

**II. International
TEXAS
Congress on Advanced
Scientific Research
and Innovation**

PROCEEDINGS BOOK

EDITED BY
Prof. Dr. German Martínez PRATZ
Dr. Mustafa Latif EMEK

ISBN: 979-8-89695-023-3

PROCEEDINGS BOOK



II. International Texas Congress on Advanced Scientific Research and Innovation

January 27-28, 2025
Houston, Texas

Editors

Prof. Dr. German Martínez PRATZ
Dr. Mustafa Latif EMEK

25.02.2025

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ISBN: 979-8-89695-023-3

CONGRESS ID

TITLE OF CONGRESS

II. International Texas Congress on Advanced Scientific Research and
Innovation

PARTICIPATION

Keynote & Invited

DATE - PLACE

January 27-28, 2025

Houston, Texas

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ÍKSAD-Institute of Economic Development and Social Researches

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PARTICIPATING COUNTRIES (18)

Türkiye, India, Kazakhstan, Nigeria, Lebanon, KSA, Albania, Iran, Iraq,
Morocco, Azerbaijan, Serbia, Kazakhstan, Jordan, Romania, Poland,
Greece, Mexico

TOTAL ABSTRACTS: 82

The number of abstracts from foreign countries: **44**

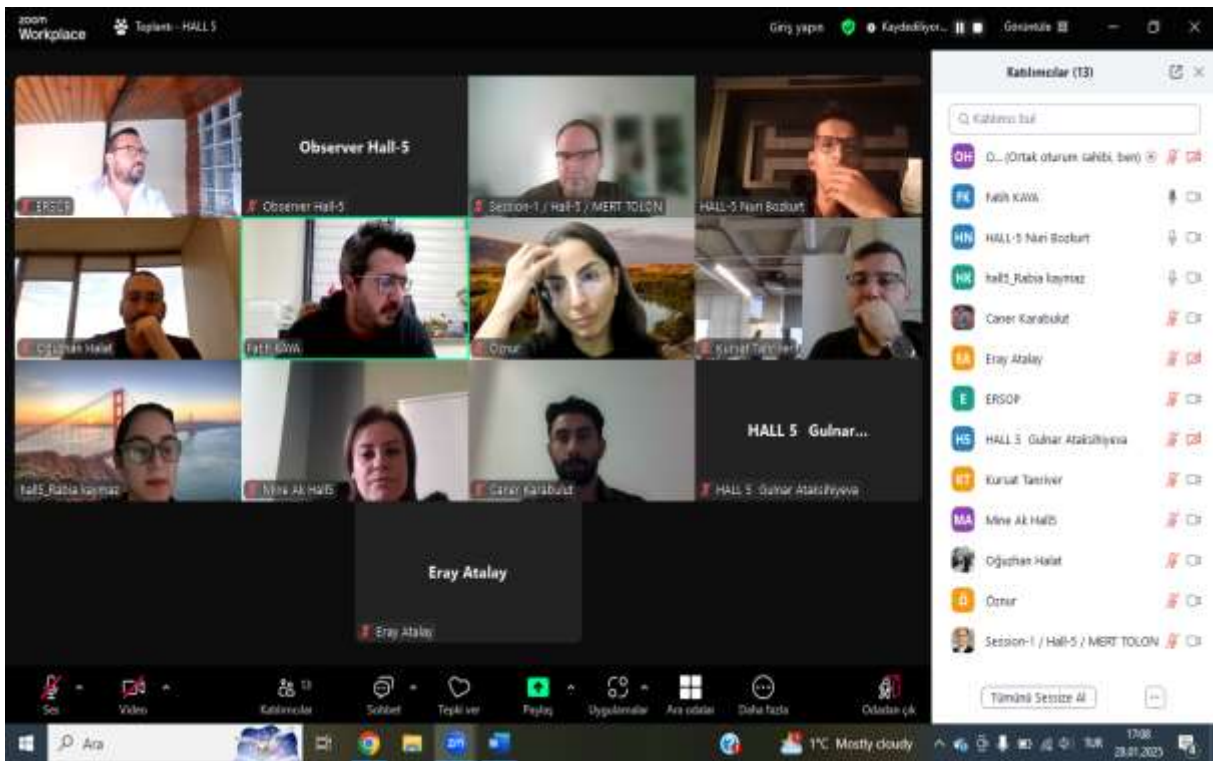
The number of abstracts from Türkiye: **38**

LANGUAGES

Turkish, English, Spanish, Russian

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

PHOTO GALLERY



PROCEEDINGS BOOK

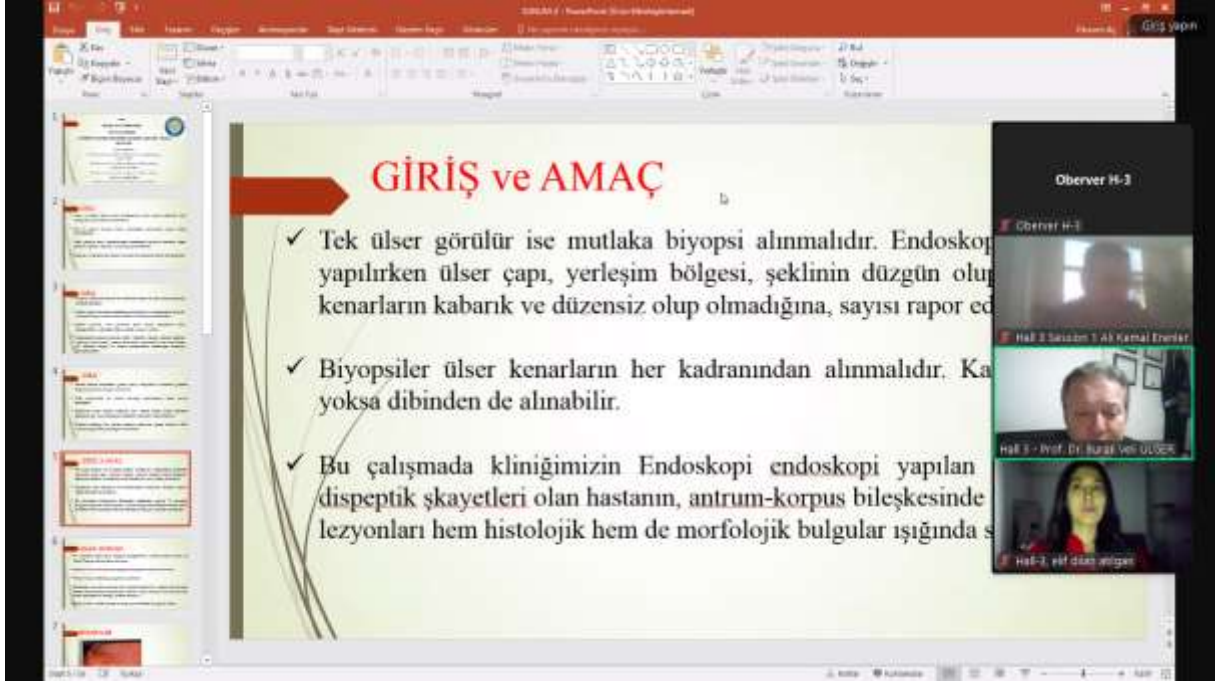
January 27-28, 2025
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INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II



January 27-28, 2025
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INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II



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II. International Texas Congress on Advanced Scientific Research and Innovation

*January 27-28, 2025
Houston, Texas*

CONGRESS PROGRAM



ONLINE PRESENTATIONS

Meeting ID: 870 6274 8180

Passcode: 272727

<https://us02web.zoom.us/j/87062748180?pwd=ux3T3EYsp5xwtB9Cc4MrJLpfmnqw5G.>

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- To be able to make a meeting online, login via <https://zoom.us/join> site, enter ID instead of "Meeting ID
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- Speakers must be connected to the session **10 minutes before** the presentation time.
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- Make sure your computer has a microphone and is working.
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- Moderator is responsible for the presentation and scientific discussion (question-answer) section of the session.

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PARTICIPANT COUNTRIES (18):

Türkiye, India, Kazakhstan, Nigeria, Lebanon, KSA, Albania, Iran, Iraq, Morocco, Azerbaijan, Serbia, Kazakhstan, Jordan, Romania, Poland, Greece, Mexico

FACE TO FACE PRESENTATIONS

27.01.2025

Session-1 / Hall-1

Texas Time: 15⁰⁰-16⁰⁰

Venue: Hyatt Regency Houston Downtown

HEAD OF SESSION: Mariam S. OLSSON

TOPIC TITLE	AUTHORS	AFFILIATION
THE TORSIONAL MECHANICAL PROPERTIES OF TI ALLOY BAR PRODUCED BY ADDITIVE MANUFACTURING	Ali DURMUŞ	Bursa Uludağ University, Bursa, Turkey
PERSPECTIVE USE OF STONE MASTIC ASPHALT IN GEORGIA	Mariam Gvinjili Giorgi Chubinidze Manuchar Shishinashvili	Georgian Technical University

28.01.2025

Session-1 / Hall-1

Texas Time: 09⁰⁰-11⁰⁰

Ankara Time: 17⁰⁰-19⁰⁰

HEAD OF SESSION: Prof. Dr. Mohammed Waheeb

TOPIC TITLE	AUTHORS	AFFILIATION
EVALUATION OF AGRICULTURAL WASTE FOR BIOMASS ENERGY POWER PLANTS: TÜRKİYE (KİRSEHİR PROVINCE CASE)	Ömer Eyüboğlu Gökhan Eyüboğlu	Ahi Evran University, Kirsehir, Türkiye Hacettepe University, Ankara, Türkiye
THE DISCOVERY OF THE OLDEST CHURCHES IN JORDAN- SOUTH LEVANT	Prof. Dr. Mohammed Waheeb	Hashemite University
THE EFFECT OF SULFURIC ACID ON THE GERMINATION OF SEEDS OF THE CAROB TREE CERATONIA SILIQUA .L IN ALGERIA	Frimehdi Noureddine Djabeur Abderrazak	Djilali Liabès University, Algeria
NEXT-GENERATION SEQUENCING IN FERMENTED FOOD MICROBIOLOGY: A GATEWAY TO UNDERSTANDING FOOD SAFETY AND QUALITY	Aghja Valiyeva Bayram	Baku State University, Baku, Azerbaijan
STRUCTURE-BASED DRUG REPURPOSING TO INHIBIT THE DNA GYRASE OF MYCOBACTERIUM TUBERCULOSIS	Balasubramani G L, Rinky Rajput, Manish Gupta, Pradeep Dahiya, Jitendra K Thakur, Rakesh Bhatnagar, Abhinav Grover	Jawaharlal Nehru University National Institute of Plant Genome Research Banaras Hindu University, India
USE OF SMART CUBE IN EDUCATION	Erkisheva Zhazira Kenesbai Arailim Zhadiger Symbat	Akhmet Yassawi International Kazakh-Turkish University, Turkistan, Kazakhstan
COLD-ACTIVE MICROBIAL CELLULASE: NOVEL APPROACH TO UNDERSTAND MECHANISM AND ITS APPLICATIONS IN FOOD AND BEVERAGES INDUSTRY	Ghazala Yunus, Mohammed Kuddus	University of Hail, Hail-2440, KSA.
PRESERVATION OF THE ENVIRONMENT BY REMOVING COPPER FROM WASTEWATER FROM METAL PLATING VIA ELECTROCOAGULATION	Ahmed Salim, A. El Bouari, M. Tahiri, O. Tanane	Hassan II University - Casablanca, Morocco
OPTIMUM DESIGN OF REINFORCED CONCRETE CANTILEVER MFO OPTIMIZATION ALGORITHM	Mehdi Shalchi Tousi	Ahle Beyte international University, Tehran, Iran

28.01.2025

Session-1 / Hall-2

Texas Time: 09⁰⁰-11⁰⁰

Ankara Time: 17⁰⁰-19⁰⁰ *trp*

HEAD OF SESSION: Major Gheorghe GIURGIU

TOPIC TITLE	AUTHORS	AFFILIATION
EL CONSUMO DE COCA COLA EN LOS ESTUDIANTES DE LA LICENCIATURA EN DERECHO DE LA DIVISIÓN ACADÉMICA DE CIENCIAS SOCIALES Y HUMANIDADES, LA VULNERACIÓN A SU DERECHO HUMANO A LA SALUD	Luis Felipe Hernández Jiménez Sandra Paola Pérez Beltrán Yazmín Isolda Álvarez García	Universidad Juárez Autónoma de Tabasco
MICROBIOTA MODULATION AS THERAPEUTIC APPROACH IN THE NEUROPATHIC PAIN IN DOG WITH SPINAL CORD INJURY: IMPACT OF POLENOPLASMIN	Major Gheorghe GIURGIU Manole COJOCARU	Deniplant-Aide Sante Medical Center, Romania Academy of Romanian Scientists Titu Maiorescu University, Romania
THE RELEVANCE OF ENVIRONMENTAL POLLUTION WITH HEAVY METALS	Nigar Aliyeva Atiga Abdullayeva	Azerbaijan Medical University, Azerbaijan
EPIDEMIOLOGICAL ASPECTS OF PIGEONS IN THE URBAN ENVIRONMENT	Dr. Ivan Pavlovic Dr. Aleksandra Tasic	Scientific Institute for Veterinary Medicine of Serbia, Belgrade, Serbia
MENTAL HEALTH CHALLENGES FACED BY WORKING WOMEN IN PAKISTAN	Ayesha Batool, Dr. Farkhanda Anjum, Hafsa Naeem, Rimsha Anwar, Zainab Fatima, Memona Liaqat, Hina Shahid	University of Agriculture, Faisalabad.
OVER EXPRESSION RECOMBINATION STAPHYLOKINASE WITH R HUMAN GROWTH HORMONE (SAK-PET21a-rhGH)	Barakat Abdul Razzaq Mutar	University of Al-Qadisiyah
THE USE OF ANTIBIOTICS IN ORAL SURGERY	Dr. Esat Bardhoshi	University of Medicine, Tirana, Albania
EFFECTS OF PROBIOTICS ON ORAL MICROBIOLOGICAL ENVIRONMENT, GINGIVAL HEALTH AND DENTAL PLAQUE; A META-ANALYSIS	Dr. Mehwash Kashif, Dr. Mehwash Kashif, Dr. Aman Ashar, Syeda Nimra Qadri, M. Asfahan Shah	Karachi Metropolitan University

28.01.2025

Session-1 / Hall-3

Texas Time: 09⁰⁰-11⁰⁰

Ankara Time: 17⁰⁰-19⁰⁰

HEAD OF SESSION: Lect. Elif Dilan ATILGAN

TOPIC TITLE	AUTHORS	AFFILIATION
BIBLIOMETRIC ANALYSIS OF GLUTATHIONE ARTICLES SINCE 1975	Ali Kemal ERENLER Mehmet Oğuzhan AY Behice Hande ERENLER	Hitit University, Çorum, Türkiye SBU Bursa Yüksek İhtisas Education and Research Hospital, Bursa, Türkiye
RELIABILITY OF YOUTUBE© VIDEOS IN TERMS OF CARDIOPULMONARY RESUSCITATION EDUCATION	Ali Kemal ERENLER Behice Hande ERENLER Ahmet BAYDI	Hitit University, Çorum, Türkiye Ondokuzmayıs University, Samsun, Türkiye
ANALYSIS OF POSTGRADUATE THESES ON EXERCISE AND SPORTS FOR DISABLED PEOPLE IN TURKEY FROM VARIOUS VARIABLES (2019-2024)	Elif Dilan ATILGAN Abdullah TÜRKMEN Gonca İNCE	Batman University, Türkiye Çukurova University, Türkiye
DIAGNOSTIC APPROACH TO LONG-TERM DYSPEPTIC COMPLAINTS: DIVERTICLE IN THE ANTRUM	Eda YILDIZHAN Alper KIZIL Burak Veli ÜLGER Şehriban DURSUN DAĞ	Dicle University, Türkiye
ULCERATED LESION IN THE ANTHROPYLORIC REGION: CASE REPORT	Eda YILDIZHAN Alper KIZIL Burak Veli ÜLGER Şehriban DURSUN DAĞ	Dicle University, Türkiye

28.01.2025

Session-1 / Hall-4

Texas Time: 09⁰⁰-11⁰⁰

Ankara Time: 17⁰⁰-19⁰⁰

HEAD OF SESSION: Prof. Dr. Adnan Celik

TOPIC TITLE	AUTHORS	AFFILIATION
THE INFLUENCE OF DIGITAL EPISTEMOLOGICAL BELIEFS ON LEARNING AND KNOWLEDGE CONSTRUCTION	Elvan GÖKÇEN Burhan AKPINAR Eyüp İZCİ	İzmir Demokrasi University, Türkiye Fırat University, Türkiye İnönü University, Türkiye
THE EFFECT OF MANAGERS' PERCEPTION OF INNOVATION ON COMPANY PERFORMANCE	Meral Arslan	Çanakkale Onsekiz Mart University, Türkiye
IMPORTANCE OF CORE COMPETENCIES IN CEO SUCCESS: SELECTIONS FROM TYPICAL EXAMPLES	Adnan Celik	Selcuk University, Türkiye
EFFECTS OF GLOBAL COMPANIES ON CLIMATE CHANGE	Adnan Celik	Selcuk University, Türkiye
NAVIGATING CHALLENGES, CURRENT PRACTICES AND REALITIES, AND EDUCATORS' FUTURE ASPIRATIONS: ESL/EFL CASE STUDY AT THE UNIVERSITY CONTEXT IN AZERBAIJAN	Turkanbayim Ahmadli	Karabakh University, Khankendi, Azerbaijan
INTERCULTURAL COMMUNICATION AND PUBLIC RELATIONS	Hacer Hande ERGİN ÇAĞATAY	Bitlis Eren University, Bitlis, Türkiye

28.01.2025

Session-1 / Hall-5

Texas Time: 09⁰⁰-11⁰⁰

Ankara Time: 17⁰⁰-19⁰⁰

HEAD OF SESSION: Assist. Prof. Dr. Fatih KAYA

TOPIC TITLE	AUTHORS	AFFILIATION
SMART PAINT TECHNOLOGY: TECHNOLOGICAL ADVANCEMENTS AND VARIOUS APPLICATION AREAS (MINI REVIEW)	Nuri BOZKURT Şeyda TAŞAR Fatih KAYA Gülbeyi DURSUN	Firat University, Türkiye
CHIMNEY INSTALLATION AND THERMAL- FLOW ANALYSIS IN COGENERATION SYSTEMS	Rabia Kaymaz Kürşat Tanrıver Mine Ak	Istanbul Health and Technology University, Türkiye
SYNTHESIS OF (Z)/(E) -ETHYL 2-PHENYL-2-(2- PHENYLHYDRAZONE) ACETATES	Gulnar Atakishiyeva Sevinç Muhtarova Shukufa Eyvazova Naila Veysova Sima Musayeva Ilhama Hamdullayeva Namiq Shikhaliyev	Baku State University, Baku, Azerbaijan Azerbaijan Technical University, Baku, Azerbaijan Baku Engineering University, Baku, Azerbaijan
SEISMIC EVALUATION OF A HISTORICAL MASONRY MOSQUE	Öznur AKDENİZ Erkut SAYIN	Firat University, Türkiye
INVESTIGATING THE DRUG DELIVERY POTENTIAL OF A SPHERICAL ZINC OXIDE NANOPARTICLE FOR FAVIPRAVIR	M. Emre Ersop Mustafa Kurban Şekip Esat Hayber	Bursa Uludağ University, Türkiye Ankara University, Türkiye
BENCHMARKING STREAMFLOW PERFORMANCE OF GR4J AND TUW MODELS USING ERA5 AND EOBS DATA OVER BARTIN RIVER	Oguzhan Murat Halat Abdullah Bin Masood Tolganay Baizhigit Berat Bayatkara Akif Zahid Genc Abuzer Durmaz Hasan Teke Eray Atalay Hazar Ege Gencer Yunus Emre Agan Berhan Selcuk Kalmuk Sevket Yilmaz Mehmet Cunejd Demirel	Istanbul Technical University, Türkiye Istanbul Gelisim University, Türkiye L. N. Gumilyov Eurasian National University, Astana, Kazakhstan
APPLICATIONS OF ARTIFICIAL INTELLIGENCE IN GEOTECHNICAL ENGINEERING PROBLEMS: A CASE STUDY OF EXCAVATION SUPPORT SYSTEM EVALUATION BASED ON PYTHON PROGRAM	Caner Karabulut Mert Tolon	Maltepe University, Türkiye

28.01.2025

Session-1 / Hall-6

Texas Time: 09⁰⁰-11⁰⁰

Ankara Time: 17⁰⁰-19⁰⁰

HEAD OF SESSION: Assoc.Prof. Dr. Bülent BAYRAKTAR

TOPIC TITLE	AUTHORS	AFFILIATION
INVESTIGATION OF THE ROLE OF THE FORMATION OF THE BLOOD-TESTICULAR BARRIER IN BIOMARKER ANDROGEN-BINDING PROTEIN PHYSIOLOGY AND REPRODUCTION	Şeyma AYDEMİR Bülent BAYRAKTAR	Hitit University, Türkiye Bayburt University, Türkiye
PHYSIOLOGY OF ACTIVIN HORMONE, AN AUTOCRINE/PARACRINE MODULATOR OF TESTIS AND OVARIUM DEVELOPMENT AND INVESTIGATION OF ITS ROLE IN REPRODUCTION	Şeyma AYDEMİR Bülent BAYRAKTAR	Hitit University, Türkiye Bayburt University, Türkiye
INVESTIGATION OF ADIPLINE HORMONE PHYSIOLOGY AND ITS ROLE IN OBESITY	Bülent BAYRAKTAR Seda ÇELİKEL TAŞCI	Bayburt University, Türkiye
INVESTIGATION OF DECORINE PHYSIOLOGY AND ITS ROLE IN DIABETES AND OBESITY	Seda ÇELİKEL TAŞCI Bülent BAYRAKTAR	Bayburt University, Türkiye
INVESTIGATION OF THE PHYSIOLOGY OF GALANIN HORMONE AND ITS ROLE IN COGNITIVE PERFORMANCE	Bülent BAYRAKTAR Süheyb OKUR	Bayburt University, Türkiye
PLACENTAL DYSFUNCTION AND FETAL GROWTH BIOMARKER PLACENTAL GROWTH FACTOR INVESTIGATION OF ITS PHYSIOLOGICAL ROLE IN PREGNANCY	Gökşad Cemil KOTAN Bülent BAYRAKTAR	Hitit University, Türkiye Bayburt University, Türkiye
INVESTIGATION OF THE PHYSIOLOGY AND ROLE OF NUTRITION OF CANCER BIOMARKER SURVIVIN	Tuğçe ORKUN ERKILIÇ Bülent BAYRAKTAR	Bayburt University, Türkiye
PHYSIOLOGY OF NEUROKIN B MODULATOR OF REPRODUCTIVE FUNCTION	Gökşad Cemil KOTAN Bülent BAYRAKTAR	Hitit University, Türkiye Bayburt University, Türkiye
INVESTIGATION OF TAU PROTEIN AND ITS PHYSIOLOGICAL ROLE IN LEARNING AND MEMORY PROCESSES	Süheyb OKUR Bülent BAYRAKTAR	Bayburt University, Türkiye
RELATIONSHIP BETWEEN CELLULAR AGING BIOMARKER SIRTUIN-1 PHYSIOLOGY AND NUTRITION	Bülent BAYRAKTAR Tuğçe ORKUN ERKILIÇ	Bayburt University, Türkiye
KANATLILARDA PODODERMATİT OLUŞUMU ÜZERİNE DİYETİN ETKİSİ	Hacer KAYA	Gümüşhane University, Türkiye
ALTERNATİF KABA YEM OLARAK MEYVE AĞACI YAPRAKLARI	Hacer KAYA	Gümüşhane University, Türkiye
BAZI HALOFİLİK MİKROORGANİZMALARIN TUZLULUK STRESİNDEKİ YONCADA (MEDİCAGO SATİVA) BAZI METABOLİK VE ANTİOKSİDAN PARAMETRELER ÜZERİNE ETKİLERİNİN BELİRLENMESİ	Dilara KAYNAR Fevziye Işıl KESBİÇ	Kastamonu University, Türkiye
INVESTIGATION OF THE ANTI CANCER AND	Gamze Betül ÜNAL	Kastamonu University, Türkiye

ANTIDIABETIC PROPERTIES OF ANISE (PIMPINELLA ANISUM) PLANT	Firat SEFAOĞLU Volkan GÜL	Bayburt University, Türkiye
INVESTIGATION OF THE ANTI CANCER AND ANTIDIABETIC PROPERTIES OF ANISE (PIMPINELLA ANISUM) PLANT	Gamze Betül ÜNAL Firat SEFAOĞLU Volkan GÜL	Kastamonu University, Türkiye Bayburt University, Türkiye

28.01.2025

Session-1 / Hall-7

Texas Time: 09⁰⁰-11⁰⁰

Ankara Time: 17⁰⁰-19⁰⁰

HEAD OF SESSION: Dr. SRINIVASAN

TOPIC TITLE	AUTHORS	AFFILIATION
ASSOCIATION OF RISK MANAGEMENT PRACTICES AND FINANCIAL PERFORMANCE OF MICROFINANCE INSTITUTIONS IN ETHIOPIA: A TWO-STEP SYSTEM GENERALIZED METHOD OF MOMENTS APPROACH	Megbaru Tesfaw Molla, Dr. Ratinder Kaur	Punjabi University, Patiala, India
RELATIONSHIP BETWEEN FEAR OF MISSING OUT (FOMO) AND CYBERLOAFING AMONG EMPLOYEES: MODERATING ROLE OF DARK TRIAD	Unsa Andleeb Ayub, Umm Eman Syed, Neelam Bibi, Dr. Anam Khan	Rawalpindi Women University, Rawalpindi, Pakistan. Rawalpindi Institute of Cardiology, Rawalpindi, Pakistan
PERSPECTIVE USE OF STONE MASTIC ASPHALT IN GEORGIA	Mariam Gvinjili Ph.D. Giorgi Chubinidze Ph.D. Manuchar Shishinashvili	Georgian Technical University
TESTING OF A CdS/g-C ₃ N ₄ /TiO ₂ TERNARY PHOTOCATALYSTS FOR PHOTOCATALYTIC APPLICATIONS	Syed Anam Shaheen Abbas Shah, Muhammad Shoaib, Muhammad Ayyaz, Muhammad Yasin Naz, Shazia Shukrullah	University of Agriculture Faisalabad, 38040, Pakistan
ANTICANCER DRUG DISCOVERY BASED ON NATURAL PRODUCTS: FROM COMPUTATIONAL APPROACHES TO CLINICAL STUDIES	A. Dinesh babu, E.Velmurugan, MD.Shanur Rahman, Dr.srinivasan	Bharath Institute Of Higher Education And Research Chennai, India
RUMINANT MANAGEMENT: PHYTOCHEMICALS AS A SOURCE OF MEDICINE	FANIYI, Tolulope Oreoluwa	Ajayi Crowther University, Africa
STRATEGIC DIMENSIONS OF MARITIME DIPLOMACY IN THE INDO-PACIFIC: A GEOPOLITICAL ANALYSIS	Md.Mizanur Rahman	Bangabandhu Sheikh Mujibur Rahman Science and Technology University Gopalganj Bangladesh
PHARMACOLOGY ASPECT OF THE CLITORIS TERNATEA	Selvakumar V, Vijayalakshmi M, Sheron Kevin S, Venkateshwaran, Ashwini A, Hamsini Eisha E	Bharath institute of higher education and research institute
THUTHI LEAF	D. ANUSHYA, R.SARAVANAN, Dr. SRINIVASAN	Bharath Institute Of Higher Education And Research,Chennai.
ROLE OF GENOMIC PROTEOMICS AND BIOINFORMATICS	V.Ranjani, K.M.Keerthivasan, Dr.W. Helen	Bharath Institute of Higher Education and Research, Chennai, Tamilnadu, India.

28.01.2025

Session-1 / Hall-8

Texas Time: 09⁰⁰-11⁰⁰

Ankara Time: 17⁰⁰-19⁰⁰

HEAD OF SESSION: Lecturer, PhD Irina-Ana DROBOT

TOPIC TITLE	AUTHORS	AFFILIATION
COMPARISON AND EVALUATION OF THE HEALTH BENEFITS OF DIETARY HABITS OF POLISH AND GREEK STUDENTS USING THE PRO-HEALTHY INDEX (p-HDI-10)	Patrycja Widłak Marzena Malara Anna Kuk Aspasia Dania Georgia Panagiotakou Georgia Papoulia	Józef Piłsudski University of Physical Education in Warsaw, Poland National and Kapodistrian University of Athens, Greece
EVALUATION AND COMPARISON OF FOOT ARCH AND PHYSICAL FITNESS IN ATHLETES TRAINING IN FOOTBALL AND KARATE	Patrycja WIDŁAK Anna KOPICZKO Bartłomiej MICHALAK Zbigniew TYC	Józef Piłsudski University of Physical Education in Warsaw, Poland
IMMERSION IN COLD WATER ON EPIPHANY: MEANINGS	Irina-Ana DROBOT	Technical University of Civil Engineering Bucharest, Romania
SUFISM AND SPIRITUAL, SOCIAL, AND POLITICAL REFORMATION IN THE LIGHT OF SIRAH OF THE PROPHET MUHAMMAD (PBUH)	Naseem Akhter	Shaheed Benazir Bhutto Women University, Peshawar, Pakistan
THE ROLE OF CIVIL SOCIETY AND EDUCATIONAL INSTITUTIONS IN PROMOTING PEACEFUL COEXISTENCE (A RESEARCH REVIEW)	Naseem Akhter	Shaheed Benazir Bhutto Women University, Peshawar, Pakistan
MUHAMMAD (PBUH): A MODEL FOR RESOLVING NATIONAL ISSUES AND EXEMPLARY LEADERSHIP	Naseem Akhter	Shaheed Benazir Bhutto Women University, Peshawar, Pakistan
INTEGRATED PLAY-BASED LEARNING IN LEBANESE PRE-PRIMARY EDUCATION: ENHANCING ACADEMIC COMPETENCES AND SOCIOEMOTIONAL DEVELOPMENT	Aya Jaber	Saint Joseph University Of Beirut
HARNESSING ARTIFICIAL INTELLIGENCE TO ACHIEVE SUSTAINABLE DEVELOPMENT GOALS: OPPORTUNITIES, CHALLENGES, AND ETHICAL CONSIDERATIONS	Ndubuisi-Okolo Purity Uzoamaka, PhD	Nnamdi Azikiwe University, Awka, Anambra State.
AVAILABILITY AND UTILIZATION OF VIRTUAL AND AUGMENTED REALITY TOOLS FOR TEACHING SENIOR SCHOOL PHYSICS IN ILORIN, NIGERIA	Aishat A. Yusuf, A. O. Akanbi, R. E Mohammed, W. O. Yahaya, S. A. Abdulkadir, Sikirat I. Mustapha	University of Ilorin, Ilorin, Nigeria Federal College of Education, Kano, Nigeria
ASSOCIATION OF RISK MANAGEMENT PRACTICES AND FINANCIAL PERFORMANCE OF MICROFINANCE INSTITUTIONS IN ETHIOPIA: A TWO-STEP SYSTEM GENERALIZED METHOD OF MOMENTS APPROACH	Megbaru Tesfaw Molla Ratinder Kaur	Punjabi University, Patiala, India

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Session-1 / Hall-9

Texas Time: 09⁰⁰-11⁰⁰

Ankara Time: 17⁰⁰-19⁰⁰

HEAD OF SESSION: Chukwuemeka Godson Eme

TOPIC TITLE	AUTHORS	AFFILIATION
FEATURE ENGINEERING AND DATA FUSION: A COMPREHENSIVE APPROACH TO BRAIN STROKE PREDICTION USING CLINICAL AND IMAGING DATA	Ramesh babu Vure Lalitha Kumari Pappala	VITAP University, Amravati, Andhra Pradesh, India
PROCEDURAL FEATURES OF THE MECHANISM FOR CONCENTRATING EVIDENCE IN VARIOUS FORMS OF ACCELERATED PROCEEDINGS	ARSENI Igor	Comrat State University, Republic of Moldova
A REVIEW ON: THE CONCEPT OF HUMAN BEHAVIOURS ACCORDING TO PSYCHOLOGY	Jayeeta Brahmachari Namrata Kumari Smita Biswas	Gauhati University
AN EPIDEMIOLOGICAL STUDY OF ACID BURN INCIDENTS IN PAKISTAN: CAUSES, CONSEQUENCES AND PREVENTION STRATEGIES	Eman Atiq, Maheen Mujeeb, Mujeeb Ur Rehman, Bilal Atiqi	Rawalpindi Women University, Rawalpindi Vandebilt Catholic high school Houma, Louisiana United state Schlumberger wireline engineer Gulf of mexico, Louisiana United state
DESIGN AND IMPLEMENTATION OF A COMPUTERIZED RESTAURANT MANAGEMENT INFORMATION SYSTEM: A STUDY OF JEVENIKS RESTAURANT LTD., ABUJA FCT	Chukwuemeka Godson Eme	National Open University of Nigeria (NOUN), Jabi-Abuja, Nigeria
THE IMPACTS OF MULTINATIONAL CORPORATIONS ON THE SOCIO-ECONOMIC DEVELOPMENT OF NIGERIA (A CASE STUDY OF NIGERIA BREWERIES PLC)	Chukwuemeka Godson Eme Kayode Kadiri	National Open University of Nigeria (NOUN), Jabi-Abuja, Nigeria
YORUBA ARCHITECTURAL DESIGN GENERATIVE SYSTEM: A MACHINE LEARNING APPROACH USING SHAPE GRAMMAR AND TEACHABLE MACHINE MODELS	AbdulRaheem Bolaji Olananbi	University of Abuja, FCT, Abuja

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

CONTENT

CONGRESS ID	I
SCIENTIFIC COMMITTEE	II
PHOTO GALLERY	III
PROGRAM	IV
CONTENT	V

Author	Title	No
Ömer Eyüboğlu Gökhan Eyüboğlu	EVALUATION OF AGRICULTURAL WASTE FOR BIOMASS ENERGY POWER PLANTS: TÜRKİYE (KİRSEHİR PROVINCE CASE)	1
Luis Felipe Hernández Jiménez Sandra Paola Pérez Beltrán Yazmín Isolda Álvarez García	EL CONSUMO DE COCA COLA EN LOS ESTUDIANTES DE LA LICENCIATURA EN DERECHO DE LA DIVISIÓN ACADÉMICA DE CIENCIAS SOCIALES Y HUMANIDADES, LA VULNERACIÓN A SU DERECHO HUMANO A LA SALUD	2
Unsa Andleeb Ayub, Umm Eman Syed, Neelam Bibi, Dr. Anam Khan	RELATIONSHIP BETWEEN FEAR OF MISSING OUT (FOMO) AND CYBERLOAFING AMONG EMPLOYEES: MODERATING ROLE OF DARK TRIAD	9
Ali Kemal ERENLER Mehmet Oğuzhan AY Behice Hande ERENLER	BIBLIOMETRIC ANALYSIS OF GLUTATHIONE ARTICLES SINCE 1975	10
Ali Kemal ERENLER Behice Hande ERENLER Ahmet BAYDIN	RELIABILITY OF YOUTUBE© VIDEOS IN TERMS OF CARDIOPULMONARY RESUSCITATION EDUCATION	12
Nuri BOZKURT Şeyda TAŞAR Fatih KAYA Gülbeysi DURSUN	SMART PAINT TECHNOLOGY: TECHNOLOGICAL ADVANCEMENTS AND VARIOUS APPLICATION AREAS (MINI REVIEW)	14
Rabia Kaymaz Kürşat Tanrıver Mine Ak	CHIMNEY INSTALLATION AND THERMAL-FLOW ANALYSIS IN COGENERATION SYSTEMS	16
Major Gheorghe GIURGIU Manole COJOCARU	MICROBIOTA MODULATION AS THERAPEUTIC APPROACH IN THE NEUROPATHIC PAIN IN DOG WITH SPINAL CORD INJURY: IMPACT OF POLENOPLASMIN	17
Gulnar Atakishiyeva Sevinç Muhtarova Shukufa Eyvazova Naila Veysova Sima Musayeva Ilhama Hamdullayeva Namiq Shikhaliyev	SYNTHESIS OF (Z)/(E) -ETHYL 2-PHENYL-2-(2-PHENYLHYDRAZONE) ACETATES	18
Ayesha Batool, Farkhanda Anjum, Hafsa Naeem, Rimsha Anwar, Zainab Fatima, Memona Liaqat, Hina Shahid	MENTAL HEALTH CHALLENGES FACED BY WORKING WOMEN IN PAKISTAN	20

