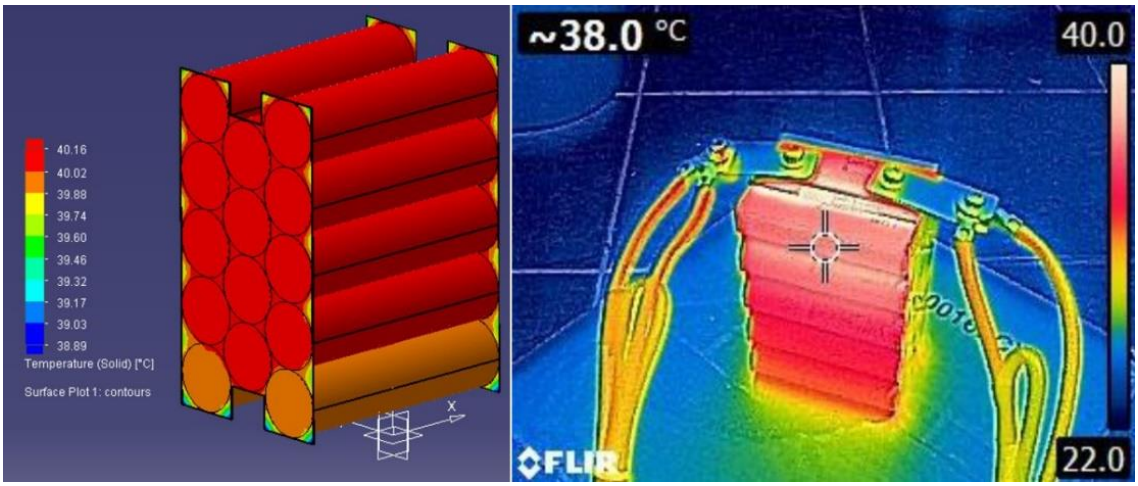
Table 2. Comparison of temperature changes

Type	Maximum (°C)	Relative deviation	Relative error (%)
Simulation (steady-state)	34.04	1.14	15.64
Test	32.9		

In the comparison of the results of the analyses and experimental tests of a single battery cell, it was seen that the thermal distribution results were similar to each other. A module was created by connecting the cells to each other in series/parallel. The analyses were carried out at an ambient temperature of 25°C and a 1C charge/discharge rate. The battery module in this study consisted of 14 Li-ion batteries. To achieve electrical conductivity between batteries, the batteries were connected to each other using nickel busbars.

The temperature distributions of the battery module created with 14 Li-ion batteries obtained using FLOEFD and as a result of the experimental tests are shown in Figure 6. Accordingly, the temperature values were observed to increase from the surface of the module to the inside, and the maximum

measured temperature was 40.16°C. To measure the consistency of the analyses results of the software simulation, these results were compared to the results measured with the thermal camera in the experimental test. According to the test results, the maximum temperature on the battery module surface was 40°C. The temperature distributions obtained in the test and analysis were compatible with each other. Moreover, the difference between the maximum battery surface temperature measurements was on a negligible level.

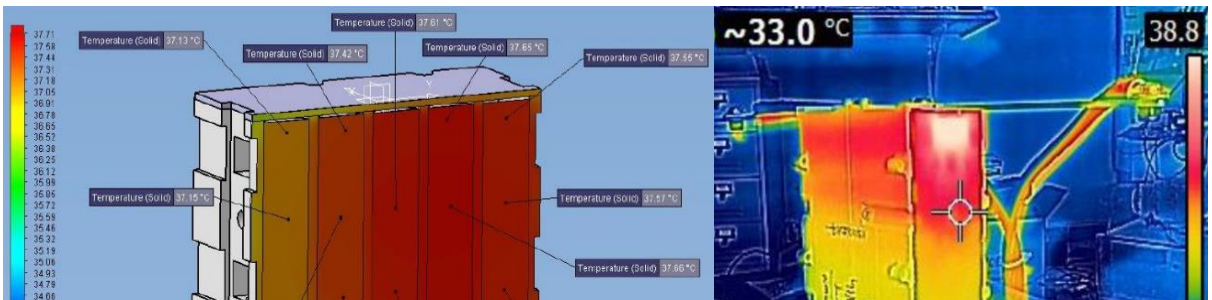


a) b)

Figure 6. Battery module heat dissipation: (a) simulation result, (b) experimental test result

As seen in the analysis results, the amount of heat dissipated to the environment by the battery model was on critical levels. The heat dissipated to the environment by a battery module creates harmful effects on other devices around it. As a result of overheating, the usage life of devices gets shortened, and this reduces their efficiency. In this context, to minimize the heat dissipating to the environment from batteries, various precautions can be taken, and one of these precautions is to encase the battery with a material that has low thermal transmittance.

The analysis and test results obtained after encasing the module are given in Figure 7. The highest temperature measurements were found as 37.71°C in the analysis and 38.8°C in the experimental test. The maximum temperature values measured here were much lower than those measured before encasing the module with the PA66-type polymer material. This result showed that the harmful effects caused by heat dissipation can be minimized when this type of polymer material is used.



a) b)

Figure 7. Heat dissipation after covering the module: (a) simulation result, (b) experimental test result

Using Eq. 13, the comparison results and error rates of the experimental test and analysis values of the maximum temperatures were calculated and are given in Table 3.

Table 3. Comparison of test and analysis results based on the maximum temperatures

Type	Single Battery Cell	14-Cell Battery Module	Polymer-Encased Module
Simulation (°C)	30.47	40.16	37.71
Test (°C)	32.9	40	38.8
Relative deviation	2.43	0.16	1.09
Relative error (%)	30.75	1.06	7.89

As a result of the analyses carried out using the FLOEFD software, the maximum temperature of a single battery cell at a 1C charging rate at an ambient temperature of 25°C was found as 30.47°C. This value was within the suitable operating ranges of Li-ion batteries. The results of the software analyses were compared to those of the experimental tests, and very close values were found. It may be thought that the 1-2°C differences between the measurements were associated with the error margins of the chemical reactions in the battery and the values provided by the measurement devices. While conducting the single-cell analyses, the methodology reported in the study conducted by Wang et al. (2017) was taken as a reference. This study employed the same conditions and revealed similar results to those in their study.

In this study, a module was created by connecting the battery cells to each other in series/parallel. To investigate the heat dissipation characteristics of the examined battery module, software analyses were carried out at a charging rate of 1C and an ambient temperature of 25°C, and the results of the analyses

were compared to the results of the experimental tests. The maximum temperature on the module was measured in the analysis as 40.16°C, and because this value would affect the operating conditions negatively, to reduce the temperature, the module was encased from the outside using a PA66-type polymer material. In the analysis conducted after encasing the module, the maximum temperature on the module was found as 37.71°C. Accordingly, it was determined that the polymer cover had a reduction effect on the module's temperature.

All boundary conditions in this study were kept constant, and the results were found based on a charging rate of 1C and an ambient temperature of 25°C. However, the operating performance of a Li-ion battery changes at lower and higher ambient temperatures. Moreover, the generated heat and surface temperatures will also vary at different charge/discharge rates. Based on these parameters, heat dissipation may show large variations. Further studies should conduct analyses by using different ambient conditions, battery capacities, and charge/discharge rates. New solutions should be created for battery packs that do not provide acceptable temperature ranges.

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MIXED CONVECTION FLOW SIMULATION INSIDE 2D CAVITY PARTIALLY HEATED FILLED WITH HYBRID NANOFLUID

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ABSTRACT

The main challenge faced by many studies in Electronic components is the overheating which leads to adverted effects on their lifetime and electrical efficiency. Several efforts have been made to control this temperature through heat evacuation.

A Numerical Simulation of Mixed convection of Hybrid Nanofluid flow in two-dimensional cavity is carried out. The configuration consists of a cavity that is filled with Hybrid nanofluid possessing a heat source in the West wall (Th). The cold Hybrid Nanofluid enters by a constant temperature to flow between the Sud wall and the heat source (Tc), while the remaining part remains in the adiabatic conditions. The volume fraction's influence on the heat transfer and thermal fields is examined by the finite volume method for several thermal parameters namely, Reynolds, Nusselt and Richardson numbers. The results revealed that the heat transfer's rate becomes important with Reynolds number and the volume fraction rise of Hybrid Nanofluids.

The Navier-Stokes equations and the energy governing the problem are discretized by the finite volume method, taking into account the Boussinesq approximation and neglecting the viscous dissipation. The conservation equations of momentum coupled with the continuity equation are solved using the SIMPLEC Algorithm. The resolution of the discretized algebraic system is based on the method of alternating directions (ADI). Interesting results has been found by proper choice of the governing parameters values and are presented in terms of isotherms, isolines, Nusselt Numbers and heat transfer rates.

Keywords: Numerical simulation; Hybrid Nanofluid; 2D Mixed convection.

EXPLOITING RENEWABLE ENERGY IN IRAQ TO CONQUER THE PROBLEM OF ELECTRICITY SHORTAGE AND MITIGATE GREENHOUSE GAS EMISSIONS

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ABSTRACT

The use of renewable energy sources is increasing rapidly to obtain clean energy and avoid environmental crises. This work is to examine the reality of electricity and the state of renewable energy in Iraq, as well as the possibility of using renewable technology to enhance the country's power generation and mitigate greenhouse gas emissions. The study found that Iraq has an abundance of renewable energy sources (water, solar, wind, biomass, and geothermal energy) and nuclear energy as a source for clean power generation. However, all of these resources are unexploited in the production of electrical energy, except for the use of hydroelectric energy, which is a small percentage of 7.41% of the total production where the dependence on fossil fuels by 92.59% in the production of electrical energy. The report presented recommendations that represent a vision for the use of various renewable energy sources in Iraq to conquer the electricity crisis and reduce dependence on fossil fuels, which is not an eternal resource, and subject to depletion and price increases, as well as a cause of pollution and global warming.

EFFECT OF HYDROGEN ON MICRO AND MACRO HARDNESS OF AL 7075

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ABSTRACT
Micro and macro hardness values of Aluminum (Al) 7075 were investigated using hydrogen-induced and hydrogen-free specimens. Test specimens were prepared from as – received material after cutting, grinding, polishing and electropolishing operations. The specimens were divided into two groups. First one is hydrogen charged and the other one is hydrogen uncharged material. In this study, electrochemical charging method was used to charge the materials with hydrogen. After hydrogen charging procedure, the specimens were tested by means of micro and macro hardness equipment. It was observed the hydrogen can change hardness at both macro and microscale. Hydrogen-dislocation interactions are responsible for microhardness changes under compressive loading. Transmission electron microscopy (TEM) is planned to be carried out to quantify the change in dislocation density. After this observation, the effect of hydrogen on microstructure and corresponding mechanical property change will be discussed in more detail.

Keywords: Micro hardness, Macro hardness, Hydrogen Embrittlement, Aluminum 7075

STUDY OF THE EMC BEHAVIOR OF THE SMPS WITH THE LISN

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ABSTRACT
In the context of the increasing use of static converters, efforts to reduce the weight of electrical systems are numerous. The mass of EMC filters being more than 30% of that of a converter, optimal sizing is sought. To comply with valid current regulations, a frequency range of 150 kHz to 30 MHz must be taken into consideration, in most cases, this will be referred to as conducted EMC to guarantee electromagnetic compatibility.
As part of this paper, we were particularly interested in increasing the immunity of the victim. Our study focused on improving the performance of EMC filters. The generation of EMC disturbances, and therefore the sizing of the associated filters, strongly depends on the converter itself, but also its electromagnetic environment. This study is part of the reduction of conducted emissions generated by static converters. To limit the PEMs, the standards give a template to be respected by the designer of a power electronics system. This conventionally induces the addition of EMC filters composed essentially of inductors and capacitors which are intended to isolate the disturbances generated by the converter and to circulate them as little as possible outside of it.

Keywords: Electromagnetic Compatibility (EMC), SMPS, Electromagnetic Interference (EMI), Filter, LISN.

CARBON CAPTURE TECHNOLOGY BY Spirulina

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ABSTRACT

Keeping in view of Urbanization and hi-tech environment of the present days it is too necessary to take action about many environmental protection aspects. Especially regarding the increase in Pollution in the atmosphere. Out of all Carbon dioxide control methods are implemented first and also in climate change.

Already some successful practices going on in many countries eg.Serbian countries as by placing some outdoor urban photo- bioreactors that use microalgae to perform photosynthesis remove the some amount of carbon dioxide as 2-10 yrs old trees.

Keywords: Spirulina,carbon dioxide,Environment, reducing level

THE EFFECTS OF SODIUM OMADINE ON FRESHWATER MUSSELS

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ABSTRACT

Sodium omadine (CAS: 3811-73-2) is an antimicrobial chemical substance to prevent the growth of the organisms. It is generally used as biocides in different areas such as carpet cleaners, latex emulsions in compounds, laundry detergents. Due to its widespread use, it is slightly moderate acute toxic to humans. Besides, it has also toxic effects on fish and aquatic invertebrates in the aquatic ecosystems, since its half-life in water is 23 days or longer. This study aims to investigate the physiological and oxidative stress effects of sodium omadine exposure on freshwater mussels (Unio delicatus). Freshwater mussels were exposed to 1 and 10 µg/L sodium omadine for 48 hours and 7 days. Due to its solubility in the water, there is only one control group in the study. To investigate physiological analysis, the total hemocyte counts (THCs) were detected via the hemolymph of mussels after the exposure periods. The digestive gland and gill tissues of mussels were sampled for oxidative stress (advanced oxidative protein products, AOPP and malondialdehyde, MDA) analysis. At the end of the 7-days exposure period, the THCs were 9 times higher in the 10 µg/L exposed groups than the control group ($p<0.01$). On the other hand, the AOPP level of digestive gland and gill were lower than the control group at 48-hours and 7-days in the 10 µg/L exposed groups ($p<0.05$). The gill tissue MDA level in the 1 µg/L exposed groups both exposure times were the lower than control groups ($p<0.05$). As a result, this study is shown that even at low concentrations of sodium omadine leads to tissue oxidative stress damage and total hemocyte counts alterations in Unio delicatus. In terms of environmental risk assessment, sodium omadine should be prevented from contamination of aquatic ecosystems.

Keywords: Sodium omadine, *Unio delicatus*, total hemocyte counts, malondialdehyde, AOPP

Introduction

Because of population growth, the amount of production is gradually increasing. According to the requirements in daily life, productions are constantly diversifying. Wastes are occured at the production, using and post using of products. These wastes act as pollutants in environment and may health risk for biomass. Environmental pollutants can be contaminated by varied ways to water systems. Sodium omadine (NaOM) is using for antifouling which is one of the important biocide products. NaOM, may contaminate to water systems during and after its uses as antibacterial and antifungal [1],[2].

Aquatic organisms are directly exposed to pollutants in environment. The mussels have become popular organisms in recent environmental pollution studies due to their ability to cling to their habitat, to be easy to hunt, to adapt easily to the laboratory and to well respond to pollutants.
Mussels, either marine or freshwater, are good model aquatic organism because they feed by filtering the water, have a low metabolic rate and have the ability to accumulate pollutants in their tissues [3]. *Unio delicatus* Lea, 1863, used in this study, is one of the species found in the river basins worldwide including Anatolia. Due to their wide distribution, *Unio* species are model organisms used for biological monitoring, ecotoxicological and phylogenetic studies [4].
Total hemocyte counts in aquatic invertebrates is an indicator of the health of the organism and is one of the important physiological parameters that show the stress depending on the environmental conditions [5]. In addition, oxidative stress also occurs in organisms and has negative effects on various biomolecules of the cell such as lipids and proteins [6]. In this study, it was aimed to investigate the physiological and biochemical effects of sodium omadine on the freshwater mussel *Unio delicatus*.

MATERIALS AND METHODS

Freshwater mussels (*Unio* sp.), the model organism of this study, were brought to the laboratory. For adaptation to laboratory conditions, 10 L tap water and constant aeration with constant temperature (21ºC) environments are provided in 15 L aquariums for two weeks and *Chlorella* sp. provided with daily feeding. The aquarium water was changed by siphoning method every two days. After the adaptation, ten freshwater mussels randomly selected from the stock aquariums were added to the 15 L aquariums containing 10 L of water. Mussels were exposed to 1 and 10 µg/L sodium omadine concentrations for 48 hours and 7 days. In the study, there is a control group consisting only of aquarium water and mussels.
Samples were taken from freshwater mussels after exposure times. In the mussels taken from the aquariums, firstly, the length, thickness and height measurements were taken with the help of precision scales and weights and calipers. In order to determine the total hemocyte counts (THCs), hemolymph samples were taken from the umba part of the mussels with the help of a 2.5 mL injector and mixed with 4% formaldehyde in a 1:1 ratio. The calculation of the THCs was carried out according to the method of [7]. Following the collection of hemolymph samples, the mussels were dissected, the gill and digestive gland tissues were removed, and they were packaged separately and thrown into liquid nitrogen and kept them at -80ºC until biochemical experiments. AOPP (Advanced oxidation protein products) was made according to [8] and the protein analysis was determined according to Bradford method [9]. The thiobarbutric acid (TBA) reagent formation method was used to determine the MDA (malondialdehyde) level [10].
In order to evaluate the test results obtained, normal distribution and homogeneity of variance tests were performed to determine the differences between the experimental groups in the total hemocyte count, AOPP and MDA determination results. Those that showed normal distribution were analyzed with the t-test and one-way Anova and those that did not were analyzed with [11], which are non-parametric tests, and their significance levels were determined with the GraphPad 5 program.

RESULTS AND DISCUSSION

This study investigated the total hemocyte counts and biochemical parameters (AOPP and MDA) of the freshwater mussels exposed to different concentrations of sodium omadine for 48 hours and 7 days.

Total hemocyte count is a physiological parameter for aquatic invertebrates that reflects their health status and their response to environmental conditions [12]. In this study, the change in total hemocyte count in freshwater mussels exposed to sodium omadine at 1 and 10 µg/L doses for different exposed times is shown in Figure 1. The highest total hemocyte counts was observed in freshwater mussels at a dose of 10 µg/L at 7 days of exposure. While the THCs were low in the control group in both exposure times, they were found to be high in the exposed groups. At the end of the 7-days exposure period, the THCs were 9 times higher in the 10 µg/L exposed groups than the control group ($p<0.01$).

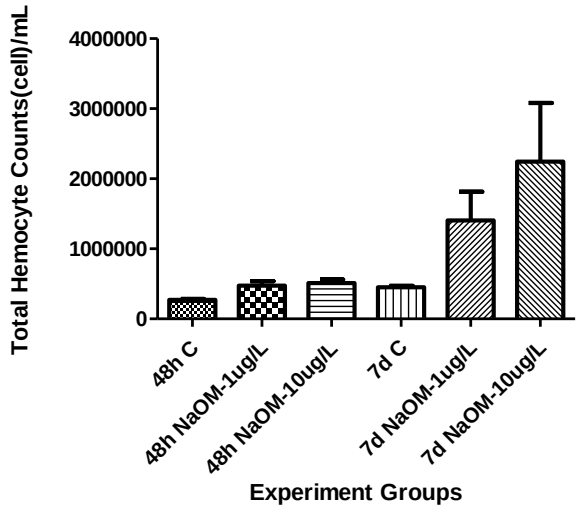


Figure 1. Total hemocyte counts exposed to sodium omadine

In this study, the effect of sodium omadine on freshwater mussels was evaluated by determining the amount of advanced oxidative protein products (AOPP), one of the oxidative stress parameters. The AOPP values obtained from the digestive gland and gill tissues as a result of exposure of freshwater mussels to sodium omadine for 48 hours and 7 days are shown in Figure 2. The AOPP level of digestive gland and gill were lower than the control group at 48-hours and 7-days in the 10 µg/L exposed groups ($p<0.05$).

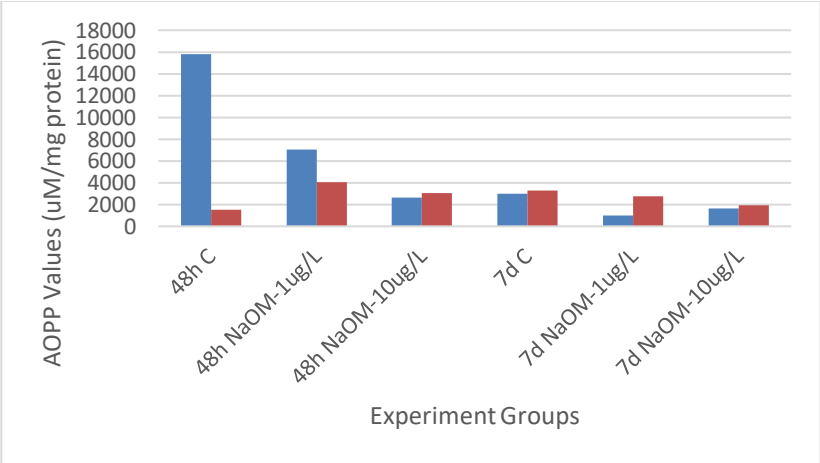


Figure 2. AOPP values exposed to sodium omadine (gill: blue graphs; digestive gland: red graphs)

In this study, the effect of sodium omadine on freshwater mussels was evaluated by determining the amount of malondialdehyde (MDA), one of the lipid oxidation parameters. The gill tissue MDA level in the 1 µg/L exposed groups both exposure times were the lower than control groups ($p<0.05$).

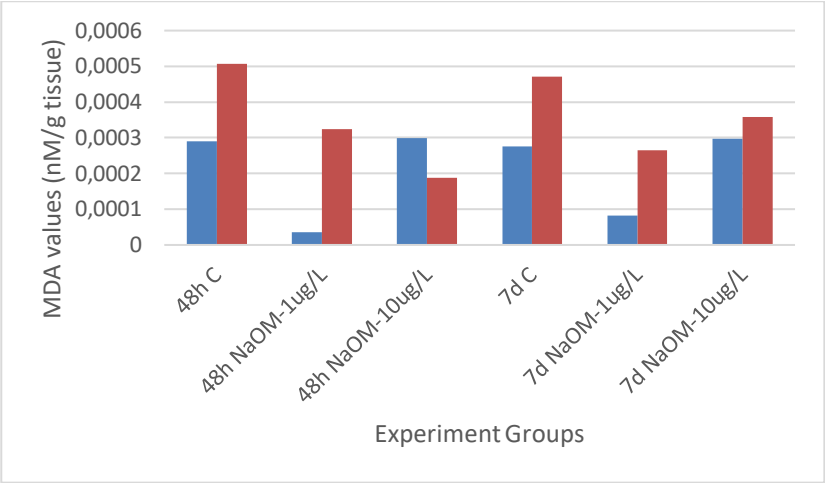


Figure 3. MDA values exposed to sodium omadine (gill: blue graphs; digestive gland: red graphs)

In a study conducted with *Unio mancus* species among Unionidae, individuals exposed to sodium omadine at a dose of 5 ug/L for 96 hours had increased gill and digestive gland MDA and glutathione levels compared to the control group [13]. On the other hand, this study found that the MDA and glutathione levels of exposed group's tissues were lower compared to controls. This might be occurred exposed dosage, periods and species differences.

CONCLUSION

In this study, the effect of sodium omadine, which is mixed with the aquatic ecosystem and has the property of dissolving in water, on physiological and biochemical parameters on freshwater mussels was investigated. The change in the total hemocyte count, which is a physiological parameter, was observed as the first response of the organism. In the gill and digestive gland tissues, there was an increase/decrease in AOPP and MDA levels compared to the control groups due to the formation of oxidative stress. Thus, it has been shown that the parameters used in this study can be used in biological pollution monitoring.

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CREATING A NEW VARIANT OF PASTA WITH SWEET POTATO AND SPINACH

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ABSTRACT

This project introduced a new variant of pasta which was made from the conventional ingrediants with the addition of sweet potato and spinach. The goal is to produce a type of pasta that is more nutritious and more aesthetically appealing to the local population in Keningau. The locals appeared to have shown less interest in eating healthy and their choice of food is heavily influenced by aesthetical appearance of the food. Thus, this project was intended to offer this food product as an alternative that can provide nutrients to the target customers with greater aesthetic appeal. The target subjects were villagers from a local area in Keningau, Sabah, Malaysia. There were 30 respondents who sampled the pasta and gave their feedback through Likert-scale questinnaire. The results revealed that the respondents generally expressed approval on the taste, aesthetic appeal, texture and aroma of the paste but remained less confident in its commercial potential for the local market. It was recommended that more experiments on the taste and texture need to be done and the target group should be expanded to gather data from different groups in the community.