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

Erkisheva Zhazira Kenesbai Arailım Zhadiger Symbat	USE OF SMART CUBE IN EDUCATION	21
Ali Durmuş	THE TORSIONAL MECHANICAL PROPERTIES OF TI ALLOY BAR PRODUCED BY ADDITIVE MANUFACTURING	27
Elif Dilan ATILGAN Abdullah TÜRKMEN Gonca İNCE	ANALYSIS OF POSTGRADUATE THESES ON EXERCISE AND SPORTS FOR DISABLED PEOPLE IN TURKEY FROM VARIOUS VARIABLES (2019-2024)	32
Patrycja WIDŁAK Anna KOPICZKO Bartłomiej MICHALAK Zbigniew TYC	EVALUATION AND COMPARISON OF FOOT ARCH AND PHYSICAL FITNESS IN ATHLETES TRAINING IN FOOTBALL AND KARATE	34
Patrycja Widłak Marzena Malara Anna Kuk Aspasia Dania Georgia Panagiotakou Georgia Papoulia	COMPARISON AND EVALUATION OF THE HEALTH BENEFITS OF DIETARY HABITS OF POLISH AND GREEK STUDENTS USING THE PRO-HEALTHY INDEX (p-HDI-10)	35
Meral Arslan	THE EFFECT OF MANAGERS' PERCEPTION OF INNOVATION ON COMPANY PERFORMANCE	36
Nigar Aliyeva Atiga Abdullayeva	THE RELEVANCE OF ENVIRONMENTAL POLLUTION WITH HEAVY METALS	37
M. Emre Ersop Mustafa Kurban Şekip Esat Hayber	INVESTIGATING THE DRUG DELIVERY POTENTIAL OF A SPHERICAL ZINC OXIDE NANOPARTICLE FOR FAVIPRAVIR	39
Mohammed Waheeb	THE DISCOVERY OF THE OLDEST CHURCHES IN JORDAN- SOUTH LEVANT	40
Ivan Pavlovic Aleksandra Tasic	EPIDEMIOLOGICAL ASPECTS OF PIGEONS IN THE URBAN ENVIRONMENT	41
Frimehdi Nourelddine Djabeur Abderrazak	THE EFFECT OF SULFURIC ACID ON THE GERMINATION OF SEEDS OF THE CAROB TREE CERATONIA SILIQUA.L IN ALGERIA	42
Aghja Valiyeva Bayram	NEXT-GENERATION SEQUENCING IN FERMENTED FOOD MICROBIOLOGY: A GATEWAY TO UNDERSTANDING FOOD SAFETY AND QUALITY	43
Naseem Akhter	SUFISM AND SPIRITUAL, SOCIAL, AND POLITICAL REFORMATION IN THE LIGHT OF SIRAH OF THE PROPHET MUHAMMAD (PBUH)	47
Naseem Akhter	THE ROLE OF CIVIL SOCIETY AND EDUCATIONAL INSTITUTIONS IN PROMOTING PEACEFUL COEXISTENCE (A RESEARCH REVIEW)	48
Naseem Akhter	MUHAMMAD (PBUH): A MODEL FOR RESOLVING NATIONAL ISSUES AND EXEMPLARY LEADERSHIP	49
Balasubramani G L, Rinky Rajput, Manish Gupta, Pradeep Dahiya, Jitendra K Thakur, Rakesh Bhatnagar, Abhinav Grover	STRUCTURE-BASED DRUG REPURPOSING TO INHIBIT THE DNA GYRASE OF MYCOBACTERIUM TUBERCULOSIS	50
hmed Salim, A. El Bouari, M. Tahiri, O. Tanane	PRESERVATION OF THE ENVIRONMENT BY REMOVING COPPER FROM WASTEWATER FROM METAL PLATING VIA ELECTROCOAGULATION	51

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

Mizanur Rahman	STRATEGIC DIMENSIONS OF MARITIME DIPLOMACY IN THE INDO-PACIFIC: A GEOPOLITICAL ANALYSIS	54
Selvakumar V, Vijayalakshmi M, Sheron Kevin S, Venkateshwaran, Ashwini A, Hamsini Eisha E	PHARMACOLOGY ASPECT OF THE CLITORIS TERNATEA	55
Anushya, R.Saravanan, Srinivasan	THUTHI LEAF	56
V.Ranjani, K.M.Keerthivasan, W. Helen	ROLE OF GENOMIC PROTEOMICS AND BIOINFORMATICS	57
Öznur AKDENİZ Erkut SAYIN	SEISMIC EVALUATION OF A HISTORICAL MASONRY MOSQUE	58
Eda YILDIZHAN Alper KIZIL Burak Veli ÜLGER Şhriban DURSUN DAĞ	ULCERATED LESION IN THE ANTHROPYLORIC REGION: CASE REPORT	68
Eda YILDIZHAN Alper KIZIL Burak Veli ÜLGER Şhriban DURSUN DAĞ	DIAGNOSTIC APPROACH TO LONG-TERM DYSPEPTIC COMPLAINTS: DIVERTICLE IN THE ANTRUM	73
Turkanbayim AHMADLI	NAVIGATING CHALLENGES, CURRENT PRACTICES AND REALITIES, AND EDUCATORS' FUTURE ASPIRATIONS: ESL/EFL Case Study at the university context in Azerbaijan	78
Adnan Celik	IMPORTANCE OF CORE COMPETENCIES IN CEO SUCCESS: SELECTIONS FROM TYPICAL EXAMPLES	87
Adnan Celik	EFFECTS OF GLOBAL COMPANIES ON CLIMATE CHANGE	95
Şeyma AYDEMİR Bülent BAYRAKTAR	INVESTIGATION OF THE ROLE OF THE FORMATION OF THE BLOOD TESTICULAR BARRIER IN BIOMARKER ANDROGEN-BINDING PROTEIN PHYSIOLOGY AND REPRODUCTION	103
Bülent BAYRAKTAR Seda ÇELİKEL TAŞCI	INVESTIGATION OF ADIPLINE HORMONE PHYSIOLOGY AND ITS ROLE IN OBESITY	107
Şeyma AYDEMİR Bülent BAYRAKTAR	PHYSIOLOGY OF ACTIVIN HORMONE, AN AUTOCRINE/PARACRINE MODULATOR OF TESTIS AND OVARUM DEVELOPMENT AND INVESTIGATION OF ITS ROLE IN REPRODUCTION	111
Seda ÇELİKEL TAŞCI Bülent BAYRAKTAR	INVESTIGATION OF DECORINE PHYSIOLOGY AND ITS ROLE IN DIABETES AND OBESITY	117
Bülent BAYRAKTAR Süheyb OKUR	INVESTIGATION OF THE PHYSIOLOGY OF GALANIN HORMONE AND ITS ROLE IN COGNITIVE PERFORMANCE	122
Gökşad Cemil KOTAN Bülent BAYRAKTAR	PHYSIOLOGY OF NEUROKIN B MODULATOR OF REPRODUCTIVE FUNCTION	128
Gökşad Cemil KOTAN Bülent BAYRAKTAR	PLACENTAL DYSFUNCTION AND FETAL GROWTH BIOMARKER PLACENTAL GROWTH FACTOR INVESTIGATION OF ITS PHYSIOLOGICAL ROLE IN PREGNANCY	133
Bülent BAYRAKTAR Tuğçe ORKUN ERKİLİÇ	RELATIONSHIP BETWEEN CELLULAR AGING BIOMARKER SIRTUIN-1 PHYSIOLOGY AND NUTRITION	137

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

Tuğçe ORKUN ERKILIÇ Bülent BAYRAKTAR	INVESTIGATION OF THE PHYSIOLOGY AND ROLE OF NUTRITION OF CANCER BIOMARKER SURVIVIN	144
Süheyb OKUR Bülent BAYRAKTAR	INVESTIGATION OF TAU PROTEIN AND ITS PHYSIOLOGICAL ROLE IN LEARNING AND MEMORY PROCESSES	151
Irina-Ana DROBOT	IMMERSION IN COLD WATER ON EPIPHANY: MEANINGS	157
Caner Karabulut Mert Tolon	APPLICATIONS OF ARTIFICIAL INTELLIGENCE IN GEOTECHNICAL ENGINEERING PROBLEMS: A CASE STUDY OF EXCAVATION SUPPORT SYSTEM EVALUATION BASED ON PYTHON PROGRAM	163
Oguzhan Murat Halat Abdullah Bin Masood Tolganay Baizhigit Berat Bayatkara Akif Zahid Genc Abuzer Durmaz Hasan Teke Eray Atalay Hazar Ege Gencer Yunus Emre Agan Berhan Selcuk Kalmuk Sevket Yilmaz Mehmet Cuneyd Demirel	BENCHMARKING STREAMFLOW PERFORMANCE OF GR4J AND TUW MODELS USING ERA5 AND EObs DATA OVER BARTIN RIVER	181
Elvan GÖKÇEN Burhan AKPINAR Eyüp İZCİ	THE INFLUENCE OF DIGITAL EPISTEMOLOGICAL BELIEFS ON LEARNING AND KNOWLEDGE CONSTRUCTION	191
Barakat Abdul Razzaq Mutar	OVER EXPRESSION RECOMBINATION STAPHYLOKINASE WITH R HUMAN GROWTH HORMONE (SAK-PET21a-rhGH)	199
Mehdi Shalchi Tousi	OPTIMUM DESIGN OF REINFORCED CONCRETE CANTILEVER MFO OPTIMIZATION ALGORITHM	200
Esat Bardhoshi	THE USE OF ANTIBIOTICS IN ORAL SURGERY	201
Ghazala Yunus, Mohammed Kuddus	COLD-ACTIVE MICROBIAL CELLULASE: NOVEL APPROACH TO UNDERSTAND MECHANISM AND ITS APPLICATIONS IN FOOD AND BEVERAGES INDUSTRY	202
Mehwash Kashif, Mehwash Kashif Aman Ashar Syeda Nimra Qadri M. Asfahan Shah	EFFECTS OF PROBIOTICS ON ORAL MICROBIOLOGICAL ENVIRONMENT, GINGIVAL HEALTH AND DENTAL PLAQUE; A META-ANALYSIS	203
Aya Jaber	INTEGRATED PLAY-BASED LEARNING IN LEBANESE PRE-PRIMARY EDUCATION: ENHANCING ACADEMIC COMPETENCES AND SOCIOEMOTIONAL DEVELOPMENT	204
Ndubuisi-Okolo Purity Uzoamaka	HARNESSING ARTIFICIAL INTELLIGENCE TO ACHIEVE SUSTAINABLE DEVELOPMENT GOALS: OPPORTUNITIES, CHALLENGES, AND ETHICAL CONSIDERATIONS	205
Aishat A. Yusuf, A. O. Akanbi, R. E Mohammed, W.	AVAILABILITY AND UTILIZATION OF VIRTUAL AND AUGMENTED REALITY TOOLS FOR TEACHING SENIOR SCHOOL PHYSICS IN ILORIN, NIGERIA	206

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

O. Yahaya, S. A. Abdulkadir, Sikirat I. Mustapha		
Megbaru Tesfaw Molla Ratinder Kaur	ASSOCIATION OF RISK MANAGEMENT PRACTICES AND FINANCIAL PERFORMANCE OF MICROFINANCE INSTITUTIONS IN ETHIOPIA: A TWO-STEP SYSTEM GENERALIZED METHOD OF MOMENTS APPROACH	207
Mariam Gvinjili Giorgi Chubinidze Manuchar Shishinashvili	PERSPECTIVE USE OF STONE MASTIC ASPHALT IN GEORGIA	208
Syed Anam Shaheen Abbas Shah, Muhammad Shoab, Muhammad Ayyaz, Muhammad Yasin Naz, Shazia Shukrullah	TESTING OF A CdS/g-C ₃ N ₄ /TiO ₂ TERNARY PHOTOCATALYSTS FOR PHOTOCATALYTIC APPLICATIONS	211
A. Dinesh babu, E.Velmurugan, Shanur Rahman, srinivasan	ANTICANCER DRUG DISCOVERY BASED ON NATURAL PRODUCTS: FROM COMPUTATIONAL APPROACHES TO CLINICAL STUDIES	212
FANIYI, Tolulope Oreoluwa	RUMINANT MANAGEMENT: PHYTOCHEMICALS AS A SOURCE OF MEDICINE	213
Volkan GÜL Fırat SEFAOĞLU	INVESTIGATION OF THE PROPERTIES OF THE HERB HOUSELEEK (RUMEX PATIENTIA L.), WHICH HAS ANTIMICROBIAL ACTIVITY AND SUPPORTS THE IMMUNE SYSTEM	214
Volkan GÜL Fırat SEFAOĞLU	INVESTIGATION OF THE PROPERTIES OF GILABURN (Viburnum opulus L.) PLANT SUPPORTING KIDNEY FUNCTION	220
Ramesh babu Vure Lalitha Kumari Pappala	FEATURE ENGINEERING AND DATA FUSION: A COMPREHENSIVE APPROACH TO BRAIN STROKE PREDICTION USING CLINICAL AND IMAGING DATA	226
ARSENI Igor	PROCEDURAL FEATURES OF THE MECHANISM FOR CONCENTRATING EVIDENCE IN VARIOUS FORMS OF ACCELERATED PROCEEDINGS	227
Jayeeta Brahmachari Namrata Kumari Smita Biswas	A REVIEW ON: THE CONCEPT OF HUMAN BEHAVIOURS ACCORDING TO PSYCHOLOGY	232
Eman Atiq Maheen Mujeeb Mujeeb Ur Rehman Bilal Atiqi	AN EPIDEMIOLOGICAL STUDY OF ACID BURN INCIDENTS IN PAKISTAN: CAUSES, CONSEQUENCES AND PREVENTION STRATEGIES	233
Chukwuemeka Godson Eme	DESIGN AND IMPLEMENTATION OF A COMPUTERIZED RESTAURANT MANAGEMENT INFORMATION SYSTEM: A STUDY OF JEVENIKS RESTAURANT LTD., ABUJA FCT	234
Chukwuemeka Godson Eme Kayode Kadiri	THE IMPACTS OF MULTINATIONAL CORPORATIONS ON THE SOCIO-ECONOMIC DEVELOPMENT OF NIGERIA (A CASE STUDY OF NIGERIA BREWERIES PLC)	254
AbdulRaheem Bolaji Olakanbi	YORUBA ARCHITECTURAL DESIGN GENERATIVE SYSTEM: A MACHINE LEARNING APPROACH USING SHAPE GRAMMAR AND TEACHABLE MACHINE MODELS	276
Hacer KAYA	ALTERNATİF KABA YEM OLARAK MEYVE AĞACI YAPRAKLARI	277

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

Hacer KAYA	KANATLILARDA PODODERMATİT OLUŞUMU ÜZERİNE DİYETİN ETKİSİ	285
Hacer Hande ERGİN ÇAĞATAY	INTERCULTURAL COMMUNICATION AND PUBLIC RELATIONS	299
Dilara KAYNAR Fevziye Işıl KESBİÇ	BAZI HALOFİLİK MİKROORGANİZMALARIN TUZLULUK STRESİNDEKİ YONCADA (MEDİCAGO SATİVA) BAZI METABOLİK VE ANTİOKSİDAN PARAMETRELER ÜZERİNE ETKİLERİNİN BELİRLENMESİ	305
Gamze Betül ÜNAL Fırat SEFAOĞLU Volkan GÜL	INVESTIGATION OF THE ANTICANCER AND ANTIDIABETIC PROPERTIES OF ANISE (PIMPINELLA ANISUM) PLANT	312
Gamze Betül ÜNAL Fırat SEFAOĞLU Volkan GÜL	INVESTIGATION OF THE ANTI CANCER AND ANTIDIABETIC PROPERTIES OF ANISE (PIMPINELLA ANISUM) PLANT	319

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

EVALUATION OF AGRICULTURAL WASTE FOR BIOMASS ENERGY POWER PLANTS: TÜRKİYE (KİRSEHİR PROVINCE CASE)

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ABSTRACT

Our country is in a lucky position in terms of biomass potential. Among the renewable energy sources, biomass technology is increasingly demanding in recent years due to incentives. Biomass; Sustainability is a renewable source of energy that has some important advantages such as not being able to cause unwanted impact on the environment. Biogerm biomass power plant, which is established in the district of Kirsehir, is a good example of this and energy production is carried out by using agricultural -based vegetable waste.

In the facility, the corn plant, which is widely breeding in our country, was used after harvesting corn stem, tree root, poplar lid and pine lid which were not evaluated in any way. The wastes covered by biomass in the facility are burned in the moving grilled biomass boiler. As a result of the evaporation of water from heat energy released as a result of combustion, electricity is produced and 468.48 tons/day agricultural waste from agricultural waste is eliminated and 19,500 MWe installed power is obtained. Biomass boiler; In the moving grille type, the natural circulatory water pipe is a high -pressure hot steam boiler feature and the process is a thermochemical transformation process obtained from biomass fuel.

Biomass boiler; In the moving grille type, the natural circulatory water pipe is a high -pressure hot steam boiler feature and the process is a thermochemical transformation process obtained from biomass fuel. 9.891 annually from the facility, 85 tons of ash are released and the corn stalk is considered as the most commonly used agricultural waste with 186,506 tons annually, while the pine cover was considered as the least used agricultural waste with 4,500 tons.

Although the ash content of the products varies according to the particle size and mold temperature, it was generally around 5 %. The ash ratios of field plants were found to be higher than the ash ratio of the products made of tree species. The ash waste is sent for use as raw materials in cement factories.

Biomass power plant contributes to the national economy by increasing the employment rate in the region, while greenhouse gases reduce the emission and carbon cycle and support the green industry with the development of rural economy.

Keywords: Biomass, Economy, Energy, Kirsehir.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

EL CONSUMO DE COCA COLA EN LOS ESTUDIANTES DE LA LICENCIATURA EN DERECHO DE LA DIVISIÓN ACADÉMICA DE CIENCIAS SOCIALES Y HUMANIDADES, LA VULNERACIÓN A SU DERECHO HUMANO A LA SALUD

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RESUMEN

El presente trabajo aborda el tema de “El consumo de Coca Cola en los estudiantes de la licenciatura en derecho de la División Académica de Ciencias Sociales y Humanidades, la vulneración a su derecho humano a la salud” Es un estudio descriptivo, transversal, observacional y documental. El objetivo es Estudiar el impacto del consumo de Coca-Cola en estudiantes de la UJAT a fin de sugerir a las autoridades estudiantiles combinar esfuerzos educativos, políticas públicas y acciones individuales para promover hábitos alimenticios saludables y reducir el consumo de bebidas azucaradas en universidades. Además, se debe aumentar la conciencia sobre los daños a largo plazo del consumo de estas bebidas. En México, el refresco se convirtió en una bebida muy presente en la vida cotidiana y festividades, Estos niveles de consumo, dañan la salud y se asocian con obesidad y enfermedades crónicas no transmisibles como la diabetes. Por esto el interés de hacer este estudio en la comunidad estudiantil con el propósito de implementar el conocimiento y ayudar a disminuir el consumo excesivo de los refrescos. México es el mayor consumidor de refrescos; 70% de los mexicanos con sobrepeso. Entre los resultados se obtuvo que 31 estudiantes encuestados; 4 prefieren Coca-Cola; consumo ocasional: 19 estudiantes; 5 diario y la percepción del precio: más de la mitad lo considera caro. En conclusión, se cuenta con un problema de consumo, muchos factores son por publicidad o mismos que se tiene la costumbre de consumir ya sea por consumos excesivos en sus viviendas.

PALABRAS CLAVE: Consumo, derecho humano, salud.

ABSTRACT

This paper addresses the issue of “Coca-Cola consumption by law students of the Academic Division of Social Sciences and Humanities, the violation of their human right to health.” It is a descriptive, cross-sectional, observational and documentary study. The objective is to study the impact of Coca-Cola consumption on UJAT students in order to suggest that student authorities combine educational efforts, public policies and individual actions to promote healthy eating habits and reduce the consumption of sugary drinks in universities. In addition, awareness should be raised about the long-term damage caused by the consumption of these drinks. In Mexico, soda has become a very present drink in daily life and festivities. These levels of consumption damage health and are associated with obesity and chronic non-communicable diseases such as diabetes. For this reason, there is interest in doing this study in the student community with the purpose of implementing knowledge and helping to reduce excessive

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

consumption of soft drinks. Mexico is the largest consumer of soft drinks; 70% of Mexicans are overweight. Among the results, it was obtained that 31 students surveyed; 4 prefer Coca-Cola; occasional consumption: 19 students; 5 daily and the perception of the price: more than half consider it expensive. In conclusion, there is a consumption problem, many factors are due to advertising or the fact that people have the habit of consuming it either due to excessive consumption in their homes.

KEYWORD: Consumption, human right, health.

Introducción

Este trabajo ofrece una reflexión en torno al problema del alto consumo de refresco en universidades en Tabasco, México. Utilizando fuentes de información secundarias, se aborda el problema, sin la intención de ser exhaustivo, pues alrededor de este tema se ha construido mucha evidencia y desde diferentes puntos de vista.

Se eligió a la Coca-Cola, debido a que esta empresa comercializa una de las bebidas más consumidas a nivel mundial [1], por lo cual se dará una mirada al impacto que genera en la sociedad estudiantil de la UJAT

La Coca-Cola en México se ha vuelto la bebida del día a día de las familias mexicanas tanto así que en lugares como Chiapas se ha vuelto parte de sus tradiciones el consumo de esta bebida azucarada, esto debido a diferentes factores como falta de agua potable o un bombardeo constante de publicidad, ubicándolo no solo como el estado que más coca cola consume en México, sino que ocupa el primer lugar como el mayor consumidor a nivel global.

La Organización Mundial de la Salud (OMS) pronostica que, para el 2025, habrá 70 millones de niños con sobrepeso y obesidad en el mundo. Precisamente en los países donde se espera un mayor aumento de su prevalencia es en aquellos con ingresos bajos o medios, donde hasta hace poco había graves problemas de hambre y acceso a los alimentos. De acuerdo con los estudios realizados por la misma organización, en gran parte del mundo hay un elevado consumo de bebidas azucaradas, las cuales contienen sacarosa. [2]

Historia de la marca Coca-Cola en el mundo

La historia de Coca-Cola comenzó en un jardín de Atlanta Georgia, EE. UU, hace más de 100 años cuando John Perberton, farmacéutico de profesión, invento la bebida más conocida del mundo el 8 del mes de mayo de 1886, al descubrir un jarabe de gusto fragante y delicioso, con efecto, tónico estimulante, reconstituyente, que inmediatamente comenzó a venderse en la fuente de soda e la Farmacia Jacobs. [3]

El contador de esta fuente de soda, Frank Robinson, amigo de Perberton, fue otro de los artífices del "milagro" puso al jarabe el nombre de COCA-COLA, pensando que las dos "C" serian efectivas en los anuncios, de su puño y letra creo el logotipo que se ha traducido a más de ochenta idiomas. En 1888 vendió sus derechos a Asa Candler por nada menos que 2300 dólares a pagar en dos años. En 1891 Candler promociono y vendió COCA-COLA fuera del estado de Georgia.[3]

En 1892 Asa Candler crea The Coca-Cola Company con un capital inicial de cien mil dólares y el 31 de enero de 1893 inscribe la marca Coca-Cola en la oficina de patentes de EE.UU. Para hacer frente a la creciente demanda de Coca-Cola, Candler quería una bebida que debía ser única y original y que fuese reconocida incluso en la oscuridad. En 1915 Alexander Samuelson de la Root Glass Company de Indiana, pensando en una silueta femenina diseño la botella inconfundible, que perdura hasta hoy. [3]

La década del 50 es la era de la consolidación asociándose con embotelladores de diversos países. Actualmente, Coca-Cola se vende en 190 países de todo el mundo, donde se ha convertido en algo más que una bebida, pues es parte de la vida cotidiana asociada a un momento en la vida de cada persona y es la marca más conocida del mundo. [3]

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La Coca-Cola en México

De acuerdo con datos de la Universidad de Yale, México es el primer consumidor de refrescos en el mundo con un promedio de 163 litros por persona al año, que significa 40 por ciento más que Estados Unidos, que, a su vez, ocupa el segundo lugar con 118 litros [4]

“En promedio, una familia mexicana destina 10 por ciento de sus ingresos totales a la compra de refrescos, 24 por ciento a otros alimentos y bebidas, y 66 por ciento a vivienda, educación y vestimenta, entre otros. Pero lo que es realmente preocupante es que, según *El Poder del Consumidor*, el consumo de bebidas azucaradas mata al año 24 mil mexicanos por la ingesta calórica y son quienes fallecen más en la región”, refirió Florence L. Theodore, del Instituto Nacional de Salud Pública, al dictar la conferencia La Construcción Cultural del Consumo de los Refrescos en México, en el Instituto de Investigaciones Sociales.[4]

El consumo de la Coca Cola

Se considera un problema el consumo excesivo de bebidas embotelladas, principalmente en de la empresa refresquera Coca Cola, no solo por causar problemas de salud en sus consumidores, sino también de forma ambiental, The Coca-Cola Company extrae recursos naturales de regiones en donde están sus mega fábricas.

Es de considerar que el consumo de la Coca Cola vulnera algunos derechos humanos, tal como el derecho a la salud, un derecho fundamental reconocido en el artículo 4 de la Constitución Política de los Estados Unidos Mexicanos y en diversos tratados internacionales.

El artículo 4 hace mención en “Toda persona tiene derecho a la alimentación nutritiva, suficiente y de calidad. El Estado lo garantizará” [5].

La Salud como un derecho va más allá de la ausencia de enfermedades, sino que abarca el bienestar físico, mental y social.

Qué implicaciones tiene este artículo:

En la promoción de estilos de vida saludables: El Estado debe fomentar hábitos saludables a través de campañas de prevención y educación.

Protección contra riesgos a la salud: El Estado debe proteger a la población de riesgos para la salud, como la contaminación y el consumo de productos nocivos.

Algunos de los componentes de la Coca-Cola son nocivos como es el ácido fosfórico, cafeína, Colorante caramelo etc.

Enfermedades que trae consigo el consumo excesivo de Coca-Cola

Todos los padecimientos relacionados con el alto consumo de bebidas azucaradas generan la más grande mortalidad en México.

Si bien, son múltiples las causas del incremento generalizado del sobrepeso y la obesidad, existe evidencia de que el consumo de bebidas azucaradas como los refrescos, aumenta el riesgo de padecerla, aunado a otros padecimientos como la diabetes tipo dos y otras enfermedades crónicas, así lo señala el Instituto Nacional de Salud Pública.[6]

Obesidad

De acuerdo con datos de la Organización para la Cooperación y el Desarrollo Económicos (OCDE), en el estudio “La Pesada Carga de la Obesidad. La Economía de la Prevención”, se estimó que México tiene una las más altas tasas de obesidad en donde uno de cada tres adultos es obeso.[7]

Este padecimiento se origina debido al desequilibrio energético entre las calorías consumidas y gastadas, es decir, la persona consume alimentos y bebidas con alto contenido energético y no realiza suficiente actividad física.

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El sedentarismo, sumado a los patrones alimenticios poco saludables, una cantidad insuficiente de sueño y altos niveles de estrés son factores que pueden incrementar el riesgo de tener obesidad.

Las consecuencias más habituales de este padecimiento es una mayor reducción en la esperanza de vida. En el caso de México se estima que las personas con obesidad viven 4.2 años menos.

Un factor que contribuye al riesgo de padecer obesidad es el consumo excesivo de jugos industrializados, refrescos y bebidas azucaradas en general que aumentan 60% el riesgo de padecer obesidad, 6% un infarto y 26% diabetes, así lo especifica la Secretaría de Salud. [8]

Diabetes

La diabetes es una enfermedad metabólica crónica caracterizada por niveles elevados de glucosa en sangre (o azúcar en sangre), que con el tiempo provoca daños graves en el corazón, los vasos sanguíneos, los ojos, los riñones y los nervios. [9]

México tiene una de las tasas más elevadas de diabetes tipo 2 en el mundo y es uno de los países que utilizan mayor cantidad de jarabe de maíz de alto contenido en fructosa como endulzante. La fructosa se usa también muy frecuentemente para edulcorar muchos tipos de bebidas azucaradas (refrescos) y se conoce que inhibe la producción de leptina e insulina, hormonas estas que contribuyen a regular la glicemia y la obesidad [10]

La diabetes es una de las principales causas de ceguera, insuficiencia renal, ataques cardíacos, accidentes cerebrovasculares y amputación de miembros inferiores.

Datos de la OMS señala el número de personas con diabetes se ha cuadruplicado desde 1980 y se espera que supere los 500 millones a finales de la década.

El aumento de la prevalencia de la diabetes se debe en gran medida al aumento de la obesidad y la inactividad física. La prevalencia del sobrepeso y la obesidad entre los niños y adolescentes de 5 a 19 años aumentó drásticamente, del 4% en 1975 a más del 18% en 2016. [11]

OBJETIVO

Estudiar el impacto del consumo de Bebidas azucaradas (Coca-Cola) en la comunidad universitaria de la División Académica De Ciencias Sociales y humanidades (DACSYH) de la Universidad Juárez Autónoma de Tabasco (UJAT) de semestre en curso agosto 2024-febrero 2025

Metodología

Es un estudio descriptivo, con enfoque cualitativo, transversal y observacional.

Según Hernández Sampiere, un estudio descriptivo es “Búsqueda específica de propiedades y características importantes de cualquier fenómeno que se analice. Describe tendencias de un grupo o población.”. En este caso se da un panorama general respecto de la situación del consumo de refrescos embotellados, altos en azúcares y sodio, que vulneran el derecho a la salud de los estudiantes, en la Universidad Juárez Autónoma de Tabasco, pertenecientes a la DACSYH.

Martyn Hammersley señala que un enfoque cualitativo consiste en prácticas interpretativas cuyo objetivo es la construcción de descripciones detalladas de situaciones y eventos sociales, y de la comprensión de los significados que las personas le otorgan a esos fenómenos

con una metodología descriptiva y cuantitativa sobre el consumo de bebidas azucaradas Coca-Cola de la población estudiantil matriculados de la licenciatura en derecho de la UJAT.

Resultados

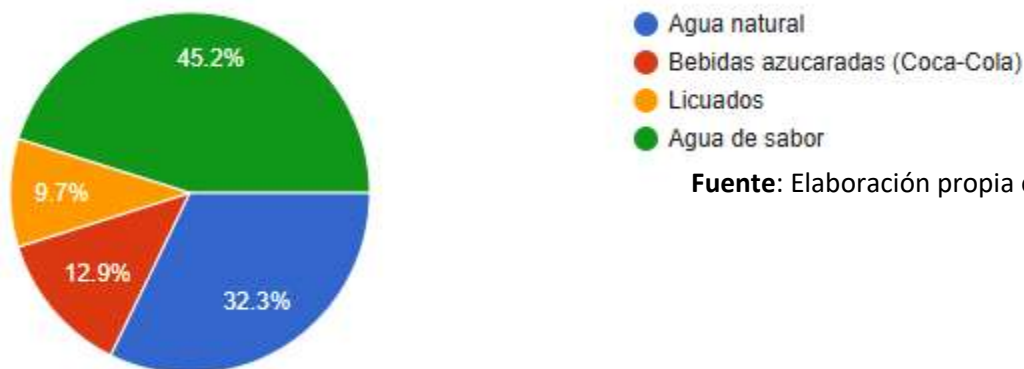
Grafico 1. Consumo de diferentes tipos de bebidas.

De acuerdo a los resultados obtenidos, se observa el consumo de diferentes tipos de bebidas.

En la muestra del 100 por ciento de los estudiantes, 32 % de estudiantes prefieren agua natural, 13% de estudiantes prefieren beber Coca-Cola, 10% estudiantes prefieren licuados y 45 % de los estudiantes prefieren beber agua de sabor.

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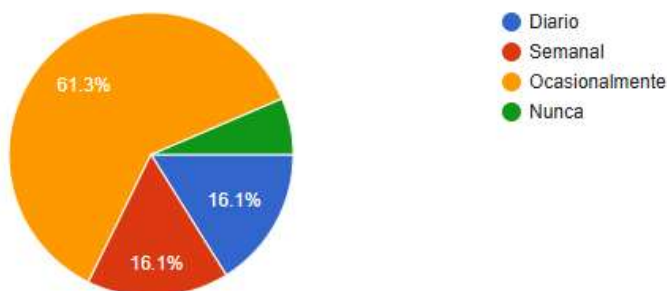
Se puede observar que el consumo de Coca-Cola es menor al agua natural y de sabor a la hora de buscar algo para ingerir a la hora de hidratarse.



Fuente: Elaboración propia con datos de las encuestas

Grafico 2. Porcentaje de consumo de Coca-Cola

De acuerdo a los resultados obtenidos, se observa la frecuencia de consumo de Coca-Cola en la población estudiantil. De acuerdo a la muestra de 100 encuestados, 61% de ellos toman ocasionalmente Coca-Cola, 16% de los estudiantes lo toman semanalmente, 16% de estudiantes de forma diaria y 6% de estudiantes nunca ingirieren Coca-Cola.

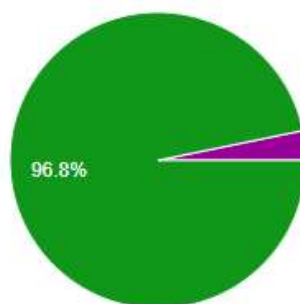


Fuente: Elaboración propia con datos de las encuestas

Grafico 3. Padecimiento de enfermedad

Se observa en la tabla que la mayoría de estudiantes se encuentran aparentemente sanos en cuestión de enfermedad con el consumo de Coca-Cola.

Colesterol	1
Enfermedad cardiovascular	0
Diabetes	0
Ninguna enfermedad	30

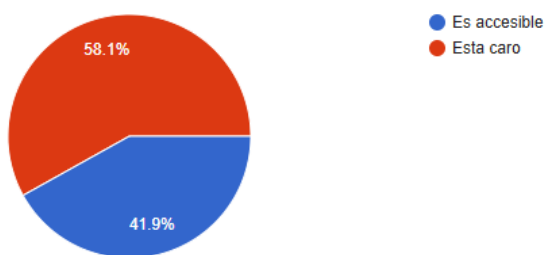


Fuente: Elaboración propia con datos de las encuestas

Grafico 4. Percepción de precio en la Coca-Cola

Más de la mitad de los estudiantes consideran que el precio de la Coca-Cola es algo caro. Pero aun así no dejan de consumirlo.

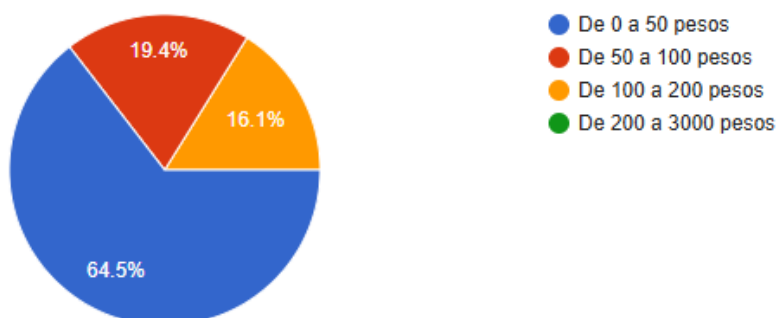
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Fuente: Elaboración propia con datos de las encuestas

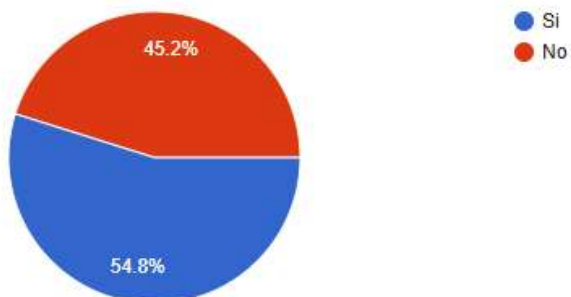
Grafica 5. Gasto aproximado semanal en el consumo de Coca-Cola

El gasto individual de los estudiantes es cercano a los 50 pesos semanales en la mayoría.



Fuente: Elaboración propia con datos de las encuestas

Grafica 6. La Coca-Cola forma parte de la tradición familiar o social



Fuente: Elaboración propia con datos de las encuestas

55%, más de la mitad de los estudiantes respondieron que la Coca-Cola ya es parte de sus tradiciones ya que está presente de forma habitual, mientras que 45% respondieron que no forman parte de su tradición ya que muchos optan por ingerir otras bebidas.

Discusión:

El consumo de Coca-Cola entre los universitarios es un tema de interés debido a su impacto en la salud y los hábitos alimenticios de este grupo poblacional. Este trabajo tiene el propósito de identificar el impacto en la vida de los consumidores universitarios con la ingesta de Coca-Cola en cualquiera de sus presentaciones, la percepción del precio del producto juega un papel crucial al momento de comprarla aunque para muchos si está a su alcance.

Es necesario combinar esfuerzos educativos, políticas públicas y acciones individuales para promover hábitos alimenticios saludables y reducir el consumo de bebidas azucaradas.

En instituciones universitarias debería de haber más conciencia con el consumo de bebidas azucaradas y el daño que esta conlleva a largo plazo, como a enfermedades de tipo cardiovascular.

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Sería interesante comparar los resultados de este estudio con otros grupos de estudiantes, como aquellos de carreras relacionadas con la salud o las ciencias

Conclusión:

El estudio sobre el consumo de Coca-Cola en estudiantes de la Licenciatura en Derecho de la DACSYH UJAT revela un patrón de consumo moderado, aunque con variaciones significativas entre los individuos. Si bien la mayoría de los estudiantes encuestados no consumen Coca-Cola diariamente, su presencia en la dieta es notable.

Los estudiantes son conscientes del que el consumo de la Coca-Cola es dañino, pero eso no los detiene para dejar de consumirlo. La Coca-Cola esta presente en la vida de los mexicanos, ya sea por la buena campaña de publicidad que tiene este producto, o por la costumbre de muchos de forma inconsciente.

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RELATIONSHIP BETWEEN FEAR OF MISSING OUT (FOMO) AND CYBERLOAFING AMONG EMPLOYEES: MODERATING ROLE OF DARK TRIAD

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ABSTRACT

The pervasive integration of digital technology into contemporary life has precipitated a complex interplay between employees' fear of missing out (FOMO) and their propensity for cyberloafing. While constant online connectivity facilitates access to information and social interaction, it can also lead to unproductive digital activities that ultimately impact employee well-being and productivity. This quantitative correlational study delved into this dynamic by examining the relationship between FOMO and cyberloafing among 238 Pakistani employees based in Rawalpindi and Islamabad. The study further explored the potential moderating influence of the Dark Triad personality traits on this relationship. Employing standardized measures, including the FOMO Scale (Przybylski et al., 2013), Cyberloafing Scale (Lim & Teo, 2005), and Short Dark Triad (Jones & Paulhus, 2014), the research uncovered a robust positive correlation between FOMO and cyberloafing. Subsequent regression analyses affirmed the predictive capacity of FOMO on cyberloafing behavior while identifying the Dark Triad as a significant predictor. Counterintuitively, the Dark Triad exhibited no moderating effect on the FOMO-cyberloafing nexus, suggesting a potential attenuation of individualistic tendencies within Pakistan's collectivist cultural framework. Demographic variables such as gender, education, job type, organizational affiliation, and marital status significantly influenced the study variables, underscoring the significance of considering individual employee differences. This research significantly adds to the existing body of knowledge on cyberloafing by delving into its intricacies within the specific cultural backdrop of Pakistan. By exploring this phenomenon in the Pakistani context, valuable insights are generated that can greatly benefit efforts aimed at improving operational efficiency, boosting economic output, and refining educational approaches. Moreover, a crucial aspect highlighted in this study is the importance of recognizing and accommodating the unique cultural nuances present in Pakistan, as well as understanding how the Dark Triad traits manifest differently in this environment. Addressing issues related to Fear of Missing Out (FOMO) and cyberloafing effectively in the workplace setting of Pakistan requires a tailored approach that takes into consideration these cultural factors and the ways in which the Dark Triad traits may influence behavior. By acknowledging these complexities and tailoring interventions to suit the local context, organizations and educational institutions in Pakistan can better mitigate the challenges associated with cyberloafing and foster a more productive and harmonious work environment.

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BIBLIOMETRIC ANALYSIS OF GLUTATHIONE ARTICLES SINCE 1975

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ABSTRACT

INTRODUCTION: Glutathione (GSH) is a tripeptide (Glu-Cys-Gly) known as the major low molecular mass thiol in mammals (1). It is characterized by a gamma-peptide bond between the carboxyl group of the glutamate side chain and cysteine. Decrease in its level results in various diseases (2). In this scientometric study, we investigated the characteristics of researches on GSH.

MATERIALS AND METHODS: We entered the Word “glutathione” into Web of Science Database. The most cited articles, top authors, countries, search fields, document types, funding/supporting organizations, languages and journals were investigated. For statistical analyses, Excel programme was used and the results were given as numbers and percentages.

RESULTS: A total of 170,970 articles were investigated. Majority of the articles were original articles in English. The USA was the most productive country followed by China. Top author was Wang Y with 722 articles. See Table for details. Journals that published the most glutathione articles were Journal of Biological Chemistry (n=3,180), Free Radical Biology and Medicine (n=2,519) and Plos One (n=1,569).

CONCLUSION: Scientometric studies lead researchers to focus on gaps and controversial issues. GSH literature is growing in years in the leadership of the USA.

Keywords: Glutathione, scientometrics, antioxidants

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Table. Ranking of Glutathione Articles According to Scientometric Parameters

	n	%
Search-field Category		
Biochemistry and Molecular Biology	38,514	22.5
Pharmacology and Pharmacy	21,156	12.3
Toxicology	18,997	11.1
Cell Biology	10,695	6.2
Oncology	9,192	5.3
Document Type		
Original Article	151,961	88.8
Review	8,116	4.7
Meeting Abstract	6,904	4
Proceedings Paper	6,070	3.5
Book Chapter	1,202	0.7
Supporting Organization		
University of California	3,157	1.8
Chinese Academy of Sciences	2,508	1.4
University of Texas	2,356	1.3
National Institutes of Health	2,232	1.3
Centre National de la Recherche Scientifique	2,115	1.2
Funding Agency		
US Department of Health Human Services	20,754	12.1
National Institute of Health	20,703	12.1
National Natural Science Foundation of China	12,601	7.3
NIH National Cancer Institute	5,458	3.1
NIH National Institute of Environmental Health Sciences	4,288	2.5
Authors		
Wang Y	722	0.4
Liu Y	675	0.3
Zhang Y	666	0.3
Li Y	604	0.3
Wang J	577	0.3
Book Series		
Methods in Enzymology	212	0.1
Annals of the New York Academy of Sciences	190	0.1
Advances in Experimental Medicine and Biology	186	0.1
Methods in Molecular Biology	100	0.05
Acta Horticulturae	99	0.05
Country		
USA	42,007	24.5
China	24,665	14.4
India	12,521	7.3
Japan	11,804	6.9
Germany	8,982	5.2
Language		
English	169,204	98.9
Chinese	294	0.1
Russian	294	0.1
French	225	0.1
German	215	0.1

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RELIABILITY OF YOUTUBE© VIDEOS IN TERMS OF CARDIOPULMONARY RESUSCITATION EDUCATION

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ABSTRACT

Introduction: Survival of patients with cardiac arrest (CA) mainly depends on accurate interventions to the victims. Education of the public on Basic Life Support (BLS) is the mainstay of the success of the process (1). In the current digital World, various digital platforms offer easier and faster access to information. People particularly choose video-sharing platforms for medical information (2). In this study, we aimed to evaluate scientific correctness of videos uploaded to one of the most popular video-sharing website; YouTube©.

Materials and Methods: This research was performed by entering keyword “Cardiopulmonary Resuscitation” to YouTube© platform on March 10th, 2024. Of the videos; download date, views, type of the videos (lecture, scenario, narrative, animation and manikin), number of likes and duration of the videos were determined. Then, the modified DISCERN Score (DS) and Global Quality Scale Criteria (GQS) were applied to the videos by the authors.

Results: A total of 303 videos related to CPR uploaded on YouTube© in one-year period were investigated. Of these videos 80 relevant videos were included into the study. Of these videos; 20 were lecture videos, 19 were scenario videos, 15 were manikin videos, 14 were narrative videos and 12 were animation videos. Mean DISCERN and GQS scores of lecture videos were each 3.4. Mean DISCERN and GQS scores of scenario videos were 3.5 and 3.1, respectively. Mean DISCERN and GQS scores of manikin videos were 3.8 and 3, respectively. Mean DISCERN and GQS scores of narrative videos were 3.7 and 3.3, respectively. Mean DISCERN and GQS scores of manikin videos were 4 and 4.2. Any statistical significance was not determined in terms of video types and DISCERN/GQS scores. Characteristics of videos in terms of categories are presented in the Table in details.

Conclusion:

Our results revealed that videos using manikin were the most viewed and liked videos. Additionally, the videos with the highest DISCERN scores were manikin videos. Using manikins may be a useful method for BLS education of the public.

Keywords: Cardiopulmonary Resuscitation, YouTube©, DISCERN, Global Quality Score, Basic Life Support

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Table. Characteristics of the CPR Videos in terms of Categories

Type of Video (n)	Uploaded (Months)	Total Views	Likes	Mean Duration (min)	DISCERN	GQS
Lecture (20)	7,04	305.4	9.2	7.3	3.4	3.4
Scenario (19)	7.8	93.5	4.2	3	3.5	3.1
Manikin (15)	9.1	12,460.3	85.6	5.3	4.1	3
Narrative (14)	6.1	217.5	9.2	6.7	3.7	3.3
Animation (12)	8	58.5	3.6	2.6	4	4.2

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AKILLI BOYA TEKNOLOJİSİ: TEKNOJİK GELİŞMELER VE ÇEŞİTLİ UYGULAMA
ALANLARI: MİNİ DERLEME

SMART PAINT TECHNOLOGY: TECHNOLOGICAL ADVANCEMENTS AND VARIOUS
APPLICATION AREAS (MINI REVIEW)

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ÖZET

Akıllı boya teknolojisi, ışık, sıcaklık ve elektrik alan gibi çevresel uyaranlara tepki veren yenilikçi kaplamaları kapsar ve bu yönüyle geleneksel boyalardan ayrılır. Bu kaplamalar, fiziksel veya kimyasal özelliklerini dinamik olarak değiştirerek enerji verimliliği, hijyen ve dayanıklılık gibi işlevsel avantajlar sunar. Temel türler arasında fotokatalitik, termokromik ve elektrokromik boyalar bulunur. Fotokatalitik boyalar, UV ışığı kullanarak kirleri oksitler ve dış mekan uygulamaları için ideal olan kendini temizleyen yüzeyler oluştururlar. Titanyum dioksit nanopartikülleri, özellikle sağlık alanında hijyenik yüzeyler sağlarken çevresel kirliliği de azaltırlar. Termokromik boyalar, sıcaklık değişimlerine bağlı olarak renk değiştirir ve soğutma ve ısıtma maliyetlerini düşürerek inşaat sektöründe enerji tasarrufu sağlayan uygulamalar için değerlidirler. Cam yüzeylerde ise güneş ışığını kontrol ederek iç mekan sıcaklığını düzenlerler. Elektrokromik boyalar, elektriksel uyaranlara yanıt olarak ışık geçirgenliğini kontrol eder ve akıllı cam uygulamalarında enerji verimliliğini ve konforu artırır. Akıllı boyaların çok yönlülüğü, onları inşaat, otomotiv, elektronik, sağlık ve çevre sektörlerinde vazgeçilmez hale getirmiştir. İnşaat, termokromik ve fotokatalitik boyalar enerji verimliliği ve düşük bakım avantajları sunmaktadır. Otomotivde, termokromik ve elektrokromik boyalar estetik değişiklikler sağlarken, anti-çizik kaplamalar dayanıklılığı artırmaktadır. Elektronik sektöründe elektrokromik boyalar enerji tasarrufu sağlarken, sağlık alanında antibakteriyel kaplamalar enfeksiyon kontrolüne katkı sağlamaktadır. Çevre teknolojilerinde fotokatalitik ve termokromik kaplamalar enerji verimliliği sağlarken, hidrofobik boyalar tarımsal su yönetimini iyileştirmektedir. Faydalarına rağmen, akıllı boyalar yüksek üretim maliyetleri ve UV ışığına bağımlı fotokatalitik boyaların sınırlı iç mekan etkinliği gibi zorluklarla karşı karşıyadır. Gelecekte, biyolojik kaynaklı pigmentler ve yapay zeka destekli malzeme optimizasyonu gibi çevre dostu çözümlerle bu sınırlamaların aşılması hedeflenmektedir. Bu çalışmada, akıllı boya teknolojisinin potansiyelini ve uygulamalarını vurgulayarak gelecek araştırma ve geliştirme çalışmaları için fikirler sunulmuştur.

Anahtar Kelimeler: Akıllı boya, fotokatalitik kaplama, termokromik boya, elektrokromik sistem, antibakteriyel yüzey, nanoteknoloji, enerji verimliliği, kendini temizleyen boyalar, sürdürülebilirlik

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ABSTRACT

Smart paint technology encompasses innovative coatings that respond to environmental stimuli like light, temperature, and electric fields, distinguishing them from traditional paints. These coatings dynamically alter their physical or chemical properties, offering functional advantages such as energy efficiency, hygiene, and durability. Key types include photocatalytic, thermochromic, and electrochromic paints. Photocatalytic paints utilize UV light to oxidize contaminants, creating self-cleaning surfaces ideal for outdoor applications. Titanium dioxide nanoparticles ensure hygienic surfaces, particularly in healthcare environments, while also reducing environmental pollution. Thermochromic paints change color with temperature variations, making them valuable for energy-saving applications in construction by reducing cooling and heating costs. On glass surfaces, they regulate indoor temperatures by controlling sunlight. Electrochromic paints adjust light transmittance in response to electrical stimuli, enhancing energy efficiency and comfort in smart glass applications. The versatility of smart paints has made them essential in the construction, automotive, electronics, healthcare, and environmental sectors. In construction, thermochromic and photocatalytic paints provide energy efficiency and low maintenance. Automotive applications benefit from thermochromic and electrochromic paints for aesthetic enhancements and anti-scratch coatings for durability. In electronics, electrochromic paints improve energy efficiency, while healthcare applications utilize antibacterial coatings for infection control. Environmental technologies employ photocatalytic and thermochromic coatings for energy efficiency, while hydrophobic paints enhance agricultural water management. Despite their benefits, smart paints face challenges such as high production costs and limited indoor effectiveness for photocatalytic paints, which depend on UV light. Future advancements aim to address these limitations with eco-friendly solutions like bio-based pigments and AI-driven material optimization. This study highlights the potential of smart paint technology and its applications, offering insights for future research and development.

Keywords: smart paint, photocatalytic coating, thermochromic paint, electrochromic system, antibacterial surface, nanotechnology, energy efficiency, self-cleaning paints, sustainability

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KOJENERASYON SİSTEMLERİNDE BACA KURULUMU ISI VE AKIŞ ANALİZİ CHIMNEY INSTALLATION AND THERMAL-FLOW ANALYSIS IN COGENERATION SYSTEMS

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ÖZET

Bu çalışmada kojenerasyon sistemlerinde baca tasarımının enerji verimliliğine etkisi, çevresel sürdürülebilirlik, kullanılan malzemelerin performansı ve atık ısı geri kazanımı üzerinde detaylı bir çalışma sunulmuştur. Bu çalışmanın girdilerini oluşturmak için Türkiye’de önemli tesisleri barındıran İZAYDAŞ Biyogaz Entegre Elektrik Tesisinde atık yönetimi ve enerji geri kazanım süreçleri incelenmiş; bu süreçlerin daha sürdürülebilir ve verimli hale getirilmesine yönelik iyileştirme önerileri üzerinde odaklanılmıştır. Bu çalışmanın baca tasarımı aşamasında kesit hesaplarının yapılması ve optimizasyonu için Kesa Aladin programı kullanılmıştır. Statik hesaplarda ise Ansys programı yapısal analiz modülünden faydalanılmıştır. Böylelikle kojenerasyon sistemlerinde baca tasarımının iyileştirilmesiyle performans artışı sağlama potansiyelini ve verimlilik hedeflerine ulaşmadaki önemini vurgulayarak okuyuculara farkındalık kazandırılması amaçlanmıştır.

Anahtar Kelimeler: Atık Isı Geri Kazanımı, Baca Tasarımı, Enerji Verimliliği, Kojenerasyon, Yapısal Analiz

ABSTRACT

This study presents a detailed analysis of the impact of chimney design on energy efficiency, environmental sustainability, material performance, and waste heat recovery in cogeneration systems. To gather inputs for this study, waste management and energy recovery processes were examined at İZAYDAŞ Biogas Integrated Power Plant, a key facility in Turkey. The research focused on identifying and proposing improvements to make these processes more sustainable and efficient. For the chimney design phase, the Kesa Aladin software was utilized for cross-sectional calculations and optimization. Additionally, the structural analysis module of Ansys was employed for static calculations. Through this approach, the study aims to highlight the potential for performance enhancement through improved chimney design in cogeneration systems and its critical role in achieving efficiency targets, thereby raising awareness among readers.

Keywords: Waste Heat Recovery, Chimney Design, Energy Efficiency, Cogeneration, Structural Analysis

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

MICROBIOTA MODULATION AS THERAPEUTIC APPROACH IN THE NEUROPATHIC PAIN IN DOG 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.

Objective 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. 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 paralyzed dogs.

Keywords: gut dysbiosis, indole, paralyzed dog, Polenoplasmin.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

SYNTHESIS OF (Z)/(E) -ETHYL 2-PHENYL-2-(2-PHENYLHYDRAZONE) ACETATES

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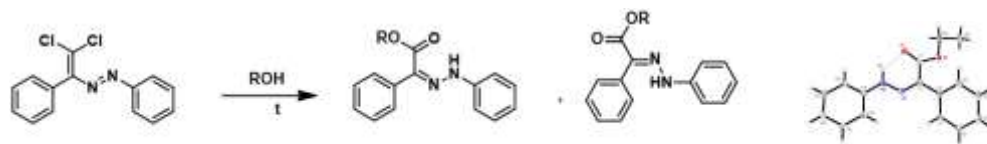
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ABSTRACT

In previous studies, we have shown that the synthesized dichlorodiazadienes are considered convenient synthons due to their unique structure. Thus, the presence of various functional groups in the composition of the compounds increases their relevance as convenient synthons in terms of organic synthesis. Thus, we have determined their use as starting compounds in the preparation of triazoles, various classes of heterocyclic compounds, and many complex structural compounds. It is from this point of view that the next transformation reactions of the synthesized dichlorodiazadienes were carried out. A mixture of isomers of ethyl (E) / (Z) -2-phenyl-2-(2-phenyl-hydrazono)acetates was synthesized from the solvolysis reaction of (E) -1-(2,2-dichloro-1-phenylvinyl)-2-phenyldiazene as a result of the hydrolysis of halogens in the presence of alcohol.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II



Thus, the synthesis of aryl hydrazones of α -keto acid esters from the solvolysis reaction of dichlorodiazadienes in alcohol is a new convenient method for us.

Keywords: Dichlorodiazadiene, solvolysis reaction,

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

MENTAL HEALTH CHALLENGES FACED BY WORKING WOMEN IN PAKISTAN

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ABSTRACT

It is a growing concern that Pakistan needs to handle with special attention and strategy. This review looks into the intersectional concerns impacting women's mental health at work. The confluence of social, cultural, economic, and organizational elements generates a unique array of stressors that affect women's mental health in both the official and informal employment sectors.

Most parts of Pakistan have been faced with a significant problem due to societal norms and long-prevailing gender roles. They face role conflict, time pressure, and emotional tiredness while trying to adjust their professional duties to domestic obligations. The mental pressure has worsened due to the lack of support from the family members, especially regarding shared household responsibilities. Gender bias and harassment in the workplace have increased stress, anxiety, and depression among working women to higher levels. Job insecurity and other economic stressors place additional pressure on women's mental health. Many people work in precarious, low-paid jobs, mainly in the informal economy, with limited legal rights and worker protection. The uncertainty of the economy and the fear of losing a job or reduced working hours create chronic stress with adverse psychological effects. Organizational variables, such as inadequate work-life balance legislation, tight working hours, and poor mental health services in the workplace, limit women's options for seeking help. "Women experience mental health disorders more often and are still stigmatized about seeking professional help, so they avoid treatment."

This research calls for the urgent intervention of the government and specific mental health treatment for working women in Pakistan. This calls for collaborative efforts from employers, politicians, and mental health professionals to create a supportive work environment by addressing workplace inequalities and increasing mental health awareness and access to mental health services. Overcoming these challenges is crucial for making Pakistan's healthier, more inclusive, and gender-balanced workforce.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

EĞİTİMDE AKILLI KÜP KULLANIMI USE OF SMART CUBE IN EDUCATION

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ÖZET

Eğitimde akıllı küp teknolojileri, dijital dönüşümle birlikte öğrenci odaklı ve etkileşimli öğrenme süreçlerini destekleyen yenilikçi araçlar olarak öne çıkmaktadır. Programlanabilir ve etkileşimli özelliklere sahip olan akıllı küpler, STEM (Fen, Teknoloji, Mühendislik, Matematik) eğitimi başta olmak üzere birçok alanda kullanılmaktadır. Bu araçlar, problem çözme, kodlama becerilerinin geliştirilmesi, işbirlikçi öğrenme ve yaratıcılığı teşvik etme gibi faydalar sunmaktadır.

CoSpaces Edu platformu, 3D içerik oluşturma, artırılmış ve sanal gerçeklik teknolojileri ile birleşerek öğrencilere interaktif bir öğrenme deneyimi sağlamaktadır. Merge Cube ile AR teknolojisinin entegrasyonu sayesinde, öğrenciler uygulamalı eğitim imkanlarına sahip olmakta ve ders materyallerini daha etkili bir şekilde öğrenebilmektedir.

Kazakistan'da AR ve VR teknolojilerinin eğitimde yaygınlaşmasını engelleyen faktörler arasında yüksek maliyet, teknik altyapı eksikliği ve eğitim materyallerinin yetersizliği yer almaktadır. Bu teknolojilerin daha etkin kullanılabilmesi için öğretmen eğitimleri, müfredata entegrasyon ve devlet desteği gibi öneriler sunulmuştur.

Anahtar Kelimeler: Akıllı Küp Teknolojileri, Artırılmış Gerçeklik (AR), Sanal Gerçeklik (VR), CoSpaces Edu, Merge Cube

ABSTRACT

Smart cube technologies in education have emerged as innovative tools that support student-centered and interactive learning processes alongside digital transformation. Smart cubes, which have programmable and interactive features, are widely used in various fields, particularly in STEM (Science, Technology, Engineering, Mathematics) education. These tools offer benefits such as problem-solving, coding skill development, collaborative learning, and fostering creativity.

The CoSpaces Edu platform combines 3D content creation with augmented and virtual reality technologies to provide students with an interactive learning experience. Through the integration of AR technology with Merge Cube, students gain hands-on learning opportunities and can grasp course materials more effectively.

In Kazakhstan, factors such as high costs, lack of technical infrastructure, and insufficient educational materials hinder the widespread adoption of AR and VR technologies in education. To enhance the use of these technologies, recommendations such as teacher training, curriculum integration, and government support have been proposed.

Keywords: Smart Cube Technologies, Augmented Reality (AR), Virtual Reality (VR), CoSpaces Edu, Merge Cube

GİRİŞ

Eğitimde teknolojik araçların kullanımı, son yıllarda büyük bir ivme kazanmıştır. Dijital dönüşüm ve 21. yüzyıl becerileri, eğitim alanında yenilikçi yaklaşımların benimsenmesini zorunlu kılmaktadır. Özellikle dijitalleşmenin getirdiği hızlı değişim, eğitim materyallerinin daha etkileşimli, yenilikçi ve öğrenci odaklı hale gelmesini sağlamaktadır. Bu noktada, eğitimde akıllı küp teknolojileri önemli bir yer tutmaktadır.

Akıllı küpler, eğitim teknolojileri alanında yenilikçi bir yaklaşımı temsil eder. Bu araçlar, genellikle programlanabilir ve etkileşimli özelliklere sahip olup, farklı disiplinlerde kullanılacak şekilde tasarlanmıştır. Akıllı küpler, hem bireysel hem de grup çalışmalarında öğrencilerin etkin katılımını teşvik eden, problem çözme ve analitik düşünme becerilerini geliştiren araçlardır. Bu özellikleriyle, STEM (Fen, Teknoloji, Mühendislik, Matematik) eğitimi gibi alanlarda yaygın bir kullanım alanı bulmaktadır. Bunun yanı sıra, bu teknolojiler öğrencilerin öğrenme sürecine aktif katılımını artırarak, daha verimli bir öğrenme deneyimi sunar.

21. yüzyılın eğitim anlayışı, öğrenci merkezli öğrenme modellerine dayanır. Bu modeller, öğrencilerin bireysel öğrenme hızlarını, ilgi alanlarını ve becerilerini göz önünde bulundurarak, öğrenme süreçlerini kişiselleştirmeyi hedefler. Akıllı küpler bu anlayışın bir parçası olarak, öğrencilerin yaratıcı düşünme becerilerini geliştiren ve işbirlikçi öğrenme ortamları yaratan bir araçtır. Bu bağlamda, akıllı küplerin sınıf içindeki etkisi, öğrencilerin yalnızca teorik bilgiye değil, aynı zamanda uygulamalı deneyimlere de erişim sağlamasına olanak tanır. Bu durum, öğrenme sürecini daha kalıcı ve anlamlı hale getirir.

Geleneksel öğretim yöntemleri, çoğunlukla tek yönlü bir bilgi aktarımı süreci olarak tanımlanabilir. Ancak bu yöntemler, günümüz öğrencilerinin ihtiyaçlarını karşılamakta yetersiz kalabilmektedir. Bu bağlamda, akıllı küpler gibi etkileşimli araçlar, öğrencilerin aktif bir şekilde öğrenme sürecine dahil olmalarını sağlayarak, öğrenme deneyimini daha etkili bir hale getirir. Ayrıca, bu araçlar, öğretmenlerin derslerini daha yaratıcı bir şekilde planlamalarına ve uygulamalarına yardımcı olur.

Akıllı küplerin eğitime entegrasyonu, yalnızca öğrencilerin bireysel becerilerini geliştirmekle sınırlı kalmaz. Aynı zamanda, grup çalışmaları sırasında işbirliği, iletişim ve takım ruhu gibi sosyal becerilerin de gelişmesine katkıda bulunur. Bu araçların, öğrencilerin öğrenme motivasyonunu artırdığı ve derslere olan ilgilerini artırdığı gözlemlenmiştir. Özellikle STEM eğitimi gibi alanlarda, akıllı küplerin sağladığı uygulamalı deneyimler, öğrencilerin teorik bilgiyi gerçek dünya uygulamalarıyla ilişkilendirmelerine olanak tanır.

Bu makale, eğitimde akıllı küp teknolojilerinin kullanımını, faydalarını ve sınıf içindeki uygulamalarını detaylı bir şekilde ele almayı amaçlamaktadır. Makalenin ilerleyen bölümlerinde, bu teknolojilerin uygulama yöntemleri, araştırma bulguları ve gelecekteki kullanım potansiyelleri incelenecektir. Ayrıca, öğretmen ve öğrencilerin bu araçlara yönelik görüşleri, akıllı küplerin eğitimdeki rolünü daha iyi anlamamıza yardımcı olacaktır.

MATERYAL VE METODLAR

Eğitimde Akıllı Küp Kullanımı

Akıllı küpler, eğitimi daha etkili ve eğlenceli hale getiren yenilikçi bir teknolojidir. Bu araçlar, özellikle STEM (Fen, Teknoloji, Mühendislik ve Matematik) eğitiminde sıkça kullanılmaktadır. Akıllı küplerin eğitimdeki başlıca kullanım alanları şunlardır:

- **Problem Çözme:** Öğrencilere gerçek dünya problemlerini simüle eden görevler sunarak analitik düşünme becerilerini geliştirir.
- **Kodlama Eğitimi:** Akıllı küpler, temel programlama becerilerinin öğretilmesinde kullanılabilir. Görsel programlama dilleri ile entegrasyonu sayesinde, öğrencilerin kodlama becerilerini kolayca geliştirmesine olanak tanır.
- **İşbirlikçi Öğrenme:** Grup çalışmaları sırasında, öğrenciler akıllı küpler aracılığıyla birlikte problem çözebilir ve yaratıcı projeler geliştirebilir.

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- **Yaratıcılığı Teşvik Etme:** Akıllı küplerin sunduğu esneklik, öğrencilerin yenilikçi fikirler geliştirmesini destekler.

Uygulama sürecinde, öğrencilerin öğrenme motivasyonunda ve derslere olan ilgilerinde belirgin bir artış gözlenmiştir. Ayrıca, öğretmenler de bu teknolojinin ders içeriklerini daha zengin ve etkileşimli hale getirdiğini ifade etmiştir.

CoSpaces Edu Programının Açıklaması

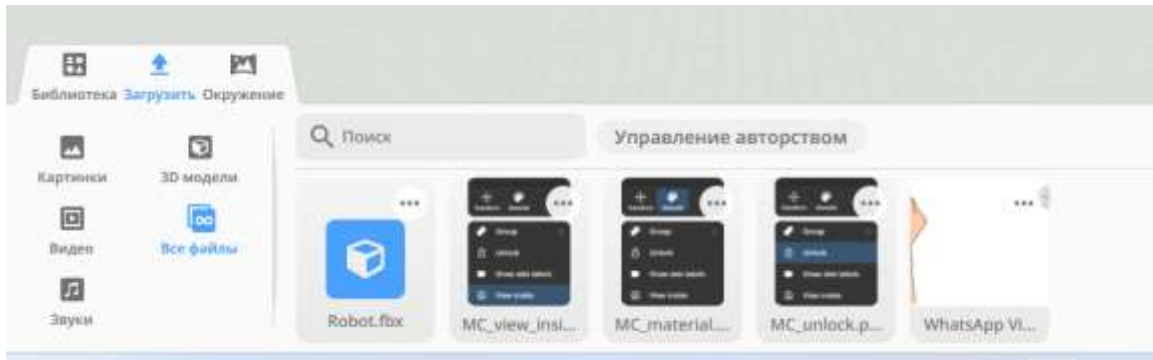
CoSpaces Edu, öğrencilerin yaratıcılığını geliştiren, 3D içerik, sanal ve artırılmış gerçeklik oluşturma becerileri kazandıran bir eğitim platformudur. Platform, sürükle-bırak yöntemiyle kullanılabilir ve CoBlocks ya da JavaScript kodlamaya imkan tanır. CoSpaces Edu, öğrencileri pasif dinleyici olmaktan çıkararak, aktif katılımcılar haline getirir. Kullanıcılar, 3D nesnelere yerleştirerek sanal dünyalar yaratabilir, projelerine animasyon ve etkileşimli öğeler ekleyebilirler. Platform, VR gözlükler ve akıllı telefonlar aracılığıyla görüntülenebilir, grup çalışmasını destekleyerek takım çalışması ve problem çözme becerilerini geliştirir.



Şekil 1. Cospaces Edu platformları

Yapay Zeka Destekli Akıllı Küplerin Çalışma Süreci

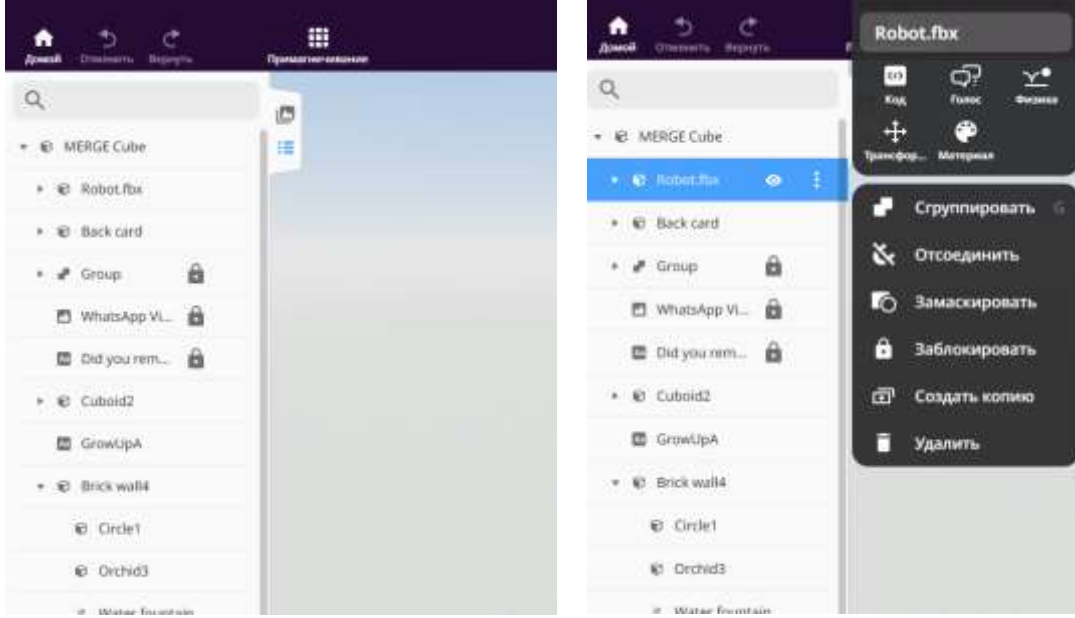
Bu projede CoSpaces Edu platformunun Merge Cube bölümü kullanılarak, öğrencilere bilgisayar bilimi eğitimi sunulmuştur. Platformun kitaplık bölümünden 3D nesnelere seçilerek veya yapay zeka destekli programlarla oluşturularak projeye eklenmiştir. Merge Cube, AR teknolojisini kullanarak küp yüzeylerindeki QR kodlar aracılığıyla 3D nesnelere etkileşim sağlar. Proje kapsamında, nesnelere hareketleri CoBlocks programlama ortamı kullanılarak kodlanmıştır.