Keywords: pasta, sweet potato, spinach, aesthetic appeal, nutrients

DETERMINATION of POMOLOGICAL CHARACTERISTICS of SOME GRAPE CULTIVARS (*Vitis Vinifera* L.) in MANISA REGION

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ABSTRACT
Grape is considered a functional food with its bioactive content and has an important in human metabolism. Due to its location, Manisa region has an ideal geographical structure for viticulture in terms of climate and soil structure, and it is a province with favorable ecological conditions for the cultivation of table, dried, wine and cider grape varieties. In this study, it was aimed to determine the pomological characteristics of 6 varieties of grapes grown commercially in Manisa. In this context, pomological and biochemical properties of grape samples were investigated by collecting Antep Karası grape, Trakya İlkeren grape, Michaeli Paliere grape, Red Globe grape, Crimson Seedless and Sultani Çekirdeksiz grapes according to harvest time.

Introduction

The grape, one of the most cultivated fruits in the world, is not very selective in terms of climate and soil, and propagation methods are easy, which is why it is produced on a wide scale and has a high economic value (Agaoglu 2002, Semerci et al. 2015). With its suitable vineyard ecology, rich vine biodiversity, historical culture and high viticulture experience of its society, Turkey is among the countries with the greatest potential in terms of viticulture and meets 5% of the world's grape production (Anonymous 2020a). Our country has a history of viticulture of about 6000 years and there is a rich vine biodiversity as wild vine (*Vitis vinifera*L. subsp.*sylvestris*) and cultivated vine (*Vitis vinifera* L. subsp. *sativa*) (Agaoglu 2002). The Aegean Region is the region where vineyard cultivation is carried out in the widest area in our country, and almost half of the country's vineyard areas are located in this region. Manisa is the leading producer of dried grapes in Turkey, accounting for 89.7% of the country’s dried grape production and 58.7% of the country’s table grape production. The vineyard area in Manisa accounts for 36.95% of the total area of fruit orchards (Anonymous 2020b). In Manisa, where modern viticulture systems are used, grapes take their place on the tables as fresh and dry, while the production of brine leaves, grape preserves, jam, must, molasses, pulp, wine, confectionery and similar products obtained from grapes is also in terms of the potential of grapes and products obtained from grapes, occupies an important place (Akin-Bascam et al. 2021).

Grapes, with their bioactive content, are recognized as a functional food, and also play an important role in human metabolism due to their nutrient content.Grape is a food known for its components that protect the body against infections, strengthen the immune and nervous system against diseases such

as cancer, obesity, diabetes, various joint disorders, and delay the effects of aging (Monagas et al.2006, Fraga 2010, Xia et al. 2010, Yang and Xiao 2013). Grape berry consists of berry skin, fruit flesh and seeds, and 5-12% of a mature fruit consists of husk (Celik 2006, Pinelo et al. 2006, Otag 2015). While the fleshy part of the grain constitutes 80-90% of the grape berry weight, the shape and size of the berries vary according to the grape variety. The main shapes are: round, flat, oval, cylindrical, inverted oval, pointed oval, sickle, as well as in many intermediate forms. The average diameter of wild grapes starts from 4 mm and the diameter length can reach 30-35 mm depending on the cultivars, and the number of seeds per berry varies between 0-4 and can reach up to 6 seed. Grape skin determines the color of the grape variety and there are grape varieties in white, yellow, green-yellow, red, blue-violet and red-black colors (Ozer and Isik 2002, Pinelo et al. 2006, Robinson 2006, Ekhvaia and Akhalkatsi 2010, Kunter et al. 2013, Duran 2014, Ferreiraa et al. 2017, Abiri et al. 2020, Balbaba and Bagci 2020). In this study, it was aimed to determine the some characteristics of 6 grape varieties grown in Manisa with comparison of pomological, biochemical and color characteristics of Antep Karası grape, Trakya İlkeren grape,Michaeli Paliere grape, Red Globe grape, Crimson Seedless grape and Sultani Çekirdeksiz grape.

Materials and Methods

Materials

The study was carried out in 2021 with Antep Karası grape, Trakya İlkeren grape, Michaeli Paliere grape, Red Globe grape, Crimson Seedless grape and Sultani Çekirdeksiz grape varieties, have been carried out. The grapes, which are the experimental material, were collected from the vineyards in the Alaşehir and Sarıgöl districts of Manisa during the harvest time of the grape varieties (August-September-October). The Turkish Standards Institute reports that according to the TS101 Table Grape Standard, thewater-soluble dry matter (WSDM) should be at least 13% in seeded varieties. When the WSDM value is higher than 13% the grapes were harvested.

Methods

Berry size (mm), berry thickness (mm) and berry width (mm) were measured with caliper in the berries taken from different parts of the grape bunch samples (Figure 1). The berry weight (g) was recorded as the number of seeds in the grape berry (n) and the number of seeds in the grape berry samples on a precision balance. The water-soluble dry matter value (%, WSDM) was determined by refractometer in grape juice. Acidity was determined in grape samples by titration (using 0.1 N NaOH) method. pH value was measured with a pH meter (Cemeroglu 2010). Maturity index was expressed as the ratio of total water-soluble dry matter to acidity (WSDM/Acidity) (Otag 2015). Using the berry size, berry width and berry thickness values of grape samples, geometric mean diameter (Dg, mm), sphericity (Φ) and roundness (%, Ro) data were calculated according to equations 1.1., 1.2. and 1.3. (Karababa and Coskuner 2013).

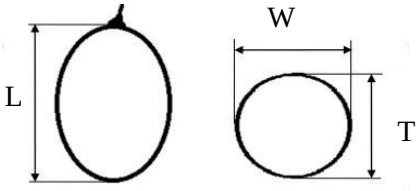


Figure 1. Size measurement of grape grains

$Dg=(L \times W \times T)^{1/3}$ **(1.1)**, $Ø= Dg/ L$ **(1.2)**, $Ro=W/L \times 100$ **(1.3)**

Grape berry skin color characteristics were performed in triplicate using chromometer (Konica Minolta Co., Osaka, Japan) in 2 different regions of 5 grapes in each replication. L*, a* and b* values were measured according to CIE Lab color system. On the color scale, the L* parameter ranges from 0 to 100 (brightness) from black to white, the a* axis shows a change from red (+a*) to green (-a*) and while the b* axis from yellow (+b*) to blue (-b*). By the way hue is color tone angle, chroma is color intensity. According to the color coordinate system; 0° defines the color red-violet, 90° yellow, 180° blue-green, 270° blue (Piccardo et al. 2019). Hue, equation 1.4. and the Chroma was determined in equation 1.5.

$h^o= \arctan(b^*/a^*)$ **(1.4)**, $C^* = (a^{*2}+b^{*2})^{1/2}$ **(1.5)**

Results and Discussion

Grape berry properties of grape varieties are given in Table 1. Average 100 grape berry weight (g), berry weight (g), berry length (mm), berry thickness (mm), berry width (mm) and number of seeds in berry (n) were 244.647-856.311 g, 2.74-12.80 g, 17.44-22.40 mm, 11.18-18.00 mm, 11.86-18.60 mm and 0-4 pieces respectively. The lowest 100 grape berry weight was determined in, Sultani Çekirdeksiz while the highest in Michael Paliere. Within the aim of the study, Sultani and Crimson grape varieties are seedless, and it was determined that the grape with the highest number of seeds among other grape varieties was Red Globe. It was noted that Antep Karası, Michael Paliere and Sultani Çekirdeksiz grapes had longer berry lengths, and Michael Paliere and Trakya İlkeren grape varieties had the highest width.

Table 1. Berry properties of grape varieties

Grape Varieties	100 Grape BerryWeight (g)	Berry Weight (g)	Berry Length (mm)	Berry Thickness (mm)	Berry Width (mm)	Number of seeds (n)
Antep Karası	519.317	6.00	22.28	15.23	15.29	2.5
Trakya İlkeren	530.280	5.32	17.56	17.32	17.56	3
Michael Paliere	856.311	10.26	22.40	18.00	18.60	3
Red Globe	741.153	12.80	18.85	16.18	16.80	4
Crimson Seedless	308.195	2.74	17.44	11.18	11.86	0
Sultani Çekirdeksiz	244.687	2.93	22.28	13.22	13.44	0

Aydin (2009) determined the berry characteristics of 12 different table grape varieties and the berry width values were 18.46-24.08 mm; and the size was determined as 19.55-25.55 mm. They determined the highest berry width value in *Alphonse Lavallee* (ALFONS) (24.08 mm) variety, and the highest average berry length value in Trakya İlkeren (19.55 mm).

In the study, the highest geometric mean diameter was measured in Michael Paliere (19.57 mm), while the lowest geometric mean diameter value was determined in Crimson Seedless (13.22 mm). The highest sphericity was detected in Trakya İlkeren grape (0.995), and the lowest sphericity was determined in Sultani Çekirdeksiz (0.710) grape. The roundness was recorded as 100.06% in Trakya İlkeren grape and 60.49% in Sultani Çekirdeksiz grape in accordance with sphericity (Table 2).

Table 2. Size measurements of grape berries

Grape Varieties	Geometric Mean Diameter (Dg, mm)	Sphericity (Φ)	(Ro, %)
Antep Karası	17.29	0.778	68.96
Trakya İlkeren	17.48	0.995	100.06
Michael Paliere	19.57	0.876	83.34
Red Globe	17.24	0.913	89.13
Crimson Seedless	13.22	0.757	68.08
Sultani Çekirdeksiz	15.82	0.710	60.49

The physicochemical properties of grape varieties are given in Table 3, and it has been determined that the acidity values of grape varieties vary between 0.313-0.438% while the pH values between 3.90-4.35. The highest maturity index was determined in Sultani Çekirdeksiz grape (58.82) and the lowest maturity index was determined in Antep Karası grape (34.61).

Table 3. The physicochemicalproperties of grape varieties

Grape Varieties	WSDM (%)	pH	Acidity (%)	Maturity İndex
Antep Karası	15.14	4.25	0.438	34.61
Trakya İlkeren	20.90	3.90	0.375	55.73
Michael Paliere	13.93	4.40	0.375	37.15
Red Globe	14.14	3.90	0.375	37.71
Crimson Seedless	20.15	4.00	0.375	53.73
Sultani Çekirdeksiz	18.38	4.35	0.313	58.82

Cangi et al. (2011) in a study on the changes that occur during the ripening of some wine grapes grown in the Tokat region, they stated that the pH value varies between 2.45-4.20 depending on ripening. Acidity, it has been stated by many researchers that the pH value increases as the grape ripening increases. This increase is explained by the decrease in organic acids, which are found in high levels in the composition of grapes during the ripening stages, due to ripening (Cangi et al. 2011, Bindon et al. 2013).

Keskin et al. (2009) reported in their study that the pH values of ripe grapes vary between 3-4 values, and that the pH values of the grapes increase significantly during the ripening period, and this situation affects the flavor positively. Hayoglu et al. (1997) in their study, the pH value of Antep Karası grape variety 3.76; they determined the total acidity as 0.29 (g100 ml^{-1}) and 20% WSDM

value.

In the researches, it is stated that the phenological stages of the vine and the sugar concentration in the must are related to the climatic conditions and cultural practices in the region, and the amount of WSDM increases with the maturation of the grape varieties (Karanis and Çelik 2002, Navarro et al. 2008, Jin et al. 2009, Yang et al. 2009, Navrátilová et al. 2021). Otag (2015) reported that the maturity index increased due to the increase in sugar concentration and the decrease in the total amount of acidity during ripening. It was stated that the maturity index varies between 1.14-1.60 in the verruk period, which is the beginning of ripening, between 27.46-43.92 in the ripening stage and between 48.54 and 73.30 in the over-ripe stage. Organic acids are taken into account together with sugars in determining the maturity status of grapes and are used in calculating the maturity index. Acidity, which is one of the quality characteristics of grapes, is expressed by the ratio of tartaric acid, which is the dominant organic acid in grapes. In addition, the pH value in grape juice, on the other hand, affects the color level of the grapes in connection with the titration acidity (Creasy and Creasy 2009, Xia et al. 2010, Ford 2012).

Appearance is an important quality parameter for economically produced grapes. Phenolic compounds affect the grapes especially hardness, softness, colour, taste, aroma etc. play a major role in their properties. In terms of color, grapes are generally divided into three main groups as white, red and black (Mitić et al. 2010, Kunter 2013, Ferreira et al. 2017, Ozcan et al. 2017, Samoticha et al. 2018, Abiri et al. 2020). Anthocyanins are water-soluble natural colorants found in fruits, vegetables, flowers, leaves, roots and other plant storage organs that give a wide range of colors from pink, red, purple and blue (Fimognari et al. 2008, Alappat and Alappat 2020, Shen et al. 2022). The color of red and black grapes is composed of anthocyanidin group, and the color of white grapes is composed of flavone (quercetin) and flavonal (quercitrin) group yellow substances (Chacona et al. 2009, Xia et al. 2010, Sparrow et al. 2020).

Table 4. Color properties of differentgrape varieties

Grape Varieties	L^*	a^*	b^*	h^o	C*
Antep Karası	21.14	1.40	-0.48	18.92	1.48
Trakya İlkeren	20.38	1.41	-0.37	14.78	1.46
Michael Paliere	21.62	1.54	-0.56	19.98	1.64
Red Globe	31.94	8.90	3.16	19.55	9.44
Crimson Seedless	27.37	9.96	2.74	15.38	10.33
Sultani Çekirdeksiz	36.94	-1.93	10.65	79.73	10.82

In table grape cultivation; factors such as the taste, aroma, shape, color and size of the grape berries and clusters are among the important factors that play a role in grape variety and are seen as an important factor in consumer demands (Bergqvist et al. 2001, Ozer et al. 2012, Teixeira et al. 2013, Ribeiro et al. 2022). In this study, it was determined that the berry skin color of Trakya İlkeren grapes was less bright compared to the L* value, +a* value, which indicates red color, was higher in Crimson Seedless, and +b* value, which indicates yellow color, was at the highest level in Sultani Çekirdeksiz.

Hue angle, which explains the hue angle, varied in the range of 14.78-79.73, while it was calculated the lowest in Trakya İlkeren grape and the highest in Sultani Çekirdeksiz grape in accordance with the Chroma value (Table 4). When the color parameters of grape varieties are examined; It was determined that yellow color was dominant in Sultani Çekirdeksiz grapes, blue-black color was dominant in Antep Karası, Trakya İlkeren and Michael Paliere grapes, and pink-red colors were dominant in Red Globe and Crimson Seedless grapes.

Conclusion

While there are many physiological and biochemical changes during the berry development in grapes, each developmental stage may vary according to the variety and environmental conditions. In this study, the data obtained by examining the pomological characteristics of the grape varieties most grown in the region were gained in the literature. It is thought that these results will be a guide for future studies. It is thought that the findings obtained in the region, which has an important export potential in table and dried grapes, can be used as basic data in future studies on technical issues such as machine harvesting, storage, transportation and production, taking into account the physical and chemical properties of grape berries of these varieties.

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REMOVAL OF AN ORANGE G AZO DYE ON GRANULAR ACTIVATED CARBON BASED ON OLIVE STONES

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ABSTRACT

The objective of this study is the removal of an azo dye, orange G, by granular activated carbon (GAC) based on olive stones with a discontinuous process.

The parametric study of the batch adsorption of orange G on granular activated carbon at room temperature enabled us to show the influence of the different operating parameters (pH, initial concentration, and mass of adsorbent) on their efficiency. The experimental data were correlated with different mathematical models such as the Langmuir model, the Freundlich model, and the Temkin model. The Langmuir model was found to describe the adsorption isotherm and the adsorption capacity is 103 $mg.g^{-1}$ of orange G on the studied GAC.

Keywords: Adsorption isotherm, Batch processes, mathematical models, Acid Orange10.

ЭКСПЕРИМЕНТТІ ЖОСПАРЛАУ ТӘСІЛДЕРІ АРҚЫЛЫ АСҚАБАҚ ДӘНДЕРІН ПРЕССТЕУ ПРОЦЕССТЕРІНІҢ РАЦИОНАЛДЫ ПАРАМЕТРЛЕРІН АНЫҚТАУ

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Бұл мақалада толық факторлы экспериментті жоспарлау әдісін қолдана отырып, шнекті май сығымдағышта асқабақ дәндерінен май сығымдау үдерісі қарастырылған. Асқабақ дәндерінен май сығымдау үдерісіне әсер ететін әртүрлі факторлардың өзара әрекеттесуін зерттеу мақсатында экспериментті жоспарлаудың математикалық әдістері қолданылды. Зерттеу нысаны ретінде асқабақ дәндері пайдаланылды (майлылығы 32 - 36 %).

DETERMINATION OF THE RATIONAL PARAMETERS OF PRESSING PUMPKIN SEEDS BY METHODS OF EXPERIMENT PLANNING

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ABSTRACT

The article describes the process of pumpkin oilseeds crushing in a screw oil press using the method of planning a full-factor experiment. Mathematical methods of experiment planning were used in order to study the interaction of various factors affecting the process of oil extraction from pumpkin seeds. Pumpkin seeds (oil content 32-36%) were used as an object of the research.

DOĞAL AFETLERIN TARIM VE GIDA GÜVENLIĞI ÜZERINE ETKILERI VE ÇÖZÜM ÖNERILERI

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ÖZET

Doğal afetlerin meydana getirdiği etkiler sonucunda toplumda birçok alanda kayıplar yaşanmaktadır. Bu kayıplar sonucunda insanların en çok karşılaştığı ve savunmasız kaldığı sorunlardan biri de gıda güvenliği sorunudur. Tahılların kirli kimyasal ve patojenlere maruz kalması afetlerin istenmeyen etkilerindendir ve yerel halkı savunmasız bırakabilir.

Yaşanan iklim değişikliği ve buna eşlik eden doğal afetlerin savunmasız ve gelişmemiş ülkelerde ciddi ekonomik ve sosyal kayıpların yanında gıda kaynaklarına ulaşım, hayvancılık faaliyetleri ve gıda güvenliğinin gerçekleştirilmesinde olumsuz etkileri bulunmaktadır.

Bu çalışmada doğal afetlerin tarım ve gıda güvenliğine etkileri ve çözüm önerileri incelenmiş ve alınabilecek önlemler ele alınmıştır. Çalışmamızda, doğal afetlerin tarım ve gıda güvenliği üzerine etkilerine yönelik proaktif çözüm önerileri ele alınarak literatüre katkı sağlanması amaçlanmıştır.

Afetler doğal ve teknolojik kaynaklı olarak iki ana gruba ayrılır. Doğal afetler; jeofiziksel, meteorolojik, hidrolojik, klimatolojik, biyolojik ve dünya dışı olarak alt gruplara ayrılmaktadır. Son yıllarda yapılan çalışmalar göstermiştir ki değişen iklim koşulları sebebiyle meydana gelen hidro-meteorolojik ve klimatolojik afetler (örneğin; kuraklık, fırtınalar vb.) doğrudan veya dolaylı olarak gıda güvenliği ve besin döngüsüne etki etmektedir. Ani veya süreç içerisinde yavaş gelişen afetlerde tarım alanlarında bozulmalar, kirlenmeler, ekosistem döngüsündeki değişmeler gıda kalitesinin ve miktarının etkilenmesine sebep olmaktadır.

İklim değişikliği sebebiyle özellikle son yarım asırda dünya yüzeyinde ısınma gerçekleşmekte ve bu durum kuraklık ve aşırı yağışlara sebep olabilmektedir. Afrika, Orta Doğu, Avustralya'nın bazı bölgeleri ve Akdeniz bölgesi iklim değişikliğine karşı savunmasız alanlar arasında yer almaktadır. Doğal afetlerin gıda güvenliğine etkileri özellikle savunmasız ve gelişmemiş ülkelerde çiftçi ve balıkçılık faaliyetleriyle ilgilenen toplulukların risklerle başa çıkma kapasitesini aşmaktadır. Bu savunmasız gruplara ihtiyaç duydukları korumayı sağlamak amacıyla proaktif önlemlerin alınması ve gerekli eğitimlerin verilmesi büyük önem taşımaktadır.

Doğal afetler sonucu savunmasız ve gelişmemiş ülkelerin yanı sıra gelişmiş ülkeler de büyük kayıplar yaşayabilmektedir. Yapılan araştırmalar son yıllarda Avrupa'da meydana gelen afetlerin büyük çoğunluğunun seller olduğunu ve savunmasız bırakabildiğini göstermektedir. Bu durumlar afetlerin gelişmiş ülkelerde de ciddi hasar ve kayıplara sebep olabileceğini ve kriz hali yaşanabileceğini göstermektedir. Proaktif önlem alma ve afetlere hazırlık çalışmalarının yaygın olarak gerçekleştiği gelişmiş ülkelerde afet etkilerini daha az ve iyileşme faaliyetlerinin daha hızlı olabileceğini düşündürmektedir.

Covid-19 pandemisi tarımsal hizmetlerin gerçekleştirilmesini ve gıda güvenliğini etkileyerek özellikle hassas toplumları savunmasız bırakmıştır.
Yerel imkanlarda baş edilemeyen ve toplumun düzenini bozan afetlerin mevcut risklerini azaltmak ve sürdürülebilir kalkınmayı sağlamak için çalışmalar yapılması gerekmektedir. Bu çalışmalara geliştirilen politikalar ve eylem planları dahil edilmeli ve denetlenmelidir. Uluslararası kurum ve kuruluşlarla iş birliği içinde olması gereken ülkeler kalkınma planlarının hazırlanmasına, mevcut riskleri önleme çalışmalarına uyum sağlaması gerekmektedir**.** Bu stratejiler hakkında halkın bilgilendirilmesi ve yapılan çalışmalara dahil edilmesi kalkınma hedefleri kapsamında çalışmaların etkin ve verimli yürütülmesi açısından önemlidir.
Üretimde azalma, arzın fazla olması, ulaşılabilirliğin kısıtlanması ve verimsizliğin artması gıda güvensizliği gibi durumlara sebep olabilmektedir. Önceki yıllara bakıldığında yapılan çalışmalar ve alınan önlemlerle afet riskleri azaltılmaya çalışılmış olsa da meydana gelen afetlerin sayısındaki ve şiddetindeki artış tarımı ve gıda güvenliğini tehdit eder duruma gelmiştir.
Sonuç olarak doğal afetlere karşı tarım ve gıda güvenliği üzerine sürdürülebilir politikalar ve eylem planları geliştirilmeli, oluşturulan mevzuatlarla bu planların uygulanması desteklenmelidir. Gelişmemiş ve savunmasız toplumların proaktif önlemlerde riskle başa çıkma kapasitesinin arttırılması ve uyum çalışmalarının sağlanması gerekmektedir.

Anahtar Kelimeler: Doğal afet, gıda güvenliği, iklim değişikliği, kıtlık, proaktif önlemler

EFFECTS OF NATURAL DISASTERS ON AGRICULTURE AND FOOD SECURITY AND SOLUTION SUGGESTIONS

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ABSTRACT

As a result of the effects of natural disasters, losses are experienced in many areas in society. As a result of these losses, one of the problems that people face most and remain vulnerable is the problem of food security. Exposure of grains to polluting chemicals and pathogens is one of the undesirable effects of disasters and can leave local people vulnerable.

Experienced climate change and accompanying natural disasters have negative effects on access to food resources, livestock activities and food security, as well as serious economic and social losses in vulnerable and underdeveloped countries.

In this study, the effects of natural disasters on agriculture and food safety and solution proposals are examined and the precautions that can be taken are discussed. In our study, it is aimed to contribute to the literature by considering proactive solutions for the effects of natural disasters on agriculture and food safety.

Disasters are divided into two main groups as natural and technological origin. Natural disasters; geophysical, meteorological, hydrological, climatological, biological and extraterrestrial subgroups. Studies conducted in recent years have shown that hydro-meteorological and climatological disasters (eg drought, storms, etc.) that occur due to changing climatic conditions directly or indirectly affect food security and nutrient cycling. In case of sudden or slow-developing disasters, deterioration in agricultural areas, pollution, changes in the ecosystem cycle cause food quality and quantity to be affected.

Due to climate change, especially in the last half century, the world's surface has been warming and this may cause drought and excessive precipitation. Africa, the Middle East, parts of Australia and the Mediterranean region are among the vulnerable areas to climate change. The food security impacts of natural disasters exceed the capacity of the farming and fishing communities to cope with the risks, especially in vulnerable and underdeveloped countries. In order to provide these vulnerable groups with the protection they need, it is of great importance to take proactive measures and provide the necessary training.

As a result of natural disasters, developed countries can experience great losses as well as vulnerable and underdeveloped countries. Research shows that most of the disasters that have occurred in Europe in recent years are floods and can leave them vulnerable. These situations show that disasters can cause serious damage and losses in developed countries and a crisis situation can be experienced. It suggests that in developed countries, where proactive measures and preparedness for disasters are widespread, disaster effects can be less and improvement activities can be faster.

The Covid-19 pandemic has affected the delivery of agricultural services and food security, leaving particularly vulnerable communities vulnerable.