Şekil 2. Kitaplık ve 3D nesnelere yüklenmesi bölümü

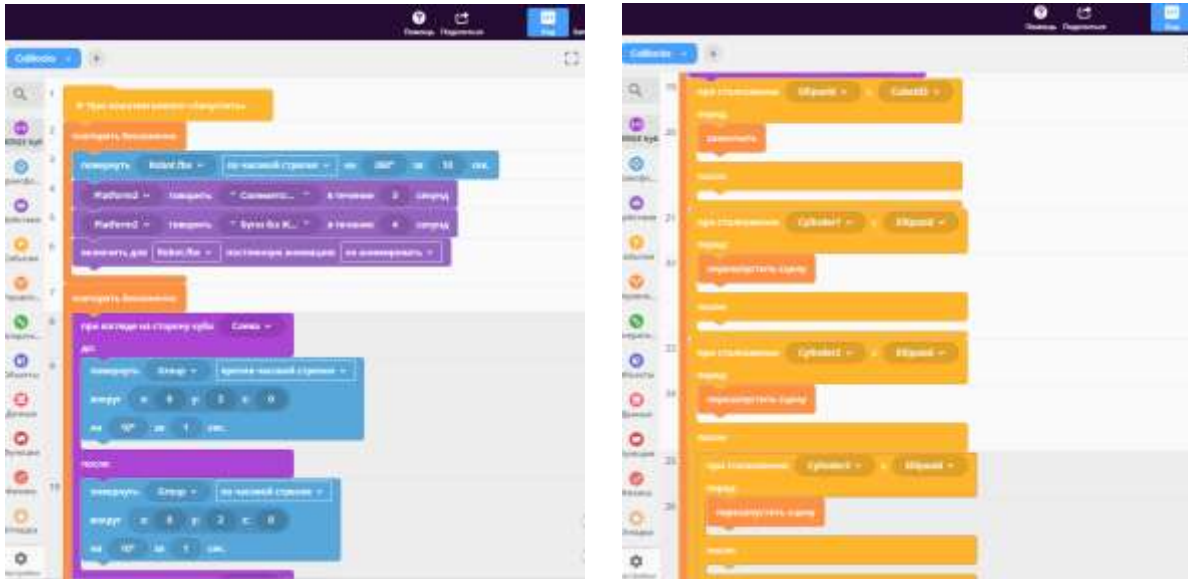
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Merge Cube ile oluşturulan projeler, AR modunda görüntülenerek öğrencilere interaktif bir öğrenme deneyimi sunar. Öğrenciler, uygulama üzerinden projelerine erişim sağlayarak, çeşitli sayfalarda yer alan interaktif videolar, soru-cevap bölümleri, oyunlar ve yazılı ödevlerle ders materyallerini pekiştirirler. Geri bildirim mekanizması sayesinde, öğrenciler eğitim süreci hakkında düzeltici geribildirim verebilirler.



Şekil 3. Yapı bölümü

CoSpaces Edu ve Merge Cube'un birleşimi, öğrencilere dijital dünyada başarılı olmak için gerekli olan yaratıcılık, mantıksal düşünme ve programlama yeteneklerini kazandırmak amacıyla etkili bir eğitim araçları sunmaktadır.



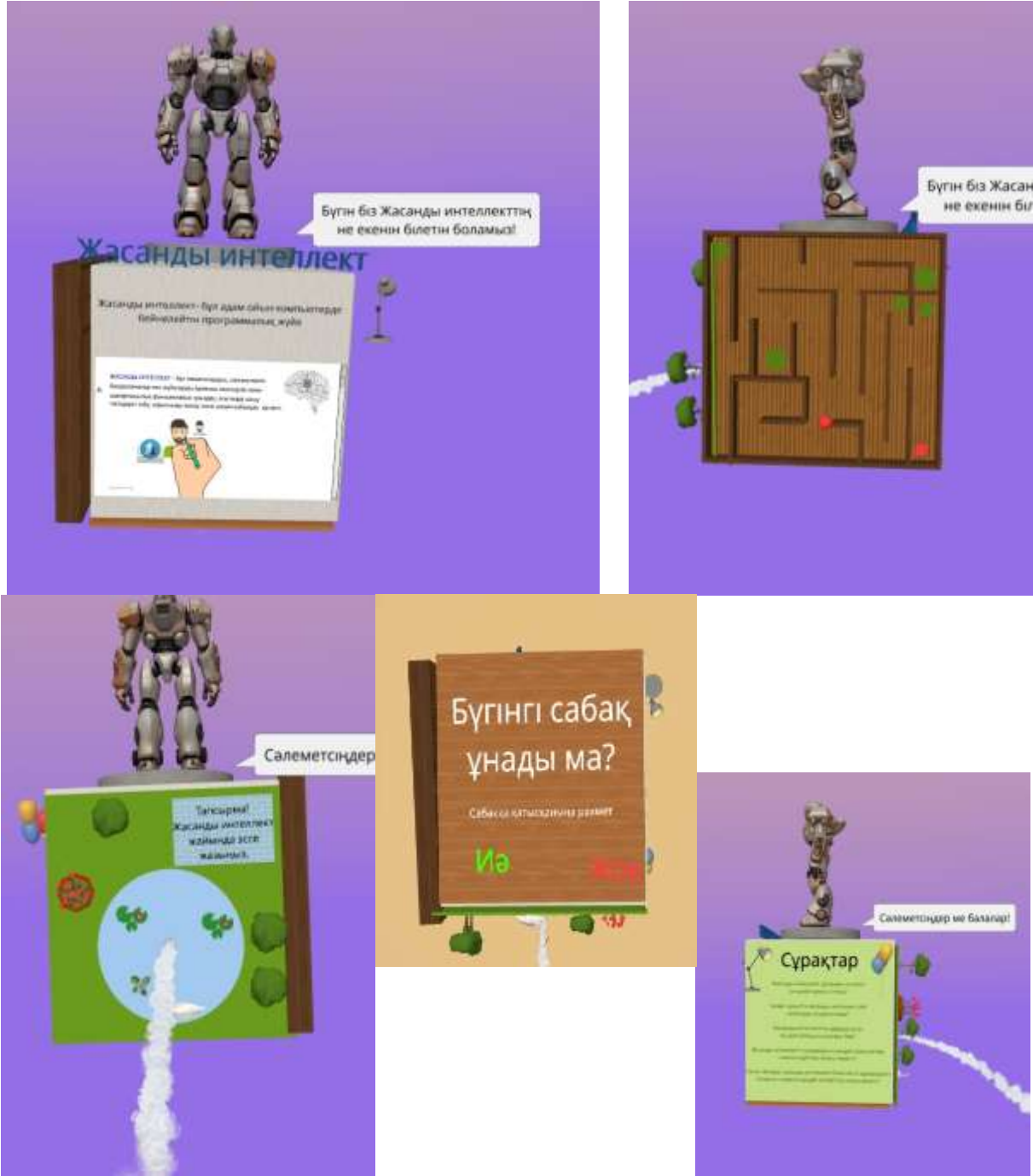
Şekil 4. CoBlocks programlama ortamı

SONUÇ VE ÖNERİLER

AR (Artırılmış Gerçeklik) ve VR (Sanal Gerçeklik) teknolojileri, eğitimin geleceğinde önemli bir rol oynamakta ve öğrenme sürecini daha yenilikçi, ilgi çekici ve verimli hale getirmektedir. Bu teknolojiler, karmaşık konuları görsel olarak açıklayarak öğrencilerin bilgiyi daha iyi öğrenmesine yardımcı olur.

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AR teknolojisi gerçek hayata sanal unsurlar ekleyerek öğrenmeyi eğlenceli hale getirirken, VR teknolojisi öğrencileri farklı ortamlara taşıyarak konuya olan ilgiyi artırır.



Şekil 5. Projenin sonucu

Dünya genelinde biyoloji, kimya, coğrafya, tarih gibi çeşitli alanlarda AR ve VR teknolojileri başarıyla uygulanmaktadır. Biyolojide hayvan ve bitki anatomisi, kimyada moleküler yapılar, coğrafyada interaktif arazi incelemeleri ve tarihte 3 boyutlu canlandırmalar bu teknolojilerin sağladığı faydalara örnek gösterilebilir. Bunun yanı sıra, havacılık ve tıp gibi uzmanlık gerektiren alanlarda da bu teknolojilerin kullanımı yaygındır.

Ancak Kazakistan'da AR ve VR teknolojilerinin eğitimde yaygın olarak kullanılmamasının başlıca nedenleri arasında; cihazların yüksek maliyeti, teknik altyapı eksikliği, öğretmenlerin yeterli bilgi ve

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beceriye sahip olmaması ve Kazakça eğitim materyallerinin eksikliği yer almaktadır. Ayrıca, uzun süreli VR kullanımının sağlık üzerindeki olumsuz etkileri de dikkate alınmalıdır.

Bu teknolojilerin Kazakistan'da daha etkin kullanılabilmesi için şu öneriler sunulmaktadır:

- **Öğretmen ve öğrencilere yönelik eğitimler:** Platformun yeteneklerini tanıtmak için seminerler ve atölyeler düzenlenmelidir.
- **Dil desteği:** CoSpaces Edu arayüzü Kazakçaya çevrilerek öğrenme süreci kolaylaştırılmalıdır.
- **Müfredata entegrasyon:** AR/VR teknolojilerinin eğitim programlarına dahil edilmesi için stratejik planlamalar yapılmalıdır.
- **Pilot projeler:** Seçilen okullarda pilot projeler uygulanarak geri bildirim toplanmalıdır.
- **Devlet desteği:** Mali ve teknik destek sağlanarak okullara AR/VR ekipmanları temin edilmelidir.
- **Online topluluklar:** Kullanıcılar arasında deneyim paylaşımını teşvik edecek platformlar oluşturulmalıdır.

Bu önerilerin uygulanması, Kazakistan eğitim sistemini daha rekabetçi hale getirecek ve öğrencilere dijital dünya ile uyumlu beceriler kazandırabilecektir.

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THE TORSIONAL MECHANICAL PROPERTIES OF TI ALLOY BAR PRODUCED BY ADDITIVE MANUFACTURING

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ABSTRACT

In this research, test samples were produced from Ti6Al4V powders by additive manufacturing (AM) method and torsion tests of the samples were carried out. The powders used were Ti6Al4V Grade 23 powders, the applied AM method was Selective Laser Melting (SLM) method. The cylindrical rod-shaped samples were subjected to heat treatment. Torsion test samples were machined by turning process. As a result of torsion test include the torsionmeter device, torsion strength, angle of twist and shear modulus of the material were determined. The purpose of this study is to determine the strength properties of Ti6Al4V plates to be used as orthopedic implants.

Keywords: Metal additive manufacturing, Ti6Al4V grade 23 powder, torsion test, torsional mechanical properties.

1. Introduction

The production of metallic parts by additive manufacturing method has been increasing in recent years. With the production of various metallic powders with suitable properties and the development of manufacturing machines, the use of these parts in the automotive, aerospace and medical fields is increasing. It is possible for these productions to replace the parts produced by conventional methods by providing the necessary mechanical properties. Due to their relatively low density, high strength and biocompatibility properties, Ti alloys are used in low costly production of parts with complex geometry especially.

The one of the most widely used alloys is Ti6Al4V. The main reasons for using Ti6Al4V alloy are its high properties such as heat resistance, flexibility, toughness, strength, corrosion resistance, machinability, weldability, biocompatibility. [1]

Research on the producing, heat treatment and post processing of Ti6Al4V parts manufactured via AM are included in the literature. On the other hand, there are various studies regarding on determining the mechanical properties. Various review papers have been published on this area [2-3]. But, there is not enough literatures on the determination of torsional strengths. For this reason, in this study, torsion tests of the samples were performed using a torsion test machine including a torsionmeter device and the values of the strength and shear modulus were determined

The use of Ti and Ti alloys as implant is quite common [4-5]. The implants in applications are mostly parts produced by conventional methods. However, it is also possible to come across implants produced by additive manufacturing. The use of titanium and its alloys has become more widespread in biomedical applications compared to stainless steel and CoCr alloys. Titanium and its alloys are used more as biomaterials due to their low elastic modulus, corrosion resistance, biocompatibility and strength. CP-Ti and Ti6Al4V are the most biocompatible and most commonly used metallic materials in medicine [6]. Ti and its alloys are used as the manufacturing material of most implants due to their superior corrosion resistance, non-toxicity and good mechanical properties [7]

Titanium parts are produced by different additive manufacturing methods. In the selective laser melting (SLM) method, metallic powder is melted using laser beam. Arabnejad et al. concluded in their study that porous titanium implants produced from Ti6Al4V material by SLM method are used for orthopedic

applications [8]. He et al. revealed that an ideal metallic biomaterial used in dental and orthopedic implants should have properties such as having a very low density, not containing cytotoxic metals, having superior strength and long fatigue life, low elastic modulus, and high plasticity at room temperature [9]

It is expected that the production of anatomical implants, especially personalized ones, will become widespread in the coming years. For this purpose, it is important to determine the torsional properties of the material itself before the torsional tests of the implants mounted on the bone. For this purpose, torsional tests of the samples produced were performed and torsional strength, torsional angle and shear modulus values were determined.

2. Materials and Methods

The powders used in sample production are Ti6Al4V grade 23 powders. Grade 23 powders can be supplied in the 15-45 μm grain size range. Grade 23 powders have a grain size of approximately 99% 45 μm and below, while the remaining are above 45 μm . Grade 23 powders are more advantageous than grade 5 powders in terms of grain size and distribution. On the other hand, it is known that grade 23 powders are more suitable in terms of biocompatibility properties. For these reasons, it was decided to use Ti6Al4V grade 23 powders in ASTM F3001 class.

The parameters used in the production of the rods are as follows. Scanning speed (mm/s): 900, Laser power (W): 190, Scanning gap (mm): 0.1, Layer thickness (mm): 0.03. Samples were produced in $\varnothing 13 \times L 115$ dimensions at least as 5 pieces.

The manufactured parts were subjected to heat treatment under vacuum. The temperature was raised to 843 $^{\circ}\text{C}$ in an argon inert gas environment within 4 hours and the parts were kept at this temperature for 2 hours. After the waiting period, the temperature was cooled to 550 $^{\circ}\text{C}$ within 6 hours and then the parts were cooled in air. After production, the parts were subjected to heat treatment together with the support structure without being removed from the support structure. After heat treatment, the torsion samples were processed by machining. The dimensions of the torsion test samples after turning are given in Figure 1.

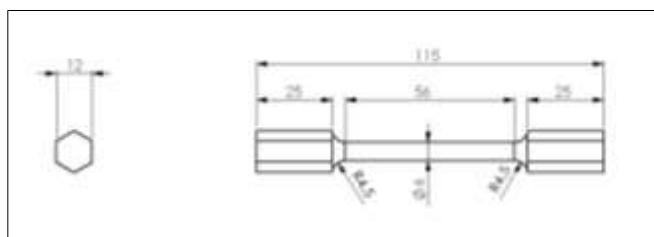


Figure 1. Torsion test sample dimensions

Microhardness measurements were carried out on the sample. The load and time are 300 g and 10 s respectively.

The evaluation of the test samples produced by additive manufacturing from titanium powders in terms of surface roughness properties and the preparation of samples suitable for the test are important. In this respect, studies were carried out on the selection of appropriate cutting tools and the optimization of the machine processing parameters during the machining of the samples. The pictures of the processed samples are given in Figure 2. In addition, the surface roughness values of the samples measured after processing were also measured.



Figure 2. Torsion test specimens machined with turning

UVE MBTC200 torsion testing machine was used in the tests (Figure 3). The angle measurement was made using a torsionmeter positioned on the narrowed region and the shear modulus was calculated using the angles measured in this way. The distance between the torsionmeter tips was 44 mm and the torsional speed was 0.5 degrees/s.

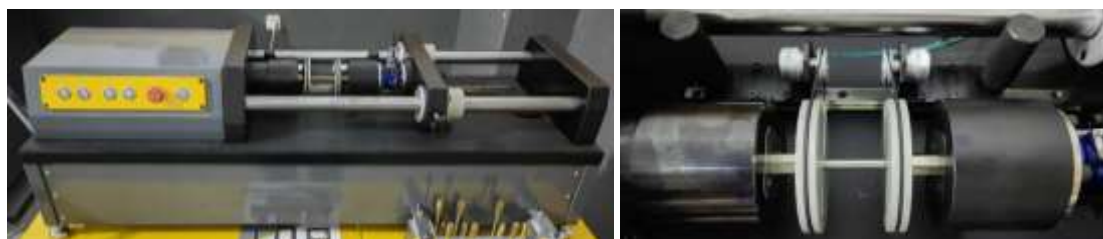


Figure 3. Torsion test machine and torsionmeter

3. Results and Discussions

The average microhardness value of the samples is 351 ± 8 HV0.3. Surface roughness R_a , R_{max} and R_z measured after turning were measured as 0.39 ± 0.10 , 2.60 ± 0.46 , 2.36 ± 0.38 , respectively. Before turning, R_a , R_{max} and R_z values were 11.18 ± 0.66 , 83.24 ± 6.90 , 72.35 ± 4.82 , respectively. As a result, it can be said that the machining parameters were determined appropriately.

Torque-angle of twist graphs and shear stress-shear angle graph obtained by processing the data as a result of torsion tests are given below Figure 4-6.

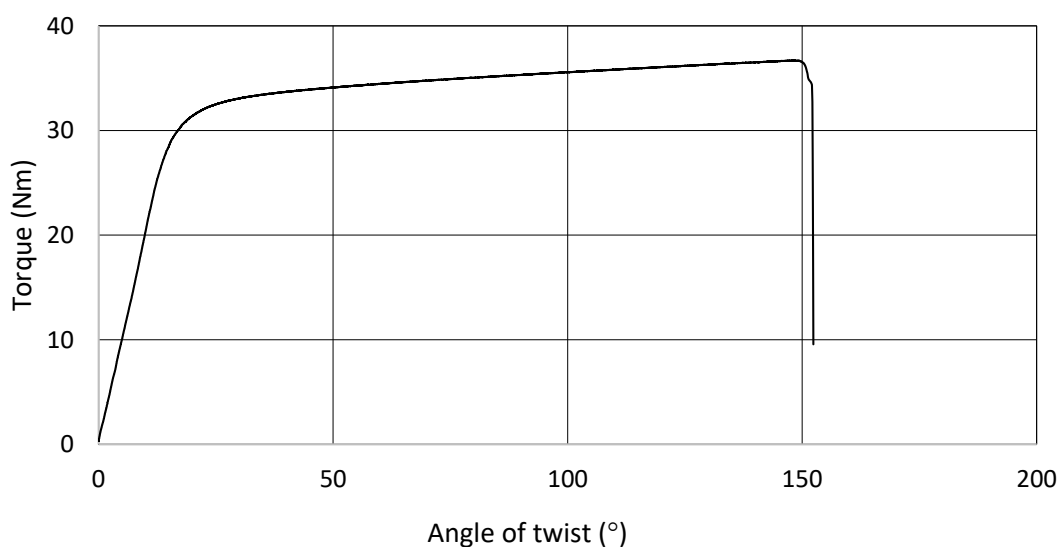


Figure 4. Torque (Nm)-angle of twist (degrees) curve

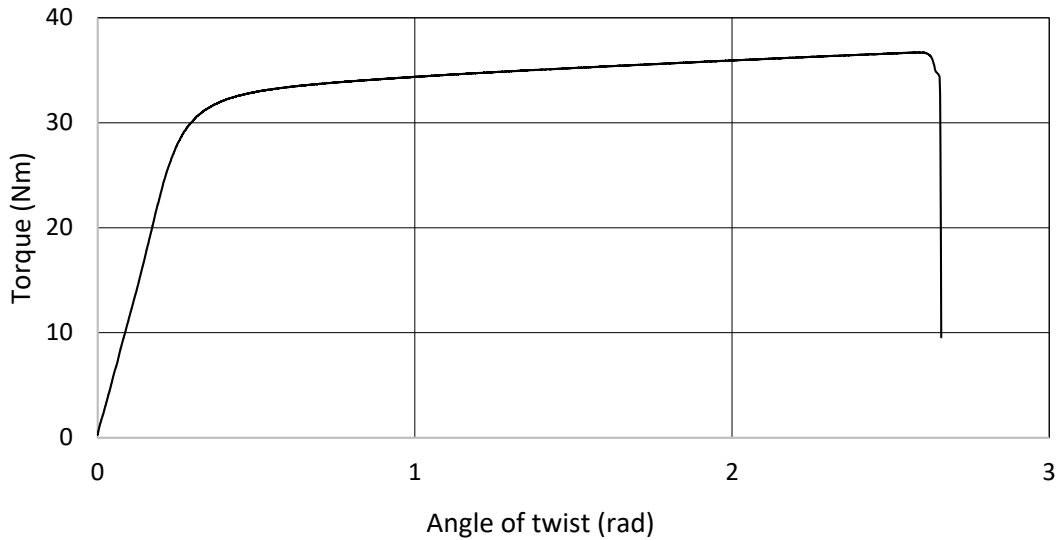


Figure 5. Torque (Nm)-angle of twist (rad) curve

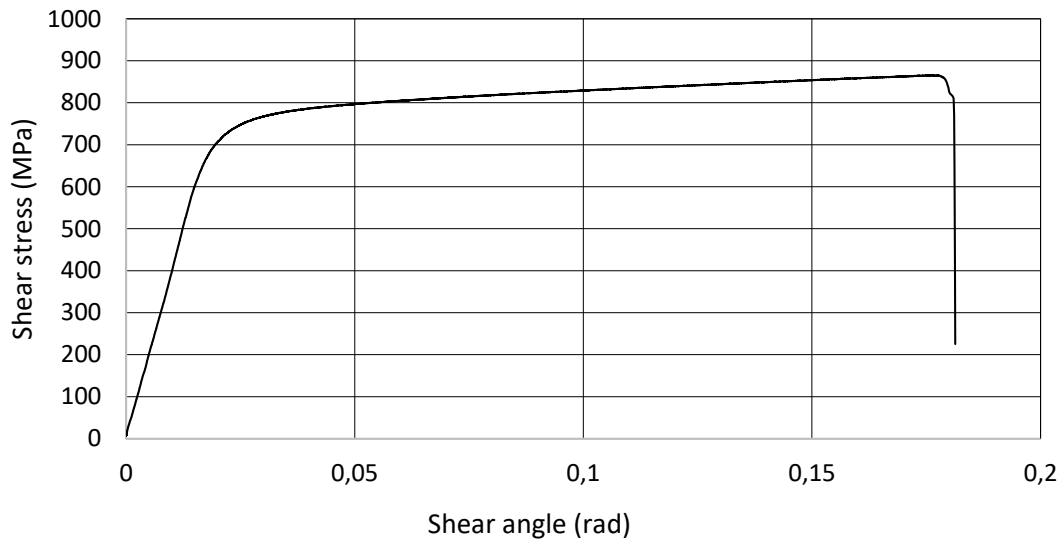


Figure 6. Shear stress vs shear angle

The shear modulus (G) and shear yield stress are obtained 40 GPa and $\sigma_y = 789$ MPa respectively. Ultimate shear stress is $\sigma_{max} = 865$ MPa. The tested sample is given in Figure 7. As can be seen, the fracture surface is perpendicular to the axis. Although titanium material is known as a brittle material, the fracture surface is not at a 45 angle. This shows that the material is enough ductile with additive manufacturing and heat treatments.



Figure 7. Sample after torsion test

Conclusions

The one of the loading conditions in orthopedic implants is torsion. For this reason, it is extremely important to determine the torsional mechanical properties of titanium parts produced by additive manufacturing before implant production. A validated torsionmeter must be used to determine the torsional angle. Only under these conditions, the correct shear modulus value can be determined.

Acknowledgements

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TÜRKİYE’DE YAPILAN ENGELLİLERDE EGZERSİZ VE SPOR KONULU LİSANSÜSTÜ TEZLERİN ÇEŞİTLİ DEĞİŞKENLER AÇISINDAN İNCELENMESİ (2019-2024)

ANALYSIS OF POSTGRADUATE THESES ON EXERCISE AND SPORTS FOR DISABLED PEOPLE IN TURKEY FROM VARIOUS VARIABLES (2019-2024)

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ÖZET

Bu araştırmanın amacı Türkiye’de yapılan engellilerde egzersiz ve spor konulu lisansüstü tezlerin çeşitli değişkenler açısından incelenmesidir. Bu amaç doğrultusunda 2019-2024 yılları arasında yapılmış 270 tez çalışması incelenmiştir. Ulaşılan tezleri bazı değişkenler açısından inceleyen bu çalışmada nitel araştırma yöntemlerinden döküman analizi tekniği kullanılmıştır. Araştırmaya dahil edilecek tezler “Ulusal Tez Merkezi” üzerinden tarama yapılarak belirlenmiştir. Tarama yapılırken anahtar kelime olarak “engelli, egzersiz, spor” kelimeleri kullanılmıştır. Araştırmaya dahil edilecek çalışmalar a) Türkiye’de yapılmış olması ve b) Türkçe veya İngilizce dilinde yazılmış engellilerde egzersiz ve spor konulu tez çalışması olarak yürütülmüş olması, ölçütleri göz önüne alınarak belirlenmiştir. Dahil edilen çalışmalar; tezlerin türü, engel grubu, çalışma konusu, araştırma yılı, araştırma modeli, tezlerin üniversitelere ve bölümlere göre dağılımı, danışman unvanları, veri toplama aracı, teze erişim durumu gibi çeşitli değişkenler göz önüne alınarak incelenmiştir. İncelenen çalışmalar yayımlandıkları yıllara ve konularına göre sıralanarak tablo haline getirilmiştir. Araştırma sonucunda engellilerde spor ve egzersiz konularında en fazla tezin % 20,74 ile 2019 yılında yapıldığı sonucuna ulaşılmıştır. Tezler araştırma modeline göre incelendiğinde % 82,96 oranında nicel yöntemin tercih edildiği görülmüştür. Yazılan lisansüstü tezlerin en çok beden eğitimi ve spor bölümünde; türüne göre ise % 83,7 ile en fazla yüksek lisans türünde yazıldığı görülmüştür.

Anahtar Kelimeler: Engelli, Egzersiz, Spor

ABSTRACT

The purpose of this research is to examine postgraduate theses on exercise and sports for disabled people in Turkey from various variables. In line with this purpose, 270 thesis studies conducted between 2019-2024 were examined. This research, which examines the accessed theses in terms of some variables, used the document analysis technique, one of the qualitative research methods. The theses to be included in the research were determined by scanning through the "National Thesis Center". While scanning, the keywords "disabled, exercise, sports" were used. The studies to be included in the research were determined by considering the criteria of a) being conducted in Turkey and b) being carried out as a thesis study on exercise and sports for disabled people written in Turkish or English. The included studies were examined considering various variables such as the type of theses, disability group, study subject, research year, research model, distribution of theses according

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to universities and departments, advisor titles, data collection tool, and thesis access status. The examined studies were tabulated by ranking them according to their publication years and subjects. As a result of the research, it was found that the highest number of theses on sports and exercise for disabled people was conducted in 2019 with 20.74%. When the theses were examined according to the research model, it was seen that the quantitative method was preferred at a rate of 82.96%. It was observed that the postgraduate theses were mostly written in the department of physical education and sports; and according to type, they were mostly written at the master's level with 83.7%.

Keywords: Disabled, Exercise, Sports

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

EVALUATION AND COMPARISON OF FOOT ARCH AND PHYSICAL FITNESS IN ATHLETES TRAINING IN FOOTBALL AND KARATE

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ABSTRACT

Physical activity is an essential component of a healthy lifestyle, influencing the entire body's functioning. The effects of systematic training are most easily observed in the musculoskeletal system. It is worth emphasizing that different sports disciplines can affect movement patterns and functional fitness in various ways, and this impact is not always beneficial. When evaluating functional fitness, the importance of the foot, the body's primary support, cannot be overlooked. Disorders in this area can negatively impact the stability and efficiency of the musculoskeletal system, potentially increasing the risk of injuries. This study aimed to evaluate the physical fitness and foot arch of football players and karate practitioners. The study included 22 football players and 21 karate practitioners. The football players competed at the 4th–5th league level and trained on average 4–5 times per week, while the karate practitioners trained 3–4 times per week and ranged in skill level from 4th kyu to 2nd dan. The FMS test, consisting of 7 trials, was used for functional assessment, while foot evaluation was conducted using the Full HD Podo4Foot® CAM podoscope. Analysis of the collected data revealed that karate training has a significantly more general developmental character, as evidenced by the FMS test results. The average FMS score for karate practitioners was 18.93 points, compared to 16.07 points for football players, out of a possible 21 points. However, in both groups, the values exceeded the threshold of 14 points, indicating a high risk of sports injuries. In the analysis of foot arches, no distinctive set of features was found to determine clear differences between the feet of the karate and football practitioners.

Keywords: foot arch, functional fitness, athletes, football, karate.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

COMPARISON AND EVALUATION OF THE HEALTH BENEFITS OF DIETARY HABITS OF POLISH AND GREEK STUDENTS USING THE PRO-HEALTHY INDEX (p-HDI-10)

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ABSTRACT

Proper dietary habits are one of the key elements of a healthy lifestyle. They play an extremely important role for young people who are in a period of dynamic physical development and intensive education. Adequate intake of nutrients, vitamins, and minerals is crucial during this time, not only for overall physical growth but also for intellectual abilities, including learning capacity. The study included 186 Polish students and 137 Greek students, all enrolled in sports-related degree programs. The research utilized the Food Frequency Questionnaire with 6 responses (FFQ-6), consisting of 62 questions about the consumption of various food product groups over the past 12 months, divided into 8 sections. Based on this questionnaire, the Pro-Healthy Diet Index (pHDI-10) was determined. The analysis of the collected data revealed that the participants predominantly exhibited a low likelihood of achieving a favorable pHDI-10 index. Only slightly more than 4% of respondents fell into the category of moderate likelihood of a pro-healthy diet, and none of the participants' diets showed characteristics of high pro-healthiness. Based on these findings, it can be concluded that the distribution of the Pro-Healthy Diet Index (pHDI-10) in the studied group is unfavorable, with no statistically significant difference in the low likelihood of a pro-healthy diet between Polish and Greek students. In the moderate category, a similar distribution of data was observed; however, this group was very small for both nationalities. None of the respondents were in the category of high likelihood of a pro-healthy diet.

Keywords: dietary habits, physical development, students, Food Frequency Questionnaire-6 (FFQ-6), Pro-Healthy Diet Index (pHDI-10),

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

YÖNETİCİLERİN İNOVASYON ALGISININ ŞİRKET PERFORMANSINA ETKİSİ THE EFFECT OF MANAGERS' PERCEPTION OF INNOVATION ON COMPANY PERFORMANCE

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ÖZET

Küreselleşmeyle birlikte iş dünyasının gündemine yerleşen inovasyon terimi şirketler için uluslararası pazarlarda rekabet edebilme ve yeni ürün yeteneklerinin geliştirilmesinde tetikleyici role sahiptir. İnovasyon, literatürün genel yaklaşımları baz alındığında tüm şirketlerin başarı ölçüğü olarak kabul edilen şirket performansını yükseltmek ve daha verimli üretim süreçleri uygulamak gibi amaçlarla kurumsal stratejilerin vazgeçilmez unsurudur. Şirket yöneticilerinin inovasyon algıları ise inovasyonun başlatılabilmesi, inovasyon dinamiklerinin doğru yönetilmesi, inovasyonun gerçekleşmesi ve inovasyon çalışmalarının yapılandırılması için kaynak niteliğindedir.

Bu araştırmanın amacı; yöneticilerin inovasyon algısıyla şirket performansı ilişki ve etkileşiminin incelenmesidir. Araştırma bu etkileşimin incelenmesiyle mevcut literatüre katkı sağlaması açısından önemlidir. Araştırmanın çalışma evreni Türkiye’de farklı sektörlerde faaliyet gösteren orta ve büyük ölçekli 412 şirket yöneticisinden oluşmaktadır. Çalışma verilerinin toplanmasında anket yöntemi uygulanmıştır. İki farklı ölçekten yararlanılan araştırma anketinde Torun (2016)’un geliştirdiği “İnovasyon Algısı Ölçeği” ve Fitzgerald ve ark. (1991) tarafından geliştirilen, “İşletme Performansı Ölçeği” kullanılmıştır. Araştırmada elde edilen bulgular SPSS (Statistical Package for the Social Sciences)’te istatistiksel olarak analiz edilmiştir. Korelasyon ve Regresyon analizlerinde inovasyon algısı ile şirket performansı arasında pozitif yönlü bir ilişki olduğu, yöneticilerin inovasyon algısının şirket performansını anlamlı düzeyde etkilediği sonucuna ulaşılmıştır.

Anahtar Kelimeler: İnovasyon 1, Liderlik 2, Algı 3

ABSTRACT

The term innovation, which has been on the agenda of the business world with globalization, has a triggering role for companies to compete in international markets and to develop new product capabilities. Innovation is an indispensable element of corporate strategies for purposes such as increasing company performance and implementing more efficient production processes, which are accepted as the success scale of all companies based on the general approaches of the literature. Innovation perceptions of company managers are a resource for initiating innovation, managing innovation dynamics correctly, realizing innovation and structuring innovation studies.

The purpose of this research is to examine the relationship and interaction between managers' perception of innovation and company performance. The research is important in terms of contributing to the existing literature by examining this interaction. The study population of the research consists of 412 managers of medium and large sized companies operating in different sectors in Turkey. Questionnaire method was used to collect the study data. Two different scales were utilized in the research questionnaire, the “Innovation Perception Scale” developed by Torun (2016) and the “Business Performance Scale” developed by Fitzgerald et al. (1991). The findings obtained in the research were statistically analyzed in SPSS (Statistical Package for the Social Sciences). Correlation and Regression analyses revealed that there is a positive relationship between innovation perception and company performance, and managers' perception of innovation has a significant effect on company performance.

Keywords: Innovation 1, Leadership 2, Perception 3,

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THE RELEVANCE OF ENVIRONMENTAL POLLUTION WITH HEAVY METALS

АКТУАЛЬНОСТЬ ЗАГРЯЗНЕНИЯ ОКРУЖАЮЩЕЙ СРЕДЫ ТЯЖЕЛЫМИ МЕТАЛЛАМИ

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Introduction. Anthropogenic pollution of the environment is a problem of global significance. Modern man is exposed to an increased risk of intoxication with heavy metals. The main sources are polluted water, air, soil and food products. This problem is especially relevant for the city of Baku with its high level of industrial production concentration, characterized by the content of heavy metals. Residents of large cities have a higher risk of developing chronic intoxication when exposed to them, since small, subtoxic doses of metals constantly enter their bodies and accumulate over a long period of time. A specific sign of the impact of toxic elements on health is an increase in their content in human biosubstrates (blood, urine, hair).

The purpose of the study. Study and hygienic assessment of the content of lead and chromium in the biological environments of the body of residents of the administrative, industrial districts, as well as the highway zone of the city of Baku.

Material and method of the study. The amount of heavy metals in human biosubstrates (blood, hair) was determined. The methods of "wet ashing" and atomic absorption spectrophotometry (AAS) were used. The method allows assessing the state of the urban ecosystem.

Results of the study. When analyzing the material for determining metals in biosubstrates, a direct correlation was established between the metal content in the blood and hair of people living in the same area (the highest concentration of metals was recorded in the hair of residents of the industrial area). Along with this, the concentration of metals in the hair turned out to be significantly higher than in the blood (for example, the concentration of lead was 0.22-0.48 $\mu\text{g/g}$, with an acceptable value of 0.1-5.0 $\mu\text{g/g}$) and exceeded the lower limits of acceptable values.

For most metals, a statistically significant high level of their content in hair compared to blood has been established. The values of metal content in hair, exceeding the limits of their reference concentrations in the studied biological materials, objectively reflect their content in the whole organism. Consequently, they may indicate their gradual accumulation to concentrations causing toxic effects.

Conclusion. Hygienically significant values of concentrations of these metals in the biosubstrates examined give grounds to expect a relatively high level of associated pathologies among the population, and can also be used as biological markers of the state of the environment.

Key words: pollution, heavy metals, biosubstrates

Проблемой мирового значения является антропогенное загрязнение окружающей среды. Современный человек подвержен повышенному риску интоксикации тяжелыми металлами.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

Основными источниками являются загрязненная вода, воздух, почва и продукты питания. Особенно актуальна эта проблема для города Баку с его высоким уровнем концентрации промышленного производства, характеризующегося содержанием тяжелых металлов. У жителей крупных городов риск возникновения хронической интоксикации при их воздействии выше, так как небольшие, субтоксические дозы металлов постоянно поступают в их организм и накапливаются в течение длительного времени. Специфичным признаком воздействия токсичных элементов на здоровье является увеличение их содержания в биосубстратах человека (кровь, моча, волосы).

Цель работы. Изучение и гигиеническая оценка содержания свинца и хрома в биологических средах организма жителей административного, промышленного районов, а также примагистральной зоныг. Баку.