It is necessary to work to reduce the current risks of disasters that cannot be dealt with in local opportunities and disrupt the order of the society and to ensure sustainable development. Policies and action plans developed in these studies should be included and supervised. Countries that need to cooperate with international institutions and organizations need to adapt to the preparation of development plans and to prevent current risks. Informing the public about these strategies and including them in the studies is important in terms of carrying out the studies effectively and efficiently within the scope of development goals.
Decrease in production, excess supply, restriction of accessibility and increase in inefficiency can cause food insecurity. Even though disaster risks were tried to be reduced with the studies and precautions taken in previous years, the increase in the number and severity of disasters has become a threat to agriculture and food security.
As a result, sustainable policies and action plans on agriculture and food safety should be developed against natural disasters, and the implementation of these plans should be supported by the legislation. It is necessary to increase the capacity of underdeveloped and vulnerable societies to deal with risk in proactive measures and to provide adaptation studies.

Keywords: Natural disaster, food security, climate change, famine, proactive measures

GİRİŞ

Doğal afetler toplumun normal düzenini bozmakla birlikte birçok alanda kayıp yaşatan olaylardır. Bu kayıplar sonucu insanları en çok etkileyen ve savunmasız bırakan sorunlardan biri de gıda güvenliği ve gıda kaynaklarına ulaşımın kısıtlı olmasıdır. Doğal afetler ve iklim değişikliğinin etkileri birleştiğinde savunmasız ve gelişmemiş ülkelerde riskle başa çıkma kapasitesi aşılmakta, tarım ve hayvancılık faaliyetleri gibi temel geçim kaynakları olumsuz etkilenebilmektedir. Özellikle 1990'lı yıllardan sonra jeofiziksel ve iklim ve hava ile ilgili afetlerin sayısının ve sebep olduğu ekonomik kayıplar önemli ölçüde artmıştır [1]. Bu kapsamda ekonomik kayıpların yanı sıra yaşam standartlarını etkileyen afetlere yönelik çalışmalar ve risk azaltma stratejileri konusunda gerekli adımların atılması gerekmektedir.

Afetler doğal ve teknolojik kaynaklı olarak iki ana gruba ayrılmaktadır. Doğal afetler; jeofiziksel (deprem, kütle hareketleri, volkanik faaliyetler), meteorolojik (aşırı sıcaklar, fırtınalar, sis), hidrolojik (sel, heyelan, dalga), klimatolojik (kuraklık, buzul gölü patlaması, yangınlar), biyolojik (epidemi, böcek istilası, hayvan kazaları) ve dünya dışı (etki, uzay havası) olaylar olarak alt gruplara ayrılmaktadır. Teknolojik afetler; endüstriyel kazalar (kimyasal sızıntı, yangın, patlama, radyasyon vb.), ulaşım kazaları (hava, kara, tren ve demiryolları) ve diğer kazalar (çökme, patlama, yangın vb.) olarak üç ana gruba ayrılmaktadır [2].

Meydana gelen afetler tarım mahsullerinin büyümesine ya da güvenli tüketimine, hayvanların telef olmasına, balıkçılık ve su ürünlerinin tüketiminde sağlık etkilerine, orman ve su gibi doğa ekosistemine zarar verebilmektedir. Bu durumlar besin zincirinde bozulmalara etki ettiği gibi ekonomik etkileriyle bireylerin ve ülkelerin başa çıkma kapasitesini bozmaktadır [1].

Tarih boyunca iklimi değişen dünyanın yüzey sıcaklığındaki ısınmanın çoğu son 35 yılda gerçekleşmiştir [3]. İklim değişikliğinin artan sıklığı ve şiddetlenen yoğunluğu ile meydana gelen afetler sürdürülebilir kalkınmayı önemli ölçüde etkilemektedir. Bu sebeple afetlere maruz kalma, savunmasızlığı ve yeni afet risklerini azaltmak amacıyla düzenlemelere ihtiyaç duyulmaktadır. İklim değişikliği senaryolarının ve bunların afet risklerine etkileri göz önünde bulundurularak ilgili paydaşlarla çalışmaların geliştirilmesi ve eylem planlarını uygulanmasına ihtiyaç duyulmaktadır [4].

İklim değişikliği tarımsal sürdürülebilirliğin yanı sıra gıda güvenliği üzerinde de olumsuz etkiye sahiptir [5, 6].
Bu çalışmada doğal afetlerin tarım ve gıda güvenliği üzerine etkileri ve çözüm önerileri ele alınmış, iklim değişikliği ve gıda güvenliği üzerine yapılmış çalışmalar derlenerek literatüre katkı sağlanması amaçlanmıştır.

2.DOĞAL AFETLERİN TARIM VE GIDA GÜVENLİĞİNE ETKİLERİ

Yaşanan şiddetli hava olayları, fırtınalar, böcek istilaları, depremler vb. afetler sosyal, ekonomik ve fiziksel olarak kayıplar meydana getirmiştir. Bu kayıpların maddi olarak boyutu 2019 yılında 122 milyar ABD dolarını bulmuştur [1].
Gıda güvenliği sorunu, insanların tarımsal ürünlere (ekinler, balıklar ve çiftlik hayvanları) veya içme suyundaki kirli kimyasallara veya patojenlere maruz kalmasıyla ortaya çıkabilecek durumdur [5]. Gıda güvenliğini tam anlamıyla sağlayabilmek için gıdaların üretiminden dağıtımına kadar tüm aşamalarda belirlenen kurallara uymak ve önlemleri almak amaçlanır [7]. 1996 yılında gerçekleştirilen Dünya Gıda Zirvesi'nde gıda güvencesi insanların her an sağlıklı ve güvenilir gıdalara erişebilmesine fiziksel ve ekonomik sürekliliğin sağlanması durumu [8] olarak açıklanmaktadır. İklim değişikliği gibi yavaş gelişen afetlerin her iki durum için de uzun vadede etkisi olduğu düşünülebilir.
Son on yılda meydana gelen doğal afetlerin büyük bir kısmını seller oluşturmaktadır. Ardından fırtınalar, depremler, aşırı sıcaklıklar ve kuraklıklar gelmektedir. İnsanları en çok etkileyen afet türü ise kuraklıklar ve ikinci sırada seller gelmektedir [9]. Seller sebebiyle insanlar ve hayvanları kontamine su ile tamas olasılığı ve bazı bulaşıcı hastalıkların (hepatit A vb.) artması muhtemeldir. Sel sonrası nehir kenarlarındaki toprağa yapılan incelemelerde bu alanlarda ağır metal içeriği tespit etmişlerdir [5]. Sıcaklığın artması sebebiyle iklim koşuluna uyum sağlayamayan bitki ve böcekler etkilenmiş, bazı bölgeler çölleşme riskiyle karşı karşıya kalmıştır. Ayrıca artan sıcaklıklar yangın ihtimalini de arttır bölgenin arazi yapısındaki bozulmalar besinleri de etkileyebilmektedir. Kuraklık, mahsul verimini, bitki büyümesini ve hayvan sağlığını etkileyebilir veya daha düşük gıda üretimi ve bulunabilirliğe sebep olabilir [10, 1].
İklim değişikliği sebebiyle özellikle Afrika, Orta Doğu, Avustralya'nın belli bölgeleri ve Akdeniz bölgesi savunmasız alanlar arasında yer almaktadır. Genel anlamda tüm dünyayı etkileyen iklim değişikliği ve buna bağlı meydana gelen kuraklık ve aşırı yağışlar ekosistem dengesine ve gıda güvenliğine neden olan etkenlerden biridir. Kuraklığa meyilli bölgelerde artan sıcaklık, su kıtlığı, UV radyasyona maruz kalma nedeniyle potansiyel verimde ve gıdalara ulaşımda kısıtlamalar görülebilmektedir [11]. Kurak ve aşırı yağışlara bağlı içme suyu kaynaklarının kirlenmesiyle gıda, vektör ve su kaynaklı hastalıkların (E. Coli, Salmonella, şigella vb.) artması önlemler alınmadığı sürece muhtemel risklerdir [12].
Son 20 yılda (2001-2020) Avrupa'da meydana gelen afetlerin yarıya yakınını seller oluşturmaktadır. Ardından fırtınalar ve aşırı sıcaklıklar gelmektedir [13]. İklim değişikliği; azalan mahsul verimi, artan orman yangını, bulaşıcı hastalıklar ve salgın riski, tarım alanlarında kirlenmelere, tarım ve gıda ürünlerinin kalitesini etkilemektedir [14].Bu durumlar doğal afetlerin gelişmiş ülkeleri de etkileyebileceğini ve kriz haline sebep olabileceğini göstermektedir. Fakat ülkelerin gelişmişlik düzeyi ve proaktif önlemleri almadaki istikrarı nispeten etkilerin daha az ve iyileştirme faaliyetlerinin daha çabuk olabileceğini düşündürebilir.
Tüm dünyada etkisini hissettiren Covid-19 pandemisi sebebiyle dünya genelinde hayati beslenme hizmetlerinde %30'luk bir azalma yaşandığı bildirilmiştir, özellikle hassas gruplar gıda güvenliği ve

ulaşımında büyük risk altında olan gruplardır. Talukder ve diğerleri [15] Bangladeş'te yaptığı çalışmada Covid-19 salgınının gıda güvenliği ve insan sağlığını ciddi şekilde etkilediğini, çiftçilerin tarımsal girdilere (tohum, gübre, ilaç, ekipman vb.) ulaşımının azaldığını, yiyecek ve içeceklere erişimin azaldığı üzerine çalışma ortaya koymuştur.

3. TARIM VE GIDA GÜVENLİĞİ ÜZERİNE ÇALIŞMALAR

Toplumun sosyal, ekonomik ve çevresel düzenini bozan afetler mevcut riskleri azaltmak ve sürdürülebilir kalkınmayı sağlamak için çalışmalar yapılması ve bu çalışmalara uyumun sağlanması denetlenmelidir. Ülkelerin politikası çerçevesinde uluslararası kurum ve kuruluşlarla iş birliği yaparak mevcut riskleri önleme veya minimuma indirmek amaçlanır. Afet risklerinin azaltılması ve uygun kalkınma planlarının hazırlanması iklim değişikliğiyle bağlantılı artan risklere uyum sağlamada önemlidir [14].

2015 yılının Aralık ayında 195 ülkenin onayıyla Birleşmiş Milletler İklim Değişikliği Çerçeve Sözleşmesi (United Nations Framework Convention on Climate Change (UNFCCC)) Taraflar Konferansı'nda kabul edilen Paris Anlaşması 2030 Sürdürülebilir Kalkınma Gündemi (Sustainable Development Goals-SDGs) çerçevesinde atılmış bir adımdır. Bu anlaşma iklim değişikliği konusunda uluslararası anlamda imzalanan ilk anlaşma özelliğine sahiptir [16]. Sürdürülebilir Kalkınma Amaçları arasında açlığa son, iklim değişikliği, karasal ve sudaki yaşam vb. 17 amaç belirlenmiştir. Bu amaçlarla ulaşılmak istenen hedefler açlık, gıda güvensizliği, yetersiz beslenme vb. sorunların ele alınması ve 2030 hedeflerine ulaşmak hedeflenmiştir [17].

Sendai Afet Risk Azaltma Çerçevesi (2015- 2030) 2015 yılında Birleşmiş Milletler Dünya Afet Riskini Azaltma Konferansı'nda kabul edilmiştir. Sendai Çerçevesi kapsamında afet risklerini azaltma, savunmasızlığı önleme, iyileştirme çalışmalarının yapılması, gıda güvenliği ve beslenme sorunları gibi pek çok afetin etkilerine çözüm bulmak ve sürdürülebilirliği sağlamak amaçlanmaktır [18]

FAO, afetlerin tarım ve gıda güvenliği sistemleri üzerindeki hasar ve kayıplara ilişkin verileri toplamak, değerlendirmek ve raporlamak amacıyla DL (damage and loss- hasar ve kayıp) metodolojisini geliştirmiştir. Bu metodoloji üretim faaliyetleri üzerindeki afet etkilerini toplayıp değerlendirerek ve mevcut boşlukları doldurmayı amaçlamaktadır [1].

Tarım ve gıda güvenliği üzerine çalışmalar her geçen yıl daha da artmakta ve bu konuda yapılan çalışmalara ulusal ve uluslararası kuruluşlar da katkı sağlamaktadır. FAO'nun İklim Değişikliğinin Tarımsal Etkileri için Modelleme Sistemi (MOSAICC), Dünyada Gıda Güvenliği ve Beslenme Durumu (SOFI) raporu, Birleşmiş Milletler Afet Riskini Azaltma Ofisi (UNDRR) vb. gibi tarım ve gıda güvenliği üzerine pek çok çalışma mevcuttur. FAO'nun yanısıra Uluslararası Tarımsal Kalkınma Fonu (IFAD), Dünya Gıda Programı (WFP), Dünya Sağlık Örgütü (WHO) gibi kuruluşlar da bu alanda çalışmalar yapan kuruluşlardan bazılarıdır.

4.SONUÇ VE ÖNERİLER

Tarım ve gıda güvenliği üzerine geliştirilen politikalar ve yapılan eylem planlarının tutarlı ve sürdürülebilir olması mevcut durumdan yola çıkarak gelecekte yaşanabilecek olaylar hakkında ders alınmasında etkili olacaktır. Bu planların uygulanmasını sağlamak için uluslararası iş birliği ve oluşturulan mevzuatlara dayandırılması gerekebilir.

Gelişmemiş ve savunmasız toplumlarda riskle başa çıkma kapasitesini artırmaya yönelik proaktif önlemlerin alınması ve halkın bilgilendirilmesi önem taşımaktadır. Yerli halkın koordinasyonu aktif katılımlı eğitimler ve uygulama faaliyetleriyle desteklenmesi farkındalığı artırma anlamında büyük

önem taşımaktadır.

Doğal afet risklerini azaltmak, iklim değişikliğinin önüne geçmek ve tarım ve gıda güvenliğini amacıyla geliştirilen politikalara uyum çalışmalarının tüm ülkelerce benimsenmesini ve uygulamaya konması önem taşımaktadır. Sürdürülebilir Kalkınma Hedefleri'nin gerçekleştirilmesi ve bu alanda yapılan çalışmaların ulusal ve uluslararası politikalarca desteklenmesi ve mevcut çalışmaların değişen koşullara göre güncellenmesi bir o kadar önemlidir.

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EFFECT OF PHYTASE AND CITRIC ACID SUPPLEMENTATION IN PLANT MEAL BASED DIET (CANOLA MEAL) IMPROVING MINERAL UTILIZATION IN *CIRRHINUS MRIGALA* FINGERLINGS

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ABSTRACT

The goal of this study was to see how CA and PHY supplementation in CM meal-based diets affected the mineral digestibility of *Cirrhinus mrigala* fish. Canola meal was utilized as a main ingredient to formulate diets by replacing fishmeal at graded levels such as 0%, 25%, 50%, and 75%. Every test diet was further subdivided into four supplementation levels of PHY and CA such as T_1, T_2, T_3, T_4, T_5, T_6, T_7, T_8, T_9, T_{10}, T_{11}, T_{12}, T_{13}, T_{14}, T_{15} and T_{16}. All diets were formulated to provide adequate levels of all nutrients essential for optimal fish growth. Each tank's feces were collected twice a day. Using standardized formulas, the effect of each treatment on mineral digestibility was estimated. Highest apparent digestibility coefficient % of minerals (Calcium 64.79%, Phosphorus 73.11%, Sodium 64.79%, Potassium 73.76%, Magnesium 71.42%, Iron 77.14%, Copper 76.52%, Manganese 71.87% and Aluminum 66.51%) was observed in the fish fed at T_{12} level which have 50% CM based diet synergistically supplemented with 2.5% CA and 750 FTUkg^{-1} PHY. Hence, the current study found that adding 2.5% CA and 750 FTUkg^{-1} PHY in CM-based diet was the most effective level for chelating minerals and releasing them to *C. mrigala* and improve the fish performance.

Keywords: Fishmeal (FM), Canola meal (CM), Citric acid (CA), and Phytase (PHY).

INTRODUCTION TO AN ETHNOBOTANICAL STUDY OF THE OUARZAZAT REGION IN MOROCCO

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ABSTRACT

People have used plants to medicate themselves, since the earliest of times. Even if the current pharmacopoeia eclipses them, there are still many who are captivated by their medicinal power. Over the last few decades, medicinal plants have been received with renewed valorization, because of their proven safety, and long track records. As well, medicinal plants represent a treasure trove of data and information, for those who have decided treat their ailments with traditional remedies, turning away from the chemical arsenal of the modern medicines.

This study has been carried out at the *Ouarzazat* region, which is renowned their significant botanical biodiversity. We distributed 600 survey sheets for five months in 40 *Douar*, these survey sheets were completed by traditional practitioners, herbalists and users of medicinal plants from *Taznakht* town community and its surrounding areas.

The results obtained from the questionnaires sheets, identified 26 endemic plant species suspected having a caregiver power against various diseases and new methods of preparation and medical applications.

Keywords: Ethnobotany, Biodiversity, Indigenous remedies, Pharmacopoeia.

INVESTIGATION OF SOME ANATOMICAL FEATURES OF *PUNICA GRANATUM* L. IN TERMS OF PHARMACEUTICAL BOTANY

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ABSTRACT
The genus Punica L. (Lythraceae) is represented worldwide by two species (Punica granatum L. and Punica protopunica Balf.f.). P. granatum (Pomegranate) is an important plant with medicinal and economic value. The bark, fruit hulls, flowers and seeds of pomegranate are used as traditional folk medicine. The plant is rich in ellagitannins and polyphenolic substances. The safe use of new drug candidates and traditional folk medicines depends on the correct diagnosis of the plants. The expose of the anatomical structures of plant organs can help diagnose plants quickly and safely.
In this study, the anatomical features of some vegetative and generative organs of P. granatum were investigated. Plant materials were collected from Kahramankazan/Ankara (Turkey). A voucher specimen was deposited in the Ankara University Faculty of Pharmacy Herbarium (AEF). The samples for anatomical studies were preserved in 70% alcohol. The transverse and surface sections were cut by hand with razor blade in microscopic preparation form. The Sartur solution was used in microscopic examinations. The anatomical analysis and the microphotographs were taken using the Leica DM 4000B.

Keywords: Punica granatum, Pomegranate, Plant anatomy, Turkey

Introduction
Punica granatum L. (The pomegranate) naturally grows in a wide area from northwest Turkey to western and northern Pakistan [1,2]. The pomegranate is cultivated throughout subtropical and tropical regions of the world [2]. The Pomegranate is in the form of a spiny shrub or a small unbranched tree [1]. The barks, fruit peels, flowers and seeds of the pomegranate is used in folk medicine [3]. The plant includes ellagitannins and other polyphenols and is used to treat circulatory system disorders [3,4]. The Pomegranate shows antimicrobial, antioxidant, anticancer, antidiabetic and immunomodulatory activities [4-9].
The safe use of new drug candidates and traditional folk medicines depends on the correct diagnosis of the plants. The expose of the anatomical structures of plant organs can help diagnose plants quickly and safely [10]. In this study, the anatomical features of some vegetative and generative organs of *P. granatum* were investigated.

Materials and Methods
Plant materials were collected from Kahramankazan/Ankara (Turkey). A voucher specimen was deposited in the Ankara University Faculty of Pharmacy Herbarium (AEF 30716). The samples for

anatomical studies were preserved in 70% alcohol. The transverse and surface sections were cut by hand with razor blade in microscopic preparation form. The Sartur solution was used in microscopic examinations. The anatomical analysis and the microphotographs were taken using the Leica DM 4000B.

Results and Discussion

Leaf

The leaf is dorsiventral. Epidermal cells are covered by a thick cuticle layer. Upper and lower epidermis cells were observed as square-rectangular. Upper epidermal cells are larger than lower epidermal cells. Palisade parenchyma consists of 1-2 rows of cells, spongy parenchyma 1-4 rows. Mesophyll contains dense starch. The leaf is protruding in the abaxial side in the midrib. In the main vein, the xylem is surrounded by a crescent-shaped phloem. In addition, adaxial phloem is observed. Solitary and cluster crystals present in the lamina and midrib. Stomata are found only on the lower epidermal layer. In the surface sections of the leaf, the number of cells adjacent to the stoma was observed as 3-5. The walls of the lower epidermal cells are sinuous.

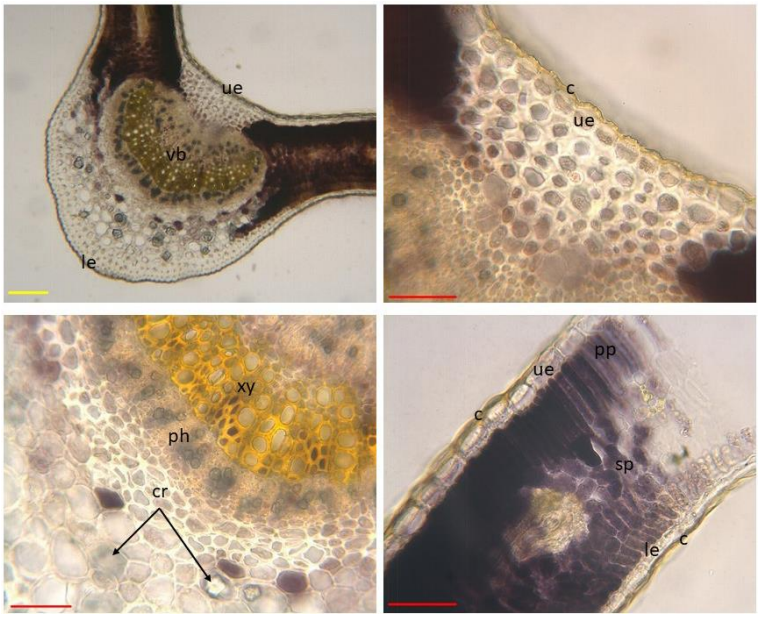


Figure 1. Transverse section of leaf; c: cuticle, cr: crystal, le: lower epidermis, pp: palisade parenchyma, ph: phloem, sp: spongy parenchyma, st: stomata, ue: upper epidermis, vb: vascular bundle, xy: xylem, (red: 50 µm, yellow: 100 µm)

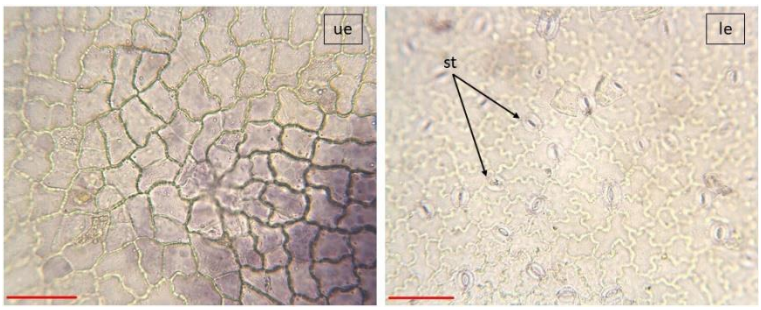


Figure 2. Surface sections of leaf; le: lower epidermis, st: stomata, ue: upper epidermis (red: 50 µm)

Petiole

The cross-section of the petiole is arc-shaped. Epidermal cells are square-rectangular with thick

cuticle. The vascular bundle is embedded in the parenchymatous tissue and the parenchyma cells contain dense starch. The xylem is crescent-shaped and is surrounded by phloem on both sides. Phloem contains numerous solitary and cluster crystals.

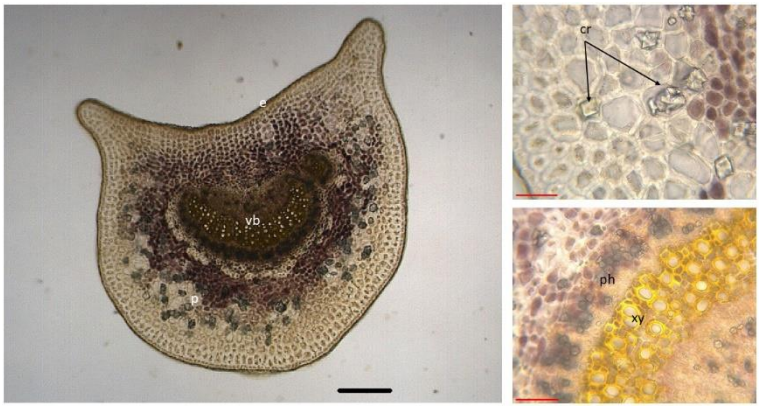


Figure 3. Transverse section of petiole; c: cuticle, cr: crystal, e: epidermis, p: parenchyma, ph: phloem, vb: vascular bundle, xy: xylem, (red: 50 µm, black: 200 µm)

Branch

The cross section of the branch is a winged circle. The cork is occur in the inner part of the pericycle and additionally pericyclic fibers are observed. Cortex parenchyma cells contain dense starch. The xylem is arranged in a ring form and the intraxylary phloem is observed. The Pith cells are large and small cells and starchy. The Solitary and cluster crystals are especially concentrated in the phloem.