Материалы и методы исследования. Определяли количество тяжелых металлов в биосубстратах человека (кровь, волосы). Применяли методы "мокрого озоления", атомно-абсорбционной спектрофотометрии (ААС). Метод позволяет оценить состояние урбоэкосистемы.

Результаты исследования. При анализе материала по определению металлов в биосубстратах установлена прямая корреляционная связь между содержанием металлов в крови и волосах людей, проживающих в одном и том же районе (самая высокая концентрация металлов регистрировалась в волосах жителей промышленного района). Наряду с этим, концентрации металлов в волосах оказались значительно больше, чем в крови (например, концентрация свинца 0,22-0,48 мкг/г, при допустимой величине 0,1-5,0 мкг/г.) и превышали нижние пределы допустимых значений.

Для большинства металлов установлен статистически значимый высокий уровень их содержания в волосах по сравнению с кровью. Величины содержания металлов в волосах, превышающие пределы их референтных концентраций в исследуемых биологических материалах объективно отражают их содержание в целостном организме. Следовательно могут свидетельствовать о постепенном их накоплении до концентраций- вызывающих токсические эффекты.

Выводы. Гигиенически значимые величины концентраций этих металлов в биосубстратах обследованных, дают основание ожидать сравнительно высокий уровень сопряженных патологий среди населения, а также быть использованы в качестве биологических маркеров состояния окружающей среды.

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INVESTIGATING THE DRUG DELIVERY POTENTIAL OF A SPHERICAL ZINC OXIDE NANOPARTICLE FOR FAVIPIRAVIR

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ABSTRACT

Nanotechnology has emerged as a transformative tool in drug delivery, offering enhanced bioavailability and targeted therapeutic delivery. Favipiravir (FAV), an antiviral drug, has been investigated for its interaction with zinc oxide nanoparticles (ZnO NPs) as a potential carrier system to improve drug release and targeting. This study focuses on the chemical binding states of FAV molecules on ZnO surfaces and evaluates their applicability in drug delivery systems. Despite its antiviral efficacy, FAV exhibits rapid elimination and low bioavailability, which constrain its clinical potential. ZnO NPs, known for their biocompatibility and large surface area, were subjected to computational analyses to explore their potential in drug delivery applications. Using Density-Functional Tight-Binding (DFTB) calculations, six ZnO-FAV configurations were modeled, examining various interactions between ZnO's zinc and oxygen atoms and FAV's functional groups. Adsorption energies ranged from -0.39 eV to -2.68 eV, indicating varying degrees of interaction stability. Among the configurations, the most stable one was identified as FAV binding through zinc atoms on the ZnO surface, signifying strong adsorption and enhanced stability. Additionally, electronic properties such as chemical hardness and electrophilicity were analyzed to determine reactivity and stability. The ZnO-FAV-Zn complex demonstrated high binding potential, suggesting its capacity to enhance FAV's pharmacokinetics by improving stability and mitigating degradation. These findings emphasize the potential of ZnO NPs to address pharmacokinetic limitations of antiviral drugs like FAV. Overall, ZnO NPs represent a promising platform for advanced nanotechnology-based drug delivery systems by enhancing stability and enabling site-specific release.

Keywords: ZnO Nanoparticles, Favipiravir, Adsorption Energy, Drug Delivery, DFTB.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

THE DISCOVERY OF THE OLDEST CHURCHES IN JORDAN- SOUTH LEVANT

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ABSTRACT

Archaeological excavations in the past five decades have revealed many religious buildings in Jordan, especially in the city of Aqaba, the area on the eastern side of the Jordan River in site of Jesus Baptism, and the town of Rehab in the city of Mafraq. The archaeological fieldwork and laboratory analyses confirmed that the discovered religious buildings represent the remains of early churches built for worship purposes since the discovery of Christianity in the East.

The results of archaeological excavations in the city of Aqaba showed the discovery of a church dating back to the third century AD; it was discovered in 1998, and the excavators confirmed that the church dates back to the time period between 293-303 AD, which is older than the Church of the Nativity and the Church of the Holy Sepulcher in Palestine. The church measures 26 x 16 m, It was built of mud bricks and was destroyed by an earthquake in 363 AD.

The second church, discovered in 2002, is called the Cave Church, where a church in the name of St Georgios was built over the cave that was used for worship during the period of Christian persecution, and is dated to 230 AD depending on the inscription found on the mosaic floor above the cave in the Byzantine Period. The cave church measures 12 x 7 meters., more than 30 other Byzantine churches have been discovered in the town where this church is located, making it one of the oldest Byzantine Church in Jordan.

The third church is the Church of the Baptism of Jesus Christ, which was discovered in 1997 in the Mar Elias hill area. The excavation results, confirmed that the church is square in shape with a basilica style, measures 13x13 m, built of dressed limestone blocks that date back to the early Byzantine period. However, the church dates back specifically to the second - third century AD. The discovered cave on the eastern side of the church, which dates back to the Early Roman period, was reused and served as an apse for the church during the Byzantine period, making it the oldest church with apse in Jordan. The cave was transformed as an apse and was used as the Holy of Holies for this church, as evidence of pilgrims and traveler's description confirms that John the Baptist resided in a cave in this area. A water channel was added to the church connected the church with the upper tow pools built directly on top of the cave area. More excavations near the cave revealed remains of Rotorius Monastery which dated back to the Byzantine era.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

EPIDEMIOLOGICAL ASPECTS OF PIGEONS IN THE URBAN ENVIRONMENT

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ABSTRACT

Pigeons represent the most frequent and numerous representatives of the ornithofauna of cities. Certain species have created their colonies in the tree rows of certain boulevards, in city parks and in the attics of buildings. Thanks to this, there is no need to talk about the constant dirtying of monuments, facades or parked vehicles, as well as passers-by. Numerous researches carried out in this period have established that city pigeons represent an evident epizootiological and epidemiological danger in the spread of zoonotic diseases. The characteristics of city pigeons are that they are highly adaptable animals that make maximum use of existing food sources and habitats in the city area. For their shelters and nesting, they use roofs and all places in attics, attics, balconies, eaves and in general all hidden places that the urban environment can provide. Their population is the most numerous in the old city core, and they move into the newly created urban units together with their construction and settle them permanently in two months. During their movement in search of food, they have a wide range of flight so that they represent a permanent transmitter of infections and parasites to both humans and domestic animals. The role of pigeons in the transmission of avian tuberculosis, chlamydiosis (psittacosis), salmonellosis, pasteurellosis, pseudotuberculosis, toxoplasmosis, aspergillosis, candidiasis, listeriosis, trichomoniasis, certain types of ticks, fleas and bedbugs has been unequivocally confirmed examination in larges cities around world. Here, the data best speak of the epidemiological and hygienic aspect of free-range pigeons in the urban environment and impose the need for constant monitoring of the epizootic situation in this bird population. The best example at one time was Venice, which was the first to accept the suppression of pigeons from public areas.

Keywords: pigeons, urban environment, epidemiology

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

THE EFFECT OF SULFURIC ACID ON THE GERMINATION OF SEEDS OF THE CAROB TREE CERATONIA SILIQUA.L IN ALGERIA

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ABSTRACT

Introduction. The Carob (*Ceratonia siliqua* L.) is a typically Mediterranean tree of the Fabaceae family; it is very common in Algeria. Because of their capacity to resist the dryness, Carob plays an irreplaceable part, of socio-economic, biotechnological and ecological importance considerable. The germination of seeds of Carob is inhibited by a tegumentary hardness, which requires preliminary treatments for its lifting of dormancy. **Objective.** The aim of this work is to examine the variability in the hardness of the seed coat that could exist between seeds from different areas of Algeria (Oran, Tlemcen, Bejaia and Misserghine), and then proceed in parallel to the comparison of the scarifying power of sulfuric acid and the best treatment for maximum germination. **Material and methods.** A morphometric study was carried out on carob pods and seeds from the four stations. Seeds from the four stations underwent chemical scarification in pure sulfuric acid (98% H₂SO₄) for different durations. Control and scarified seeds were germinated. In addition, we developed *In vitro* the germination of immature seeds of the Hermaphrodite foot has fine knowledge the viability of these last. **Results.** The morphometric study of the pods and seeds of Carob collected of the four areas of Algeria revealed a great phenotypical diversity inter and intra populations. The results obtained show that scarification by the sulphuric acid (H₂SO₄), improves the percentage of the germination of seeds of Carob, although a variability according to the populations and of the duration of steeping is considerate. *In vitro* germination of immature seeds of the Hermaphrodite foot gave a development of the radical what confirms that the problem of these seeds is not in immaturity or can be that the feet of this place have undergoes an exogenic stresses. **Conclusion.** It would therefore be interesting to further this research to know the relationship between seed color and coat dormancy and to know the origin of the malformations of the pods and seeds of the hermaphrodite foot of Misserghine.

Keywords: *Ceratonia siliqua*, phenotypical diversity, Coat dormancy, chemical scarification, germination.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

NEXT-GENERATION SEQUENCING IN FERMENTED FOOD MICROBIOLOGY: A GATEWAY TO UNDERSTANDING FOOD SAFETY AND QUALITY

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ABSTRACT

Fermented foods are globally celebrated for their unique flavors, nutritional benefits, and the intricate microbial ecosystems underpinning their production. These ecosystems play a pivotal role in driving fermentation processes, enhancing sensory attributes, and ensuring food safety. Traditional culture-based approaches, while foundational, have been limited in their ability to capture the full complexity and diversity of these microbial communities. This study underscores the transformative impact of Next-Generation Sequencing (NGS) technologies in unraveling the microbiology of fermentation. NGS enables precise profiling of microbial diversity, metabolic pathways, and functional genomics, offering unprecedented insights critical for advancing food safety, quality, and innovation.

Focusing on yogurt as a representative model, the research leverages shotgun metagenomics to achieve species-level resolution and functional characterization of microbial communities. The methodology encompasses rigorous DNA extraction, library preparation, high-throughput sequencing, and advanced bioinformatics analysis. While the adoption of NGS is constrained by high costs, data complexity, and variability in protocols, its integration into fermented food microbiology represents a paradigm shift. NGS holds immense promise for optimizing fermentation processes, developing robust starter cultures, and ensuring the consistent production of safe, high-quality fermented food products.

Key words: Next Generation Sequencing, Food safety, Metagenomics

Introduction

Fermented foods are integral to human diets across cultures, celebrated for their unique flavors, nutritional benefits, and extended shelf life. These foods, ranging from dairy products like cheese and yogurt to plant-based items such as kimchi, sauerkraut, and soy-based ferments, rely on complex microbial ecosystems. These microbial communities drive fermentation processes, producing metabolites that enhance sensory qualities and improve the safety of the final products. Beyond their culinary importance, fermented foods also have profound health implications, contributing to gut microbiota modulation and delivering probiotics that support human health [1] [2].

Understanding the microbiology of fermentation is critical for improving food safety, consistency, and quality [3]. Historically, studies relied on culture-based methods, which, while effective in isolating and identifying dominant microorganisms, failed to capture the diversity and complexity of microbial ecosystems [6]. Many microorganisms in fermented foods are non-culturable under standard laboratory conditions, and others may only thrive under specific fermentation environments [8]. These limitations left significant gaps in understanding microbial interactions and their roles in fermentation dynamics.

The advent of Next-Generation Sequencing (NGS) technologies has transformed food microbiology [9]. Unlike traditional methods, NGS enables researchers to study microbial communities comprehensively without the need for culturing. By sequencing DNA or RNA directly from samples, NGS provides insights into microbial diversity, community dynamics, and functional roles. This capability is particularly transformative for fermented food microbiology, where the interplay between microorganisms determines not only the sensory attributes of the product but also its safety and nutritional value [10].

NGS has enabled researchers to profile microbial communities in fermented foods at unprecedented levels of detail. From mapping microbial shifts during fermentation to identifying genes responsible for

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

bio-preservation and flavor enhancement, NGS offers a wealth of information that was previously inaccessible [11] [12]. These insights are instrumental in optimizing fermentation processes, developing tailored starter cultures, and ensuring consistent product quality across batches. Furthermore, NGS is pivotal in addressing food safety concerns by monitoring the presence of pathogens and spoilage organisms [5].

This article delves into the methodologies and applications of NGS in fermented food microbiology, exploring its potential to advance food safety, enhance quality, and drive innovation in food production. It also examines the challenges associated with implementing NGS technologies and provides a forward-looking perspective on its role in shaping the future of fermented foods.

Methodology

This study focuses on identifying the microbial species present in fermented food products such as yogurt using advanced sequencing technologies [11][14]. Shotgun metagenomics was selected for its ability to provide species-level resolution and functional insights into the microbial community [6]. While 16S rRNA sequencing offers a cost-effective option, it is limited to genus-level identification [12]. Metatranscriptomics, although valuable for understanding active gene expression, involves additional complexity in preparation and analysis, making it less suitable for species-level identification [10][13]. Shotgun metagenomics enables a comprehensive profiling of microbial DNA, making it the optimal method for this research [14].

Currently, the study is in the sample preparation phase, where fresh yogurt samples have been collected aseptically and stored at -20°C to preserve microbial integrity. The samples are being homogenized under sterile conditions to ensure an even distribution of microorganisms. Total DNA will be extracted from these samples using a commercial kit designed for complex food matrices, ensuring the removal of inhibitors such as lipids and proteins. The quality and concentration of the extracted DNA will be assessed using spectrophotometry and agarose gel electrophoresis to confirm suitability for sequencing.

In the subsequent steps, the extracted DNA will be prepared for sequencing through library preparation. This involves fragmenting the DNA into smaller pieces and attaching adapters to enable sequencing. Unique barcodes will also be added to the adapters if multiple samples are processed in a single run. Once the library is prepared, sequencing will be conducted on a high-throughput platform such as Illumina [11]. The sequencing data will be processed using bioinformatics tools to ensure accuracy and reliability. Raw reads will undergo quality filtering and trimming with tools like FastQC and Trimmomatic [6]. Taxonomic classification will be performed using tools such as Kraken or MetaPhlan, while functional genomic analysis will utilize software like HUMAnN to explore microbial diversity, metabolic pathways, and gene function [9] [14].

Finally, the analyzed data will provide a detailed profile of the microbial species present in the yogurt, including their roles in flavor production, probiotic properties, and fermentation efficiency [5]. The integration of shotgun metagenomics ensures comprehensive species-level identification and functional profiling, overcoming the limitations of traditional culture-based and 16S rRNA sequencing methods [13].

Challenges and Limitations

While NGS has transformed fermented food microbiology, its application is not without challenges. High costs associated with sequencing platforms and reagents limit its accessibility, particularly in smaller institutions and developing regions [9]. Moreover, the complexity of data analysis requires advanced computational tools and expertise, with errors in bioinformatics pipelines or gaps in microbial databases often leading to incomplete or inaccurate interpretations [3]. These databases frequently lack comprehensive coverage of fermented food microbiomes, making it difficult to identify novel species or functional roles [7].

Another critical limitation lies in NGS's inability to distinguish viable from non-viable microorganisms, which can misrepresent active microbial populations [10]. Techniques like RNA-based metatranscriptomics or viability dyes can address this but add cost and complexity [13]. Additionally,

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

variability in sample preparation and sequencing protocols contributes to inconsistent results, emphasizing the need for standardized methodologies [8].

Finally, the high energy consumption and environmental impact of NGS workflows pose sustainability concerns, while the technical and financial demands of these technologies hinder their routine application in food safety monitoring [6]. Addressing these limitations through cost-reducing innovations, improved bioinformatics tools, and sustainable practices will be key to fully realizing the potential of NGS in fermented food microbiology [5].

Conclusion

Next-Generation Sequencing (NGS) has revolutionized fermented food microbiology, enabling detailed insights into microbial diversity, dynamics, and functional roles, which are essential for improving food safety and quality. Despite its potential, challenges such as high costs, complex data interpretation, and the need for standardized protocols remain.

Currently, the study is in the DNA extraction and sample preparation stage, with metagenomic sequencing selected for its ability to provide species-level resolution and functional profiling. This approach will enhance understanding of microbial ecosystems in fermentation, contributing to improved food safety and consistency.

As NGS technology advances, its broader application will drive innovation and lead to safer, higher-quality fermented food products.

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SUFISM AND SPIRITUAL, SOCIAL, AND POLITICAL REFORMATION IN THE LIGHT OF SIRAH OF THE PROPHET MUHAMMAD (PBUH)

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ABSTRACT

This research work is specific to the spiritual, social, and political change through Sufism from the perspective of Seerat-un-Nabi (peace be upon him). Sufism in Islam relies on Taqwa, which denotes purity of heart and soul, truthfulness, and God as confrontation which is synonymous with the virtuous characteristics of the Seerat-un-Nabi (peace be upon him). The brilliant aspects of the character and actions of the Holy Prophet (peace be upon him) were spiritual elevation, social justice, and affairs of political stability and discipline. This research introduces the teaching of Sufism as a proper way to develop spiritual growth, social justice, and political justice in human and societal life.

The essential findings of the research are that the Holy Prophet (peace be upon him) not only enshrined the basic principles of Sufism to maintain the incorporation of peace, tolerance, and social cohesion but also set social reforms and governance in the realization of the same value system. The more down-to-earth aspects of Sufism as the kind of austere conduct, pietism, and emphasis on prayer have been regarded as providing an example of the steady functioning of the social and political order.

The research work can conclude that Sufism is the key to spiritual purification and social and political justice at the individual and social level. It is seen that it is quite possible for reforms to occur in the era of today by adopting some principles of the life standard of the Prophet (peace be upon him).

Keywords: Spiritual, social, and political reform, Sufism, Islam, Political stability

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

THE ROLE OF CIVIL SOCIETY AND EDUCATIONAL INSTITUTIONS IN PROMOTING PEACEFUL COEXISTENCE (A RESEARCH REVIEW)

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ABSTRACT

This research work aims to review the existing literature on the part played by civil society and educational institutions to foster peaceful coexistence. Amity, pluralism, and respect ought to be the cornerstones of any society, and the civil society/education system is a key to the realization of these core principles. This research describes how educational institutions can help learners develop cultures of tolerance and non-violent conflict-solving, and how civil society can contribute to the fostering of tolerance and respect for living together by increasing awareness among the communities.

The research work also discusses how certain important aspects of the curriculum such as concerns with peace and tolerance; elements of conflict resolution and dialogue skills are useful and functional in initiating sustainable peace in society. Members of civil society other NGOs and other societal organizations can also play a major proactive role in sensitizing members of the public on social issues, minimizing conflicts, and enhancing mutual coexistence at the public/national level.

Thus, the research states that educational institutions and civil society are willing to support each other in regard to the peaceful existence and the collective actions of these two groups could be useful for creating a stable society, tolerance, and development.

Keywords: Civil society, Societal organizations, Peace and tolerance

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

MUHAMMAD (PBUH): A MODEL FOR RESOLVING NATIONAL ISSUES AND EXEMPLARY LEADERSHIP

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ABSTRACT

Great leadership and practical problem-solving techniques were demonstrated by Prophet Muhammad (PBUH), which could assist governments and nations in effectively managing their issues. In addition to addressing societal, political, and economic issues, the suggested framework is comprehensive and can promote justice, unity, and long-term progress.

Prophet Muhammad's leadership was characterised by the cardinal characteristics of equality, justice, knowledge, and kindness. In addition, he was a perfect example of leadership, capable of learning how to resolve disputes, negotiate, and reach out to the welfare of the community. The Mithaq-e-Madina, or the Charter of Medina, for example, is a special kind of collaboration and respect for one another, peaceful cohabitation, and a sustainable, equitable form of governance in a multicultural community.

The same applies to his principles concerning economic justice, rational use of resources, and combating corruption, which provide viable answers to today's economic questions.

As well, we have to realize that the Prophet (PBUH) had spoken about many things such as having a good character and the submission of leaders to their people as good role models. He had the consultative type of decision-making known as Shura whereby he brought in all the relevant parties on matters relating to policies and matters to be addressed. Hence, this type of leadership would thus be able to tackle various mechanical democracy questions, enhance the principles of democracy, and prevent political instability.

The biography of Muhammad's (PBUH) life by itself emphasizes that it is possible to encourage social development through humane and fair leadership that assists people in resolving their disputes and transforms society. In the contemporary world, Leadership entails solving national problems and credible leadership that will inspire the citizens through trust, togetherness, and ideas that can make a difference.

Keywords: Shura, Decision-making, Economic justice, Multicultural community

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

STRUCTURE-BASED DRUG REPURPOSING TO INHIBIT THE DNA GYRASE OF *MYCOBACTERIUM TUBERCULOSIS*

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Short Introduction:

Drug repurposing is an alternative avenue for identifying new drugs to treat tuberculosis (TB). Although TB can be cured with anti-tubercular drugs, the emergence of multidrug-resistant and extensively drug-resistant strains of *Mycobacterium tuberculosis* H37Rv (Mtb), as well as the significant death toll globally, necessitate the development of effective drugs to treat TB.

Experiments and Key result findings:

In this study, drug repurposing approach was employed to address this drug resistance problem by screening drugbank database to identify novel inhibitors of the Mtb target enzyme, DNA gyrase. The compounds were screened against the ATPase domain of gyrase B subunit (MtbGyrB47), and the docking results showed Echinacoside, Doxorubicin, Epirubicin, and Idarubicin possess high binding affinities against MtbGyrB47. Comprehensive assessment using fluorescence spectroscopy, SPR, and CD titration studies revealed that Echinacoside as a potent binder against MtbGyrB47. Further, ATPase, and DNA supercoiling assays exhibited IC₅₀ values of 2.1-4.7 μM for Echinacoside, Doxorubicin, Epirubicin, and Idarubicin. Among these compounds, the least MIC₉₀ of 6.3 μM and 12 μM were observed for Epirubicin and Echinacoside, respectively. Hence, our findings indicate that Echinacoside and Epirubicin target mycobacterial DNA gyrase, inhibit its catalytic cycle, and retard mycobacterium growth. Further these compounds exhibits potential scaffolds for optimizing novel anti-mycobacterial agents that can act on drug-resistant strains.

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PRESERVATION OF THE ENVIRONMENT BY REMOVING COPPER FROM WASTEWATER FROM METAL PLATING VIA ELECTROCOAGULATION

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ABSTRACT

The pollution of aquatic ecosystems by heavy metals poses a significant and immediate environmental threat worldwide. Industrial operations often result in the direct discharge of effluents into rivers, lakes, and ponds, leading to the contamination of these water bodies. Subsequently, these pollutants can percolate into groundwater systems through a range of transport mechanisms. Although certain heavy metals play essential roles in the metabolic processes of organisms, their elevated concentrations in aquatic environments present substantial risks, disrupting ecological balance and potentially affecting human health. This study examines the process of copper (Cu) removal from wastewater using electrocoagulation techniques. The research found that the effectiveness of copper extraction increased with extended electrocoagulation times, higher concentrations of sodium chloride (NaCl), and elevated applied electric currents. The most efficient removal was achieved under optimal conditions, which is defined as an average pH level of about 4 and a current of 2 A , and a duration of electrolysis set at 60 minutes.

Keywords: Wastewater; Heavy metals; Electrocoagulation; copper; electric currents.

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STRATEGIC DIMENSIONS OF MARITIME DIPLOMACY IN THE INDO-PACIFIC: A GEOPOLITICAL ANALYSIS

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ABSTRACT

The Indo-Pacific region has emerged as a pivotal arena for global power dynamics, where maritime diplomacy plays a crucial role in shaping geopolitical strategies. This paper explores the strategic dimensions of maritime diplomacy in the Indo-Pacific, analyzing how states leverage naval power, alliances, and multilateral frameworks to secure their interests in a highly contested maritime space. The rise of China as a maritime power, the U.S. pivot to Asia, and the increasing role of regional players like India, Japan, and Australia are examined in the context of maritime security, trade routes, and access to natural resources. This research has been conducted using a mixed-method approach. Through a comprehensive review of policy documents, strategic dialogues, and expert analyses. Through a geopolitical lens, this research delves into key maritime strategies such as freedom of navigation operations, military exercises, and port access agreements that influence regional stability. The study also highlights the role of regional organizations, including ASEAN and the Quad, in fostering maritime cooperation while balancing great power rivalries. Furthermore, it discusses the impact of emerging technologies, such as underwater surveillance and maritime domain awareness systems, on enhancing security and deterring conflicts. This paper argues that maritime diplomacy in the Indo-Pacific is not only a tool for conflict prevention but also a means of asserting influence and projecting power in a region critical to global trade and security. By examining case studies of territorial disputes, resource competition, and power projection, this analysis provides insights into the evolving strategic landscape of the Indo-Pacific and its implications for regional and global security. The findings underscore the necessity for cooperative maritime frameworks to address the growing complexities of Indo-Pacific geopolitics.

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PHARMACOLOGY ASPECT OF THE CLITORIS TERNATEA

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Bharath institute of higher education and research institute

ABSTRACT

A member of the Fabaceae family, the butterfly pea is widely distributed throughout the world, but especially in tropical and subtropical areas. Because butterfly pea (*Clitoria ternatea*) contains flavonoid chemicals, which are mostly found in its roots, leaves, and flowers, locals frequently use it as a medicinal resource. Phenolic molecules called flavonoids have antioxidant qualities that protect cells from damage brought on by free radicals. Thorough mechanistic research has revealed that the hormetic dosage responses are mediated by common signalling pathways and the cross-pathway contacts they facilitate. According to these results, the idea of hormesis is central to wound healing, and it may have significant ramifications for clinical approaches, agent screening, and assessment. The purpose of this literature study is to investigate the many health advantages linked to butterfly peas. The purpose of this literature study is to investigate the many health advantages linked to butterfly peas. Antioxidants, anti-inflammatory, antidiabetic, antihyperlipidemic, hypoallergenic, antitussive, anti-aging, and antidepressant activities are among the beneficial attributes of butterfly pea blossoms, according to the review.

Key Words: *Clitoris ternatea*, Pharmacology of *Clitoria ternatea*, Butterfly pea.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

THUTHI LEAF

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ABSTRACT

Abutilon indicum is a plant that belongs to the Malvaceae family, which is distributed throughout a number of tropical and subtropical areas and has been used for various disorders in traditional and folk medicine. The various medicinal applications of this plant include anti-inflammatory, antioxidant, demulcent, aphrodisiac, laxative, diuretic, pulmonary and sedative. Thus the present study was formed to identify the biological activities of A. indicum fruit by in silico and in vivo approach. The ethanolic extract was prepared and screened for in vitro antimicrobial activities against Staphylococcus aureus and Enterococcus faecalis and also against a fungi Aspergillus niger. The ethanolic extract was subjected to Gas chromatography–mass spectrometry (GC-MS) analysis for identification of compounds present in fruit sample. The identified compounds were then screened for anti-inflammatory activity by molecular docking against the Cyclooxygenase-2 inhibitors. Also, Density Functional Theory (DFT) & Absorption Distribution Metabolism Excretion and Toxicity (ADMET) studies were carried out to assess the quantum-chemical parameters and pharmacokinetics behaviour respectively. The ethanolic fruit extract of A. indicum showed moderate antimicrobial activity against S. aureus, E. faecalis and Aspergillus niger at the MIC of 25 µg/µl. AI 1003, AI 1004 and AI 1005 were identified as lead compounds against the target Cyclooxygenase –2 which exhibited strong hydrogen bond interaction & also desirable pharmacokinetic properties. DFT studies also showed the promising reactivity with lowest energy gap of compounds AI 1004 &AI 1005. Thus, owing to the significant interaction of the compounds with the target COX-2 and desirable pharmacokinetic properties of compounds of ethanolic extract of A. indicum could be further explored for anti-inflammatory properties by in vitro & in vivo analysis.

Keywords: Abutilon indicum Antimicrobial Molecular docking DFT Inflammation.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

ROLE OF GENOMIC PROTEOMICS AND BIOINFORMATICS

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ABSTRACT

The systematic study of human DNA sequences, or genomics, began in earnest with the completion of the human genome project in 2003. A logical extension of genomics is proteomics, which is the study of all the proteins that are present in a single cell. When combined, the data from proteomics and genomes have enormous potential to transform clinical practice. The way doctors are trained will need to change significantly in order to incorporate this knowledge into medical diagnosis and treatment. To be able to use the technology and discern the benefits and drawbacks of genomic/proteomic testing, medical genetics, epidemiology, bioinformatics, and statistics, all students and aspiring doctors must gain sufficient understanding of the underlying sciences. The use of genomic or proteomic testing in patient diagnosis and treatment will raise ethical concerns that should be addressed throughout the medical curriculum, as these tests can reveal a great deal about an individual's genetic composition and susceptibility to disease.

Keywords: Genomics, DNA Sequences, Medical Genetic, Bioinformatics, Proteomic Testing

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

SEISMIC EVALUATION OF A HISTORICAL MASONRY MOSQUE

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ABSTRACT

The fact that Edirne was under Ottoman protection in the early 14th century created a significant impact in the Balkans and Europe and facilitated the capture of Istanbul. The city, which became the base of the Rumelia campaigns, served as the capital of the Ottoman Empire from its conquest until the conquest of Istanbul (1453). In the 14th century, the city experienced intensive construction activities and many buildings and important monuments were constructed. Two major disasters in the mid-18th century greatly affected Edirne; most of the houses and important buildings in the city were destroyed due to the fire in 1745 and the earthquake in 1751. Although the exact number of mosques built in Edirne during the Ottoman period (from the 14th century to the 20th century) is not known, it is estimated that 314 mosques and mescids were built and only 55 of these mosques remain today. These historical mosques, which are an important part of our cultural heritage, are still actively used today. In this study, the seismic behavior of the Yahya Bey Mosque, one of the single-domed mosques built in this period and not previously examined, was investigated using the acceleration records of the 1999 Düzce earthquake. For this purpose, the mosque was modeled three-dimensionally with the SAP2000 finite element program using the macro modeling method and dynamic analyses were performed. As a result of the dynamic analyses, the maximum displacement and stress values occurring in the mosque were obtained.

Keywords: Historical mosques, Finite elements, Dynamic analysis

1. INTRODUCTION

Historical artifacts that act as bridges between generations are the social and cultural reflections of a society. Historical structures, which are the common heritage of humanity, must be protected and preserved. Therefore, the protection of historical structures is important in terms of not losing our past and revealing our cultural development. Some of the problems encountered during the protection of historical structures can be listed as earthquakes, inadequate reinforcement and restoration works, workmanship, material and usage errors during maintenance and repair. In order to ensure the uniqueness of historical artifacts and their transfer to future generations, it is important to carry out appropriate modeling and analysis studies to minimize the damage that may occur in these structures. Historical structures can be seriously damaged under earthquake loads due to various reasons such as low tensile strength of the materials, inadequate connections between structural elements, lack of out-of-plane strength and deterioration of the materials used over time [1-4]. Turkey has a rich cultural heritage that includes historical structures from different periods. 19 of these heritage sites are on the UNESCO World Heritage List and 84 are on the Temporary Heritage Sites List. In addition, according to the General Directorate of Cultural Heritage and Museums, there are approximately 120,000 immovable cultural assets in our country [5]. Research on the protection of historical structures in Europe began in the 19th century and gained great importance after the Second World War. Studies on the protection of historical structures have developed in recent years in our country [6]. The examination of historical structures that have managed to survive for many years despite many negativities can be an

example of new construction systems in terms of both material and construction technique. Stone, brick and wooden materials are generally used in the foundations of historical structures [7]. In these structures, floor is made of wooden beams and rafters, wooden or iron beamed volta flooring, vaults or domes [8-9]. The walls are made of stone, brick and adobe, and door and window gaps are left to facilitate people's use, and these gaps reduce the resistance of the walls against earthquakes. Depending on the size of these gaps, it is aimed to strengthen the seismic behavior of the walls by using block stones, wooden or iron lintels, overlapping arches or arches [8]. The columns that are vertical carriers are generally made of marble and granite in circular and single pieces. Transition elements are structures that establish a relationship between structures with geometrically dissimilar forms, create continuity in terms of surface, mass and volume, and also provide load transmission. Traditionally used squinch, pendentive and Turkish triangle are transition elements to the dome. In classical Ottoman architecture, pendentive and squinch were generally used in brick, stone or stone-brick alternation [8,10-11]. Historical masonry mosques are structures whose structural behaviors are difficult to determine due to their different construction techniques, complex geometric forms and material properties used. In order to detect possible damages that may occur in these structures, the behavior of the structure must first be known correctly. However, it is quite difficult to evaluate historical mosques with analytical calculations. For this reason, these structures are mostly modeled using the finite element method and their seismic analyses are performed. In recent years, many numerical studies have been conducted on the earthquake behaviors of historical structures in our country. Köseoğlu and Canbay [1] examined the historical Cenabı Ahmet Paşa Mosque in their study. A finite element model of the structure was created and the behavior of the structure under environmental loads was tried to be determined. Çarhoğlu et al. [12], in order to obtain the seismic behavior of Kars Kümbet Mosque, modeled the structure with the finite element method and performed earthquake analyses under different earthquake acceleration records in the time history domain. Kazaz and Kocaman [13], created a three-dimensional finite element model of Erzurum Lala Paşa Mosque and examined its behavior under static and dynamic loads. They used the acceleration records of the 1992 Erzincan earthquake for dynamic analyses. Bayraktar et al. [14], in their study, modeled the historical Fatih Mosque with the three-dimensional finite element method. They investigated the effect of window openings on the behavior of the structure on this model. For this purpose, linear dynamic analyses of the structure were performed and the effect of window openings on the behavior of the structure was examined. Dabanlı [15] modeled the Hırka-i Şerif Mosque in three dimensions and made numerical analyses of the mosque under different loading conditions. Maraş et al. [16] determined the damages in the historical Sütlü Mosque in Malatya after the 2020 Elazığ earthquake with the help of dynamic analyses. They determined that the damages obtained in the finite element model were compatible with the damages that occurred during the earthquake in the mosque. Kocaman and Kazaz [17], modeled the finite element model of the Sultan Selim Mosque in Konya using two different material properties and performed time-domain analyses of these models. As a result of dynamic analyses, they obtained different collapse mechanisms of the mosque. Usta et al. [18], numerically modeled the Afyon Sandıklı Ulu Mosque and examined its behavior under earthquake effects and determined the most affected areas of the structure under dynamic loads.

In this study, the seismic behavior of the Yahya Bey Mosque in Edirne was examined. The mosque was modeled three-dimensionally using the macro modeling method and dynamic analyses were performed under the 1999 Düzce earthquake. As a result of dynamic analyses, the maximum displacement and stress values occurring in the mosque were obtained.

2. YAHYA BEY MOSQUE

Yahya Bey Mosque was built by Mimar Sinan between 1577-1578 as a small mosque. The mosque, which is built with alternating cut stone and bricks, has a square plan and a single dome, and has a short minaret sitting on a five-sided base adjacent to the main wall on the north side of the eastern facade of the prayer hall (Figure 1, 2).