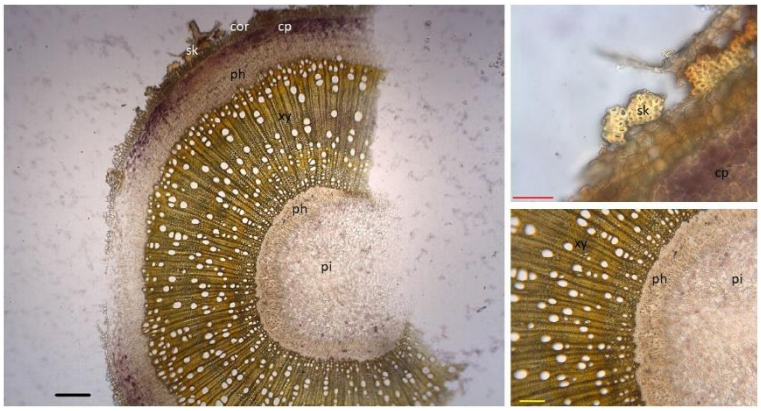


Figure 4. Transverse section of branch; cor: cork, cp: cortex parenchyma, ph: phloem, pi: pith, sk: pericyclic fiber, xy: xylem (red: 50 µm, yellow: 100 µm, black: 200 µm).

Sepal

In the outer surface section of the sepal, mostly square-rectangular or polygonal shaped epidermal cells without stoma are observed. The passages of the cells are conspicuously. The epidermal cells on the inner surface are polygonal shaped and carry dense stomata. The epidermal cells of apical edges of the sepal have elongated papillae and contain dense crystals.

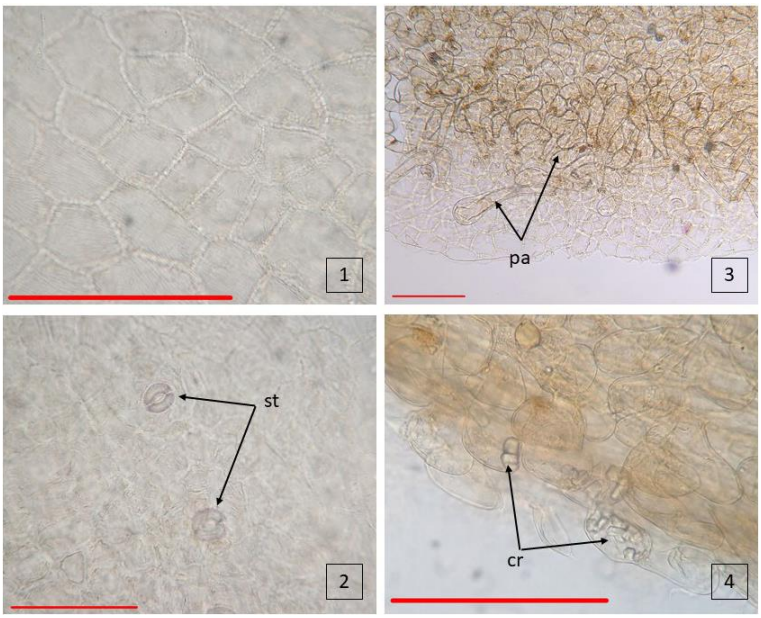


Figure 5. Surface section of sepal; 1: outer surface, 2: inner surface, 3-4: apical edges, cr: crystal , st: stomata , pa: papillae (red: 50 µm)

Conclusions

In this study, the anatomical features of some vegetative and generative organs of *P. granatum* were investigated. According to the results, the pomegranate leaf is dorsiventral and characterized with 1-2 rows of palisade and 1-4 of spongy parenchyma. Stomata are only found on the lower epidermal surface. The number of cells adjacent to the stoma was observed as 3-5. The adaxial phloem is observed. The cross-section of the petiole is arc-shaped. The xylem is crescent-shaped and is surrounded by phloem on both sides. The cross section of the branch is a winged circle. The cork is occur in the inner part of the pericycle and additionally pericyclic fibers are observed. The xylem is arranged in a ring form and the intraxylary phloem is observed. The epidermal cells on the inner surface of sepal are polygonal shaped and carry dense stomata. The epidermal cells of apical edges of the sepal have elongated papillae and contain dense crystals.

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STUDIES ON THE CHARACTERIZATION OF BIOSOOT OF VITEX NEGUNDO, AN AROMATIC PLANT

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ABSTRACT

Biosoot is defined as the smoke or soot generated when burning the biomaterials which may either be of plant or of animal origin. These soots are found to differ in their characteristic features as size, shape and their chemical composition according to the plants. In this study, an attempt was made to characterize the biosoot developed using the leaves of *Vitex negundo* (an aromatic plant). The soot from *Vitex negundo* produced a number of important secondary metabolites, like alkaloids, flavonoids, steroids, glycosides, polyphenols and amines. DLS studies revealed the presence of Carbon nanoparticles of different size ranging from 100-200nm, 500-1200nm reveling their coalescing properties. The study also reveals the generation of Particulate Matter from the Biosoot. SEM revealed the size range of Biosoot ranging from 200nm to 220nm in size. This shows that the biosoot are carbon nanoparticles which have the capacity to airborne. EDX revealed the presence of Carbon in large amount among biosoot. FTIR revealed the presence of associated organic compound along with the core Carbon Nanoparticle. The results in detail will be discussed.

Keywords: Biosoot, *Vitex negundo,* Aromatic plant, Carbon Nanoparticles, SEM & EDAX.

POTENTIAL OF *ACTINOPYGA LECANORA* HYDROLYSATES-BASED NANOEMULSION FOR TOPICAL APPLICATION

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ABSTRACT

Actinopyga lecanora hydrolysates (ALH), which are obtained from the enzymatic hydrolysis was reported to contain relatively high antioxidant activities, and are mostly applied in food industries. Despite having a high potential of antioxidant activities that is essential in skincare products, no work has been reported specifically on ALH as an active ingredient. Therefore, to diversify the usage of ALH in the cosmeceutical application, nanoemulsion containing ALH was developed, particularly to alleviate skin aging and to improve skin pigmentation. The optimum nanoemulsion formulation was obtained by using D-optimal mixture design, where the model was significant with an insignificant lack of fit. R^2 value of 0.9956 and adjusted R^2 of 0.9915 suggested a good fit between predicted and actual size with less than 2% of residual standard error (RSE). An acceptable polydispersity index and zeta potential values were observed and good stability within 28 days when stored separately at different temperatures (4 and 25 °C). *In vitro* penetration study exhibited the ability of the nanoemulsion to enhance the permeability of the ALH. For *in vitro* cytotoxicity effect against normal 3T3 fibroblast cells, all samples were non-toxic with IC_{50}>500 μg/mL, proving that the optimized nanoemulsion containing ALH is suitable for topical application.

Keywords: nanoemulsion; *Actinopyga lecanora* hydrolysates; penetration study.

MECHANICAL, MORPHOLOGICAL, AND VISCOSIMETRIC PROPRIETIES OF POLYSTYRENE COMPOSITES WITH THERMALLY TREATED SNAIL SHELLS NANOPARTICLE (SSP)

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ABSTRACT

Nanoparticle/polymer composite materials have gained wide popularity in the scientific community in recent years. The research objectives for new materials are performance gain, low cost, and reliability improvement. Nanoparticle powder was extracted and treated from snail shells using the mechanochemical process, and thermal treatment respectively. Polystyrene matrices were solvated in chloroform in order to measure the intrinsic viscosity of Polystyrene, and the effect of Snail Shells nanoparticle. All of the composites (PS/SSP) elaborated was analyzed with the mechanical essay as Tensile stress, Thermal proprieties using DSC. Morphological analysis using Polarizing Optical Microscope (POM). The result shows that polystyrene has intrinsic viscosity of 25,835 ml/g. In addition, the mechanical essay obtained prove that the polystyrene with 10 % of nanoparticles CaCO3 has a good Tensile stress by the increasing in the young modulus with 41,3%. Also, the nanoparticles influence thermal proprieties by increasing the values of T_g, T_f, and T_C with 36%, 3, 88%, and 20% respectively. The morphological analysis shows the 10% of nanoparticles that have a good dispersion in the surface of polystyrene matrices. The nanoparticles CaCO3 as the charge has a good effect and enhanced the mechanical, thermal, structural, morphological, and Viscosimetric proprieties of the matrices of polystyrene.

Keywords: Composites, Nanoparticles $CaCO_3$, Polystyrene, Snail Shell.

AIRY'S INHOMOGENEOUS EQUATION WITH SIGMOID FORCING FUNCTION

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ABSTRACT
Analysis and solution of Airy's inhomogeneous equation, when its forcing function is the sigmoid logistic function, are provided in this work. Relationship between the Nield-Kuznetsov functions, the Scorer functions and the sigmoid function are established in this work. Solutions to initial and boundary value problems are obtained.

Keywords: Airy's Equation; Sigmoid Logistic Function; Nield-Kuznetsov Functions.

INTRODUCTION
Rooted in the nineteenth century, Airy's ordinary differential equation (ODE), (Airy, 1838), arose in Airy's study of astronomy and optics. Airy's homogeneous ODE takes the form

$$y'' - xy = 0 \tag{1}$$

wherein "prime" notation denotes ordinary differentiation with respect to the independent variable. ODE (1) has its general solution given by (Vallée and Soares, 2004):

$$y = c_1 A_i(x) + c_2 B_i(x) \tag{2}$$

where c_1 and c_2 are arbitrary constants, and $A_i(x)$ and $B_i(x)$ are the linearly independent Airy's functions of the first and second kind, respectively, defined by the following improper integrals

$$A_i(x) = \frac{1}{\pi}\int_0^\infty \cos\left(xt + \frac{t^3}{3}\right) dt \tag{3}$$

$$B_i(x) = \frac{1}{\pi}\int_0^\infty \left[\sin\left(xt + \frac{t^3}{3}\right) + \exp\left(xt - \frac{t^3}{3}\right)\right] dt \tag{4}$$

The non-zero Wronskian of $A_i(x)$ and $B_i(x)$ is given by, (Vallée and Soares, 2004):

$$W\left(A_i(x), B_i(x)\right) = A_i(x)\frac{dB_i(x)}{dx} - B_i(x)\frac{dA_i(x)}{dx} = \frac{1}{\pi} \tag{5}$$

Equation (1) is at least as relevant to mathematical physics today as it was in the nineteenth century due to its various practical applications and theoretical implications (*cf.* Dunster, 2021(a,b) for some of the more recent mathematical analysis incorporating functions in this work and other related functions). It can been argued that many equations in mathematical physics can be reduced to Airy's

ODE by an appropriate change of variables, (Vallée and Soares, 2004). Furthermore, it has been used extensively in the study of Tricomi, Schrodinger and Stark equations (*cf.* Abramowitz and Stegun, 1984; Temme, 1996; Khanmamedov, *et.al.*, 2021, and the references therein).

Extensions beyond homogeneity of Airy's ODE has lead to the introduction of new and additional functions in mathematical physics, together with expanded applications of this mathematical gem. For instance, the twentieth century witnessed an interest in the inhomogeneous Airy's ODE of the form:

$$y'' - xy = f(x) \tag{6}$$

Scorer, (1950), provided the following general solutions to (6) when $f(x) = \mp\frac{1}{\pi}$:

$$y = c_1 A_i(x) + c_2 B_i(x) + H_i(x) \tag{7}$$

when $f(x) = \frac{1}{\pi}$, and

$$y = c_1 A_i(x) + c_2 B_i(x) + G_i(x) \tag{8}$$

when $f(x) = -\frac{1}{\pi}$.

The functions $G_i(x)$ and $H_i(x)$ are known as the Scorer functions (Scorer, 1950), with integral representations given by

$$G_i(x) = \frac{1}{\pi}\int_0^\infty \sin\left(xt + \frac{t^3}{3}\right) dt \tag{9}$$

$$H_i(x) = \frac{1}{\pi}\int_0^\infty \exp\left(xt - \frac{t^3}{3}\right) dt \tag{10}$$

When $f(x) = R$, where R is any constant, writing the solution to ODE (6) in terms of the Scorer functions requires non-trivial mathematical manipulations (Vallée and Soares, 2004). However, this case was discussed in the work of Nield and Kuznetsov, (2009), as it arises in the study of flow through porous layers in the presence of a transition layer. The work of Nield and Kuznetsov, (2009), resulted in the introduction of an integral function, denoted by $N_i(x)$, in terms of which the general solution to (6), with $f(x) = R$, can be expressed as, (Hamdan and Kamel, 2011):

$$y = c_1 A_i(x) + c_2 B_i(x) - \pi R N_i(x) \tag{11}$$

The integral function $N_i(x)$ is now known as the *Standard Nield-Kuznetsov Function of the First Kind*, and is given by (Hamdan and Kamel, 2011):

$$N_i(x) = A_i(x)\int_0^x B_i(t)dt - B_i(x)\int_0^x A_i(t)dt \tag{12}$$

Clearly, when $R = \frac{1}{\pi}$, solution (11) reduces to (8), and $N_i(x) = -H_i(x)$. When $R = -\frac{1}{\pi}$, solution (11) reduces to (9), and $N_i(x) = G_i(x)$. The relationship between $N_i(x)$ and the Scorer functions has been shown to take the general form (Hamdan and Kamel, 2011):

$$N_i(x) = \frac{2}{3}G_i(x) - \frac{1}{3}H_i(x) \tag{13}$$

Improper integral representation of $N_i(x)$, obtained from (9), (10) and (13), takes the form:

$$N_i(x) = \frac{2}{3\pi}\int_0^{\infty} \sin\left(xt + \frac{t^3}{3}\right) dt - \frac{1}{3\pi}\int_0^{\infty} \exp\left(xt - \frac{t^3}{3}\right) dt \quad (14)$$

Various properties of the Standard Nield-Kuznetsov function of the first kind, $N_i(x)$, and its series representations and efficient computations have been previously discussed (*cf.* Hamdan and Kamel, 2011; Hamdan et.al. 2021(a,b,c)).

The case where the right-hand-side of Airy's inhomogeneous equation is a function of x, namely ODE (6), was discussed in the work of Miller and Mursi, (1950), who introduced a special methodology that has restrictions on the function $f(x)$, in addition to being time consuming in its application. However, a general approach to the solution of (6), for any differentiable forcing function, $f(x)$, was introduced by Hamdan and Kamel, (2011), who expressed the general solution to (6) as:

$$y = c_1 A_i(x) + c_2 B_i(x) + \pi K_i(x) - \pi f(x) N_i(x) \quad (15)$$

where $N_i(x)$ in the Standard Nield-Kuznetsov function of the first kind, defined by (12), and $K_i(x)$ is the Standard Nield-Kuznetsov function of the second kind. The integral function, $K_i(x)$, is defined by the following equivalent forms, (Hamdan and Kamel, 2011):

$$K_i(x) = A_i(x)\int_0^x \left\{\int_0^t B_i(\tau)d\tau\right\} f'(t)dt - B_i(x)\int_0^x \left\{\int_0^t A_i(\tau)d\tau\right\} f'(t)dt \quad (16)$$

$$K_i(x) = f(x)N_i(x) - \left\{A_i(x)\int_0^x f(t)B_i(t)\,dt - B_i(x)\int_0^x f(t)A_i(t)\,dt\right\} \quad (17)$$

Solution (15) suggests that the particular solution to (6) is of the form:

$$y_p = \pi K_i(x) - \pi f(x) N_i(x) \quad (18)$$

This form has proved to be convenient for computations involving many forms of the forcing function $f(x)$ (*cf.* Abu Zaytoon et.al., 2016, and Alzahrani et.al., 2016). The following alternative form of the particular solution is obtained by using equation (17) in (18):

$$y_p = \pi\left\{B_i(x)\int_0^x f(t)A_i(t)\,dt - A_i(x)\int_0^x f(t)B_i(t)\,dt\right\} \quad (19)$$

Both forms, (18) and (19), have recently been used in obtaining particular solutions to (6) when $f(x) = A_i(x), B_i(x),$ and $N_i(x)$, (Jayyousi Dajani and Hamdan, 2021). These forms of forcing functions have given rise to interesting integrals involving products of these special functions. The arising integrals enrich our mathematical knowledge and expand applicability of Airy's inhomogeneous ODE to potential and arising subfields of mathematical physics. They also motivate the current work in which the interest is to solve ODE (6) when $f(x)$ is the sigmoid logistic function. It will be shown that this choice of forcing function leads to the establishment of connections between the sigmoid function, Airy's functions, the Nield-Kuznetsov functions, Scorer functions, and polylogarithmic functions.

THE SIGMOID LOGISTIC FUNCTION

A function that continues to receive considerable attention in neural networks and deep learning, as it serves as an activation function is the sigmoid logistic function, (*cf.* Skapura, 1996, Haykin, 1999, von Seggern, 2007, and Wood, 2022, and the references therein). Its characteristic S-shaped curve

maps the number line onto a finite-length subinterval, such as (0,1), and its most common form is given by:

$$S(x) = \frac{e^x}{1+e^x} = 1 - S(-x) \tag{20}$$

Recently, this smoothly-increasing function has made it to the porous media literature, where it has been used in modelling variations in permeability across a porous layer (Roach and Hamdan, 2022). The *S-shaped* graph of the sigmoid function, (von Seggern, 2007), makes it appealing in the study of transition layers, and Roach and Hamdan, (2022), provided a modification of $S(x)$ and used it in the modelling of Poiseuille flow through a Brinkman porous layer of variable permeability, wherein they created a continuously varying permeability between relatively constant permeability regions. An advantage of the Roach and Hamdan approach is that it treats the flow domain as one region with variable permeability, while replicating flow in layered media.

Some properties of the sigmoid function, $S(x)$, are listed in what follows, (some of these properties can be found in von Seggern, (2007) and Weisstein, (2022)).

Property 1: Domain of $S(x)$ is the set of real numbers, $-\infty < x < +\infty$.

Property 2: $S(x)$ has horizontal asymptotes at $x = \mp\infty$ with

$$\lim_{x\to+\infty} S(x) = 1 \text{ and } \lim_{x\to-\infty} S(x) = 0 \tag{21}$$

Property 3: The first two derivatives of $S(x)$ are given by

$$S'(x) = \frac{e^x}{(1+e^x)^2} \tag{22}$$

$$S''(x) = \frac{e^x(1-e^x)}{(1+e^x)^3} \tag{23}$$

Property 4: Values at zero of $S(x)$ and its first two derivatives are $S(0) = \frac{1}{2};\ S'(0) = \frac{1}{4}; S''(0) = 0.$

Property 5: Properties 3 and 4 imply that $S(x)$ is increasing on its domain and has a point of inflection at $x = 0$.

Property 6: $S(x)$ represents solution to Bernoulli's ODE of the form

$$y' - y = g(y) \tag{24}$$

where $g(y) = -y^2$, with initial data $y(0) = \frac{1}{2}$.

Property 7: Indefinite integral of $S(x)$ is given by

$$\int S(x)dx = \log(1 + e^x) + \mathrm{C} \tag{25}$$

where C is a constant and log stands for the natural logarithm.

Property 8: Definite integral of $S(x)$ over the interval [0,1] is given by

$$\int_0^1 S(x)dx = \log(1 + e) - \log 2 \tag{26}$$

Property 9: Higher derivatives of $S(x)$ can be written as polynomials in $S(x)$. This might be of convenience in obtaining higher deivatives of $S(x)$.

$$S'(x) = S(x) - S^2(x) \tag{27}$$

$$S''(x) = S(x) - 3S^2(x) + 2S^3(x) \tag{28}$$

Equation (28) suggests that $S(x)$ is related to the solution of an ODE of the form:

$$y'' = y - 3y^2 + 2y^3 \tag{29}$$

Property 10: Higher derivatives of $S(x)$ can be written in terms of the first derivative, $S'(x)$. This might also be of convenience in obtaining higher derivatives of $S(x)$. With the first derivative given by (27), the second derivative can be written as:

$$S''(x) = S'(x)[1 - 2S(x)] \tag{30}$$

Equation (30) suggests that $S(x)$ is related to the solution of an ODE of the form:

$$y'' - (1 - 2y)y' = 0 \tag{31}$$

Property 11: $S(x)$ possesses the following Maclaurin series representation, (Weisstein, 2020):

$$S(x) = \sum_{n=0}^{\infty} \frac{(-1)^n E_n(0)}{2\, n!} x^n = \frac{1}{2} + \frac{x}{4} - \frac{x^3}{48} + \frac{x^5}{480} - \cdots \tag{32}$$

where $E_n(x)$ is an Euler polynomial.

SOLUTION TO AIRY'S EQUATION WITH SIGMOID FORCING FUNCTION

If $f(x) = S(x)$, ODE (6) takes the form

$$y'' - xy = S(x) \tag{33}$$

Solution to the homogeneous part of (33) is given by (2). Particular integral (19) for ODE (33) takes the form

$$y_p = \pi\{B_i(x) \int_0^x S(t)A_i(t)\, dt - A_i(x) \int_0^x S(t)B_i(t)\, dt\} \tag{34}$$

The integrals on the right of (34) are evaluated using integration by parts, with the help of (25), to yield:

$$\int_0^x S(t)A_i(t)\, dt = A_i(x) \log(1 + e^x) - A'_i(x) \int_0^x \log(1 + e^t) dt \tag{35}$$

$$\int_0^x S(t)B_i(t)\, dt = B_i(x) \log(1 + e^x) - B'_i(x) \int_0^x \log(1 + e^t) dt \tag{36}$$

Using (35) and (36) in (34), yields

$$y_p = \pi[A_i(x)B'_i(x) - B_i(x)A'_i(x)] \int_0^x \log(1 + e^t) dt \tag{37}$$

Using (5), equation (37) can be written as:

$$y_p = \int_0^x \log(1 + e^t) dt = Li_2(-1) - Li_2(-e^x) \tag{38}$$

where

$$Li_2(x) = \sum_{n=1}^{\infty} \frac{x^n}{n^2} \tag{39}$$

is the dilogarithm function (Maximon, 2003; Lewin, 1991).

Using the value $Li_2(-1) = -\frac{\pi^2}{12}$ in (38), and subsequent use of (2), the general solution to (33) can be written as:

$$y = c_1 A_i(x) + c_2 B_i(x) - Li_2(-e^x) - \frac{\pi^2}{12} \tag{40}$$

The above analysis furnishes the proof to the following Theorem.

Theorem 1.

Particular solution to Airy's inhomogeneous ODE with the sigmoid logistic function as its forcing function is given by

$$y_p = -Li_2(-e^x) - \frac{\pi}{12} \quad \ldots (i)$$

and its general solution is given by

$$y = c_1 A_i(x) + c_2 B_i(x) - Li_2(-e^x) - \frac{\pi^2}{12} \quad \ldots (ii)$$

Now, using (18) and (38), the following relationships are obtained between $K_i(x)$ and $S(x)$:

$$K_i(x) = S(x)N_i(x) - \tfrac{1}{\pi} Li_2(-e^x) - \tfrac{\pi^2}{12} \tag{41}$$

$$K_i(x) = S(x)\left\{A_i(x)\int_0^x B_i(t)dt - B_i(x)\int_0^x A_i(t)dt\right\} - Li_2(-e^x) - \tfrac{\pi^2}{12} \tag{42}$$

Using (13), equation (41) can be written in terms of the Scorer functions, as:

$$K_i(x) = S(x)\left\{\tfrac{2}{3}G_i(x) - \tfrac{1}{3}H_i(x)\right\} - \tfrac{1}{\pi}Li_2(-e^x) - \tfrac{\pi^2}{12} \tag{43}$$

The above analysis furnishes the proof to the following Theorem.

Theorem 2.

The Nield-Kuznetsov functions of the first and second kinds are related to dilogarithm, sigmoid, Airy's, and Scorer's functions through the equations

$$K_i(x) = S(x)N_i(x) - \frac{1}{\pi}Li_2(-e^x) - \frac{\pi^2}{12} \quad \ldots (iii)$$

$$K_i(x) = S(x)\left\{A_i(x)\int_0^x B_i(t)dt - B_i(x)\int_0^x A_i(t)dt\right\} - Li_2(-e^x) - \frac{\pi^2}{12} \quad \ldots (iv)$$

$$K_i(x) = S(x)\left\{\frac{2}{3}G_i(x) - \frac{1}{3}H_i(x)\right\} - \frac{1}{\pi}Li_2(-e^x) - \frac{\pi^2}{12} \quad \ldots (v)$$

SOLUTION TO INITIAL VALUE PROBLEM

Consider the initial value problem composed of solving equation (33) subject to the initial conditions

$y(0) = \alpha$ (44)

$y'(0) = \beta$ (45)

where α and β are known constants.

From (40) and (38), the general solution is written as:

$$y = c_1 A_i(x) + c_2 B_i(x) + \int_0^x \log(1 + e^t) dt \tag{46}$$

Evaluating (46) at $x = 0$, and using (44) yields

$$\alpha = c_1 A_i(0) + c_2 B_i(0) \tag{47}$$

Differentiating (46) once results in:

$$y'(x) = c_1 A'_i(x) + c_2 B'_i(x) + \log(1 + e^x) \tag{48}$$

Evaluating (48) at $x = 0$, and using (45) yields

$$\beta = c_1 A'_i(0) + c_2 B'_i(0) + \log 2 \tag{49}$$

Equations (47) and (49) provide the following solution for c_1 and c_2:

$$\mathrm{c}_1 = \frac{\alpha[1 - \pi \mathrm{A'_i}(0)\mathrm{B_i}(0)]}{\mathrm{A_i}(0)} - [\pi\{\beta - \log 2\}\mathrm{B_i}(0)] \tag{50}$$

$$\mathrm{c}_2 = \pi[\{\beta - \log 2\}\mathrm{A_i}(0) - \alpha \mathrm{A'_i}(0)] \tag{51}$$

where

$$A_i(0) = \frac{1}{3^{\frac{2}{3}}\Gamma(\frac{2}{3})} \tag{52}$$

$$B_i(0) = \frac{\sqrt{3}}{3^{\frac{2}{3}}\Gamma(\frac{2}{3})} = \sqrt{3}\, A_i(0) \tag{53}$$

$$A'_i(0) = \frac{-1}{3^{\frac{1}{3}}\Gamma(\frac{1}{3})} \tag{54}$$

$$B'_i(0) = \frac{\sqrt{3}}{3^{\frac{1}{3}}\Gamma(\frac{1}{3})} = -\sqrt{3} A'_i(0) \tag{55}$$

wherein $\Gamma(.)$ is the Gamma function.

The following solution to the initial value problem is obtained:

$$y = \left\{\frac{\alpha[1 - \pi \mathrm{A'_i}(0)\mathrm{B_i}(0)]}{\mathrm{A_i}(0)} - [\pi\{\beta - \log 2\}\mathrm{B_i}(0)]\right\} A_i(x) + \{\pi[\{\beta - \log 2\}\mathrm{A_i}(0) - \alpha \mathrm{A'_i}(0)]\} B_i(x) - Li_2(-e^x) - \frac{\pi^2}{12} \tag{56}$$

In (58), the functions $A_i(x)$ and $B_i(x)$ can be computed using ascending or asymptotic series, depending on the value of x, given as follows.

Ascending series:

In order to evaluate the integrals and the Nield-Kuznetsov functions arising in the solutions above, the following ascending series have been developed (Abramowitz and Stegun, 1984; Hamdan and Kamel, 2011):

$$A_i(x) = a_1 \sum_{k=0}^{\infty} \left(\frac{1}{3}\right)_k \frac{3^k x^{3k}}{(3k)!} - a_2 \sum_{k=0}^{\infty} \left(\frac{2}{3}\right)_k \frac{3^k x^{3k+1}}{(3k+1)!} \tag{57}$$

$$B_i(x) = \sqrt{3} a_1 \sum_{k=0}^{\infty} \left(\frac{1}{3}\right)_k \frac{3^k x^{3k}}{(3k)!} + \sqrt{3} a_2 \sum_{k=0}^{\infty} \left(\frac{2}{3}\right)_k \frac{3^k x^{3k+1}}{(3k+1)!} \tag{58}$$

wherein $a_1 = A_i(0)$ and $a_2 = -A'_i(0)$, given in equations (52) and (54) and $(b)_k$ is the Pochhammer symbol, defined by, (Temme, 1996):

$$(b)_k = \frac{\Gamma(b+k)}{\Gamma(b)} = b(b+1)(b+2)\ldots(b+k-1);\ (b)_0 = 1. \tag{59}$$

Asymptotic Series:

Alternatively, based on the asymptotic series representations of Airy's functions, their leading terms when $x \gg 1$, take the forms (Temme, 1996; Temme, 2010):

$$A_i(x) \approx \frac{\exp(-\mu)}{2\sqrt{\pi} x^{\frac{1}{4}}} \tag{60}$$

$$B_i(x) \approx \frac{\exp(\mu)}{\sqrt{\pi} x^{\frac{1}{4}}} \tag{61}$$

wherein $\mu = \frac{2}{3} x^{3/2}$.

SOLUTION TO BOUNDARY VALUE PROBLEM

Consider the two-point boundary value problem composed of solving equation (33) subject to the following conditions on interval $[a, b]$:

$$y(a) = \alpha \tag{62}$$

$$y(b) = \beta \tag{63}$$

where α and β are known constants.

Using conditions (62) and (63) in general solution (40) yields:

$$c_1 A_i(a) + c_2 B_i(a) = \alpha + \frac{\pi^2}{12} + Li_2(-e^a) \tag{64}$$

$$c_1 A_i(b) + c_2 B_i(b) = \beta + \frac{\pi^2}{12} + Li_2(-e^b) \tag{65}$$

Solutions to (64) and (65) are given by

$$c_1 = \frac{\alpha + \frac{\pi^2}{12} + Li_2(-e^a)}{A_i(a)} - \frac{\left[\beta + \frac{\pi^2}{12} + Li_2(-e^b)\right] B_i(a) - \left\{\alpha + \frac{\pi^2}{12} + Li_2(-e^a)\right\} \frac{A_i(b) B_i(a)}{A_i(a)}}{[A_i(a) B_i(b) - A_i(b) B_i(a)]} \tag{66}$$

$$c_2 = \frac{\left[\beta+\frac{\pi^2}{12}+Li_2(-e^b)\right]A_i(a)-\left\{\alpha+\frac{\pi^2}{12}+Li_2(-e^a)\right\}A_i(b)}{A_i(a)B_i(b)-A_i(b)B_i(a)} \tag{67}$$

Using (66) and (67) in (40) gives the following solution to the posed boundary value problem:

$$y = \left\{\frac{\alpha+\frac{\pi^2}{12}+Li_2(-e^a)}{A_i(a)} - \frac{\left[\beta+\frac{\pi^2}{12}+Li_2(-e^b)\right]B_i(a)-\left\{\alpha+\frac{\pi^2}{12}+Li_2(-e^a)\right\}\frac{A_i(b)B_i(a)}{A_i(a)}}{[A_i(a)B_i(b)-A_i(b)B_i(a)]}\right\}A_i(x) +$$
$$\left\{\frac{\left[\beta+\frac{\pi^2}{12}+Li_2(-e^b)\right]A_i(a)-\left\{\alpha+\frac{\pi^2}{12}+Li_2(-e^a)\right\}A_i(b)}{A_i(a)B_i(b)-A_i(b)B_i(a)}\right\}B_i(x) - Li_2(-e^x) - \frac{\pi^2}{12} \tag{68}$$

CONCLUSION

The problem of solving the inhomogeneous Airy's equation (33), when its forcing function is the sigmoid logistic function, was provided in this work. Relationships between the Nield-Kuznetsov functions of the first and second kinds, Airy's functions, the sigmoid logistic function and the dilogarithm function have been established and given in ***Theorems 1 and 2.*** General solution to the posed problem was cast in terms of Euler's dilogarithm function, as given in ***Theorem 1***. General formulations of an initial value problem and a two-point boundary value problem were given and solutions were obtained. Methods of computing the solutions were outlined in terms of ascending and asymptotic series.

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VALORIZATION OF PALM SOLID WASTE FOR ENERGY PRODUCTION IN OUARGLA REGION

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ABSTRACT

In rural areas neighboring of Ouargla city (Algeria), the farmers use solar pumping systems with small electricity storage. But, for night heating, farmer needs to find an alternative energy source. Among farm wastes, some solid palm wastes like the petioles, empty fruit bunches, inflorescence covers, sleeves and bunch branches are poorly exploited. Usually, to get rid of this waste, it is burned in the open. But, this waste has great potential for assisting the heat production. The seasonal workers harvest of palm trees during the autumn and winter periods. The daily transportation between town and farms is relatively expensive and has an important loss of working hours compared to staying near the farms during the concerned period. Generally, in these areas, some abandoned homes which are drugged in mountains during previous ages. After a small arrangement, these homes can present an attractive solution to overcome the transportation problems by staying in comfortable shelters during cold nights. A brief literature analysis shows a lack of exploiting the available geothermal potential in these traditional premises. This sustainable clean potential contributes to the reduction of energy needs and consequently the consumption of fossil sources. The covering of the walls and the roof by the mountain rocks presents a perfect insulation against the surrounding environment effects; it remains only the front facade which allows a small heat loss. So, during the night, the room requires little energy for their heating. A global estimation is carried out to determine the energy heating needs to get comfort temperature in winter. The results show that the recovery of thermal energy extracted from the solid waste of one half hectare of palm trees can satisfy the heating needs of this discovered façade room for seasonal workers during all cold nights.

Keywords: palm trees, solid waste, energy generation, home heating.

OPPORTUNITIES FOR THE APPLICATION OF REVERSING PLANETARY TRANSMISSIONS

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ABSTRACT
The application of planetary gear trains (PGTs) offers numerous benefits in comparison to conventional gear trains. For example, a multi-carrier planetary gear train may be built by linking the shafts of different component PGTs, and several transmission ratios may be achieved by providing links between different elements of the component PGTs. Furthermore, another specialty of PGTs is the possibility to change the transmission ratio under load by means of a brake or clutch acting on a gear train component. This can be easily exploited to create rugged and reliable transmissions for internal combustion powered modern transport applications. For example, railway vehicles are expected to be capable of moving in both directions at the same speed, while ships and boats must be able to reverse under load without engine shutdown. PGTs can be applied in the form of an output or main reduction gearbox providing two equal transmission ratios, however with the output shaft rotating in different directions. Designs using multiplate clutch-type brakes for should be given priority when compactness and reliability are a concern, however band brakes should be given priority for ease of maintenance. The focus of this paper is on two-carrier, two-speed PGTs consisting of two coupling shafts and four external shafts, as the most notable characteristic of this type of compound PGT is the possibility to change the transmission ratio under load. A method for the quick determination of the structure and important basic parameters of two-speed planetary gear trains that meet the predefined transmission requirements is presented in this paper, together with an overview of the computer program DVOBRZ purposefully developed for this matter. A numerical example of the procedure is provided, dealing with the application of a two-speed PGT as a main reduction and reversing gearbox.

Keywords: marine reduction and reverse gearbox, mechanical power transmission, planetary gearbox, railway vehicle transmission.

Introduction
The application of planetary gear trains (PGTs) presents considerable advantages in relation to the application of conventional gear trains. Therefore, there has been a significant expansion of their applications in various areas of mechanical engineering, e.g., machine tools, robot drives, fishing boats, railway vehicles etc. [1,2,3,4,5,6].

For example, machine tools such as linear planers and shapers have a slow, high load working motion, while the return motion is fast and has virtually no load except the internal resistances of the tool. As the machine usually incorporates a flywheel, reversing the main drive may become impractical, so a planetary gearbox capable of providing both transmission ratios may be used due to its capability to change ratios under load.

Modern railway vehicles are required to move in directions with the same speed. Both straight hydrodynamic and combined hydrodynamic/PGT transmissions are in common use in these vehicles, however an additional mechanical stage is required to reverse. A planetary gearbox providing two equal transmission ratios, however with the output shaft rotating in different directions can be used as an output stage.

Marine propulsion is also an important area for the application of PGTs as reverse and reduction gear trains. Marine gearboxes must be built for extreme reliability and ease of servicing at sea. Low speed diesel engines must be reversed or fitted with a controllable pitch propeller, while medium and high-speed engines can be fitted with a reversing planetary gearbox with two equal transmission ratios, however with the output shaft rotating in alternate directions to drive a considerably simpler fixed pitch propeller.

This can all be achieved by the application of compound two-speed PGTs obtained by linking the shafts of different component planetary gear trains. This paper deals with two speed PGTs, notably two-speed, two-carrier PGTs with four external shafts composed of two PGTs of the basic type.

A layout of the internal structures of compound gear trains is given, as the significant number of all possible schemes requires a systematization of the variants, as well as their labelling.

The procedure for the determination of the structure and important basic parameters of the gear train is followed by a numerical example in which the optimal two-speed planetary gear train configuration that meets predefined transmission requirements is selected. This is defined by the numbers of teeth of the central gears, their gear modules, and the ideal transmission ratios of the component gearsets. The position of the application and working conditions of the transmission determine the input data required for the computer program to define the structure and important internal parameters of the component planetary gear trains. The program will calculate several valid variants within the application parameters. However, the best solution must be determined by comparative analysis of the solutions [7,8].

Planetary gearboxes with multiple external shafts

The two-component compound PGT is the simplest form of compound PGT. A PGT with four external shafts is created when two shafts of one component PGT are connected to two shafts of the other component PGT (Fig. 1). Of these four external shafts, two are coupled shafts and two are single external shafts. The component PGTs will be referred to as the component trains, while the complex geartrain with four external shafts will be referred to as the compound train.

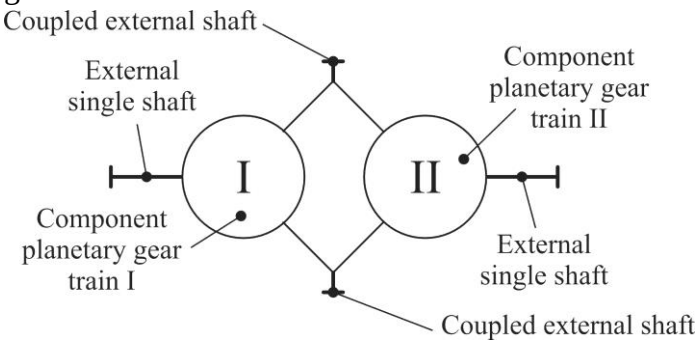


Figure 2. Compound planetary gear train with four external (two single and two coupled) shafts

The component PGTs are planetary gear trains of the basic type, as they consist of a sun gear 1, planet gears 2, ring gear 3 and planet carrier h, as shown in Fig. 2. This type of PGT is commonly used in engineering applications. Usually, it can be found as a single stage transmission, or as an integral part of compound PGTs. The primary advantage of this PGT over other PGT types lies in its efficiency and ease of calculation. Manufacturing is relatively easy, and the PGT is relatively small and lightweight in comparison to the transmitted power. Wolf-Arnaudov symbols (Fig. 2) will be used for the description of both the simple and compound PGTs discussed in this paper [1,9].

The torques acting on the planetary gear train shafts are indicated in Fig. 2. The torque on the ring gear shaft T_3 and the torque on the carrier shaft T_h are given as functions of the ideal torque ratio t and the torque acting on the sun gear shaft T_1.

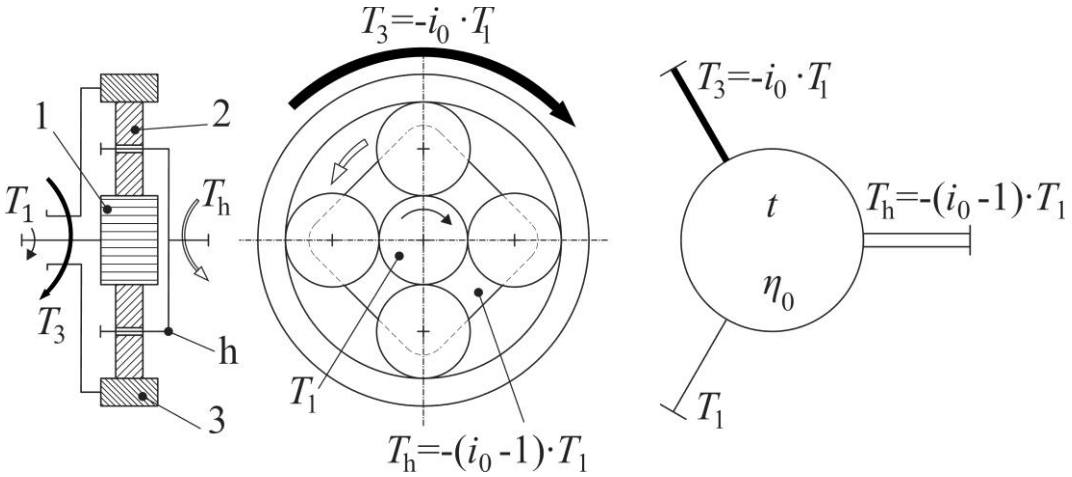


Figure 3. Compound planetary gear train with four external (two single and two coupled) shafts

The ideal torque ratio of the component PGT is given by Eq. 1:

$$t = \frac{T_3}{T_1} = \left|\frac{z_3}{z_1}\right| = -i_0 > +1 \qquad (1)$$

Where i_0 is the basic transmission ratio, z_1 is the number of teeth of the sun gear and z_3 is the number of teeth of the ring gear. The actual transmission ratio depends on whether the sun gear, ring gear or planet carrier are the locked element.

Two component PGTs can be joined in a total of 36 possible ways [10], however only 12 different PGTs with four external shafts are possible due to isomorphism, as shown in Fig. 3.

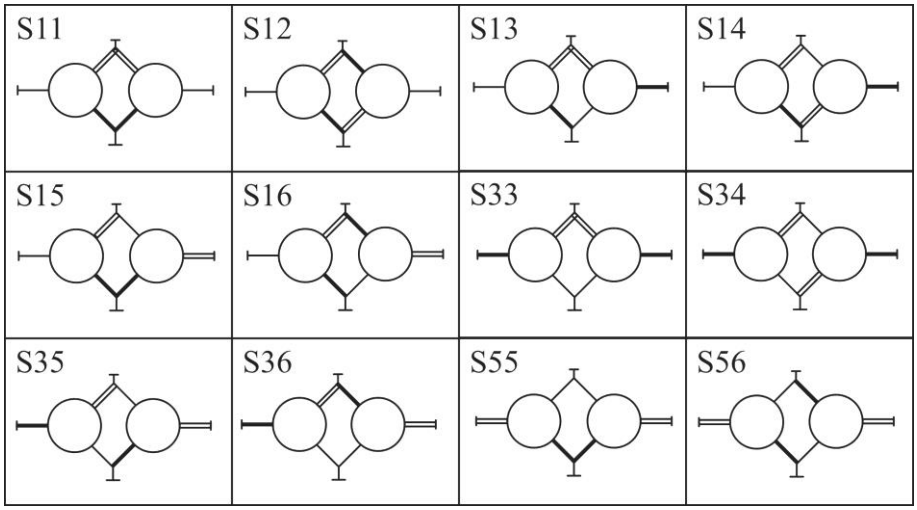


Figure 4.All possible schemes of two-carrier planetary gear trains with four external shafts [1,10]

All schemes have the possibility for a brake to be placed or the driving or operating machine to be connected to any external shaft in 12 different ways (V1…V12). These possibilities are referred to as

the layout variants (Fig. 4). The placement of brakes on different shafts makes it possible to influence the flow of power flow and the kinematic characteristics of the PGT. This is a very important advantage, as these transmissions can then be used as multiple-speed gearboxes.

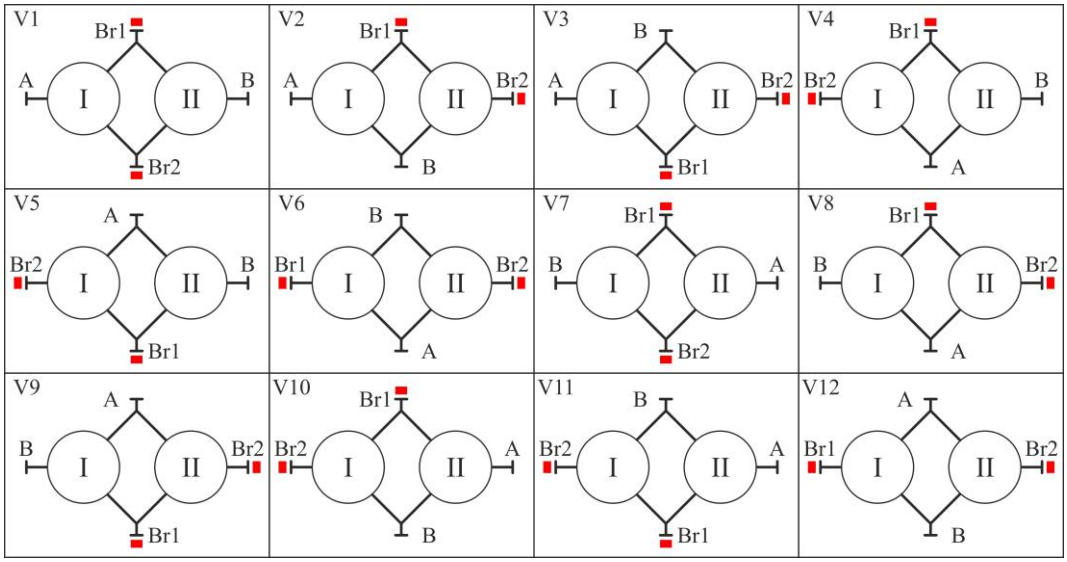


Figure 5. Variants of two-carrier PGTs with four external shafts [11,13]

Numerical Example And Discussion Of Results

DVOBRZ is a computer program developed to synthetize two-speed PGTs [10]. It is also used to select the optimal variant from similar multi-speed PGTs.

The transmission ratio achieved with brake Br1 on is designated i_{Br1} while the transmission ratio achieved with brake Br2 on is marked as i_{Br2}, and all valid solutions are finally stored. The program can compare and sort all valid solutions according to the defined relevant criteria, such as minimal radial dimensions, maximum equivalent efficiency, minimum weight etc. [10].

The transmission of a railway vehicle will be used as a practical example for the selection of two-speed PGTs, although the same procedure would be applied in other occasions, such as a fishing boat transmission, a machine tool gearbox, a conveyor main drive etc.

In this case, the required transmission ratios are $i_1 = -4{,}5$ and $i_2 = 4{,}5$. Solutions have been found with transmission ratios in the ranges $-4{,}6 \leq i_1 \leq -4{,}4$ and $4{,}4 \leq i_2 \leq 4{,}6$. The frequency of working with each transmission ratio also provides important input data: $\alpha_{i1} = 0{,}5$ (50%) and $\alpha_{i2} = 0{,}5$ (50%). Now the optimal solution must be chosen according to the criteria of maximum efficiency while taking into consideration the operating conditions of the railway vehicle [12]. Six possible solutions for two-speed PGTs will be listed by the DVOBRZ program based on the requirements and assumptions listed above.

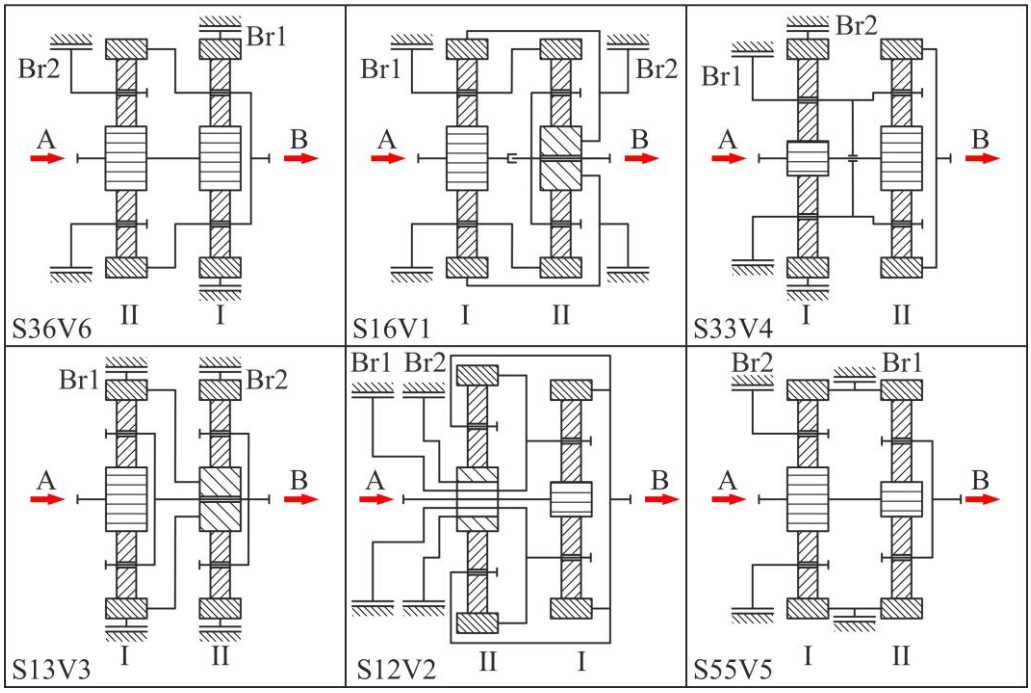
The summary of the main parameters is given in Table 1 while the kinematic schemes of acceptable solutions are listed in Table 2. The main parameters that have been provided include the numbers of teeth for all gears and ideal torque ratios for both component gear trains. All gearsets use three planet gears, except for the solution in bold using four. The program DVOBRZ was used to determine the ideal torque ratios for both gear trains. These ideal torque ratios were used to adopt the tooth numbers of all gears [13], the values of which have been presented in Table 1.