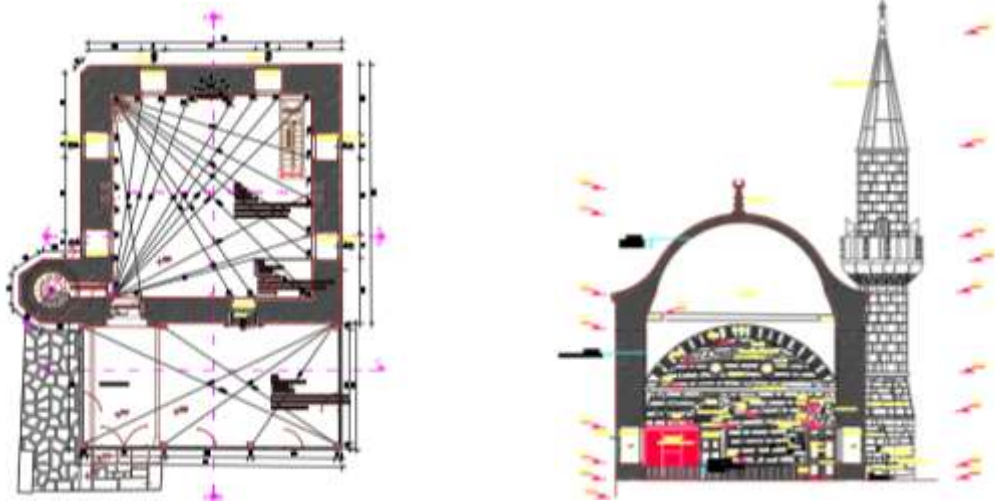


Figure 1. Yahya Bey Mosque First Floor Plan [23] **Figure 2.** Yahya Bey Mosque D-D Section [23]

There are three windows on the east and west sides of the harim, two on the bottom and one on the top, and four windows on the south side, two on the bottom and two on the top. The windows are made of brick and have pointed arches. The narthex is made of wood, and the crown door is on the left side of this side. In the middle of the facade, there is a windowed mihrab hidden by muqarnas, and the crown door and the mihrab slightly protrude from the main wall. The crown door opening is flat arched and is enclosed in a pointed arched socket surrounded by a curb band from the edges of the door. The construction inscription is located on the flat arch. When looking at the door from the inside, an eyebrow arch is seen above the wooden wings within the deep pointed arch. The minaret entrance is located in this part of the harim. There is no plaster on the harim walls. The dome sits on a dodecagon drum. The three-dimensional finite element model of the Yahya Bey Mosque is given in Figure 3. The mosque foundation height is 71 cm, the side wall height is 705 cm, the minaret height (including the cone section) is 1725 cm, the maximum height of the dome is 1157 cm, and the dome diameter is 690 cm (Figure 4).

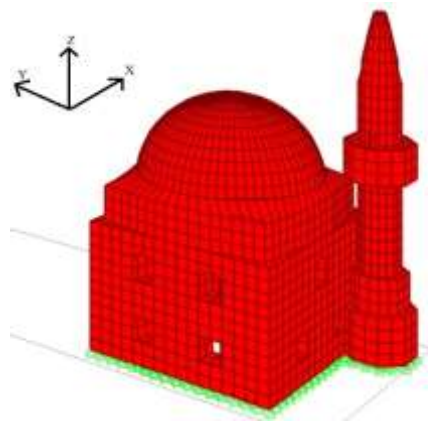


Figure 3. 3D Model of Yahya Bey Mosque

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a) Southern facade



b) Eastern facade



c) Western facade



d) Northern facade

Figure 4. Views of the Yahya Bey Mosque [20-22]

The mosque, which is owned by the General Directorate of Foundations, underwent restoration in the 1990s. The mosque, which is open for worship, was registered with the decision of the Edirne Cultural and Natural Heritage Protection Board [19-23]. Old photographs of the Yahya Bey Mosque was given in Figure 5.



a) North Facade



b) West-South Facade

Figure 5. Old photographs of Yahya Bey Mosque [22]

3. MODELING AND SEISMIC EVALUATION OF THE MOSQUE

In this study, the mosque was modeled in three dimensions. SAP2000 finite element program was used for the modeling process. Three different modeling techniques are widely used in finite element modeling of masonry structures depending on the size of the structure. These are called detailed micro, simplified micro and macro modeling. These modeling techniques are given in Figure 6. When the

literature is examined, the macro modeling technique is frequently preferred because it significantly reduces the computer solution time in the modeling of large systems [24-26].

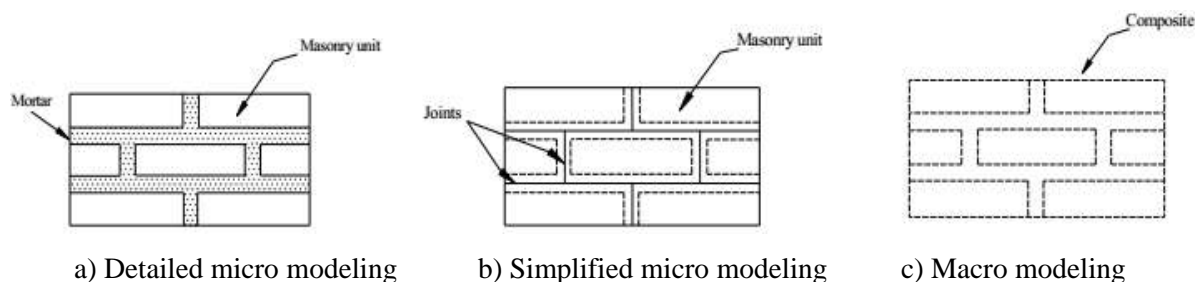


Figure 6. Modeling techniques of masonry structures [27]

The three-dimensional finite element model of the mosque was generated with the SAP2000 program. A total of 6962 nodal points and 4066 quadrilateral prismatic elements were used in this finite element model. The mosque was modeled with the macro modeling technique. Eight-nodal three-dimensional solid elements with three degrees of freedom at each nodal point were used in the generation of the finite element model of the mosque. In this study, the areas of the mosque in contact with the ground were modeled as fixed supports. The elasticity modulus, unit volume mass and Poisson ratio of the mosque stone material was considered as 1000 MPa, 2.5 t/m³, and 0.20, respectively. The three-dimensional finite element model of the mosque and the nodal point 7374, where the displacement were examined, are given in Figure 7.

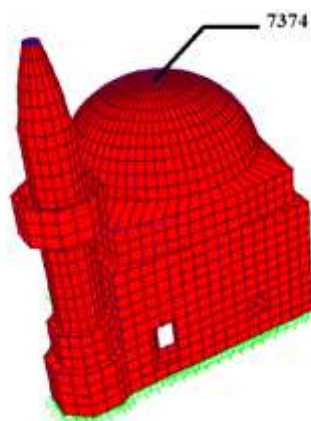


Figure 7. 3D finite element model of the mosque

In order to obtain the dynamic characteristics of the mosque, analytical modal analysis of the mosque was performed. The first two of these modes were obtained as local modes belonging to the minaret and were not taken into account. The free vibration periods, mass participation ratios and mode shapes of the mosque were determined with the modal analysis. In the modal analysis, a sufficient number of modes were taken into account so that the sum of the effective mass participation ratios calculated would be greater than 90% of the total mass of the mosque. The first five modes of the mosque (excluding local modes) are given in Figure 8. When the mode shapes are examined, the third and fourth modes of the structure were obtained in the transverse y direction, and the fifth and sixth modes were obtained in the transverse x direction. The ninth mode of the structure was found to be torsional mode.

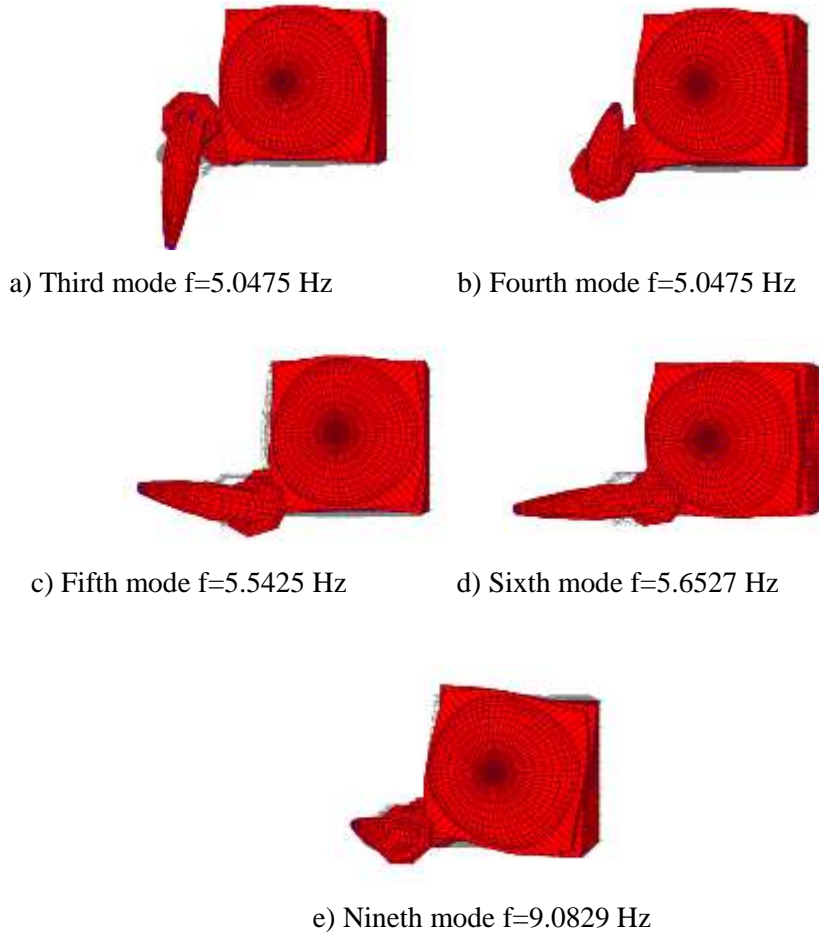


Figure 8. Mode shapes of dominant modes.

The acceleration record of the 1999 Düzce earthquake were used to evaluate the dynamic behavior of the mosque. For this purpose, the east-west component of the earthquake was affected from the x-direction of the mosque. In the analyses, the entire acceleration record of the earthquake was used without shortening. The acceleration record of the east-west component of the 1999 Düzce earthquake is given in Figure 9.

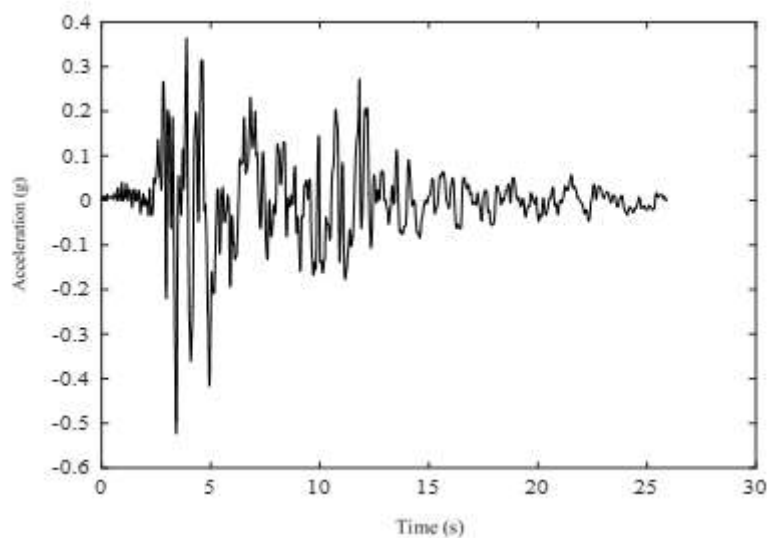


Figure 9. East-west acceleration record of the 1999 Düzce earthquake.

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The HHT- α (Hilber-Hughes-Taylor) algorithm was used for dynamic analyses. The damping type was assumed to be a Rayleigh type damping, and stiffness and mass proportional damping coefficients were calculated. The damping ratio was assumed to be 5% in the analyses. The integration time step was taken into account as 0.005 s. In the dynamic analyses, the structure's own weight was taken into account together with the earthquake accelerations. As a result of the analyses, the displacement-time graph of the selected nodal point is given in Figure 10. The maximum displacement of the selected nodal point at the dome was obtained as 1.1 mm.

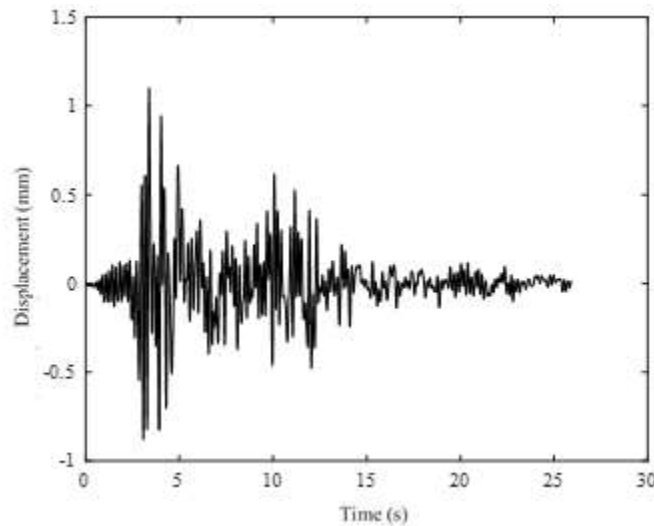
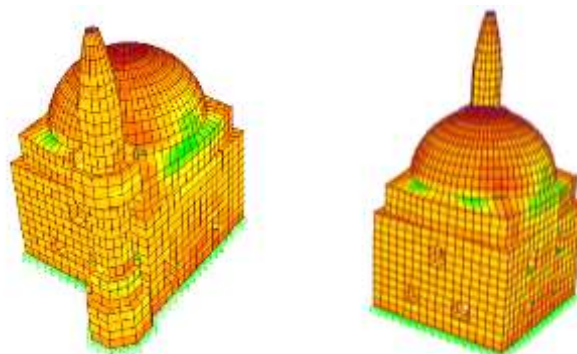
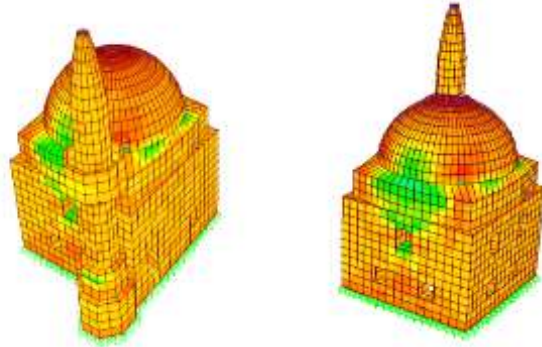


Figure 10. Displacement-time graph of node 7374.

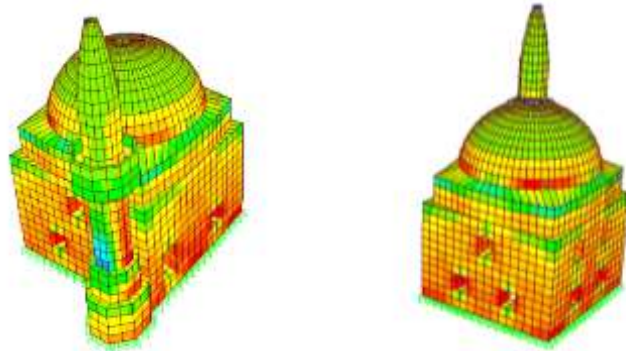
Within the scope of this study, the maximum and minimum values of the stresses (Envelope max, min) that vary with time obtained as a result of dynamic analyses are presented. The normal stress diagrams obtained for Envelope max. as a result of the analyses conducted in the time domain using the 1999 Düzce earthquake are given in Figure 11. As a result of the analyses, the maximum tensile stress was obtained as 251.04 kPa. It can be said that the maximum tensile stresses are concentrated in the base, cube and body parts of the minaret and in the parts where the dome of the mosque meets the drum. The normal stress diagrams obtained for Envelope min. are given in Figure 12. As a result of the analyses, the maximum compressive stress was found as 1157.78 kPa. It can be said that the maximum compressive stresses are concentrated in the cube and body parts of the minaret and in the parts where the dome of the mosque meets the drum and in the parts of the body of the mosque close to the ground.



a) σ_{xx} stress, Envelope max.

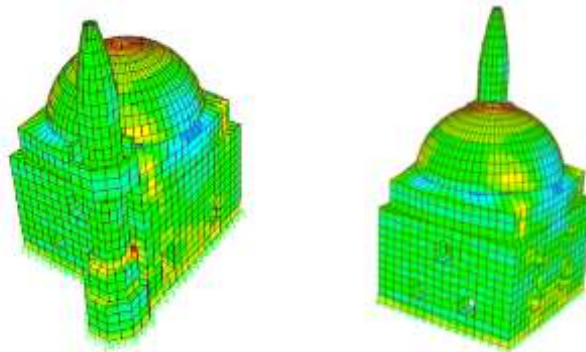


b) σ_{yy} stress, Envelope max.

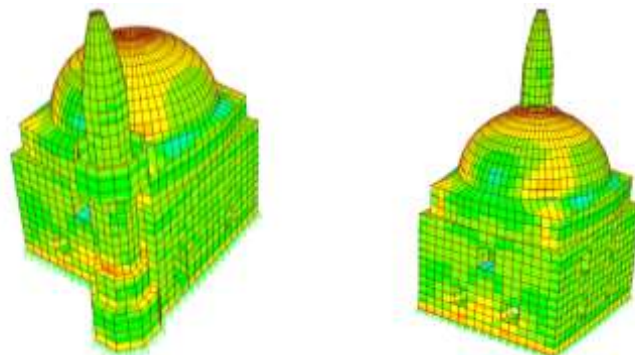


c) σ_{zz} stress, Envelope max.

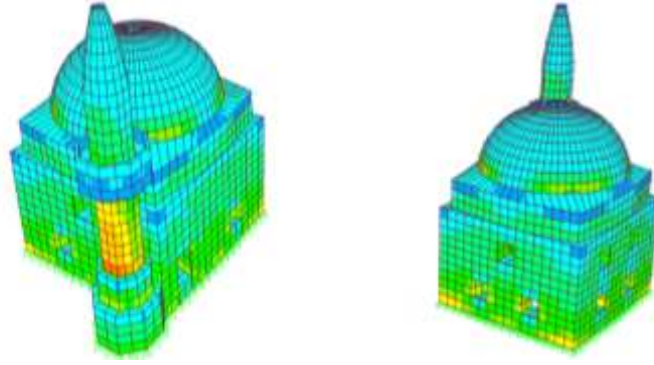
Figure 11. Normal stresses for the 1999 Düzce earthquake, Envelope max.



a) σ_{xx} stress, Envelope min.



b) σ_{yy} stress, Envelope min.



c) σ_{zz} stress, Envelope min.

Figure 12. Normal stresses for the 1999 Düzce earthquake, Envelope min.

4. RESULTS

Historical mosques are one of the cultural heritages that should be safely transferred to future generations. Considering the construction techniques and materials used, these mosques are seismically fragile structures. In this study, a seismic assessment of a historical masonry mosque in Edirne was performed under the 1999 Düzce earthquake. The maximum displacement of the selected nodal point in the dome was obtained as 1.1 mm. It was observed that the stresses obtained as a result of the analyses made in the time history using the 1999 Düzce earthquake were concentrated in the base, cube and body parts of the minaret and in the parts where the dome of the mosque meets the drum.

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ANTROPYLORİK BÖLGEDE ÜLSERE LEZYON: OLGU SUNUMU ULCERATED LESION IN THE ANTHROPYLORIC REGION: CASE REPORT

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ÖZET

Akut ve kronik gastrit mide mukozasının çeşitli zararlı etkenlere karşı verdiği bir yanıt olarak tanımlanabilir. Her iki gastrit türünün farklı endoskopik görüntülere sahip olduğu bilinmektedir. Akut gastritte tanıyı destekleyecek endoskopik bulgular arasında; ödem, eksüda, hiperemi, erozyon ve kanama görülmektedir. Endoskopik raporlama yapılırken ülser çapı, yerleşim bölgesi, şeklinin düzgün olup olmadığına, kenarların kabarık ve düzensiz olup olmadığına, sayısı rapor edilmelidir. Biyopsiler ülser kenarlarının her kadranından alınmalıdır. Bu çalışmada kliniğimizde Endoskopi endoskopi yapılan, dispeptik şikayetleri olan hastanın, antropylorik bölgesinde izlenen ülser lezyonları hem histolojik hem de morfolojik bulguları sunulmuştur. 79 yaşındaki hasta dispeptik semptomların yanında tarama amacı ile Genel Cerrahi polikliniğine başvurmuştur. Tanısal amaçlı endoskopi yapılması planlanmıştır. Endoskopi sırasında mideye girildiğinde midede safra reflüsü olduğu, izlenmiştir. Antrumda mukoza hiperemik ve ödemli gözlenirken, antropylorik bölgede 3 adet yaklaşık 3 cm boyutlarında ülser lezyonları olduğu saptanmıştır. Ülser çevresi ve tabanından biyopsiler alınmıştır. Mikroskopik bulgularında ışık mikroskobu altında incelenen dokular Hematoksilen & Eozin (H&E) ile boyanmış ve dokulara kronik, atrofik gastrit tanısı konulmuştur. Endoskopik olarak benign ve malign ülser ayırımını yapmak zordur. Ülserin boyutu, lokalizasyonu, sınırları ve tabanı, ülserin benign veya malign olduğuna karar vermekte önemli kriterlerdir. Histopatolojik değerlendirme, nadiren de olsa yanıltıcı olabilir. Gastrik ülserli tanıli hastalarda, ülser iyileşene kadar kontrol endoskopi ve biyopsi ile takip edilmelidir.

Anahtar Kelimeler: Akut gastrit, Dispepsi, Ülser, Histopatoloji.

ABSTRACT

Acute and chronic gastritis can be defined as a response of the gastric mucosa to various harmful agents. It is known that both types of gastritis have different endoscopic images. Endoscopic findings that support the diagnosis in acute gastritis include edema, exudate, hyperemia, erosion and bleeding. During endoscopic reporting, the ulcer diameter, location, whether the shape is smooth, whether the edges are raised and irregular, and the number should be reported. Biopsies should be taken from each quadrant of the ulcer edges. In this study, both histologic and morphologic findings of ulcerated lesions in the

antrorik bölge of a patient with dyspeptic complaints who underwent endoscopy in our clinic are presented. A 79-year-old patient presented to the General Surgery outpatient clinic with dyspeptic symptoms and for screening. Endoscopy was planned for diagnostic purposes. During endoscopy, bile reflux was observed in the stomach. While the mucosa was hyperemic and edematous in the antrum, 3 ulcerated lesions approximately 3 cm in size were found in the antrorik region. Biopsies were taken around and at the base of the ulcer. Microscopic findings were examined under light microscope and stained with Hematoxylin & Eosin (H&E) and the tissues were diagnosed as chronic, atrophic gastritis. Endoscopic differentiation between benign and malignant ulcers is difficult. The size, localization, borders and base of the ulcer are important criteria to decide whether the ulcer is benign or malignant. Histopathologic evaluation may rarely be misleading. Patients with gastric ulcer should be followed up with control endoscopy and biopsy until the ulcer heals.

Keywords: Acute gastritis, Dyspepsia, Ulcer, Histopathology.

GİRİŞ

Akut ve kronik gastrit mide mukozasının çeşitli zararlı etkenlere karşı verdiği bir yanıt olarak tanımlanabilir. Her iki gastrit türünün farklı endoskopik görüntülere sahip olduğu bilinmektedir. Akut gastritte tanıyı destekleyecek endoskopik bulgular arasında; ödem, eksüda, hiperemi, erozyon ve kanama görülmektedir. Erozyon ve kanama akut gastrit için özellikli lezyonlar olarak bilinmektedir. Erozyon genellikle antrum'da izlenirken bazen de nadir olarak korpusta görüle bilmektedir.

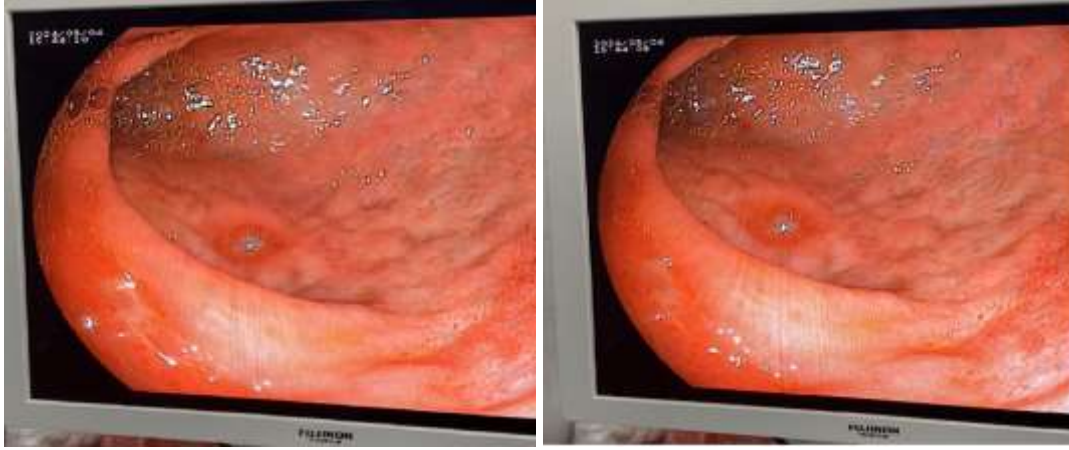
Kronik gastrit tanısında endoskopik görüntüler ile histopatolojik bulgular arasında oluşan uyumsuzluklar nedeni ile sorunlar yaşanmaktadır. Kronik gastritte, akut gastritten farklı olarak semptomlar daha nonspesifiktir ve medikal tedaviye daha az yanıt verirler. Endoskopik bulgular arasında; ödem, hiperemi, eksüda, kanama odakları (peteşiyal veya lineer), yüzeysel erozyonlar, hipertrofik pli'ler veya atrofik pli, özellikle korpus ve fundus mukozasında submukozal damarsal belirginleşmedir. Tanısal amaçla antrumdan (pilora yakın), korpustan ve anormal görünen bölgelerden punch biyopsi alınmalıdır.

Mide ülserlerinde ise, ülserin derinliği submukozaya kadar devam etmektedir. Hastaların hiçbir şikayeti olmadığı gibi, yemek sonrası erken dönemde epigastrik ağrı veya nonspesifik dispeptik şikayetleri olabilmektedir. Midenin herhangi bir yerinde lokalize olabilirler, ancak sıklıkla (%80) insisura bölgesinde görüldüğü bilinmektedir. Tek ülser görülür ise mutlaka biyopsi alınmalıdır. Endoskopik raporlama yapılırken ülser çapı, yerleşim bölgesi, şeklinin düzgün olup olmadığına, kenarların kabarık ve düzensiz olup olmadığına, sayısı rapor edilmelidir. Biyopsiler ülser kenarlarının her kadranından alınmalıdır. Kanama eğilimi yoksa dibinden de alınabilir (1,2).

Bu çalışmada kliniğimizin Endoskopi endoskopi yapılan 79 yaşındaki dispeptik şikayetleri olan hastanın, antrum-korpus bileşkesinde izlenen ülser lezyonları hem histolojik hem de morfolojik bulgular ışığında sunulacaktır.

OLGU SUNUMU

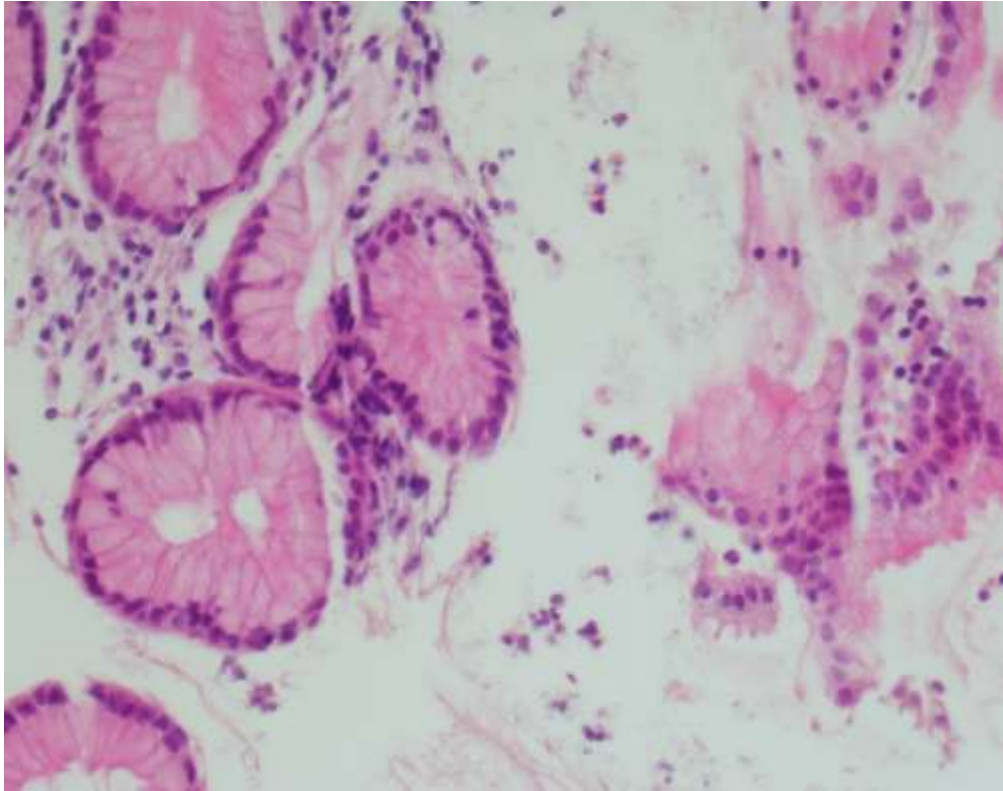
79 yaşındaki erkek hasta dispeptik semptomların yanında tarama amacı ile Genel Cerrahi polikliniğine başvurdu. Hastanın fizik muayenesinde epigastrik bölgede hassasiyet mevcuttu. Tanısal amaçlı endoskopi yapılması planlandı. Endoskopi randevusu alan hastanın işlemden 8 saat önce yeme-içmesini stoplaması istendi. Endoskopi sırasında özofagus peristaltizm ve sekresyonu normal izlendi. Mideye girildiğinde midede safra reflüsü mevcuttu. Antrumda hem mukoza hiperemik ve ödemli gözlenirken hemde antrum-korpus bileşkesinde izlenen 3 adet yaklaşık 3 cm boyutlarında ülser lezyonlarının olduğu görüldü (Resim 1). Ülser çevresi ve tabanından multipl sayıda random biyopsiler alındı. Midenin genel görünümünde korpusta rugalarlar silinmiş izlenimde, yaygın hiperemi ve atrofi mevcuttu. İşlem komplikasyonsuz olarak sonlandırıldı. Hastaya patoloji sonuçları çıkınca tekrar polikliniğe gelmesi gerektiği açıklandı.



Resim 1. Antrum-korpus bileşkesinde ülser lezyon görünümü.

Ülserlerden alınan doku örneklerinin makroskopik bulgularında; en büyüğü 0,4x0,4x0,3 cm, en küçüğü 0,2x0,1x0,1 cm boyutlarında grimtrak renkte 6 adet doku parçası incelenmiştir.

Mikroskopik bulgularında ise; ışık mikroskobu altında Hematoksilin & Eozin (H&E) ile boyanan dokulara kronik, atrofik gastrit tanısı konulmuştur (Resim 2). İnflamasyon ve atrofi (++) pozitif izlenmiştir. Ayrıca hastanın *Helicobacter pylori* testi ise negatif olarak rapor edilmiştir.



Resim 2. İnflamasyon ve atrofi, Korpus bölgesi (**Boyama:** Hematoksilin & Eozin, **Bar:** 100 µm).

TARTIŞMA

Atrofik gastrit (AG), preneoplastik bir durum olarak bilinmektedir. Uygun gastrik glandüler yapıların, uygun olmayan nonmetaplastik atrofi veya metaplastik atrofi ile yer değiştirmesi sonucu ortaya çıkan kronik enflamasyon halidir (3-5). AG birçok aşamadan oluşan, prekanseröz kaskadın ilki olarak kabul edilmektedir. gastrik intestinal metaplazi ile başlayıp, displazi ve son olarakta gastrik adenokarsinoma dönüşebilir (6). AG'nin en yaygın 2 etiyolojisi arasına, *Helicobacter pylori* ile kronik enfeksiyon ve

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

otoimmünite yer almaktadır. Ancak *Helicobacter pylori*'nin daha baskın olduğu düşünülmektedir (7). Hastamızda *Helicobacter pylori* testi negatif olarak sonuçlanmıştır.

AG yavaş bir süreçte ilerler. Yıllar süren mukozal iltihaplanma sonucu mide bezleri giderek küçülür ve nihayetinde tamamen kaybolabilir. İntestinal metaplazi ise, AG'nin en sık teşhis edilen histopatolojik belirtisidir (8). Ancak hastamızın patoloji sonucunda inflamasyon ve atrofi (++) pozitif izlenmiş ve hastamızda atrofik, kronik gastrit tanısı konulmuştur.

Günümüzde, gastritin yaşa özgü yaygınlık oranlarının yaşa bağlı artışı, gelişmekte olan popülasyonlarda gelişmiş popülasyonlara göre daha belirgin ve ani olmaktadır; yani, genç yaş gruplarında veya hatta çocukluk çağında gastritin yaygınlığı, gelişmekte olan popülasyonlarda %50'den çok daha fazladır; buna karşın gelişmiş popülasyonda bu yaygınlık genellikle %50'den çok daha azdır (9,10). Hastamız da ileri yaşta bir hasta olup 79 yaşındadır.

Sadece antrumla sınırlı olan şiddetli atrofik gastrit oldukça nadirdir. Yalnızca korpusta oluşan veya hem antrum hem de korpus bölgelerinde aynı anda görülen ileri dereceli atrofi, kronik gastritin yaygın bir fenotipidir (11,12). Hastamızın korpus bölgesinden almış olduğumuz biyopsi sonucu, kronik gastrit tanısı hem korpus hem de antrum bölgelerinde inflamasyon olduğunu doğrulamıştır.

SONUÇ

Endoskopik olarak benign ve malign ülser ayırımını yapmak zordur. Ülserin boyutu, lokalizasyonu, sınırları ve tabanı, ülserin benign veya malign olduğuna karar vermekte önemli kriterlerdir. Histopatolojik değerlendirme, nadiren de olsa yanıltıcı olabilir. Gastrik ülserli tanılı hastalarda, ülser iyileşene kadar kontrol endoskopi ve biyopsi ile takip edilmelidir.

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UZUN SÜRELİ DİSPEPTİK ŞİKAYETLERE TANISAL YAKLAŞIM: ANTRUMDA DİVERTİKÜL

DIAGNOSTIC APPROACH TO LONG-TERM DYSPEPTIC COMPLAINTS: DIVERTICLE IN THE ANTRUM

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ÖZET

Gastrik divertikül mide duvarının dışarı doğru keseleşmesiyle oluşmaktadır. Gastrik divertiküller, gastrointestinal divertiküller arasında oldukça nadir görülen anatomik anormalliklerdir. Bu çalışmada kliniğimizin Endoskopi endoskopi yapılan hastanın, preplorik bölgesinde izlenen çift ağızlı divertikül hem histolojik hem de morfolojik bulgular ışığında sunulmuştur. 28 yaşındaki erkek hasta hazımsızlık, midede şişkinlik hissi, mide bulantısı ve mide yanması gibi semptomların yanında karın ağrısı şikayetleri ile polikliniğimize başvurmuştur. Hastanın anemnezinde özellik saptanmazken, fizik muayenesinde epigastrik bölgede hassasiyet olduğu izlenmiştir. Tanısal amaçlı endoskopi yapılması planlanmıştır. Endoskopi antrum mukozası hiperemik ve ödemli gözlenmiş ve antrumdan örnekleme yapılmıştır. Preplorik bölgede ise yaklaşık 0,8-1,2 cm çapında çift ağızlı divertikül olduğu izlenmiştir. Antrumdan alınan doku örnekleri Hematoksilen & Eozin (H&E) ile boyanarak ışık mikroskobu altında incelendiğinde hastaya reaktif gastropati tanısı konulmuştur. Gastrik divertikül büyük olduğunda, hastalar medikal tedaviye yeterince yanıt vermezse komplikasyonlar meydana gelebilir. Tanısal amaçlı Özofagogastroskopi yapılması gerektiği göz ardı edilmemelidir.

Anahtar Kelimeler: Gastrik divertikül, Antrum konjesyon, Histopatoloji.