Table 1. Main parameters of component PGTs

	t_I	t_{II}	z_{1I}	z_{2I}	z_{3I}	z_{1II}	z_{2II}	z_{3II}
S36V6	3,5	4,555	14	17	49	**20**	**35**	**92**
S16V1	1,714	1,604	42	15	72	53	16	85
S33V4	1,714	4,437	42	15	72	16	27	71
S13V3	3,5	1,553	14	17	49	47	13	73
S12V2	4,55	1,553	20	35	91	47	13	73
S55V5	1,714	3,4	42	15	72	15	18	51

The tooth numbers of the component PGTs respect the assembly conditions of coaxiality, adjacency and conjunction. The transmission ratios and efficiencies have been calculated for all acceptable solutions in both cases: with brake Br1 active, and with brake Br2 active. The results are presented in Table 3.

Table 2. Kinematic diagrams of acceptable PGT layouts



The transmission ratio with brake Br1 on, i_{Br1} and the transmission ratio with brake Br2 on, i_{Br2}, are defined by using the adopted tooth numbers from Table 1. The basic efficiency was calculated as a function of the tooth numbers of all gears [10, 15], and the results presented in Table 3. The efficiency with brake Br1 on, η_{Br1} and the efficiency with brake Br2 on, η_{Br2}, were calculated as a function of ideal torque ratios and basic efficiencies [9].

Table 3. Transmission ratios and efficiencies

	i_{Br1}	i_{Br2}	η_{0I}	η_{0I}	η_{Br1}	η_{Br2}
S36V6	4,5	-4,55	0,973	0,985	0,979	0,985
S16V1	-4,464	4,407	0,976	0,978	0,962	0,976
S33V4	-4,438	4,422	0,976	0,980	0, 0,980	0,959
S13V3	4,5	-4,436	0,973	0,973	0,979	0,934
S12V2	-	4,573	0,985	0,973	0,985	0,969

	4,55					
S55V5	4,4	-4,475	0,976	0,974	0,980	0,924

All solutions provide the required transmission ratios while also providing the high efficiency values in both directions of rotation of the output shaft. The designer then selects the optimal solution according to technological and economical demands of the PGT target application.

The selection is performed by analyzing the kinematic diagrams as given in Table 2. Priority is given to designs which do not require drilled shafts. This is achieved with layout S36V6. This layout is shown kinematically in Fig. 5 and symbolically in Fig. 6. The direction of the power flow through this transmission solution is also shown in Figs. 5 and 6.

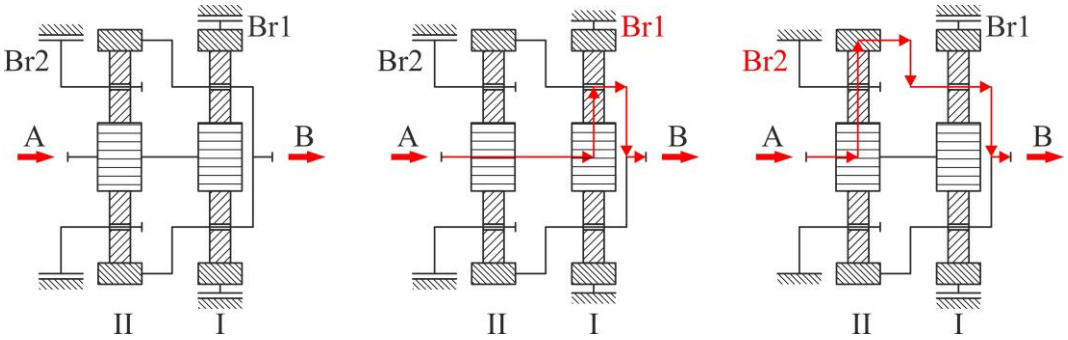


Figure 6. Left: Kinematic scheme of transmission S36V6. Center: Power flow with brake Br1 on. Right: Power flow with brake Br2 on.

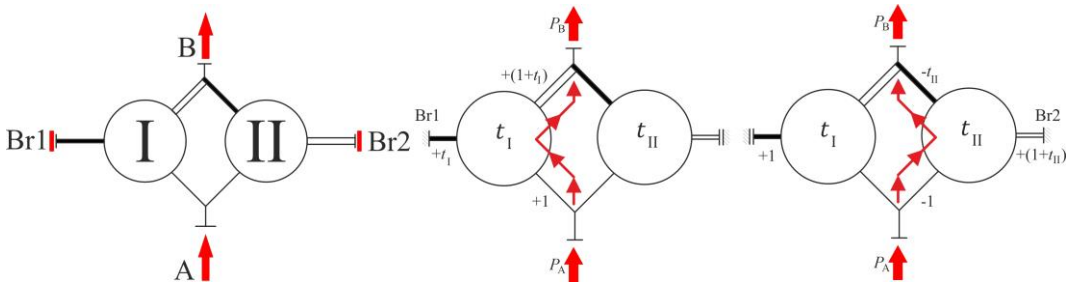


Figure 7. Left: Symbolic view of transmission S36V6. Center: Symbolic view of power flow with brake Br1 on. Right: Symbolic view of power flow with brake Br2 on.

The transmission ratio for solution S36V6 with brake Br1 on is given by Eq. 2, while the ratio with brake Br2 on is given by Eq. 3.

$$i_{\mathrm{Br1}} = \frac{T_{\mathrm{B}}}{T_{\mathrm{A}}} = 1 + t_{\mathrm{I}} \qquad (2)$$

$$i_{\mathrm{Br2}} = -\frac{T_{\mathrm{B}}}{T_{\mathrm{A}}} = -t_{\mathrm{II}} \qquad (3)$$

With this design, both brakes are acting on single external shafts. It should be noted that in both situations, i.e., by activating any brake, only one stage remains operational (two-shaft operating mode), while the other revolves idly. Because of that, power is wasted in only one PGT stage and there is only one power output.

Conclusion

This paper deals with two-speed planetary gear trains with four external shafts, composed of two simple planetary gear trains, including a systematization of their kinematic structure and layout variants. Due to their characteristics, such gear trains are applicable in systems which require the transmission ratio to change under load.

This paper presents a quick overview of the structure and determination of basic parameters of two-

speed planetary gear trains by means of the DVOBRZ computer program. This program was developed for the examination of two-speed planetary gear trains. Afterwards, a numerical example dealing with the application to a railway vehicle where two directions of rotation at the same speed are necessary is given.
All the possible schemes obtained by program have realized and the main parameters defined. The most appropriate scheme was chosen by analyzing the obtained schemes according to application target demands.

Acknowledgment
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DETERMINATION OF THE CONDUCTED EMISSIONS GENERATED BY A THREE-PHASE INVERTER

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ABSTRACT

The electromagnetic disturbances specific to the three-phase inverter are mainly due to the switching of the inverter, which will be considered as the source of disturbances. The very fast voltage fronts and the high switching frequencies of these converters can cause the circulation of important HF currents and thus damage or even destroy certain elements of the system.

The propagation of conducted emissions in three-phase inverters takes place in two ways: Common Mode (CM) disturbances: Differential Mode (DM) disturbances.

In this work, we will focus on the common mode disturbances, i.e. those circulating between the power module and the ground. The simultaneous presence of parasitic capacitances and strong voltage gradients across these capacitances will cause a current to flow. Capacitive coupling is one of the transmission modes of electromagnetic disturbances. Thus, the quantification of the parasitic capacitances of a power module will give us an indication on the susceptibility to disturbances of the module. The common mode current is due to the variations of the common mode voltage generated by the inverter, it is at the origin of the radiated disturbances. It can be calculated from the knowledge of the common mode voltage imposed by the inverter and the common mode impedances of the system.

The spectral estimates are referred to EN 55022, the standard for measuring radio interference from information processing equipment.

Keywords: Commun Mode, Electromagnetic Interference (EMI), EN55022 Standard, Inverter.

ADVANCED COOLING SYSTEM FOR HYDROPOWER PLANT

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ABSTRACT

This paper documents heat and fluid flow characteristics of counterflow heat exchangers with line-to-line flow channels embedded fins of a fractal air-water cooler for hydrodynamic power plant generator which was analyzed numerically using Computational Fluid Dynamics to simultaneously solve the continuity equation using the equation of motion, the conservation equation for energy calculation and transport equation that represents the transport of linear momentum throughout the computational domain in three dimensions, and the conformal mesh technique is applied to generate the grid for the phenomenon of conjugate flow of heat of the cooling system. For the computation numerically, a constant heat coefficient is used as a boundary condition of the wall of fin and the flow is assumed to be laminar and fully developed. The Reynolds number for the CFD analysis is in the range of 80–1200, pressure drop range of 35-45 x 105 Pa. Numerical results reveal that the channel pipes can improve the integrated performance of the cooling system. The pressure drop through the pipe channel of the cooler decreases obviously when compared with that of conventional channels. The networks showed a more uniform temperature distribution and relatively lower maximum surface temperature. The analyzed results after the CFD computation in Ansys Fluent showed that the structure of cooling fins could intensify the transfer of heat remarkably and lower the power of the pump in a quick fashion related to the conventional tube system.

Keywords: Cooling channel; Convection; Heat transfer; Fractal network

IMPROVEMENT THE PERFORMANCE OF MPPT TECHNIQUE BASED A WIND ENERGY SYSTEM USING A HEURISTIC METHOD

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ABSTRACT
The wind energy system is considered one of the most important energy sources; Wind is, by nature, a highly intermittent energy source. To capture the maximum power, wind turbines are usually equipped with an MPPT (Maximum Power Point Tracking) controller; then this technique requires a robust and intelligent control, for this aspect, the fuzzyPI control optimized by the PSO algorithm is applied to have a good follow-up of the turbine speed.

Keywords: MPPT, FuzzyPI, PSO algorithm

ADAPTIVE FUZZY PI CONTROL OF GRID-CONNECTED SOLAR PHOTOVOLTAIC INVERTER

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ABSTRACT

Solar energy is the most abundant and inexhaustible source of energy on the planet and solar photovoltaic (PV) technology is becoming the mainstream source of electricity worldwide. PV system applications can be classified into two groups: "autonomous" (lighting, supplying isolated areas, electric vehicles, etc.) and "interactive" (grid-connected systems, hybrid systems and power plants). This focus of this paper is to improve the performance and efficiency of a grid-connected PV inverter. The inverter control system consists of a DC voltage (Vdc) regulation circuit and a circuit for the control of the direct and quadratic components (Id, Iq) of the inverter current provided by the inverter phase-locked loop (PLL). Three controllers are proposed in this paper for the regulating the DC link voltage including a conventional proportional integral (PI) controller, a fuzzy logic controller and an adaptive fuzzy PI controller (AFLC-PI). The design goals for the inverter current PI controller are enhanced efficiency and stability and increased power factor of the inverter while minimizing the total harmonic distortion (THD) of the inverter output current as well as the voltage.

Keywords: Solar energy, photovoltaic inverter, adaptive fuzzy PI control.

ESTIMATION OF GROWTH CURVES WITH NONLINEAR MODELS IN AWASSI MALE AND FEMALE LAMBS

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ABSTRACT
In this study, eight nonlinear models, namely Lojistik, Brody, von Bertalanffy, Richards, Gompertz, Negative Exponential (NE), Morgan Mercer Flodin (MMF), and Weibull were used to determine the variation of growth in terms of body weight from birth to 30 weeks of age in Awassi lambs. The values of mean square error (MSE), adjusted coefficient of determination (R^2), Akaike's information criterion (AIC), and Bayesian information criterion (BIC) were used to determine the best fitting model. While Lojistik, Gompertz, Brody and von Bertalanffy models with the highest R^2, lowest MSE, AIC and BIC values showed the best fit in Awassi male and female lambs, the models showing the worst fit were Weibull and NegExpo models in male lambs and Weibull, NegExpo and MMF models in female lambs. In conclusion, in this study, it was found that the model that best explains the growth by showing the best fit to the data obtained from Awassi male and female lambs is the Lojistik model, it has been determined that the Gompertz model gives values close to the Lojistik model.

Keywords: Awassi, nonlinear models, growth curves

Introduction
Growth is one of the most important biological features of living things. Many definitions of growth have been made to date. Although there is no standard definition, growth can also be expressed as a change in body weight over time. The growth characteristics of animals are shaped by very complex metabolic activities. For this reason, researchers have tried to analyze growth using various mathematical models in order to express complex biological event more easily. The use of mathematical growth models provides a good way of summarizing the information contained in such data into a few parameters with biological meaning (Efe 1990; Akbaş 1995; Tekel 1998; Bilgin et al., 2000). Growth varies by species and each species has its own growth curve. Lifetime weight-age relationships have become subjects of major interest to animal scientists and producers, due to the economic importance of mature weight, rate of maturing, and related characteristics. These models are useful because they summarize time series data into a few parameters to enable an objective comparison of the growth efficiencies. When these functions are expressed graphically, irregular fluctuations in weight caused by random environmental effects are usually eliminated (Efe 1990; Tekel 1998; Yakupoğlu 1999; Bilgin and Esenbuga 2003; Esenbuga et al, 2000; Lambe et al. 2006). The aim of this research is to determine the model that will best predict the growth of Awassi female and male lambs using age-body weight data with some nonlinear models.

Materials

The animal material of this research consists of 52 single-born Awassi female and male lambs raised in the Sheep Farm of Atatürk University Food and Livestock Application and Research Center. The birth weight of each lamb was weighed the first 24 hours after the birth. The same care and feeding conditions were applied to the lambs in the farm. Body weight data measured at 15-day intervals from birth to 30 weeks of age were used to calculate the parameters of the growth curves.

Growth Curve Models

Nonlinear models such as Brody, von Bertalanffy, Gompertz, Logistics, Negatif Exponential, Morgan-Mercer-Flodin (MMF), Richards and Weibull were used to estimate the growth curves (Tablo 1).

Table 1. Growth curve models

Models	
Brody	$\boldsymbol{Y_t = A[1 - \beta * \exp(-k * t)]}$
Von Bertalanffy	$\boldsymbol{Y_t = A\,[1 - \beta * \exp(-k * t)]^3}$
Gompertz	$\boldsymbol{Y_t = A * \exp[-\beta * \exp(-k * t)]}$
Lojistik	$\boldsymbol{Y_t = A\,[1 + \beta * \exp(-k * t)]^{-1}}$
Negatif Eksponensiyal (NegExpo)	$\boldsymbol{Y_t = A[1 - \exp(-k * t)]}$
Morgan-Mercer-Flodin (MMF)	$\boldsymbol{Y_t = (A * \beta + k * t^m)/(\beta + t^m)}$
Richards	$\boldsymbol{Y_t = A[1 - \beta * \exp(-k * t)]^m}$
Weibull	$\boldsymbol{Y_t = A - \beta * \exp(-k * t^m)}$

Biologically, parameters from the different functions can be in interpreted as follows: *W*t is observed weight at age t. The parameter *A* is weight at maturity, that is, asymptotic limit of the weight when age (t) approaches infinity. β is the initial weight; k is the growth rate. The parameter m is the shape parameter defining the inflection point, which occurs where the estimated growth rate changes from an increasing to a decreasing function. All parameters estimated by the Levenberg-Marquardt iteration method using NLIN procedure in SPSS program (SPSS, 2010). Several criteria are used to determine the goodness of fit: coefficient of determination (R^2), mean square error (MSE), Akaike's information criterion (AIC) and Bayesian information criterion (BIC).

Result and Discussion

The growth curve parameters of Awassi female and male lambs estimated by nonlinear models are presented in Table 2.

Table 2. Means and standard errors of parameters of growth curve models

Models		A	B	k	m
Brody	Female	44.64±4.33	0.94±0.008	0.035±0.007	-
	Male	48.95±3.13	0.94±0.008	0.030±0.007	-
Von Bertalanffy	Female	46.31±3.94	0.54±0.02	0.073±0.007	-
	Male	48.95±3.80	0.54±0.01	0.067±0.007	-
Gompertz	Female	39.15±3.15	2.15±0.076	0.093±0.007	-
	Male	48.55±3.28	2.17±0.072	0.087±0.006	-
Lojistik	Female	33.44±1.29	5.72±0.39	0.153±0.007	-
	Male	40.37±1.22	5.81±0.37	0.148±0.006	-
NegExpo	Female	45. 95±4.69	-	0.06±0.008	-
	Male	55.14±4.52	-	0.05±0.008	-
MMF	Female	4.15±40.11	122.48±33.70	41.89±21.85	1.47±0.28
	Male	5.03±36.36	190.21±30.77	45.15±21.43	1.65±0.27
Richard	Female	102.13±15.59	0.95±0.008	0.028±0.005	1.99±0.81
	Male	110.13±14.77	0.94±0.008	0.030±0.005	1.94±0.81
Weibull	Female	28.02±11.28	27.59±2.02	0.11±0.009	1.45±0.16
	Male	34.96±11.07	33.45±1.95	0.07±0.009	1.75±0.15

When Table 2 is examined, the parameter A was determined the highest by the Richard model and the lowest by the MMF model. The parameter B was determined with the highest MMF model in females and males, and the lowest with the Bertalanffy model. Parameter k was determined with the highest MMF model for females and males, and the lowest with the Richard model, similar to parameter B. The parameter m gave the highest Richard model in females and males, the Weibull model the lowest in females, and the MMF model in males.

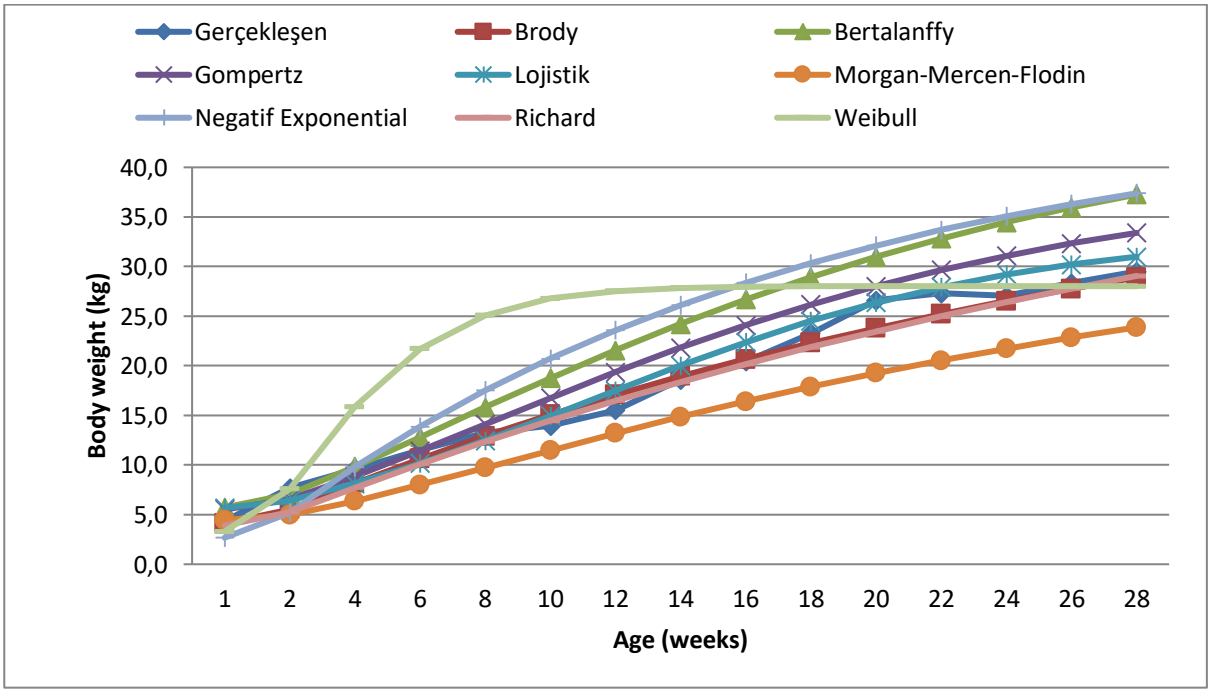
Table 3. Goodness of fit criteria (MSE, R^2, AIC ve BIC) results for models değerleri.

Models		MSE	R^2	AIC	BIC
Brody	Female	2.84	96.4	16.30	18.62
	Male	4.10	96.9	22.88	25.20
Von Bertalanffy	Female	2.58	96.7	14.48	16.80
	Male	3.72	97.2	21.13	23.45
Gompertz	Female	3.61	96.7	13.74	16.06
	Male	4.04	97.2	20.63	22.95
Lojistik	Female	2.31	96.9	11.95	14.26
	Male	3.38	97.4	19.37	21.69
NegExpo	Female	4.11	94.3	22.21	23.75
	Male	5.77	95.2	28.47	30.01
MMF	Female	3.20	96.4	14.90	17.99
	Male	3.56	97.4	21.01	24.09
Richard	Female	3.76	96.3	16.57	19.66
	Male	4.43	96.9	24.76	27.85
Weibull	Female	5.89	91.0	16.82	19.91
	Male	10. 97	90.7	25.34	28.43

To compare the models, R^2, MSE, AIC and BIC values were calculated and presented in Table 3. As you can see Table 3, MSE was determined the highest in the female and male Awassi lambs in the Weibull model and the lowest in the Logistik model. R^2 was obtained from the Logistik and MMF models with the highest in males, and the lowest from the Weibull model. In females, R^2 was determined the highest in the Logistic model and the lowest in the Weibull model. AIC values were highest in male and female lambs with NegExpo model; the lowest was detected in the Logistics model. BIC values were highest in male and female lambs with the NegExpo model; the lowest was estimated by the Logistics model.

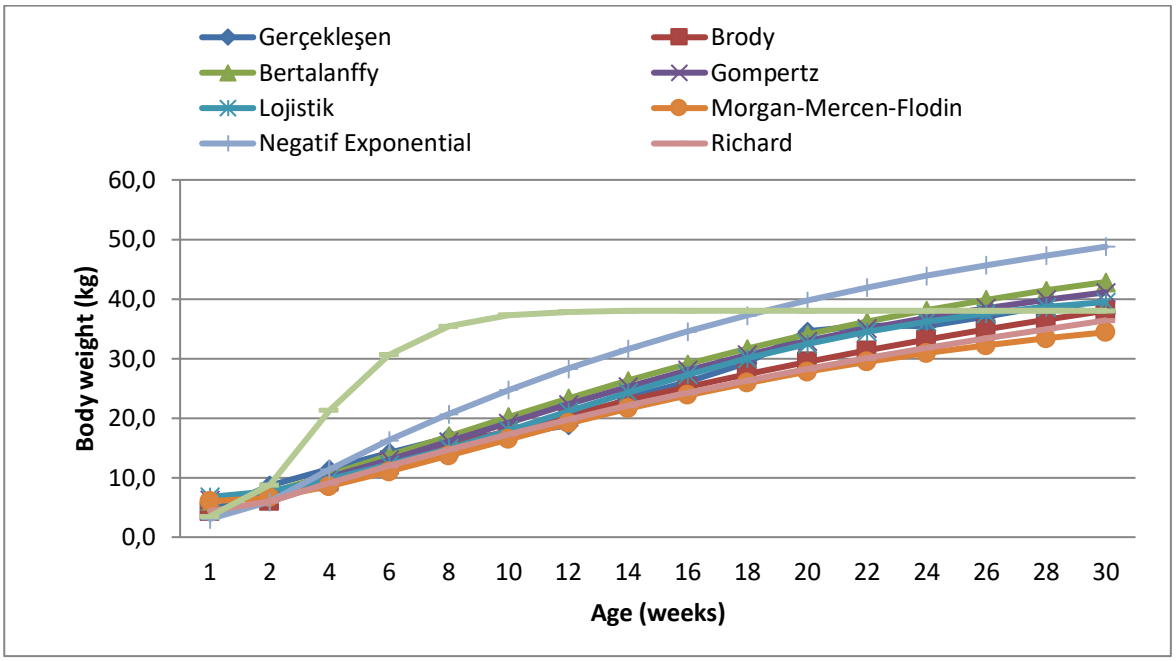
Similar to our study, Lambe et al., (2006), while the models that best describe growth in Texel and Scottish Black Head lambs are Logistik, Gompertz and Richards models; Malhado et al., (2009) found that Gompertz and Logistik models were the best fit models in their study with Dorper and Brazilian domestic sheep. Daskiran et al. (2010) in their study with Norduz lambs, that the model that best describes the growth is the Logistic model; Özdemir and Dellal (2009) reported that the Logistik and Gompertz models were the best fit models in their study with Angora goats.

Unlike our study, Bilgin et al. (2004) used the Brody model as the best model among the Brody, von Bertalanffy, Gompertz and Richards models; Köyceğiz (2003) reported that the best model explaining the growth of Awassi and Morkaraman lambs was Brody in male lambs and Gompertz in females. Kopuzlu et al., (2014) reported that the Brody model in Hemşin male and female sheep can be recommended because it has fewer parameters than Richards and Janoschek models and is easy to interpret. Nimase et al., (2018) have reported that Brody and Richards models have the highest R^2 (99.0%), the lowest AIC and BIC values, and the Brody model is the most suitable model for estimating the growth curves of sheep due to its ease of calculation and simple interpretation in Magdyal male and female lambs. Mohammadi et al., (2019) reported that the Logistic model was the model that showed the worst fit for male and female Kordi lambs.