ABSTRACT

Gastric diverticula are formed by outward saccularization of the stomach wall. Gastric diverticula are very rare anatomical abnormalities among gastrointestinal diverticula. In this study, a double-mouth diverticulum observed in the preploric region of a patient undergoing endoscopy in our clinic is presented in the light of both histologic and morphologic findings. A 28-year-old male patient was admitted to our outpatient clinic with complaints of abdominal pain in addition to symptoms such as indigestion, bloating, nausea and heartburn. His anamnesis was unremarkable and physical examination revealed tenderness in the epigastric region. Endoscopy was planned for diagnostic purposes. Endoscopy revealed hyperemic and edematous antrum mucosa and sampling was performed from the

antrum. In the preploric region, a double-mouth diverticulum with a diameter of approximately 0.8-1.2 cm was observed. When the tissue samples taken from the antrum were stained with Hematoxylin & Eosin (H&E) and examined under light microscope, the patient was diagnosed with reactive gastropathy. When the gastric diverticulum is large, complications can occur if patients do not respond adequately to medical treatment. Esophagogastrosopy for diagnostic purposes should not be ruled out.

Keywords: Gastric diverticulum, antral congestion, histopathology.

GİRİŞ

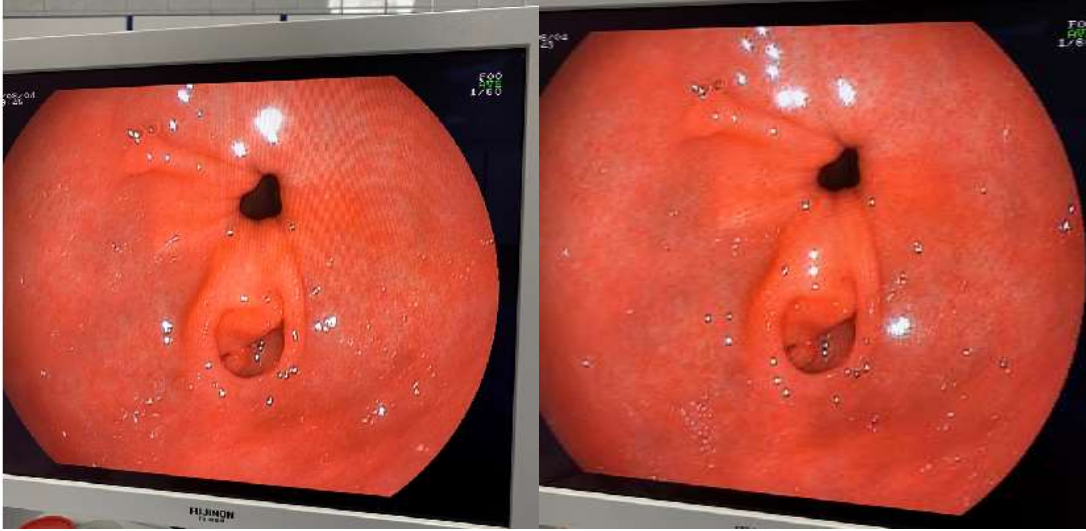
Gastrik divertikül mide duvarının dışarı doğru keseleşmesiyle oluşmaktadır. Gastrik divertiküller, gastrointestinal divertiküller arasında oldukça nadir görülen anatomik anormalliklerdir. İnce bağırsak divertikülleri ve kolon divertiküllerine benzer özelliklere sahiptirler (1). Genellikle rutin tanı testleri sırasında tesadüfen fark edilirler. Tespit oranları, tespit için kullanılan yöntemle bağlı olarak değişmektedir. Kontraslı Radyografilerde % 0.04 oranında, Üst Gastrointestinal Sistem Endoskopilerde % 0,01-0,11 oranında ve otopsi çalışmalarında ise %0,02 oranında tespit edilmektedirler (2-5).

Hastaların çoğunda sebepsiz karın ağrısı, epigastrik dolgunluk, dispepsi gibi abdominal semptomlar görülmektedir (6,7). Ancak nadiren de olsa ülserasyon, üst gastrointestinal kanama, hemoraji, perforasyon gibi hayatı tehdit edebilen ve cerrahi tedavi için endikasyonlar oluşturan durumlar gelişebilir (8,9). Gastrik divertiküller genellikle 1-3 cm çapındadır ve midenin her bölümünde görülebilir. Ancak konjenital (gerçek) divertiküller en sık mide arka duvarı gastroözefagial bileşke komşuluğunda oluşurken, edinsel (yalancı) divertiküller ise daha sık antrum yakınlarında oluşmaktadır (1).

Bu çalışmada kliniğimizin Endoskopi endoskopi yapılan 28 yaşındaki hastanın, preploric bölgesinde izlenen çift ağızlı divertikül hem histolojik hem de morfolojik bulgular ışığında sunulacaktır.

OLGU SUNUMU

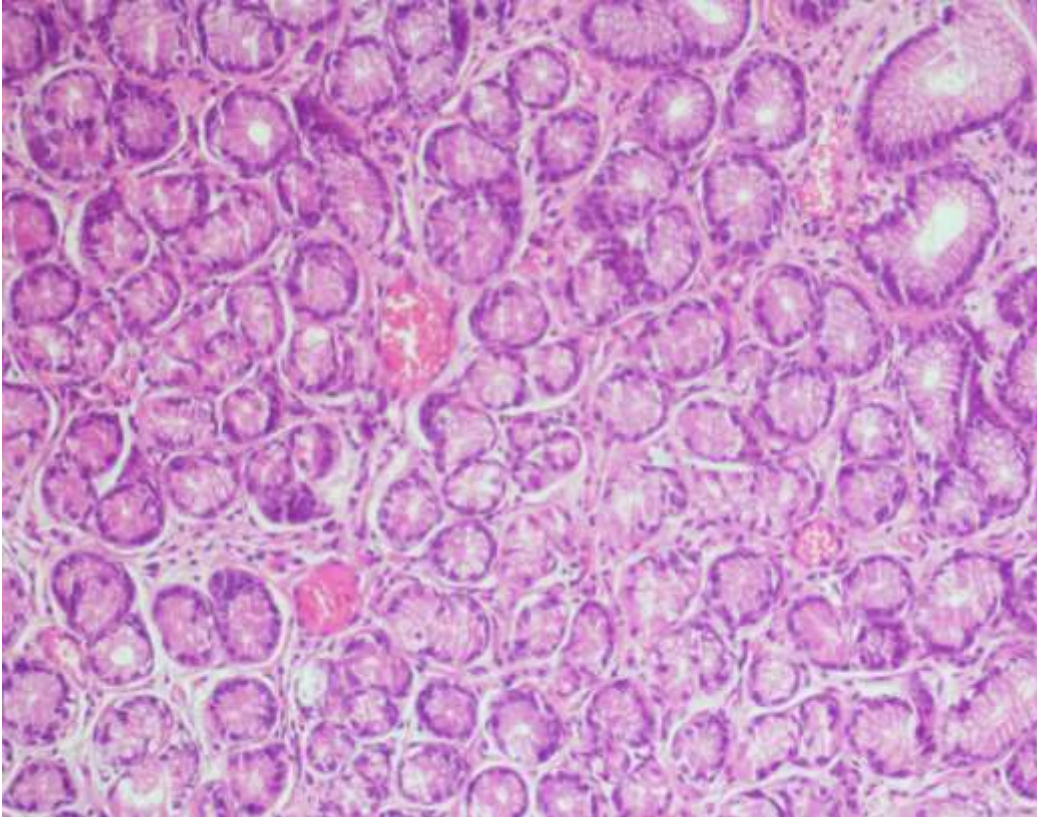
28 yaşındaki erkek hasta hazımsızlık, midede şişkinlik hissi, mide bulantısı ve mide yanması gibi semptomların yanında karın ağrısı şikayetleri ile Genel Cerrahi polikliniğine başvurdu. Hastanın anamnezinde özellik saptanmazken, fizik muayenesinde epigastrik bölgede hassasiyet mevcuttu. Tanısal amaçlı endoskopi yapılması planlandı. Endoskopi randevusu alan hastanın işlemden 8 saat önce yeme- içmesini stoplaması istendi. Endoskopi sırasında özofagus peristaltizm ve sekresyonu izlendi. Fundus, korpus ve antrum mukozası hiperemik ve ödemli gözlemlendi, antrumdan örnekleme yapıldı. Preploric bölgede yaklaşık 0,8-1,2 cm çapında çift ağızlı divertikül olduğu izlendi (Resim 1). İşlem komplikasyonsuz sonlandırıldı. Hastaya patoloji sonuçları çıkınca tekrar polikliniğe gelmesi gerektiği açıklandı.



Resim 1. Antrum bölgesinde divertikül ve hiperemi.

Antrumdan alınan doku örneğinin makroskopik bulgularında; 0,3x0,2x0,2 cm boyutlarında 1 adet grimsi renk doku parçası incelenmiştir.

Mikroskopik bulgularında ise; ışık mikroskobu altında Hematoksilin & Eozin (H&E) ile boyanan dokulara reaktif gastropati tanısı konulmuştur (Resim 2). Ayrıca hastanın *Helicobacter pylori* testi negatif olarak rapor edilmiştir. Hastaya proton pompa inhibitörü tedavisi başlanmış ve diyetine dikkat etmesi gerektiği anlatılmıştır.



Resim 2. Antrumda konjesyon (Boyama: Hematoksilin & Eozin, Bar: 50 µm).

TARTIŞMA

İlk kez gastrik divertikülleri 1661 yılında Moebius, daha sonra da 1774 yılında Roax tanımlanmıştır (10). Meerof ve arkadaşlarının yaptığı otopsi çalışmalarında divertikül prevalansı % 0,1-2,6 oranında bulunmuştur (11). Akerlund ile Schmidt ve ark. divertikülleri iki sınıfa ayırmıştır. Bunlar; konjenital (gerçek) divertiküller ve edinsel (yalancı) divertiküller. Bunların arasında ise konjenital olanlar daha yaygın görülmektedir (12). Edinsel mide divertikülleri midenin herhangi bir bölümünde görülebilirken, konjenital divertiküller, fetal dönemde, kardiya seviyesinde longitudinal kasların ayrılmasındaki zayıflıktan dolayı oluşmaktadır (13,14). Genellikle gastrik düvertiküller orta yaşlarda görülmektedir. Erkekler ve kadınlar arasında eşit dağılım gösterdiği bilinmektedir. Bizim hastamızda 28 yaşında olup, erkek hastadır. Gastrik divertiküller genellikle tektir ve boyutları 1 ila 3 cm arasında değişir (5). Hastamızda da izlenen divtülün yalnızca 1 tane olduğu izlenmiştir.

Gastrik divertiküllerin çoğu asemptomatiktir (15). Ancak hastaların % 18-30' un da divertikül ağzının büyüklüğüne bağlı olarak üst karın ağrısı, bulantı, kusma görülebilmektedir (3). Ancak bazen gastrik divertiküllerden kaynaklı masif kanama ve perforasyon gibi ciddi komplikasyonlar da görülebilmektedir (16-18). Bizim hastamızda hazımsızlık, midede şişkinlik hissi, mide bulantısı ve mide yanması gibi semptomlar görülmüştür. Ayrıca karın ağrısı şikayeti de mevcuttur. Hastanın bu semptomlarından dolayı tanısız amaçlı endoskopi yapılmış ve antrum bölgesinde divertikül olduğu izlenmiştir. İzlenen divertiküle karşı yaklaşım konusunda divertikülün büyüklüğü baz alınmıştır. Çünkü asemptomatik divertiküllerin spesifik bir tedavisi yoktur (15). Eğer semptomlar arasında kanama, perforasyon ve malignite gibi komplikasyonlar olursa, cerrahi rezeksiyon önerilmelidir. Cerrahi sonrası hastaların üçte ikisinden fazlasında semptomların azaldığı izlenmiştir (19,20). Hastamıza cerrahi değil, medikal tedavi önerilmiştir.

SONUÇ

Gastrik divertikül nadir görülen bir hastalıktır. Özofagogastroskopi sırasında genellikle fark edilir. Dispepsi ve üst karın ağrısı gibi semptomların uzun sürmesi hastalığın tanısında ve yönetiminde düşündürücü semptomlardandır. Ayrıca ağız kokusu gibi ciddi bir sosyal etkiye sahip hijyenle ilgili diğer semptomlarda spesifik araştırmayı tetikleyebilir. GD büyük olduğunda, hastalar medikal tedaviye yeterince yanıt vermezse komplikasyonlar meydana gelebilir. Tanısız amaçlı Özofagogastroskopi yapılması gerektiği göz ardı edilmemelidir.

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INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

NAVIGATING CHALLENGES, CURRENT PRACTICES AND REALITIES, AND EDUCATORS' FUTURE ASPIRATIONS: ESL/EFL Case Study at the university context in Azerbaijan

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ABSTRACT

This study examines the difficulties and current methods faced by English teachers at one of the regional universities' Foreign Language Department in Azerbaijan who taught non-major students in English as a Second or Foreign Language (ESL/EFL). A thorough literature review places the findings in context by examining previous research and pointing out important knowledge gaps about the particular difficulties experienced by teachers at regional university. The main goal is to identify the particular challenges faced by educators, the strategies they use to overcome these obstacles, and their future goals. The challenges of teaching in a university's regional setting, where teachers must juggle institutional limitations, a range of student demands, and little resources, are given special consideration.

According to this qualitative study, teachers deal with a number of issues, such as big class numbers, students' differing levels of English ability, and restricted access to state-of-the-art teaching resources. The results show that teachers use adaptable and innovative teaching techniques in spite of these challenges. These include prioritizing ongoing professional development, adapting lessons to accommodate a diverse student body, and using technology to increase engagement. Additionally, the teachers' aims demonstrate their dedication to adjusting the university's continuous modernization initiatives and looking for creative ways to enhance student results and support the university's larger educational objectives.

The study offers insightful information about this university's ever-changing ESL/EFL teaching environment, with useful suggestions for improving teaching methods and bringing them into line with the school's modernization plans. This contribution is crucial for addressing the evolving needs of both instructors and students in the regional university context.

Keywords: English teaching, challenges, methodology, diverse proficiency, technology.

INTRODUCTION

No special phrases or expressions are needed to accentuate the importance of knowing English as a second language in modern times. English has historical ownership of being a lingua franca and has a "demographic, economic and political power" over English-speaking and non-English-speaking countries over the years [Clyne and Sharifian, 2008]. Around 380 million speakers share English as their mother tongue, and a billion speakers use it as their additional language and communication tool around the world, according to Clyne and Sharifian [2008]. That is a considerable number for being shared as an international language. As per Smith's definition, who was one of the first people who define an international language, we can say it's "the language used to communicate with one another by people of different nations" [1976]. It gives most people credit for mastering it in order to be fully understood and converse confidently. In that case, teaching and learning become a necessity, which has always been one of the fundamental research topics.

All these historical processes have brought us to the present day, where almost all classrooms teach English as a second language. Speaking of its importance, challenges and practical implications in higher education need to be examined. Obviously, English is part of the curriculum in Azerbaijan, as well as

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

other subjects. I want to draw your attention here, like other subjects. English is more than to be called just a subject; it's a language. In fact, it is clear to consider English as a subject, as we include it in the curriculum, yet the overall approach needs to be modified. Second language learning passes through various stages, more like developmental sequences, and indeed, its users have influences of their L1 while learning it [Lightbown & Spada 2017]. Many other factors affect second or foreign-language learning, and it makes the whole process complex. Hence, it also has strong bounds with the learner's age, first language background, learning environment, etc. [Lightbown & Spada [2017]. Learning language is also more than grammar structures and memorized vocabulary [Barin, 2011]; it requires an authentic communication environment and real speaking, listening, and even consistent reading and writing activity to gain competency.

These factors do not allow us to limit English to just under the name of a single subject. Understanding one's language competency is not only restricted to listening and reading comprehension but also fluency and accuracy levels of oral communication. It follows educators all the way to higher education.

To achieve that, they are expected to analyse their students' existing level and accordingly individualise their methodology. In their paper, Rytivaara, A., & Vehkakoski [2014] state that the term "individualisation" or "individualised instruction" contains various definitions and approaches which can refer to tailoring instruction to meet individual student's needs rather than adhering to a uniform curriculum for all. Alternatively, as they add, it can involve providing extra support and attention to certain students during regular classroom interactions. To avoid the traditional connotations of "individualisation," the term "personalised learning" has been proposed, although not all scholars agree that it necessarily implies accommodations or modifications. Moreover, they refer to the paper of Timothy J. Landrum and Kimberly A. McDuffie [2010], as "differentiated instruction" is closely related, aiming to respond flexibly to students' learning styles, readiness levels, and learning speeds to maximise their learning opportunities.

LITERATURE REVIEW

Higher education ESL/EFL teaching can be challenging for the instructors because learners do not acquire language implicitly as they did in childhood, named "*critical period*" [Bergey et al., 2018]. Adult learners are already competent in one language and need instruction in a way that can help them identify the differences and implement new information in a completely new language. They also want to learn everything directly and apply them in real-life situations.

Higher educational educators, also considered adult educators, sometimes lack proper training and credentials and receive professional development through in-service possibilities rather than pre-service training. Even if pre-service training is provided, it can be insufficient, and further development programs are needed because teachers encounter the actual cases after starting teaching. However, providing professional development opportunities for them can be challenging due to their workload, varied subjects, limited resources, and financial constraints. [Schaezel et al., 2007].

Different techniques and strategies by the instructors in ESL/EFL teaching are used for methodology optimization. Instructors are educated in their fields, joining professional development training and improving their capabilities in various settings, including technological use of education. For ESL instructors, the use of technology shows itself in authentic (real-world) materials; and the types of those materials can be anything from multimedia presentations and video conferencing to online tools that can be used to design and conduct lessons. [Abunowara, 2014] Instructors find technology advantageous in many ways, such as internet-based communication, research skills, improving four core skills via digital websites or testing language learners [Abunowara, 2014].

Education requires not only lower-order skills as well as higher-order skills, which are considered predominantly critical thinking, open-ended discussions, collaborations etc. to be in line with modern-day requirements. To facilitate these techniques, learning management systems (LMS) e-learning tools, can be utilized to provide opportunities for collaborative learning, encourage active and reflective engagement among students, provide feedback mechanisms, and engage students in real-world activities

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[Zanjani et al., 2017]. Learning Management Systems (LMS) provide an online classroom that supports the learning process for both teachers and students. (Bradley, 2020)

This study focuses on the ESL/EFL instruction challenges at Mingachevir State University, where English is not a major. Indeed, I want to state background information on ESL/ EFL instruction in Azerbaijan before we get there.

Mingachevir State University is currently taking significant steps towards becoming the university of the new era. This renewal phase has already begun to pay off. Our University is fully dedicated to providing quality higher education services focusing on both national and international levels, considering modern realities. The University prioritises educators' and students' capacity and professional growth to endorse their current and prospective career development. Student's readiness for further occupational opportunities and fulfilling contemporary labour market standards meet our mission.

We desire to maintain the research and innovation potential, improve the regional ecosystem, and restore the existing infrastructural, technical ground and capacity. In the modernisation stage, international and local partnerships comprise a crucial part of the mission. Mingachevir State University is one of the prevalent options for students from many regions of Azerbaijan, including remote districts and rural schools, such as the Aran region.

The main focus of ELT in Azerbaijan is to foster effective and proficient communication in English in a fast-growing world. All traditional teaching methods and strategies have been modified to make the ELT more student-centered. The younger instructors tend to study abroad and learn more about the practical implications of new strategies and trends in ESL classrooms [Mammadova, 2020]. However, according to the 2023 English Proficiency Index (EF EPI), Azerbaijan is currently at 83rd, considered low proficiency and not the best position to be in [English Proficiency Index, 2023].

Foreign language education is compulsory in higher education in Azerbaijan, and in most cases, it's English. At BA and BSc (where English is not a major), English is taught twice a week and totals 180 hours. Mainly, it is instructed in the first education year or at some universities for the first two years [Mammadova, 2020]. At Mingachevir State University, it depends on the department. It comprises either the first or first and second years.

Most English language teaching study programs are currently initiated to navigate ESL/EFL challenges, identify the gaps and offer solutions in Azerbaijan. However, according to recent studies and interviews, not all instructors follow modern-day communication requirements in ELT [Mammadova, 2020].

Let's look back. As a former Soviet Union country, Azerbaijan has a history of using the Russian language as a medium of instruction in higher education. Most of the subjects were taught in Russian, and English was considered a second language. Soviet ELT in schools and universities relied only on translating sentences and understanding fundamental grammar structures, called the grammar-translation method [Mammadova, 2020]. That was the teaching style mostly acquired by the ESL instructors and considered the right way to teach for a long time. At that time, knowing grammar rules and reading and understanding basic texts were sufficient and considered highly prestigious for language proficiency.

Nabiyeva [2003] illustrates in her article the education system of the Soviet stage as a teacher-centred approach, where the government regulated all the processes and aspects. All policies and regulations were controlled by the main party (Communist Party of the Soviet Union), as well as the implementation of developmental instruction. The Ministry of Higher Education and Specialised Secondary Education was a responsible structure for universities, including textbooks, curricula, syllabi and professional development of the teachers. Obviously, all these aspects led to academic dependence and centralised control where the students were receiving large amounts of information without criticizing or analysing them.

When we review the cases in other post-Soviet countries we can identify similar patterns. For instance, English language demand in Georgia increased due to the people's desire to distance themselves from

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

the Soviet Union. For that reason, the Georgian government launched a teacher development program in 2001, with the assistance of the World Bank, to improve qualifications [Jakhaia & Holmes, 2018]. Their qualitative data report results showcase the teachers' dissatisfaction in terms of pre-service education, which did not prepare them to become effective instructors. As per the feedback provided by the teachers, the present teaching methodologies and academic curriculum taught at universities are inadequate, and study participants mostly link it to the previous Russian system. Especially teachers with international experience in education find that sufficient due to their comparative perspective. [Jakhaia & Holmes, 2018].

However, I also want to highlight another Georgian university case study by Buskivadze [2021], where they clearly remark the teachers' highly qualified educational foundation in their field. I also need to point out that, as per the 2023 results, Georgia rates 32nd on EPI, considering moderate proficiency [English Proficiency Index, 2023]. Their mentioned research evidently indicates the university's students' attitudes towards the English language. To me, the fact most students do not accept that teachers of Georgian language use to facilitate even difficult concepts is a real incentive to create an English-speaking environment.

In the Estonian case, educational improvement consists of four phases in the post-soviet era. The evolution of the higher education system can be characterized by chaotic and individual-driven changes in the initial phase (1988–1992), followed by a significant expansion and development of legal frameworks in the second phase (1993–1998). The third period (1999–2005) witnessed reforms aligning with the principles of the Bologna Process, and in the fourth period (2006 onwards), measures were implemented to enhance the international competitiveness and sustainability of the shrinking higher education sector (2018). Another research highlights a bottom-up approach in designing EFL in Estonia training programs, proposing a sample module that incorporates areas like methodology and language mastery, along with a focus on content and language-integrated learning, aligning with global educational trends [Raud & Orehova, 2017].

When I look back, I see the teacher as the only source of information who is responsible for transmitting the knowledge and students who are receivers of that information memorizing it. Learners who have passed through this educational environment did not have a chance to boost their creativity and improve their metacognitive abilities for learning. Indeed, the teachers had the same restricted capacity in their teaching styles, where they found no need to evaluate their methods and embrace new strategies. All answers to the questions were simply known to the students and were considered either right or wrong. There was no way to question the validity of the source, which, again, I say, destroyed the analytical side of young brains.

After gaining independence in 1991, Azerbaijan still had a big shortage of available resources. Change in educational processes was also slow and outdated teaching styles were still the case. It was not easy for a newly independent country to reform every aspect of government and establish a brand-new educational system [Nabiyeva, 2003]. Undoubtedly, some instructors with over 20 years of experience remain loyal to such traditional methods [Mammadova, 2020]. The core cause of today's English proficiency level in Azerbaijan goes back to this historical period.

It is doubtless, that today's educational system requires more from educators. It is the same case for second/foreign language teaching and learning, as in most cases it is English, just identifying gaps might not be enough. Many strategies and approaches have been proposed and applied by ESL/EFL instructors, and these implementations have been based on their understanding of students' needs or their previous experiences [Lightbown & Spada, 2017].

RESEARCH QUESTIONS

This study states the most recent challenges and current realities of ESL/EFL educators at Mingachevir State University and their vision from a professional perspective. The research is trying to find answers to these questions: How do the strategies of MSU ESL/EFL educators influence student proficiency levels? What is the current role of technology in MSU ESL/EFL classrooms? How did the professional development resources help MSU educators? Are they resisting or accepting?

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

METHOD

The results were obtained from thirteen faculty members (out of twenty-eight) of the Foreign Languages Department. Questions were sent to the instructors via email in a semi-structured survey format, followed by the researcher's observations of classes and participants attended voluntarily. Survey questions are considered the primary source of information. According to the survey results, most ESL/EFL instructors at MSU have been working there between 0-5 years, which is 61.4% of the proportion. Therefore, this study focuses, mostly on younger faculty members.

RESULTS AND DISCUSSION

The main focus for the challenges was on diverse language backgrounds, limited exposure to English, incorporating technology, teacher training and language learning anxiety. The instructors were also allowed to share their own experiences regarding this point. Apparently, results say educators mostly find diverse proficiency levels challenging, followed by technology incorporation in the classroom. Some educators agree that limited exposure to English is a common hardship for ESL/EFL classrooms for language learners in Azerbaijan. None of the instructors believe they lack sufficient training to effectively manage these challenges in the classroom.

As highlighted above, all the participants responded that the students did not come to the classroom with an expected level of English. The anticipated level of the language is pre-intermediate. Most educators think the reason behind that is their previous language studies, which was a second/foreign language other than English. Only three participants believe it's because of students' previous English course design in their studies.

Interestingly, survey participants did not mention other factors besides the given ones. It is good to hear that most educators find these two issues manageable for their lesson design. However, one of the instructors who thinks that causes a problem states:

"Some students were taught French or Russian as a foreign language at school."

Another educator:

"I think the main problem in this matter is related to secondary school. The English teaching level in secondary schools is low. It is my opinion."

From the first opinion, we can imply that different second-language backgrounds can cause discrepancies since these students start their studies immediately at universities without having fundamental familiarity with English.

I inquired about their methodology for personalised instruction strategies. Three popular techniques among instructors are adaptive materials, teacher support and regular process monitoring. They also employ individualised assignments, targeted feedback and flexible grouping techniques. As well as multimodal learning is one of the methods that some instructors choose. Yet, peer tutoring and one-on-one meetings are not actively preferred methods.

The instructors provided interesting responses on the factors that trigger and guide their decisions. At the beginning of each term, some instructors conduct diagnostic tests to identify any issues mentioned previously. The findings are also based on the learners' needs, interests and language levels, individual goals, and daily activities. Most importantly, MSU instructors prioritize working with learners to design lessons. It helps them to identify optional instructional methods throughout the lesson program. Regular process monitoring is helpful to track the learners' development and make it easy for them to address the issues that come up immediately. Targeted feedback is essential for them because, through this method, the educator identifies the parts that language learners have difficulty with and clarifies those issues, which is considered the essence of the supportive environment. According to the instructors, targeted feedback focuses on particular issues that a learner needs to address, such as weaknesses and/or strengths or, if any, areas needing improvement. As we know, in a learning environment, most likely, they are needed.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

Most teachers moderately integrate technology into their ESL classroom, and the most active method is multimedia presentations, where each instructor chooses that approach. Interactive quizzes and educational websites/apps are the next most preferred method for MSU ESL/EFL educators. During the time of COVID-19, with the rise of videoconferencing, to my great surprise, it decreased to the most unused methods. The Pandemic nudged MSU ESL educators to transfer their teaching methods to a technological environment, and, for obvious reasons, virtual conferencing was an optimal choice for conducting the lessons and exams. Since then, most higher educational institutions have still been using virtual tools and hybrid conferencing as a part of the academic process. At Mingachevir State University, Microsoft Teams was the primary tool for the aforementioned reasons and is still used for hybrid conferences and meetings but not for lecturing or instruction.

Most instructors agreed on student engagement regarding technology use in the ESL/EFL classroom. They stated interactivity and creating a positive environment through technology help boost learners' communicative approach. Technology also enhances accessibility to many internet resources, which enables learners to research and present their findings effectively. It is also highlighted that technology allows individualised instructions for students with different proficiency levels and learning methodologies. Data collection tools can be utilised to identify those needs. One of the instructors states:

"Interactive quizzes and digital tools collect valuable data on student performance. Educators can use this data to identify areas of improvement and customise their teaching strategies accordingly, ensuring that no student is left behind."

According to the data, all instructors are familiar with some LMS tools, and the most recognised tool among them is Blackboard. Canvas and Google Classroom are also popular tools for our instructors. However, these tools are not actively used for academic purposes. The primary reason is that the university still needs to launch a centralised learning management system. Yet, we can tell that some of the Foreign Languages Department instructors still individually incorporate LMS into their lessons regardless of institutional policy. Among the survey participants, only four did not utilise it at all, and each case was different; one was due to cost, and one instructor chose to exclude it.

As the university's new campus is under construction, the older campus does not have the necessary facilities and equipment for technology use. As we know, LMS does not necessarily require classroom technology, where students can use their personal laptops. Still, the network system matters a lot, which could be stronger at the university. That is the root cause of the limited technology in classrooms. It is still valuable to see most ESL/EFL instructors try to include technology in their lessons, but they use personal devices.

Most instructors wish to have smartboards and modern computers in all classrooms with internet access, which will be the case for the new campus, and it seems currently unlikely to have virtual boards in each classroom. Some instructors are also keen on incorporating virtual reality into ESL/EFL classrooms.

For classroom activities, I asked our instructors about the type of professional development programs they engage in. Most instructors chose the workshop and training sessions as the preferred method. Online courses and joining professional organizations and associations were the second most popular choice. However, it was concerning to see that only 4 out of 13 instructors engage in peer observation and reflective practice. Only two instructors have got their online portfolios, and they appreciate receiving feedback from others, but only one is involved in mentorship.

According to the data all teachers have participated in professional development programs. It is noteworthy that 10 out of 13 instructors find the professional development programs adequate, whereas 2 were sceptical about the knowledge they received. One of the instructors does not find it enough at all.

They express various reasons for that. In most circumstances, the training sessions enhanced their teaching methodology for creating relevant content and practical applications, individualising their methods according to the student's proficiency and providing/getting feedback. Throughout the programs, they also improved their language skills.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

As a researcher, I was interested in what way all the professional development they participated in helped them. Some lecturers found that despite learning to use technology tools, its effectiveness was limited due to students' low language backgrounds. However, most of them emphasized that understanding modern training methods and technologies developed their professional skills and helped update their teaching approaches. The training sessions also equipped MSU instructors with enhanced teaching strategies tailored to diverse language proficiency levels, including integrating technology tools for language learning, using data to track progress, and creating inclusive learning environments. Instructors expressed that the new methods they learned increased their confidence and engagement in teaching. They felt more capable of organising lessons catering to students' interests and desires, engaging all learners more effectively.

I am also interested in their professional development needs and desires, where I have pretty diverse points that need to be highlighted. Participants expressed a desire to learn new digital skills, improve academic writing, and attain proficiency in cutting-edge technologies to enhance teaching and professionalism. Several instructors aspire to obtain higher degrees like a PhD, become more professional, and potentially transition to roles such as teacher trainers. To me, it reflects a commitment to academic advancement and expertise in education. Some also desire to teach abroad, demonstrating a keen interest in gaining diverse teaching experiences and understanding the differences in global educational systems. A collective aspiration for a modern teaching campus indicates a shared vision for an updated, technologically advanced learning environment within their university. There's a regular theme of the importance of ongoing professional development through training, workshops, and courses. The focus is on adaptability, acknowledging the value of continuously evolving pedagogical strategies to fit diverse teaching scenarios.

LIMITATIONS

As a case study, this research's scope is limited to only the Mingachevir State University Foreign Languages Department. The number of department instructors voluntarily participating in the survey is small and includes mainly young teachers, which affects the generalization of the results. The validity of the results would be more profound if more instructors participated in the survey; nevertheless, the research reveals the challenges of foreign language instructors in the university's foreign language department and their attitudes towards them in the current conditions.

Another issue is that the opinions of the participants were simply collected based on the survey method (one source) and interpreted according to the researcher's analysis. In this case, the results are restricted by the researcher's interpretations. It would be reasonable to include multiple data sources, such as interviews or documents, in the name of the subjectivity of data collection. Due to the workload of the department's teachers, the time problem, the absence of the researcher in the country at the time of this study, and the extreme time difference affected the use of this method.

Additionally, the fact that the article was based solely on participants' opinions, did not include any student data and presented a one-sided approach to this study. However, at the same time, it creates a foundation for further research by focusing on students' thoughts as well.

CONCLUSION

The insights highlight the challenges MSU ESL/EFL instructors face, their adaptive teaching methodologies, technology integration, infrastructure limitations, and the continuous pursuit of professional development. There's a substantial focus on managing diverse learner needs, incorporating technology effectively, and a shared vision for a technologically advanced teaching environment within the university.

Main takeaways:

Students enter with lower English proficiency than expected, attributed chiefly to prior language studies. Second-language backgrounds vary, causing discrepancies in English familiarity among students.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

Instructors employ adaptive materials, teacher support, and process monitoring for individualised instruction.

Diagnostic tests and student-centric lesson designs help identify and address learner needs.

Technology integration, although moderate, involves multimedia presentations, interactive quizzes, and educational websites/apps.

Familiarity with LMS tools like Blackboard, Canvas, and Google Classroom exists, yet their active use is largely due to the need for a centralised learning system.

The lack of technological infrastructure at the current campus limits classroom technology use, often relying on personal devices.

Instructors aspire to have smartboards, modern computers, and internet access in classrooms, aiming for these upgrades in the new campus.

A desire for higher degrees, improved teaching methodologies, and exposure to diverse teaching environments signify the commitment to continuous professional growth.

ACTIONS TAKEN

Mingachevir State University [Bayramov, 2023] is working in collaboration with the U.S. Embassy in Baku to promote international engagement and intercultural communication. As a host institution for U.S. Department of State exchange programs, MSU had the privilege of hosting a Fulbright U.S. Student Program English Teaching Assistant (ETA) for the 2022-2023 and 2023-2024 academic years [Bayramov, 2023]. The ETA's main responsibility is to enhance English language proficiency and establish citizen-to-citizen connections between Azerbaijan and the United States. MSU plans to continue welcoming American exchange participants, specifically TESOL experts. In addition to this, MSU's Foreign Language Department has partnered with EducationUSA to offer a free College Prep Club (CPC) for ambitious English-speaking Azerbaijani students who aspire to study in the USA [Bayramov, 2023]. The CPC offers pre-IELTS lessons and scholarship guidance, which are facilitated by a local advisor with the support of Fulbright ETA. These initiatives aim to promote cultural exchange, improve language skills, and foster closer Azerbaijan-U.S. relations [Bayramov, 2023].

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INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

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INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

IMPORTANCE OF CORE COMPETENCIES IN CEO SUCCESS: SELECTIONS FROM TYPICAL EXAMPLES

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ABSTRACT

Management is a universal phenomenon. This phenomenon has somehow come to the agenda since the first human being. The process of two or more people combining their labor has accelerated. Because, living beings have to continue. First of all, the human race has many needs. The dimensions of these can be physical and/or social. Private sector or public authorities have been formed to meet the needs. Business organizations have gained momentum. Information, technology, capital, finance, labor transfers have concentrated here. Internal and external environmental elements have formed. Their effective organization has become a problem in itself. Even if they are organized, they also need to be managed in line with the purpose. Here, there has been a need for leading managers. Or, the need for executive leaders has increased. Although rare, it is seen that some entrepreneurs apply for this task. However, capital ownership and effective management are not the same things. What is in question are managers who have received sufficient education in their field and have experience in the field. Over time, they can rise to the top of business organizations. In other words, they can even be strategic leading managers. These positions are not easily attained. A comprehensive education, many skills and lived work experiences are needed. This study is about the importance of basic skills in the success of the CEO (Chief Executive Officer). In the study, firstly the literature on top management and CEO issues in companies was evaluated. Secondly, the methodology was shared. Then, the findings and discussion section was organized in the light of the literature and experiences. Finally, general evaluations were made.