Graph 1. Growth curves of Awassi female lambs observed and estimated by different models

The growth curves of the body weight values observed for Awassi female and male lambs and estimated by nonlinear models over time are given in Graph 1 and 2. As can be seen in the graphs, the curves estimated by the Weibull, NegExpo and MMF models for both genders are quite deviated.



Graph 2. Growth curves observed for Awassi male lambs and estimated by different models

It is extremely important to follow the growth processes in terms of breeding. If the growth slows down, stops or has a decreasing trend, it may indicate a problem related to care or feeding. Therefore, following the growth processes provides great benefit to the business in the regulation of care and feeding, that is, herd management. Growth curve parameters provide the opportunity to breed animals at an early age by using them as breeding criteria as well as defining growth. It is possible to determine the most appropriate (optimal) slaughter age of the individual and evaluate it economically by estimating the later body weights from the data obtained. In order to determine the model or models with the best fit in line with the results obtained, the models were compared with each other using R^2, MSE, AIC and BIC values. It was determined that the Logistic model had the highest R^2, lowest MSE, AIC and BIC values in Awassi female and male lambs and this model was followed by the Gompertz and von Bertalanffy models. Weibull and NegExpo models showed the worst fit in all genders.

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THE EFFECT OF EXTERNAL ENVIRONMENTAL CONDITIONS ON INTERNAL AIR QUALITY IN POULTRY HOUSE

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ABSTRACT
A study was conducted to determine the relationship between inner environmental factors (internal temperature (IT, ºC), inner relative humidity (IRH, %), ammonia (NH_3, ppm), hydrogen sulfide (H_2S, ppm), carbon dioxide (CO_2, ppm) and dust (mg/m^3)) and outer environmental factors (outer temperature (OT, ºC), outer relative humidity (ORH, %)) in different seasons along the 24 months in poultry houses to provide reliable information and practical current knowledge for proper management conditions. Inferential statistics, which included the use of multiple regression models and correlation analysis was employed to determine the relationship between outer and inner environmental factors in poultry house in the study area in order to identify the factors that are critical to concentration of gases. Results of the present study showed that air quality of poultry house was significantly ($P < 0.01$) affected due to the year, season, mont and outer temperature. The correlation coefficient obtained in poultry house showed that inner temperature, inner relative humidity, CO_2 and NH_3 (r=0.668, -0.403, -0.736 and -0.653 and respectively) were highly related with outer temperature, while H_2S and dust were insignificant correlated. Similarly, outer relative humidity was highly related to inner temperature, inner humidity, CO_2, NH_3 and dust (r=-0.473, 0.344, 0.476, 0.295 and -0.222 respectively), while H_2S recorded insignificant correlation results. High concentrations of different gases present in houses in different season are of great importance not only for the production and animal welfare but also for the safety of the staff. In general, an adequate environment within poultry houses is required for success in the poultry industry.

Keywords: Temperature, relative humidity, air quality, poultry house,

Introduction
Chickens are among the most sensitive animal groups to environmental conditions. Inadequate environmental conditions can cause stress on animals, leading to decreases in productivity and the emergence of various diseases. It is known that many factors are effective on egg yield and quality. However, at this point, it is necessary to keep the environmental conditions in the shelter, which constitute the living environment of the chickens, separate from other factors. Because the effect of environmental conditions on production reaches the level of 70%. The combined effects of environmental variables such as temperature, humidity, ventilation rate, concentration of particles, gases and microorganisms in the air determine the environmental quality in poultry houses and their effects on the quality of life of chickens (Banhazi et al., 2008).
The most important elements of the environmental conditions in the shelter are temperature, relative humidity, ventilation and lighting (Seedorf et al., 1998; Kılıç and Şimşek, 2008). In the henhouse,

The recommended temperature values are between 15-20 °C and the relative humidity is 60-70%, and the carbon dioxide concentration should not be higher than 3000 ppm, ammonia not higher than 15 ppm, and hydrogen sulfide not higher than 3 ppm (Şenköylü, 2001). The effects of high indoor temperatures in animal shelters may vary according to the relative humidity value. High relative humidity values adversely affect the animals at high temperatures and reduce the yield (İpek and Ertek 1994). The high relative humidity in the indoor air of the hen house condenses on and inside the building elements in cold seasons, causing rot and mold to form (Uğurlu and Kara 2002; Kılıç and Şimşek, 2008). In the case of a decrease in relative humidity, dusting in the house air increases, and as a result, an increase in respiratory tract diseases of chickens is observed (Özen 1986; Türkoğlu et al., 1997).

The aim of this study is to determine to what extent the temperature and relative humidity measured outside the poultry house affect indoor air quality such as indoor temperature, indoor relative humidity, ammonia, hydrogen sulfide, carbon dioxide and dust.

Materials and Methods

The research was carried out in 5000 capacity laying poultry house was used in Atatürk University Food and Livestock Application and Research Center. The poultry house in which the experiment will be conducted is built in accordance with the cold conditions. Heating is done with a central heating system and there is no cooling system. It has automatic feeding and drinking system. Manure is cleaned once a day at the same time every morning with an automatic belt system under the cage. Ventilation; the intake of fresh air with the fans on the long facades is ensured by leaving the poultry house through the chimneys on the roof.

Measurements of outdoor temperature, humidity, and indoor air quality were taken over a period of 24 months (2 years). Temperature and relative humidity values were measured with a thermograph. Carbon dioxide, ammonia and hydrogen sulfide concentrations were measured with a gas detector (Dräger Multiple Gases Detection), and the total dust concentration was measured with SKC (HD-1002).

Multiple regression and bivariete correlation analysis were used to determine the relationship between external and internal environmental factors. Data were analysed by SPSS package program.

Result and Discussion

Global climate change causes frequent and intense temperature fluctuations in climates, resulting in extremely high temperatures in summer and low temperatures in winter. Severe hot and cold weather can adversely affect indoor air quality. When Table 1 is examined, it was determined that the effect of the year factor on the indoor relative humidity, CO_2, H_2S, NH_3 and dust was very significant ($P<0.01$).

When the effects of the seasons on indoor air quality were examined, the effects on indoor temperature, indoor relative humidity, CO_2 and H_2S were very significant ($P<0.01$) and significant ($P<0.05$), while the effects on NH_3 and dust were insignificant. When the indoor air quality is examined in terms of seasons, the temperatures in the henhouse were measured as 19.04, 23.12, 19.31. and 17.13 ºC in the spring, summer, autumn and winter seasons, respectively. As expected, the highest temperatures were obtained in the summer season, while the lowest temperature values were observed in the winter season.

Table 1. Factors affecting the indoor air quality

	InTemp	InHumid	CO_2	H_2S	NH_3	Dust
Year	0.835	0.001	0.001	0.001	0.001	0.001
Seasons	0.002	0.012	0.044	0.001	0.472	0.105
Month	0.001	0.136	0.001	0.001	0.001	0.001
OutTemp	0.012	0.182	0.001	0.001	0.001	0.762
OutHumid	0.719	0.061	0.879	0.035	0.013	0.093

It is reported that optimum temperature values in layer hens can be 12.8-21.1 ºC in light breeds and 12.8-18.3 ºC in heavy breeds (Okuroğlu and Delibaş 1986). It is seen that the temperature values obtained from the study are between these ranges, except for the summer season. Similar to our study, Karaman et al. (2005) reported that indoor temperatures were significantly affected by outside temperature. In addition, they reported that the breeders completely or partially canceled the ventilation openings in order not to reduce the temperature in the hens, especially in winter, or that the windows and doors were never used for ventilation in winter, as the reason for the temperature being within the appropriate limits in the henhouses (Karaman et al., 2005).

In-house relative humidity values were measured as 72.89, 65.92, 66.77 and 73.93 in spring, summer, autumn and winter seasons. Contrary to the temperature, the highest relative humidity was obtained in winter, while the lowest values were obtained in summer. Ekmekyapar (1993), and İpek and Ertek (1994) state that under optimum temperature conditions, the relative humidity should be between 65-75% and should not exceed 80% in laying hens. It is seen that the relative humidity values obtained from the study are in these ranges. Karaman et al. (2005) reported that the reason for the high relative humidity level detected in the henhouses may be due to the reduction of ventilation in the winter months.

In-house NH_3 concentrations were highest in winter (25.57 ppm) and lowest in summer (10.79 ppm). In spring and autumn, NH_3 concentrations were determined as 17.70 ppm and 13.35 ppm, respectively. CO_2 concentrations were determined as 1874.07, 908.33, 1476.92 and 2733.33 ppm in spring, summer, autumn and winter seasons, respectively. The highest CO_2 concentration was obtained in winter, while the lowest value was obtained in summer. Talukder et al. (2010) reported that feed consumption and egg weight decreased significantly when CO_2 and NH_3 concentrations were higher than 3000 and 37 ppm. H_2S concentrations obtained in spring, summer, autumn and winter seasons were determined as 8.89, 5.58, 5.12 and 6.80 ppm, respectively. In terms of H_2S concentrations, the highest value was obtained in spring and the lowest in autumn. Dust values measured inside the henhouse were determined as 2.73, 2.50, 2.17 and 2.43 in spring, summer, autumn and winter seasons. Similar to our study, Kocaman et al., (2006); Yıldız et al., (2013) reported that CO_2, NH_3, H_2S and relative humidity levels, which were low in summer, increased in winter.

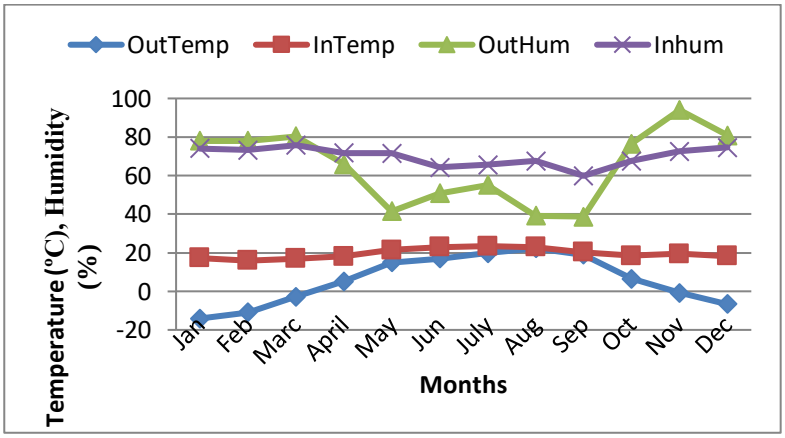
When the effect of the months on the factors inside the henhouse was examined, it was determined that all factors were affected by the months very significantly ($P<0.01$), except for the relative humidity. While the effect of outdoor temperature on indoor temperature, CO_2, H_2S and NH_3 was significant ($P<0.01$), its impact on indoor relative humidity and dust was insignificant. The effect of the relative humidity outside the hen on the properties outside the hen H_2S and NH_3 was determined to be insignificant.

Table 2. Correlations between some environmental parameters measured inside and outside the poultry house

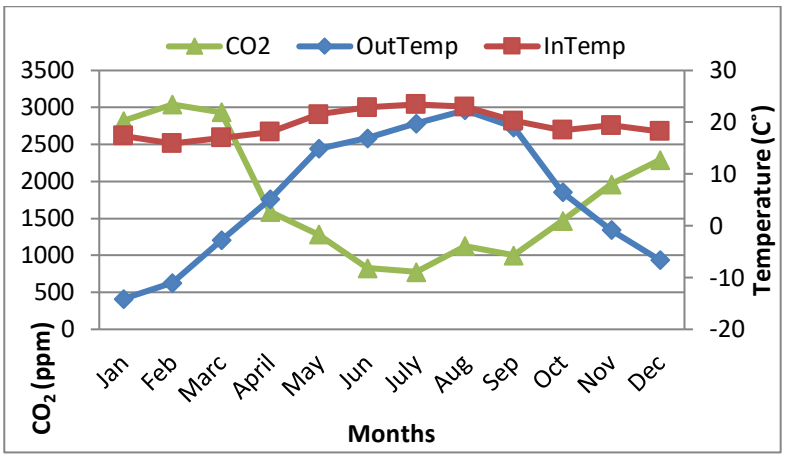
	OutTemp	OutHumid	InTemp	InHumid	CO_2	NH_3	H_2S
OutHumid	-0.700**						
InTemp	0.668**	-0.473**					
InHumid	-0.403**	0.344**	-0.233*				
CO_2	-0.736**	0.476**	-0.537**	0.411**			
NH_3	-0.653**	0.295**	-0.500**	0.330**	0.839**		
H_2S	-0.176	-0.001	-0.165	0.298**	0.549**	0.558**	
Dust	0.083	-0.222*	0.107	0.243*	-0.01	0.048	0.323

Correlation analysis was performed to determine the relationship between outside and indoor air quality. A very significant positive correlation was determined between the outside temperature and the indoor temperature. A very significant negative correlation was determined between external relative humidity and internal relative humidity, CO_2 and NH_3 (Tablo 2).

When Graph 1 is examined, it is seen that the internal temperature changes depending on the increase and decrease in the outside temperature. It is observed that the external and internal relative humidity increases, especially in the winter months when the external temperature decreases. In addition, while the outside temperature increased, the external and internal relative humidity, CO_2 and NH_3 decreased. In parallel with the results of our study, it has been reported that in the regions where the outside temperature drops to minus degrees in the winter season, there is not enough ventilation to prevent the temperature inside the henhouse from falling, and as a result, the level of dust and harmful gases in the environment rises (Takai et al., 1998; Kocaman et al., 2006; Kılıç and Şimşek 2006; Yıldız et al., 2013).

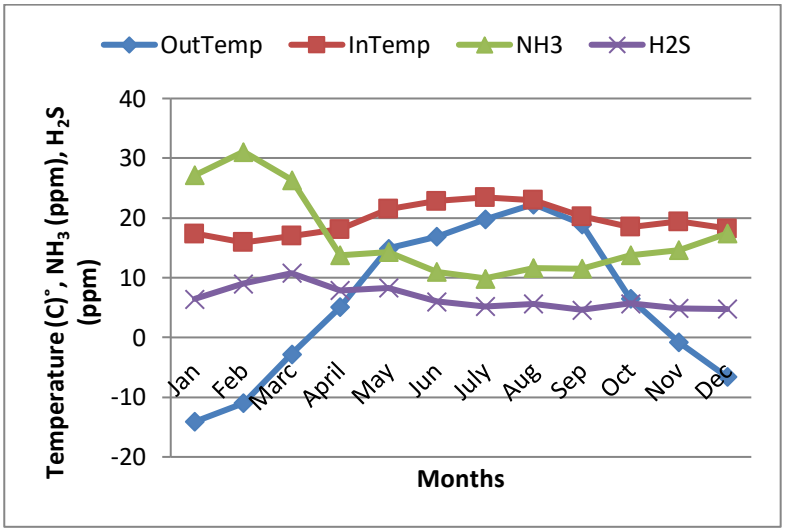


Graph 1. Annual changes of outside temperature, outside relative humidity, indoor temperature and indoor relative humidity values



Graph 2. Annual changes in outside temperature, indoor temperature and CO_2 values

In our study, it is seen that relative humidity, and harmful gases such as CO_2 and NH_3 increase in the henhouse as a result of the lack of ventilation to prevent the temperature of the henhouse from falling, especially in winter (Grafik1, 2 ve 3).



Graph 3. Annual changes of outside temperature, indoor temperature, NH_3 and H_2S values

Based on the results of this study, it has been determined that outdoor climate parameters have a significant effect on the formation of harmful gases in the poultry house. In addition, it has been determined that the levels of harmful gases in the henhouses sometimes reach levels that will negatively affect animal health and welfare. In order to prevent this situation, it is important to provide adequate and regular ventilation in the poultry houses. Reducing harmful gases, which negatively affect animal production and cause environmental pollution, is a critical factor that should be considered in providing an environment suitable for animal welfare and obtaining quality products.

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EFFECTS OF DIFFERENT BIOINK MATERIALS ON ADIPOCYTE CELL VIABILITY IN 3D BIOPRINTING APPLICATIONS

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ABSTRACT
3D Bioprinting enables the artificial creation of living tissues and organs by the three-dimensional, layer-by-layer deposition of living cells together with an appropriate protective and supporting matrix using various printing methods. The cells are encapsulated in a matrix (bioink) and printed to form a three-dimensional (3D) structure. Bioink must provide an environment that ensures adequate nutrient supply to cells over long periods in vivo, while the composition of the extracellular matrix (ECM) changes to perform specific tasks depending on tissue needs. Current 2D culture systems of adipocytes have a problem with the high lipid content accumulating in differentiated cells, cells detaching from the surface making the cells float. Therefore, it is thought that encapsulating cells in a 3D matrix will eliminate the problem of separation of cells from the ground, facilitate longer cell culture studies, and especially facilitate adipocyte cell culture. In this study, the effects of three different bioinks containing Carboxymethyl Cellulose (CMC), Alginate, and Bovine Gelatin on 3T3-L1 adipocyte cells on cell viability were investigated. To obtain the number of cells needed for the 3D bioprinting experiments, 3T3-L1 fibroblast cells were expanded in Dulbecco's Modified Eagle Medium (DMEM), 10% fetal bovine serum, and 1% antibiotics. Then, the cells were cultured in an adipogenic differentiation medium consisting of an expansion medium supplemented with 0.5 mM 3-Isobutyl-1-methylxanthine, 10 µg/ml insulin, and 1 µM dexamethasone. CMC (1%), Alginate (1%), and Gelatin (1%) were prepared by dissolving in the medium. Bioinks were inoculated into each well of 96 well-plate by droplet method with an injector. As the control group, the 2D cell culture method without bioinks was used. After 3D bioprinting, the constructs were either crosslinked in 100 mM CaCl2 for ten minutes. The printed constructs were briefly rinsed with medium to remove residues of the crosslinking agent before the fresh medium was added. He then added 10000 adipocyte cells to each well. The constructs were then placed in an incubator at 37°C, 5% CO2. After 48 hours, cell viability analysis was performed by the MTT method. The MTT assay is used to measure cellular metabolic activity as an indicator of cell viability, proliferation, and cytotoxicity. After analyzes, cell viability was found to be 126% (p=0.008) in gelatin, 118.7% (p=0.029) in CMC, and 97.4% (p=0.21) in alginate when compared to the control. Compared with standard 2D culture systems, new methods for 3D cell culture of adipocytes can provide more physiologically accurate data and a deeper understanding of metabolic diseases.

Keywords: Bioprinting, Bioink, Adipocyte, Cell Culture, Cytotoxicity.

INTRODUCTION
One of the most recent applications used in tissue engineering research is 3D bioprinting technology.

The process of producing computer-aided designs (CAD) as living tissue precursors using the basis of 3D bioprinting and 3D cell culture applications is called biofabrication. Three-dimensional (3D) bioprinting technology allows the development of correct scaffold geometries for complex anatomical structures by imitating the composition and organization aspects of natural tissues using biomaterials, cells, proteins and/or genes (Calvert, 2007; Mironov et al., 2003). Bioprinting involves layer-by-layer deposition of cell-laden biomaterials in a predetermined structural architecture to produce functional tissues or organs. This technique uses biomaterials, living cells, and controlled systems to create complex structures, but has demonstrated that it has more precise control over more advanced structures than other methods available. Thus, the fabrication of very complex structures such as tissue engineering scaffolds, biomedical devices and tissue models with controlled porosity, permeability and mechanical properties is possible (Gopinathan and Noh, 2018). Three-dimensional bioprinting is based on three basic approaches: biomimicry, self-assembly and mini-tissues (Murphy and Atala, 2014). Biomimicry (inspired by nature to develop new materials) involves the production of identical mimics of the cellular and extracellular components of a tissue or organ (Ingber et al., 2006).

Although the biomaterials used to support cell proliferation and tissue formation in 3D culture environment differ according to the production method used, they are used in the form of tissue scaffolds called scaffolds. In addition to the porous structure resulting from the morphological characteristics of the biomaterial, the tissue scaffold allows the components in the culture medium to interact easily with the cells in the inner layers of the 3D structure, thanks to its structural pores. Parameters such as the space between the pores of the scaffold, the height of the structure and the arrangement of the scaffold mesh structure vary according to the tissue type in which the scaffold will be used (Hutmacher et al., 2008; Hollister et al., 2009). The structure serves as an environment in which cells can attach and multiply without being exposed to any stress. The implanted tissue scaffold degrades in a controlled manner according to the biomaterial and cross-linking method used, and the tissue formed by the proliferating cells remains. The scaffold, which degrades faster than it should, will prevent the cells from forming tissues by producing an extracellular environment. A scaffold that remains undegraded for too long will cause the cells to be under stress and lead to cell death.

The properties required in bioink for 3D bioprinting; Biocompatible (non-toxic or insignificant toxicity, no or little immunological reaction), bioprintable using 3D bioprinters, biostable or cross-linkable with sufficiently strong mechanical properties, biodegradable (especially the rate of biodegradation, new tissue/ must match the rate of organ formation), the host must be sutured with vascular and neural networks, permeable to nutrients and gases, biostorable and sterilizable before printing.

Hydrogels are 3D hydrophilic polymer networks that can absorb and retain large amounts of water and gel under certain physical (eg, heat-sensitive), chemical (eg, covalent bond) or biochemical (eg, enzymatic) conditions. The physical and chemical properties of hydrogels can be designed for specific biomedical applications by selecting appropriate polymer components, inorganic solvents and gelling protocols (Kong et al., 2004; Fedorovich et al., 2011; Hou et al., 2015). Conventional hydrogels face several challenges, such as inability to provide adequate protection to living cells and low solubility during their stabilization. Therefore, the mechanical and biological properties of hydrogels should be improved for high-resolution bioprinting and cell viability (Aljohani et al., 2018). Due to their different biocompatibility and printability, there are various hydrogels, natural and synthetic, that support cell growth, such as gelatin, agarose, polyethylene glycol (PEG)-diacrylate

and alginate, which are used for bioink production (Datta, 2020).

Cellulose is the most abundant polymeric polysaccharide material in nature. Its fibrous form is found in the plant cell wall and has a water-insoluble feature. Cellulose, which consists of D-glucose units linked by β-(1→4) glycosidic bonds, should not be preferred frequently in tissue engineering studies due to its low biodegradation. On the other hand, modified cellulose derivatives are used in various studies depending on their properties (Svensson et al., 2005). Gelatin is a denaturated form of collagen. Its structure is helical and viscous at low temperatures. As the temperature rises, the helical structure turns into irregular folds. One of the most important reasons for the frequent use of collagen and gelatin in tissue engineering applications is the amino acid sequence of Arginine - Glycine - Aspartic acid (Arg - Gly - Asp, RGD) found in protein structures (Nandan et al., 1988). Alginate or sodium alginate (SA) is an anionic polysaccharide derived from seaweed. It has structural similarity to natural extracellular matrices. Therefore, it has been widely applied in various biomedical applications as well as in the delivery of bioactive substances and wound healing. Sodium alginate, a biodegradable, non-immunogenic and non-toxic polysaccharide polymer, is naturally present; consists of mannuronic and guluronic acids (Yu et al., 2013). In this study, the effects of three different bioinks containing Carboxymethyl Cellulose (CMC), Alginate, and Bovine Gelatin on 3T3-L1 adipocyte cells on cell viability were investigated.

MATERIAL AND METHOD

Cell Culture

Murine 3T3-L1 fibroblasts were purchased from the American Type Culture Collection (ATCC) (Manassas, USA). 3T3-L1 cells were cultured in glucose-free Dulbecco's Modified Eagle's Medium (DMEM) supplemented with 10% fetal calf serum, penicillin (100 units/ml), and streptomycin (100 µg/ml) in a humidified atmosphere of 5% CO2 at 370C, with a change of medium every 2-3 days. Sub-cultured as necessary by routine trypsinization method.

Differentiation of 3T3-L1 preadipocytes

3T3-L1 cell differentiation was based on the protocol by Miard et al. (2008). Cells were grown in DMEM medium until 80% confluence. Two days after confluence (Day 0), cells were washed with phosphate buffered saline (PBS) and fed with adipocyte differentiation media (DMEM, 10% fetal calf serum, 1 µM dexamethasone, 10 µg/mL insulin, and 0.25 mM 3-isobutyl-1-methylxanthine) for 2 days. Two days (Day 2) post induction, medium was supplemented with only 10 µg/mL insulin and replaced every 2 days until terminal differentiation.

Oil Red O Staining

Cells were washed with PBS and then fixed for 1 hour with 10% formalin solution. 60% isopropanol was added to each well and let sit for 5 minutes. Oil red O was diluted with water (3:2), filtered through a 0.22µm filter and incubated with the fixed cells for 5 min at room temperature. Cells were washed with water and the stained lipid droplets in the cells.

Bioink Preparation

CMC (1%), Alginate (1%), and Gelatin (1%) were prepared by dissolving in the medium. Bioinks were inoculated into each well of 96 well-plate by droplet method with an injector. As the control group, the 2D cell culture method without bioinks was used. After 3D bioprinting, the constructs were either crosslinked in 100 mM CaCl2 for ten minutes. The printed constructs were briefly rinsed with medium to remove residues of the crosslinking agent before the fresh medium was added. Then 10000

adipocyte cells were added to each well. The constructs were then placed in an incubator at 37°C, 5% CO2. After 48 hours, cell viability analysis was performed by the MTT method.

MTT Assay

The MTT assay is used to measure cellular metabolic activity as an indicator of cell viability, proliferation, and cytotoxicity. By using the MTT [3- (4,5-dimethyldiazol-2-yl) -2,5 diphenyl Tetrazolium Bromide] method, the proportion of living cells in the cell population was determined colorimetrically. The test was carried out according to the principle of transformation of the yellow MTT dye, which is released by the disintegration of the tetrazolium ring, into a dark blue-purple formazan product. MTT analysis was performed according to the method of Yerlikaya et al. Data was analyzed with the GraphPad Prism 5.0 program (GraphPad Software, Inc., La Jolla, CA, USA) and a graph was generated. To calculate the IC_{50} value, the data were normalized by nonlinear regression analysis using the GraphPad Prism 5.0 program.

Cell Viability Analysis

Viability rates of cells were calculated compared to untreated control cells. The viability of untreated cells was considered 100% and the viability percentages of cells were calculated as follows:
% Viability: (Treated cell / Untreated cell) X100

RESULTS

When the 3T3-L1 fibroblast cells grown by cell culture methods reached sufficient numbers, differentiation medium was given for their transformation into adipocytes. Conversion to adipocytes is characterized by the appearance of intracellular lipid droplets. Lipid droplets were also visualized by oil-red staining.

Current 2D culture systems of adipocytes have a problem with the high lipid content accumulating in differentiated cells, cells detaching from the surface making the cells float. Therefore, it is thought that encapsulating cells in a 3D matrix will eliminate the problem of separation of cells from the ground, facilitate longer cell culture studies, and especially facilitate adipocyte cell culture. CMC (1%), Alginate (1%), and Gelatin (1%) bioinks for 3D bioprinting were into each well of 96 well-plate by droplet method. After 48 hours of incubation of cells, MTT analysis was performed to determine the cytotoxicity of the bioinks. After analyzes, cell viability was found to be; 126% (p=0.008) in gelatin, 118.7% (p=0.029) in CMC, 97.4% (p=0.21) in alginate when compared to the control (Figure 1).

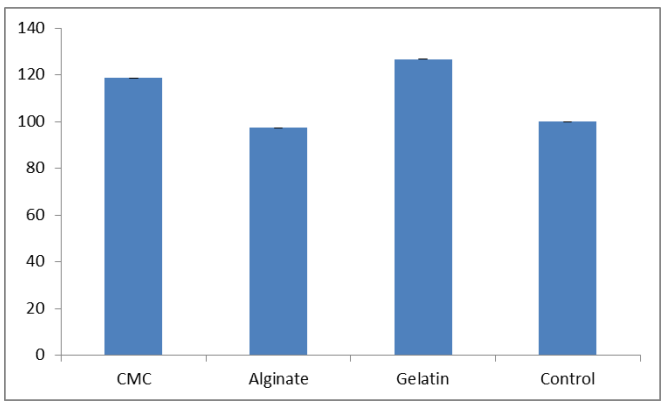


Figure 1. Cell viability results.

DISCUSSION

Three-dimensional bioprinters function in the appropriate cell delivery environment that promotes growth, proliferation of intercellular communication, and differentiation of living cells to ultimately achieve complete regeneration of the defect and depends on the cell type and the type of printer used. An ideal bio-ink should have characteristic physical or chemical cell encapsulation with high cell viability before and after printing.

Cell pellets are concentrated cellular aggregates in which the growth of these cells is determined by a supporting polymer mold. Tissue strips are manually guided to synthesize constructs in soluble alginate tubes. A 3-dimensional culture system of adipocytes may provide a more accurate model for adipose tissue research, which could be useful for in vitro studies of metabolic diseases such as diabetes (Xu et al., 2010). Various methods have been developed for mature adipocyte cell culture, such as swimming under a trans well insert (Stacey et al., 2009) or a flask filled with media (Sugihara et al., 1989), but these methods are technically challenging. A more commonly used approach is to differentiate precursor cells on 3D scaffolds or gel. For example, a 3D culture system was used for ASC differentiation by combining HA from the placenta with ECM, but this method did not improve differentiation compared to a 2D control (Flynn et al., 2007). Few studies have been published on printing cells for adipogenic differentiation (Gruene et al., 2011, Lee J-S et al., 2014, Schutz et al., 2015). But these studies show that 3D bioprinted cells actually show the effect of bioinking on cell viability compared to 2D culture

CONCLUSION

Compared with standard 2D culture systems, new methods for 3D cell culture of adipocytes can provide more physiologically accurate data and a deeper understanding of metabolic diseases. Our work provides a framework for other bioprinting researchers to predict substrate limitations and cell densities for bioprinting, reducing the need for frequent post-printing cell viability assessments from a quality assurance perspective.

Prior to further research and its application to clinical and chairside treatments, specific Standardization protocols by regulatory and legal bodies regarding Bioprinters, and cell engineering is yet to be laid down. Bioprinting and bioink designing could be established as a field of scientific specialty in the future-oriented for metabolic diseases.

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INVESTIGATION OF THE OXIDANT EFFECT OF HYBRID USE OF EXENATIDE AND BORON ON OBESITY THERAPY IN 3T3-L1 ADIPOCYTE CELLS

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ABSTRACT
Obesity is a metabolic problem that results in serious morbidity and mortality. Given the worldwide prevalence of obesity, the number of pharmacotherapy used is limited. Glucagon-like peptide-1 receptor agonists (GLP-1RA) are currently being developed for weight control. It has been reported that boron has a positive effect on human health and is associated with weight reduction. The aim of this study was to investigate the oxidant and antioxidant capacity levels of adipose cells in the use of exenatide and boron hybrids in 3T3-L1 adipocyte cells. 3T3-L1 fibroblast stem cells (ATCC® CL - 173) were commercially obtained from ATCC. Fibroblast cells were then differentiated into adipocyte cells. Transformation in adipocyte cells was determined by Oil Red O staining method. As a result of the application of exenatide and boron to 3T3-L1 adipocytes at different doses, the cytotoxic activity on adipocytes was determined by MTT method. After 48 hours of hybrid drug administration, total oxidative stress (TOS) and total antioxidant capacity (TAS) in adipocyte cells were determined using a colorimetric-based ELISA kit. The total oxidant capacity of the hybrid drug-treated adipocyte cells was decreased compared to the control adipocyte cells ($p<0.05$). In addition, treatment of 3T3-L1 adipocytes with the use of hybrid drugs increased the total antioxidant capacity ($p<0.05$). These results show that exenatide and boron hybrid treatment applied to adipocytes may have beneficial effects on the antioxidant system and can be shown as a candidate pharmacotherapy agent for obesity treatment as a result of advanced molecular analyzes.

Keywords: 3T3-L1 Adipocyte, Exenatide, Boron, Cytotoxicity, TAS, TOS

GIRIŞ
Dünya Sağlık Örgütü'ne (WHO) göre obezite, "sağlık açısından risk oluşturan anormal veya aşırı yağ birikimi" olarak tanımlanmaktadır [1]. Obezite, aterosklerotik kardiyovasküler hastalıklar, tip 2 diyabet ve belirli kanser türleri dahil olmak üzere bulaşıcı olmayan hastalıklardan kaynaklanan artan mortalite nedeniyle yaklaşık 20 yıla kadar, yaşam beklentisinin azalmasına neden olmaktadır [2-5]. Obezitenin bireysel düzeydeki sonuçlarına ek olarak, obezite pandemisi toplum için çok büyük bir sağlık yükü oluşturmaktadır [6].

Obezitenin sadece hastalıklar için bir risk faktörü olduğu görüşünün aksine, Dünya Obezite Federasyonu obezitenin kendisini kronik, tekrarlayan ilerleyici bir hastalık olarak ilan etmiştir [7]. Bu, obezitenin patofizyolojisini, çevresel faktörlerin, genetik duyarlılıkla etkileşimini, pozitif enerji dengesi ile sonuçlanan bir epidemiyolojik model yaklaşımı ile doğrulanmıştır [7].

Obezite tedavisi için yaşam tarzı müdahalesi, farmakoterapi ve bariatrik cerrahi gibi çeşitli terapötik yaklaşımlar geliştirilmiştir [8]. Yaşam tarzı değişiklikleri, kilo yönetiminin temel taşlarıdır, ancak başarılması ve sürdürülmesi zordur. Sonuç olarak, farmakoterapi tipik olarak ek bir tedavi seçeneği olarak kabul edilir [9].

Hayvanlarda ve insanlarda çeşitli antiobezite ilaçları ve bunların terapötik hedefleri araştırılmıştır. Obezite tedavisi için FDA tarafından onaylanan ilaçlar: phentermine, orlistat, lorcaserin, liraglutide,

naltrekson/ bupropion ve fentermin/topiramatdır. Bu ilaçların çoğu, yağ emilimini azaltarak ve iştahı azaltmak veya tokluğu artırmak için merkezi sinir sistemi yolları aracılığıyla çalışır [10]. Bununla birlikte, etkisizlik ve yan etki riskleri, birçok obezite terapötik ajanının geliştirilmesi üzerine gölge düşürerek piyasadan çekilmelerine yol açmıştır [11]. Olumsuz etkilerin örnekleri arasında pulmoner hipertansiyon, felç ve nöropsikiyatrik sorunlar yer alır [12]. Bu istenmeyen deneyimler, risk-fayda değerlendirmelerinin önemini vurgulamakta ve daha güvenli ve daha verimli obezite tedavi seçeneklerine ulaşmak için yeni ilaç stratejilerinin geliştirilmesini zorunlu kılmaktadır.

Glukagon benzeri peptid-1 reseptör agonistleri (GLP-1RA) inkretin bazlı bir tedavidir [13]. Yapılan çalışmalarda, GLP-1'in periferal ve santral mediatörler aracılığıyla iştah ve gıda alımı üzerine etkisi olduğu gösterilmiştir [14]. Bu tür ilaçlar alan obez hastalarda, lipid profilleri ve kolesterol homeostazında iyileşme gösterilmiştir [15], ancak dahil olduğu mekanizmalar henüz tam olarak bilinmemektedir. Exenatide (exendin-4), 39 amino asitli bir peptittir. Eksenatid, hem günlük hem de haftalık formülasyonlarda, metformin veya sülfonilüre tedavisi ile yetersiz kontrol edilen tip 2 diyabetli hastaların tedavisi için FDA tarafından onaylanmıştır. GLP-1 agonistleri ile yapılan çalışmalar, tedaviye yanıt olarak açıklanamayan yüksek kilo kaybı değişkenliği göstermiştir. Acostaas ve ark. [16] yaptıkları çalışmada GLP-1 agonisti eksenatid ile tedavi, plaseboya kıyasla, katıların mide boşalmasını önemli ölçüde geciktirdi ve plaseboya kıyasla kalori alımında azalma sağladı.

Bor, canlı organizmalarda biyolojik işlevleri olan nadir bir elementtir. Bor, bitkilerin, hayvanların ve insanların gelişimi için hayati bir elementtir. Çevrede borik asit ve borat tuzu şeklinde oluşur. Fizyolojik düzeyde yaşam aktiviteleriyle ilişkili çok sayıda bileşiğin kullanımı, metabolizma veya bor, glikoz ve trigliseritler gibi enerji substratlarından, proteinler ve amino asitler gibi azotlu maddelerden ve reaktif oksijen türevlerinden etkilenir. Bor, karbonhidrat metabolizmasını etkiler. Diyetteki fizyolojik miktarlarda borun plazma glukoz konsantrasyonlarını arttırdığı ve insülin metabolizmasını etkilediği gösterilmiştir. Borun, kan şekeri seviyelerini korumak için gereken insülin miktarını azalttığı gösterilmiştir. Son zamanlardaki bor araştırmaları, antikanser aktivitesi, oksidatif stres, protein biyomoleküler etkileşimleri ve yeni sentezlenmiş bor bileşikleri yoluyla ilaç dağıtımı çalışmalarına odaklanmıştır.

Bu çalışmanın amacı, 3T3-L1 adiposit hücrelerinde eksenatid ve bor hibrit kullanımının adipoz hücrelerindeki oksidan ve antioksidan kapasite düzeylerini araştırmaktır.

YÖNTEM

3T3-L1 Fibroblast Embriyonik Kök Hücre kültürü

Çalışmada kullanılan 3T3L-1 fibroblast hücre soyu American Type Culture Collection (ATCC) (Manassas, USA) ticari olarak temin edildi. ATCC'den temin edilen 3T3-L1 fibroblast hücre soyları kuru buzla birlikte geldi ve çalışma yapılana kadar -164^{0}C'de saklandı. Hücre kültürü çalışmasına başlamadan önce DMEM (Dulbecco's modified Eagle's medium) medyumu+%10 Fetal Bovin Serum (FBS)+ penisilin (100 unit/ml) ve streptomisin (100 µg/ml) içeren besi yeri steril şartlarda UV kabin içerisinde hazırlandı.

3T3-L1 Fibroblast Hücrelerinin Adiposit Hücrelerine Dönüşümü

3T3-L1 fibroblast hücrelerinin farklılaşması Miard ve ark. [17] protokolüne göre yapıldı. 3T3-L1 fibroblast hücreleri DMEM (Dulbecco's modified Eagle's medium) medyumu+%10 Fetal Bovin Serum (FBS) içinde %5'lik karbondioksit etüvde 37^0 C'de 4 gün inkübe eldir. Flaskların %75'inin hücreler tarafından doldurulması ile hücrelere DMEM-FBS içine 10µg/ml insülin + 1µM

dexametazone + 0.5 mM 3-isobutyl-1- methylxanthine eklenmiş besi yeri ilave edilir. Farklılaşmanın başlatılması amacıyla inkübasyon 3 gün yapıldı. Daha sonra 2'şer gün aralıklarla DMEM-FBS +10µ/ml insülin içeren besi yeri ile hücrelerin 3 kez besi yeri yenilemesi yapıldı. Adiposit farklılaşması hücre içi lipid damlacıklarının birikimi ile saptandı.

Adipositlerin Oil Red O Boyama ile Tespiti

3T3-L1 fibroblast hücrelerinin olgun adiposit hücrelerine dönüştüğü Oil Red O boyama yöntemi ile tespit edildi. Hücreler %10luk formalin solusyonunda bir saat bekletildi. Oil red o stok çözeltisinden % 60'lık oil red o çalışma çözeltisi hazırlandı. Hücreler 5 dakika oda sıcaklığında oil red o çalışma çözeltisi ile inkübasyona bırakıldı. Yağ damlacıkları kırmızı renkle boyandıktan sonra inverted mikroskopta gözlem yapıldı

MTT Assay

MTT [3-(4,5-dimethyldiazol-2-yl)-2,5 diphenyl Tetrazolium Bromid] yöntemi ile hücre topluluğundaki canlı hücrelerin oranı kolorimetrik olarak tespit edildi. Test, tetrazolium halkasının parçalanmasıyla açığa çıkan sarı renkteki MTT boyası koyu mavi-mor formazan ürününe dönüşme ilkesine göre yapıldı. Flasklarda çoğaltılan hücreler uygulama yapılmadan 24 saat önce 96 kuyucuklu mikroplakalara 5000 hücre /200µl besi yeri olacak şekilde ekildi ve inkübasyona bırakıldı. Hücrelere farklı dozlarda bor bileşikleri uygulandı. MTT analizi, Yerlikaya ve ark. yöntemine göre yapıldı [18]. Veriler, GraphPad Prism 5.0 programı (GraphPad Software, Inc., La Jolla, CA, ABD) ile analiz edilerek grafik oluşturuldu. IC_{50} değerinin hesaplanması için, GraphPad Prism 5.0 programı kullanılarak doğrusal olmayan regresyon analizi ile veriler normalize edildi.

3T3-L1 Adipositlerde TAS-TOS Analizinin Ölçümü

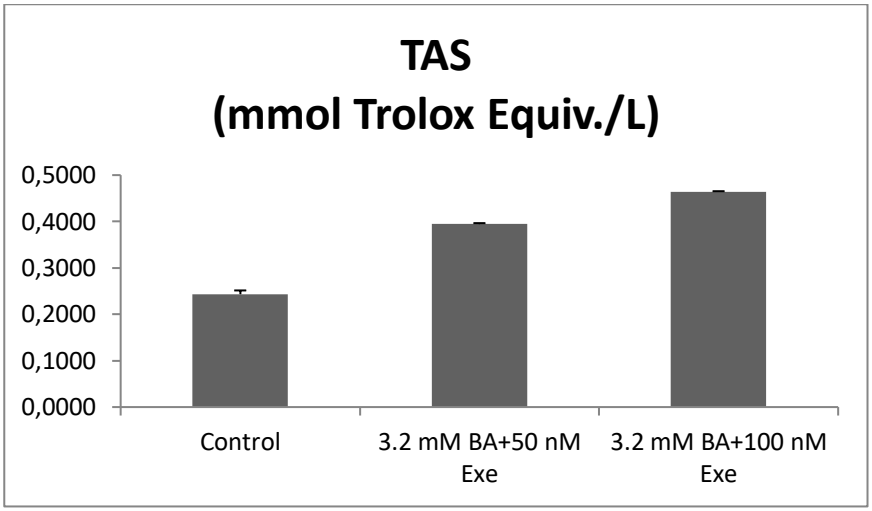
Toplam antioksidan durumu (TAS) ve toplam oksidan durumu (TOS) seviyeleri, ticari ELISA kitleri (Rel Assay Diagnostics TAS Kit, Türkiye; Rel Assay Diagnostics TOS Kit, Türkiye) kullanılarak belirlendi.

İstatistiksel analiz

Veriler standart hataları ile ortalama olarak gösterilmiştir. Tüm istatistiksel analizler GraphPad Prism 5 yazılımında yapıldı. Tüm gruplar arasındaki farklılıkların önemi, tek yönlü bir ANOVA ve ardından Bonferroni'nin çoklu karşılaştırma testi ile analiz edildi. $p < 0.05$ değeri anlamlı kabul edildi.

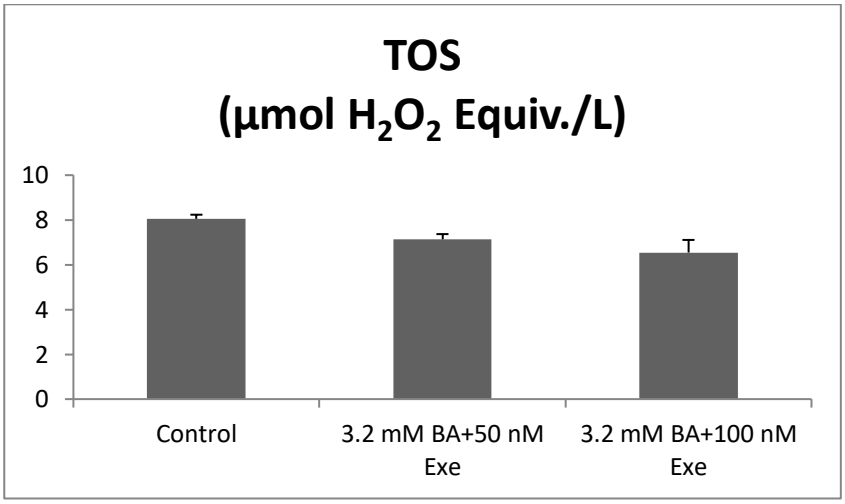
BULGULAR

TAS, vücut sıvıları ve plazmadaki tüm antioksidanların etkisini, TOS ise tüm oksidanların toplam etkisini yansıtır. Çalışmada ölçülen toplam antioksidan kapasite değerleri arasındaki istatistiksel anlamlılık değerlendirildiğinde; 50 nM eksenatid+ 3.2 mM boron ve 100nM eksenatid+ 3.2 mM bor ile tedavi edilen hücrelerde artışın kontrol grubuna göre istatistiksel olarak anlamlı olduğu bulundu ($p<0.05$) (Şekil 1). Adiposit hücrelerinde hibrit ilaç kullanımı, hücrelerdeki antioksidan aktiviteyi arttırmıştır.



Şekil 1. 3T3-L1 adipositlerindeki total antioksidan kapasite (*$p<0.05$).

TOS değerleri arasındaki istatistiksel anlamlılık değerlendirildiğinde, 50 nM eksenatid+ 3,2 mM boron ve 100nM eksenatid+ 3,2 mM bor ile tedavi edilen hücrelerde kontrol grubuna göre artış saptandı ($p<0.05$) (Şekil 2). Bu sonuç, hibrit ilaç kullanımın adipotler üzerindeki oksidatif stresi azalttığını gösterebilir.



Şekil 2. 3T3-L1 adipositlerindeki total oksidan kapasite (*$p<0.05$).

TARTIŞMA

Obezitenin etiyolojisi, çevresel ve genetik etkilerle karmaşıktır. Gelişiminin ana mekanizması, vücut tarafından alınan ve harcanan enerji arasındaki dengesizliktir. Fazla enerji yağ dokusu olarak depolanır [19]. Ancak, bu modülasyonda oksidatif stresin katılımı hakkında halen yeterli bilgiye sahip değiliz. Obeziteye neden olan faktörlerden biri de oksidatif strestir. Obezitede artan ROS, DNA, protein ve lipidlerin oksidasyonu sonucu hücre hasarına, nekroza ve apoptoza neden olur. Depolanmış

yağda artan oksidatif stresin, adipositokin düzensizliğinin ve metabolik sendromun gelişiminin temel bir nedeni olduğu çalışmalarda gösterilmiştir [20]. TOS vücudun genel oksidatif durumunu ölçmek için, TAS vücudun genel antioksidan durumunu ölçmek için kullanılır. Literatürde yapılan çalışmalarda obez bireylerde TOS yüksek, TAS düzeyleri ise düşük bulunmuştur [21,22]. Literatür ile uyumlu olarak, eksenatid+bor ile tedavi edilen adiposit hücrelerinde TAS seviyesinin kontrol adiposit hücrelerine göre daha yüksek olduğu, TOS seviyesinin ise düşük olduğu bulundu. Bu sonuçlar eksenatid ve bor kullanımını adiposit hücreleri üzerinde oksidatif stres önleyici etkiye sahip olduğunu göstermektedir.

SONUÇ

Bu sonuçlar, adipositlere uygulanan eksenatid ve bor hibrit tedavisinin antioksidan sistem üzerine yararlı etkileri olabileceğini ve ileri moleküler analizler sonucunda obezite tedavisi için aday farkmakoterapi ajanı olabileceğini gösterilebilir.

TEŞEKKÜR

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EFFECT OF TEMPERATURE ON STATIC DAMAGE OF CPVC

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ABSTRACT

Plastics play an important role in our daily life due to their ease of installation and relatively low production costs. Currently, polymers are materials of great importance in our modern societies [1]. The Chlorinated PVC is one of the main polymers currently used. is obtained by post-chlorination of the PVC. It has been used in a variety of processes and industries for over 30 years. The effect of adding more chlorine to the PVC molecule is to raise the glass transition temperature (Tg) of the base resin from 95 to the 115–135 ◦C range [2]. The main objective of this study is to characterize the mechanical behavior of chlorinated polyvinyl chloride (CVPC) at different degrees of temperature based on simple experimental tensile tests. The experimental results obtained allowed us to follow the evolution of the damage and to quantify it. Subsequently, we were able to determine three stages of damage which make it possible to initially predict the initiation of the damage and then the instant of the critical damage and therefore be able to intervene in time for predictive maintenance of the system.

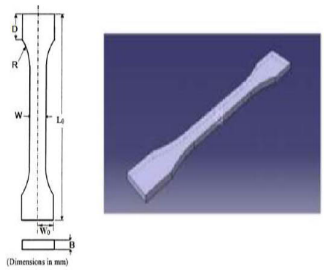


Fig.2 – The Zwick Roell Traction Machine

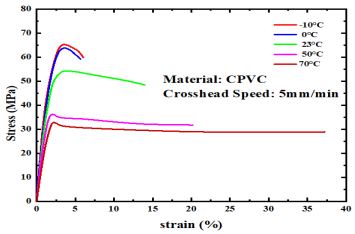


Fig.3 Curves Stress - Strain CPVC specimen at different temperatures [4]



Keywords: CPVC; Temperature; damage; tensile test; fraction of life

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