Keywords: Chief Executive Officer (CEO), Top Management in Companies, CEO Competencies, CEO Achievement Examples

INTRODUCTION

Humanity has gone through various stages throughout history. Individuals have wanted to live in healthy and safe environments. For this reason, meeting needs has become important. Meeting desires, wishes or needs has basically required production. Entrepreneurship has been called the implementation of these activities. Some individuals or companies have undertaken various risks. In other words, entrepreneurship has been revived. Bringing together production factors has led to the emergence of some tangible and/or intangible products. The marketing function has been revived by being able to present these to the relevant parties or to the market. Various environments have been formed for the work units where these are made. Some of these have formed internal and some external environmental elements. Stakeholdership and interlocutorship have emerged. Here, management and administration have become important. The concept of management has become a bridge to reach goals. Managers have been the ones who designed this bridge. The bridge metaphor here means a kind of organizational design. Naturally, the sustainability of this structure is also important. This has been provided by the leading managers or executive leaders. These are; They are recognized as individuals who are well educated in their field, have various competencies and have field experience.

The device called management is operated by managers. Managers can be classified in two ways in terms of the place they occupy in the organizational hierarchy. One of these is “functional and general managers”. The other is the “vertical differentiation” distinction. Functional managers evoke the

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

management of departments such as “supply, production, marketing, finance, accounting, human resources management, public relations and research and development”. It is expected that these types of managers are individuals who are specialized in the relevant fields. Because they are mostly held responsible for managing that part of the organization. There is a triple classification in the vertical differentiation distinction. Managers are ranked as “first, middle and senior” according to their positions. Here, especially “senior” managers are studied. A manager at the top of the organization is also a type of strategic manager. Among these, more executives may stand out for various reasons. The person in the highest position managing the institution is referred to as the Chief Executive Officer (CEO). Those who have this title are responsible for the entire management of the organization. This management level determines the policies of the organization and directs the interactions of the organization with its environment. Examples of top managers include the general manager of the company, assistant general managers, etc. The CEOs, who are specifically discussed in our topic, fall into this group.

This study was prepared for the importance of basic skills in CEO success. Because, it is useful to know the basic skills that will increase CEO success. For this purpose, the relevant literature was examined. First, the top management in companies was introduced. Then, the concept of CEO was explained. In the methodology section; the purpose and importance of the research and the research method were shared. In the findings and discussion section, the place of basic skills in CEO success was emphasized first. Then, selected CEO success examples were listed. The study was completed with results and suggestions.

1. LITERATURE REVIEW

1.1. Top Management in Companies

Managers can be classified into two types in terms of the place they occupy in the organizational hierarchy. One of these is “functional and general managers”. The other is the “vertical differentiation” distinction. A functional manager is a type of manager who is responsible for a specialized organizational activity such as “supply, production, marketing, finance, accounting, human resources management, public relations and research and development”. People managed by a functional manager and activities are brought together to serve a common purpose. On the other hand, a general manager is a person who manages and directs a complex unit such as a large company, a business of this company or a sub-division of this company. A general manager will be responsible for all activities of the unit he manages - production, marketing, sales and finance. However, a functional manager is only responsible for the activities of the area he specializes in - such as accounting, production or marketing. While a small company may have a single general manager such as a president or executive vice president, a large organization may have many general managers, each heading a relatively independent department. In a large food company, for example, there may be a vegetable and fruit department, a refrigerated products department, and finally a frozen products department. There is a triple classification in vertical differentiation. Managers are ranked as “first, middle, and top level” according to their positions (Donnelly et al., 1997: 46-48; Simsek & Celik, 2023: 16).

It is useful to explain the classification of managers in detail according to their positions in the hierarchical structure. The following information can be given for “lower (first), middle, and top level (top)” managers in this context (Simsek & Celik, 2023: 16-17):

1. Lower (First) Level Managers: The lowest level in the organization where managers responsible for the work of others are located is called “first level” or “first level” management. First level managers direct and supervise the employees or subordinates who do the work themselves. Examples of first level managers; a foreman in a manufacturing plant, a technical supervisor in a research department, and a branch manager in a large office can be given as examples.

2. Middle-Level Managers: The concept of middle-level management can cover many levels in the organization. Managers at this level often direct the activities of other managers and sometimes employees. One of the basic responsibilities of middle-level managers can be expressed as directing the activities that will serve the actual implementation of the organization's comprehensive policies. The

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

division or department managers of companies and department managers in the public sector are certain examples of middle-level managers.

3. Top-Level and Strategic Managers: A relatively small group of executive managers can be at the highest management level or in strategic positions in the organization. They are responsible for the entire management of the organization. This management level determines the policies of the organization and directs the interactions of the organization with its environment. Examples of top managers can be given as general managers of the business, assistant general managers, etc. The CEOs, who are specifically discussed in our subject, fall into this group.

1.2. Chief Executive Officer (CEO)

When it comes to CEO, many things are actually mentioned. First of all, it is an executive individual or very high-level positions. A strategist position is aimed with the title of CEO. Now, the top management of the organization is mentioned. In the education community, the following title can be used for very senior teachers; “teacher of teachers”. Similarly, the following title can be used for CEOs: “manager of managers”.

When it comes to CEO, a series of positions and actions can be thought of. For example, the highest positions of a company are mentioned. The person or persons who perform this action are the senior managers who carry the greatest responsibility and make the most important decisions. In other words; the president or chairman of the board of directors who are responsible for managing a company are in question. Because those who are not at a very high level are far from determining strategies. It is not the duty of every manager to take full responsibility for a company. Here, the CEO comes first (Cambridge, 2024; Segal, 2024).

The concept of CEO can refer to the chairman or deputy chairman of the executive board. This term can also be used as “executive director” or “executive director”. The executive board should be considered as the chairman of the executive committee. There are also those who say “chief executive”. Chairman of the board of directors also fall into this group. It can also apply to the chairman of a company. There are differences between the CEO and those at other management levels (Kocel, 2020: 208, 465). First of all, there is a top management position. In other words, coordinative or operational levels are not considered within the scope of the CEO.

2. METHODOLOGY

2.1. Purpose and Importance of the Research

For a business organization, management and organization are very important. Organizational success rises on this. Naturally, there are many tasks for the managers there. Especially, those in strategic or top positions have to be successful. In this study, the focus is on the basic skills that will increase CEO success. It was deemed important to emphasize the basic skills in CEO success. In addition, attention was drawn to the need for cooperation between theory and practice. As a result, an effort was made to create useful and noteworthy perspectives.

2.2. Research Method

This study was created based on the information in the literature. First of all, the issues of CEO, top management in companies and CEO competencies were examined. In addition, CEO success examples were evaluated. Then, it was analyzed to what extent the theory corresponded to the field. For this purpose, the most successful CEO evaluations on a global scale were reached. The lists of the publications and popular sources active in this field for the year 2020 and later were analyzed. The general outlines of the top 10 of some evaluations between 2020-2024 (inclusive) were drawn. Based on theoretical and popular data, some future projections have also been developed.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

3. FINDINGS AND DISCUSSION

3.1. The Place of Basic Competencies in CEO Success

CEO success requires the existence of many issues. Some of these have been tried to be explained (Eren, 2019: 13; Simsek & Celik, 2023: 12-15):

1. There are general regulations that need to be known in terms of public organizations and/or private sector enterprises. There have been many different efforts throughout the historical process. The aim was to improve management for stakeholders and make it more sustainable. One of these has been accepted as the "corporate governance philosophy". Corporate governance is built on four basic principles: "fairness, transparency, accountability and responsibility". There have also been efforts to move from the abstract rules here to concrete evaluations. Although full uniformity has not been achieved in practice, there are studies in the literature. The Organization for Economic Co-operation and Development (OECD) started publications under the name of corporate governance principles in 1999 (updated in 2015). There are also efforts by various institutions and organizations in our country. The Capital Markets Board (SPK) and BIST are examples in this area (Telceken, 2021: 88-124). The principles here also apply to every CEO. One must be fair, equitable, honest, transparent, accountable and reliable. Responsibilities towards internal and external stakeholders must also be taken into account.

2. Every CEO must have the skills that will increase effectiveness. He/she must also make appointments to relevant positions accordingly. First of all, he/she must value those with technical skills. In other words, he/she must form a competent and expert committee. It is important to internalize information about the sector and the institution. The appropriate balance must be achieved between material and human elements. Increases in production capacities can be achieved with intensive technology. Optimal sales figures can also be achieved. However, it is the human power that provides these. In other words, the human factor should not be ignored. Internal relations and the direction of human resources should be well determined. A CEO must prioritize the psycho-social wealth of both himself/herself and subordinate managers. Effective relationships should be established with internal and external stakeholders. Sustainable attitudes should be adopted. He/she should exhibit emotional intelligence and analytical thinking.

3. There are certain tasks that must be fulfilled for success. It should be compatible with his/her nature. He/she should not forget that success will come through them. He/she should manage the competition within the organization positively. He/she should also be able to mediate or arbitrate when necessary. In other words, he/she should not avoid taking responsibility. He/she should act like an idea person. He/she should be a policy developer. He/she should also act like a diplomat when necessary. He/she should act like an activist when necessary in terms of adapting to changing conditions. This also requires having advanced business development skills and adaptation expertise. It is also necessary to be equipped with both global and local information.

4. He/she should define the roles between individuals well. Because, he/she may be the "number one person" for the organization. A leading management is expected from him/her. He/she also provides high-level representation with the relevant environment. Sometimes, he/she may also have some ceremonial duties (such as receiving visitors, attending the engagement or wedding ceremonies of the personnel, taking the customer to dinner, showing him/her around, etc.). A CEO can also assume senior roles in "providing information and "making decisions" (Simsek & Celik, 2023: 15). 5. Authority and responsibility balance should be ensured. A CEO can make strategic or very important decisions. It is natural for him/her to engage in some indispensable practices. However, he/she should not do every job or task himself/herself. He/she should delegate some to lower-level managers. Especially frequently repeated (routine) decisions should be left to lower-level managers. The "Short Circuit Principle" or "Fayol Bridge" in the literature contains useful information. Therefore, strategic decisions are expected from the CEO. He/she should focus more on issues that concern top management. General managerial decisions can be left to middle-level managers. Technical decisions can be made by lower-level managers.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

3.2. Selected CEO Success Examples

Abigail Adams (1744-1818) is an important figure in American history. The following statements written to Thomas Jefferson (1743-1826), one of the founders of the USA, in 1790 are important in terms of leadership; “These are hard times in which a genius would wish to live. Great necessities call for great leaders” (Adair, 2010: 139). Leadership has existed in every period of history. It can be argued that humanity, which has a hierarchical nature, will not give up on leaders in the future. Because cooperation is required for some things. Group psychologies are formed for needs, interests and expectations. The leadership function is needed for various goals to be achieved. This situation is also valid at the organizational and social levels. In the upper management of organizations, it is desired to exhibit competent leadership. Leaders in the upper management also protect the benefits of the organization and the audience (Eren, 2017: 435; Blanchard, 2020: 301). Creating a more livable world for stakeholders is a very important goal.

CEO competencies in this regard also include some issues that require leadership. Because every manager wants to be effective in the management pyramid. The goal of most people is to reach the top of that pyramid. This may or may not happen over time. After all, there is a high-level career path. Beyond that, desires to be very successful and even very famous may also emerge. Each sector may have its own unique situations. Sometimes the market expands, sometimes it may contract. In other words, trends and preferences may change. However, this does not pull down the CEO board of that company. Sometimes it is a maximum profit target. Sometimes it may be necessary to close the season with minimum cost. These issues should also be taken into consideration when evaluating success and effectiveness. There are various CEO evaluation channels on a global scale. The most common are magazine or magazine lists that select the most successful types of that year. For the purpose of evaluating the last 5 years, the focus was on the 2020 and later elections. In addition, the top 10 places in each year's list were included. In other words, a kind of “Top 10 of every list” approach has been adopted.

Different magazines and magazine organizations have made various evaluations for 2020. Among these, CEOWORLD magazine’s “Best CEOs in The World 2020” ranking was preferred. The top ten here are listed as follows; “1. Jamie Dimon (JPMorgan Chase Bank, NY-USA), 2. Satya Nadella (Microsoft, Washington-USA), 3. Tim Cook (Apple, CA-USA), 4. Bob Chapek (Walt Disney Company, CA-USA), 5. Warren Buffet (Berkshire Hathaway, Nebraska-USA), 6. Jeff Bezos (Amazon, Washington-USA), 7. Larry J. Merlo (CVS Health, RI-USA), 8. David M. Solomon (Goldman Sachs, NY-USA), 9. Sundar Pichai (Alphabet, CA-USA), 10. Phebe Novakovic (General Dynamics, Virginia-USA)”. Some of these are entrepreneurs. Some are managers. Some are leader managers or executive leaders. As a result, decision makers included them in the “list of the most successful CEOs of the year”. When looking at popular evaluations, it is not surprising that JPMorgan CEO Jamie Dimon is at the top (CEOWORLD, 2021). The Glassdoor evaluation is remarkable in terms of 2021. The selection here is different from other workplace awards. The best CEOs in North America and some parts of Europe were evaluated in terms of various factors. First, leadership styles and management practices were considered important. Their personality structures, accessibility and transparency were examined. Their level of dedication to the company mission was determined. It was important for them to invest in the company culture. The work accomplished in the last year was analyzed. The professional development opportunities provided to stakeholders were checked. The increases in their capacity to learn and demonstrate leadership were examined. The form of organization and the order of the work environments were also scored. In addition, the insights of the stakeholders about their employers were also included. In the 2021 evaluations, the Covid-19 dimension was also included, in particular. Crisis management leadership was scored. Regulations regarding the health, safety and well-being of employees were also taken into account. As a result, the top ten in the "8th Employees' Choice Awards" list are as follows; “1. Rich Lesser (Boston Consulting Group), 2. Shantanu Narayen (Adobe), 3. Peter Pisters (MD Anderson Cancer Center), 4. Gary C. Kelly (Southwest Airlines), 5. Alfred F. Kelly, Jr. (Visa Inc.), 6. Satya Nadella (Microsoft), 7. Charles C. Butt (H E B), 8. Ed Bastian (Delta Air Lines), 9. Paul Cormier (Red Hat), 10. Horacio D. Rozanski (Booz Allen Hamilton)” (Paulise, 2021).

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

For 2022, the Comparably “Best CEOs for Diversity” list was taken as a basis. This institution has various evaluations in the fields of “large companies”, “small/mid-size companies” and “women entrepreneurs & chief executive officer”. Here, the focus was mostly on the CEOs of important companies. While creating the Best CEO list, attention was paid to fairness and statistical significance. For this reason, additional weight was given to companies that had more participation from the employee base. The successes of senior management were investigated. Importance was given to organizational cultures and the positive images created. The emotional ratings of employees were also included. In this context, the prominent names are as follows; “1. Satya Nadella (Microsoft), 2. Shantanu Narayen (Adobe), 3. Maria Black (ADP), 4. Yamini Rangan (HubSpot), 5. Arvind Krishna (IBM), 6. Dara Khosrowshahi (Uber), 7. Vladimir Schmunis (RingCentral), 8. Nathan Schultz (Chegg), 9. Brian Cassin (Experian), 10. Eric Johnson (Momentive.ai)” (Comparably, 2022).

Comparably “Best Company CEOs” list was again considered for 2023. Again, those in senior management were evaluated. The rankings were determined according to a series of questions about the CEO. A numerical score was given to the answer to each question. Then, comparisons were made with similarly sized companies in North America. An attempt was made to reveal successes and positive impacts. In this context, the following names stood out; “1. Dara Khosrowshahi (Uber), 2. Shantanu Narayen (Adobe), 3. Maria Black (ADP), 4. Artie Starrs (Topgolf), 5. Sarah Friar (Nextdoor), 6. Kumsal Bayazit (Elsevier), 7. Yamini Rangan (HubSpot), 8. Eric Harmon (Trustwawe), 9. Aneel Bhusri & Carl Eschenbach (Workday), 10. Fidji Simo (Instacart)” (Comparably, 2023). For 2024, CEOWORLD magazine's “Most Successful Energy CEOs, 2024” list was preferred. In this study, more than 2,300 CEOs from 61 countries were evaluated. The following names and organizations were listed in the top 10; “1. Brian Moynihan (Bank of America, USA); 2. Jamie Dimon (JPMorgan Chase & Co., USA); 3. Amin H. Nasser (Saudi Aramco, Saudi Arabia); 4. Darren W. Woods (Exxon Mobil, USA); 5. Satya Nadella (Microsoft, USA); 6. Tim Cook (Apple, USA); 7. Wael Sawan (Shell, UK); 8. Akio Toyoda (Toyota Motor, Japan); 9. Liao Lin (Industrial & Commercial Bank of China, China); 10. Kyung-Kye Hyun (Samsung Electronics, South Korea)”. Undoubtedly, there are many other successful and famous people. For example, Dr. Oliver Blume from Volkswagen and Jane Fraser from Citigroup. They may not be on this list like D. W. Woods or T. Cook. However, they are people who have made a name for themselves in their fields. In other words, they may or may not be on this list. A successful CEO immediately brings to mind the following; “Long-term vision and creating lasting value” (Wilson, 2024).

Many issues can be highlighted for the people listed above. First of all, they have filled the senior management areas. They have determined the policies of the companies they are in. They have also implemented the strategies that will realize these (Guney, 2004: 254). Organizational success does not come by chance, of course. It requires the presence of many elements. First of all, either executive leadership or a leading management style is needed. A successful organization requires both a successful senior management and a successful team. Here, CEO competencies are very important. As in many branches of art or professions, there may be various limitations in this area. In other words, it is difficult to make generalizations. It is not easy to prepare a single prescription or list of suggestions. The basic skills that will increase CEO success should be internalized.

CONCLUSION AND RECOMMENDATIONS

Every business organization wants to be successful. The entrepreneur wants an efficient and profitable organization. Internal and external environmental elements also expect their expectations to be met. In other words, various general and/or specific goals are formed. For this, various duties and responsibilities fall on the management levels. In particular, the top management mechanism is very important. A lot is expected from strategic managers or top executives. This study is aimed at the importance of basic skills in CEO success. For this purpose, the focus is on these basic skills. In other words, an attempt is made to emphasize the basic skills in CEO success. The lists of publications and popular sources active in this field have been analyzed. The general outlines of some evaluations here have been drawn. In the light of these, some projections for the future have also been developed.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

A real CEO is ablaze with determination and excitement to succeed. This desire and desire keeps him/her very alive. Their mission and vision are remarkable. They can prioritize producing useful things for themselves, their organizations and their societies. They can prioritize institutionalization. They have sustainable organizational goals. For them, it is important to produce permanent and significant outputs. Then, success stories are formed. First, the business and family circles feel this. In other words, the close circle becomes aware. Then, it attracts the attention of those in the sector. As their competence and success increase, they start to be known by national and global circles. Business and professional organizations start to include them in their showcases. Their recognition with popular culture elements may increase even more. Some of their colleagues have started to be shown as exemplary people. Some sympathizers or fans may even form from the social world. They have become among those who need to be reached by potential investors. Policy makers and/or lawmakers need their views. The monetary funds they manage can multiply the Gross National Product amounts of some countries. Their personal and institutional charisma can be more effective than some country managers.

A CEO can be quite famous in the business world and social circles. He/she can receive invitations to magazine programs. His/her name can be mentioned in popular publications. He/she can even be recognized as an important actor in the virtual world. If these do not disrupt his/her work and duties, it is his/her own choice. As long as the organization he/she manages is successful, there may not be many critics. However, when negativities arise, he/she can be declared the main culprit. What is important is to preserve his/her basic skills. To rank the jobs according to priority. To implement the targeted plans and programs. To keep his/her mission and vision dynamic. To constantly analyze the internal and external environment of the organization. To provide the necessary variables. And to predict the parameters on time and in the right place. These issues listed are not unfamiliar to a successful CEO. Because, first of all, a real CEO has received good education in his/her field. He/she has various competencies and field experience. Business blindness can cause some problems. Physical and psychological problems can also affect that person. In normal situations, a competent CEO can make himself/herself and his/her organization successful. CEO is a long journey. Success can be achieved. Losses can also be experienced. Some suggestions can be developed for those who aim for this. Or, they may have achieved their goals but also experienced road accidents. As a result, there are suggestions to be shared in general. First of all; technical skills, the ability to establish human relations and analytical thinking should be internalized. Teamwork is important. There is no need for a legendary charismatic leadership dream that says “I know everything” or “I do the best”. Most of the difficulties can be overcome more easily with stakeholders. Inspiration and vision should be instilled in the people you work with. In decisions and practices; both team consultation and self-confidence in practice are required. Indecision is never welcomed. Open communication, accepted motivational practices and morale management should be exhibited. Capital owners can prioritize efficiency and profitability. A competent CEO should also consider the happiness of their stakeholders and a livable world.

This study primarily consists of theoretical information. Field experiences were also tried to be added to these. For this purpose, the most successful CEO lists and their scopes on a global scale were examined. Some selected successful CEO examples were also evaluated. These situations have also brought some limitations to the study. Primary sources can be created with field research. Or more concrete data can be reached with case studies, interviews or interviews.

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INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

EFFECTS OF GLOBAL COMPANIES ON CLIMATE CHANGE

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ABSTRACT

Global companies are business organizations known by different names. First of all, they are giant economic organizations or institutions. They are also explained with concepts such as international businesses, multinational businesses and transnational businesses. Since they operate on a world scale, they have the power to influence almost every region. They make mass or continuous production. Many natural resources in the world are consumed by them. Focusing solely on profit in production and marketing activities poses a great danger. In other words, they need to feel social responsibility. They are expected to be sensitive to the ecological structure. Otherwise, they are the main culprits of an uninhabitable world. The natural structure is being destroyed more and more every day. Fossil fuels increase emission rates. The seasons have become unbalanced. Climate changes cause many problems. Global companies have very important duties here. A more livable world is everyone's expectation. Undoubtedly, various platforms are organized on the subject. However, we should no longer be satisfied with just rhetoric. So concrete actions are needed. It is a known fact that the world is drifting towards extinction every day. Therefore, all relevant circles must join hands. This study is related to the global companies dimension of the subject. First of all, attention has been drawn to the problems in this context. Then, possible solutions were developed.

Keywords: Global Companies, Climate Changes, Effects of Global Companies on Climate Changes

1. INTRODUCTION

Companies are economic units. These also have social, technical and financial aspects. In general terms, they were created to meet human needs. They are referred to by various names within themselves. Many factors can be taken into consideration here. For example, the number of personnel employed, capital structure and capacity can be listed. In terms of number of people and sales revenues; They can be grouped into five separate groups. Enterprises that employ less than ten people and whose annual net sales revenue or financial balance sheet does not exceed 1 Million Turkish Liras (TL) are considered "micro". Enterprises that employ less than fifty people and whose annual sales revenue or financial balance sheet does not exceed 8 Million TL are considered "small". Enterprises that employ less than two hundred and fifty people and whose annual net sales revenue or financial balance sheet is less than 40 Million TL are considered "medium-sized". Enterprises that employ more than two hundred and fifty people and whose annual net sales revenue or financial balance sheet is more than 40 Million TL are called "large-scale". Those that exceed large-scale enterprises are classified as "giant" or "global" enterprises (Celik, 2018: 64-65). It may not always be realistic to use the above-mentioned measures individually and independently of each other in determining the size of businesses. In other words, one, several or all of these measures can be used simultaneously to determine business size. On the other hand, the purpose and type of activity of the business will determine which measure will be taken as the dominant factor in determining the size.

Humanity has witnessed new kinds of developments after the industrial revolutions. Undoubtedly, technological advances have brought various benefits. Quality of life has started to increase. In terms of the size reached today, we are faced with digital revolutions. However, since the 20th century, various problems have begun to be observed. Among these, climate changes are an important dimension. Climate refers to the long-term regional or global average of temperature, humidity and precipitation

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

patterns over seasons, years or decades. The deterioration in this structure has appeared as increases in global air and ocean temperatures. Global sea levels have risen. Snow and ice cover has begun to decline on a large scale, steadily over the long term. Atmospheric and oceanic circulation has changed, affecting seasonal precipitation. Changes in regional weather patterns have increased (WB, 2024).

Many issues in the ecological structure are not related to a single dimension. There are internal and external stakeholders of the issue or issues. There are variables that can be controlled. However, there are also risks and uncertainties that exceed control limits. Not every aspect that has the characteristics of a parameter can be easily influenced. However, improvements are also needed. The issue of climate change should also be approached from this perspective. This study has been prepared to address one aspect of the subject. In other words, the current situation of global companies and their duties in the future are prioritized. Also, efforts were made to determine areas of strategic cooperation. Based on the generally accepted literature in this field, three separate parts are organized. First of all, the literature on “global companies” and “climate changes” was shared. Then, based on literature information and current evaluations, “the effects of global companies on climate changes” are revealed. With the help of the current dimension and some selected applications, various suggestions have been developed for the parties.

2. GLOBAL COMPANIES

The concept of modern business has been reached through home economics and barter economy. In ancient times, the closed household economy, called “Okinomica” by the Greeks, constituted a unit in which family members produced everything they consumed. In the ages when such units dominated, economic conditions were still very simple. In parallel with human needs that have increased and diversified over time, the home economy has also had to change its nature. This change in quality has occurred in the form of home economies tending to specialize in certain areas (Celik, 2018: 42). However, subsequent developments have reached dimensions that cannot be followed. Especially with the last two industrial revolutions, the acceleration has increased even more. New technologies and business methods are talked about every day. Some inventions or innovations that emerged within the scope of Industry 4.0 and Industry 5.0 are as follows; “SMS, DVD, Windows 95, USB port, Google, Bluetooth, iPod, Facebook, YouTube, Twitter, Amazon Kindle, Bitcoin, Big data, Blockchain, Artificial DNA, Quantum Computing, Driverless Vehicles, Bionic Eye, Smart Watches, 3D Printing , Organ Microchips, Nano Devices, Smart Factories, Smart Drone, Virtual Reality (VR) & Augmented Reality (AR), Cloud & Edge Computing, Solar Roof, Zero Avia, Covid-19 vaccine, 5G Connectivity, Humanoid Robots, Chatbots, Natural Language Processing (NLP), Artificial Intelligence, OpenAI-ChatGPT & Google-Gemini” (Gordon, 2000: 56-57; Wolchover, 2016; Munirathinam, 2020: 3; Gormley, 2021; Karel, 2023; Pusztai, 2023; Tekin & Celik, 2023: 82-83; Okatan, et al, 2024).

Global companies are generally structures that operate on a worldwide scale. There are also those with multinational dimensions. There are also those who call these giant enterprises. The number of people they employ can be two thousand or more. Of course, only the number of human resources is not the measure. Other issues are also taken into account. For example, the production methods they use include advanced technology. In other words, they have a high level of production power. Their market share is quite large. They may not even grant the right to life to SMEs and/or national large-scale companies in these markets. So they have a lot of competitive advantages. Capital sizes are also very large (Simsek & Celik, 2023: 46). Since they are already like this, they can easily operate worldwide.

For global companies, the concepts of “international enterprises, multinational enterprises and transnational enterprises” can also be used. They can appear as quite different and comprehensive organizations. It can also be seen that they sometimes engage in cartel, concert and trust-style collaborations among themselves. As can be seen, the issue has various dimensions. From an economic perspective, they have undertaken large-scale investments that other businesses cannot easily achieve. Among these, areas such as “nuclear power plants, giant dams, oil refineries, large ports, seawater-based drinking water production, shipping, arms industries” can be listed (Simsek & Celik: 2023. 46). The issue also has socio-economic dimensions. It is even claimed that such companies determine socio-political strategies.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

3. CLIMATE CHANGES

Climate change has become a phenomenon that occupies more and more agendas day by day. It has become generally accepted that this issue poses a threat to living things. It has already become a costly feature with its negative effects. This issue has been the environmental problem that has attracted the most attention on the international agenda in recent years. Increasing concerns about the problem of climate change, especially since the 21st century, have forced countries to take precautions at national and international levels. The fact that the effects of climate change will transcend borders and cause a global problem has rendered national efforts insufficient and necessitated an international intervention. There should no longer be any room for negligence in this regard. Because more damage may occur with each passing day. All areas of life such as the natural environment, urban life, development and economy, technology, human rights, agriculture and food, clean water and health may become more negative. Therefore, it should be at the top of the world agenda (Selcuk, 2021: 9; CSB, 2021: 1).

Natural and man-made disasters are becoming more evident every day. In this context, slow-developing natural disasters (severe cold, drought, famine) can be listed first. Then, sudden natural disasters (earthquakes, floods, landslides, rock falls, avalanches, storms, tornadoes, volcanoes, fires) can be highlighted. There are also human-induced disasters (nuclear-biological-chemical accidents, transportation accidents, industrial accidents, accidents caused by overcrowding, immigrants and displaced people). Many people have been in a very difficult situation due to these disasters of geological, climatic, biological, social and technological variety. Various factors such as unpreventable changes in climate, increasing natural events, excessive orientation to cheap inputs in order to make more profit, increase the extent of damage to the environment day by day (Erbasi, 2022: 1).

Climate changes have brought with them many problems. Due to the addition of greenhouse gases to the atmosphere, climate systems have begun to be affected by the extra heat. These additional greenhouse gases; It is primarily caused by human activities such as the burning of fossil fuels (coal, oil and natural gas), deforestation, agriculture and changes in land use. These activities increase the amounts of 'heat-trapping' greenhouse gases in the atmosphere. The pattern of changes observed in the climate system proceeds in parallel with the increasing greenhouse effect. The general climate structure may not change immediately from today to tomorrow. So it may involve long periods. Average weather conditions; It may become warmer, wetter, or drier over a period of several decades or longer. However, the periods here are getting shorter day by day (WB, 2024). In particular, anthropogenic emissions emerge as an important problem.

Nowadays, this issue has begun to be discussed very frequently. So "how can we limit global warming?" The question has started to be asked a lot. According to some experts, this is not such an easy task. According to them, limiting the increase in global warming is theoretically achievable. However, there are many problems in political, social and economic terms. To reduce warming, the same sources of greenhouse gas emissions must be limited. There are many tasks to be done. Oil and gas used to generate electricity or industrial energy must be reduced. Instead, net zero emission technologies such as wind and solar energy should be increased. Another important source of emissions is transportation and logistics activities. More electric vehicles should be produced. Public transport and safe bike paths are important. Walkable cities are needed. Innovative urban designs should be developed (Gibbens, 2024).

4. EFFECTS OF GLOBAL COMPANIES ON CLIMATE CHANGE

Climate variability affects the sustainability of human and environmental health. Food security is another worrying scenario that could lead to deterioration of food quality, high food prices and inadequate food distribution systems. Global forests face different climatic factors such as storms, droughts, flash floods and heavy rainfall. Today, modern life on Earth is shaped by consistent climate patterns, and therefore it is of great importance to adapt to such significant changes. This increasingly global conundrum requires urgent attention at all scales, from the basic community level to the international level, as more rapid changes in climate will make it harder to survive and adapt (Abbass et al, 2022: 42549).

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

Climate change is a multifaceted phenomenon that includes various elements. There are also variables and parameters specific to the subject. Uncertainties also exist for any future projection. While advances continue to be made in understanding the physics of climate and the response of the climate system to increases in greenhouse gases, many uncertainties are likely to remain. The rate of future global warming depends on future emissions, feedback processes that reduce or strengthen disturbances in the climate system, and unpredictable natural impacts on climate such as volcanic eruptions. The uncertain processes that will influence how quickly the earth warms for a given emission pathway are dominated by cloud formation, but also include water vapor and ice feedbacks, changes in ocean circulation, and natural cycles of greenhouse gases. Although information from past climate changes largely confirms model calculations, this too may have a degree of uncertainty due to potentially important factors about which we have incomplete information (WB, 2024).

The problems caused by climate change and may arise in the future can be discussed in various categories. First of all, macro and micro dimensions can be improved. Domestic or international situations can also be addressed. Cross-societal evaluations may also be needed. Comparative studies can even be carried out from culture to culture. In this study, global companies are focused on. It is talked about the power of global companies to influence the whole world. Their strategies also closely concern nations or societies. Even socio-economic activities at the regional or local level have been affected. Their management, production and marketing strategies are becoming more important day by day. The decisions they make or will make are not limited only to socio-economic structures. It is also closely related to ecological structure and environmental management.

When conducting a study on global companies, one may undoubtedly encounter various dimensions. When viewed from these perspectives, it can be thought that they primarily provide good for the world. There may also be those who emphasize it as the dynamic of socio-economic development, especially in their own societies. Undoubtedly, development is important for every society and country. Regardless of the development level of countries, true sustainable development is a desired situation. Development and national development dimensions need to be well known. Here, we can talk about total development. In other words, both physical and social development should be balanced. Some countries may be economically developed. However, if there is no development in social and human areas, we can talk about an incomplete structure. Undoubtedly, economic growth is needed. Every country wants to increase its level of development. Physical improvements at the individual, group and institutional levels are also important. However, these should also be supported by social justice, human development and freedoms. Every society aiming for real development should focus on these together (Celik, 2023: 104-105).

There may also be those who emphasize that global companies are important elements for a sustainable economic order. Continuity will be more meaningful if it develops within ethical principles and carries social responsibility. So, it shouldn't just be for select societies and their large-scale businesses. Undoubtedly, states and large-scale businesses are not satisfied with temporary successes. Permanence is an important goal for them. However, this should be for everyone's benefit. Not only efficiency or profitability, but also mission and vision achievement should be discussed. Living life must also be protected. Undoubtedly, each country may have its own unique socio-economic conditions. Each country's own internal dynamics may come to the fore. However, there is always a need for sustainable planning. One can also interact with local governments, chambers of commerce and industry, universities, institutes, non-governmental organizations, cooperatives, farmers, unions and investor organizations. The aim should be a more livable world (Savrul, 2012: 264; Pauliene, 2017: 99-101; Kocel, 2020: 589-591).

Undoubtedly, many other dynamics that constitute global companies can be mentioned. Among these, considerations such as size, market penetration and remaining unrivaled may come to the fore. The increase in the cost of growth along with the intensification of global competition encourages businesses that are in a position to complement each other in terms of resources to turn to strategic alliances. Today, in the globalization and destructive competition environment, advertising, propaganda and sales development are not sufficient for companies to survive, eliminate the pressure of competitors and create a positive image in the market (Simsek & Celik, 2023: 61, 321).

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

Global businesses want production to increase. They hope to expand their marketing opportunities. Maximum profit is very important for capitalist societies and their elements. However, the world does not consist only of these. There are a wide variety of living creatures, especially humans. So the world is for all living things. The issues here are discussed at various levels. Davos 2024 meeting was one of them. In particular, climate changes are included among the main themes. In this context, attention was drawn to the following issues: “deadly heat waves, floods affecting cities, duties of governments, sustainable business”. The need for improvements in industry branches was emphasized. It was especially emphasized that large-scale enterprises should be active. Otherwise, it was stated that the problems would increase. For example, it was shared that there will be more disruptions in supply chains (Ruggeri, 2024: 1).

Another important issue expected from large-scale businesses is to demonstrate an understanding of “Corporate Social Responsibility (CSR)”. This dimension is becoming more important day by day. Because, while businesses produce goods and services, they have to feel responsible for the environment they operate in. In order to maintain their existence, they must demonstrate sensitivity towards society. In other words, they are expected to operate in a socially responsible manner. In this sense, one of the best ways to gain the trust and support of stakeholders is the CSR approach. With globalization, this issue has become more widespread. There are also rapid technological developments, legal regulations and public awareness. Consumers are acting more organized day by day. Their impact on businesses is also increasing. Many large-scale businesses can make CSR a corporate culture and act accordingly. There are also people who use this situation as an advertising tool (Celik & Canbulat, 2024: 301). The issue is also important in the case of climate change. They should limit their activities in this area to their control limits. They need to reduce fossil fuels to a minimum. Raw materials that are compatible with nature and harmless to humanity should be used. Recycling is also important.

There are also notable developments today. Various platforms are available. Global warming, which was once considered a very difficult issue, has now become widely discussed. Solutions on this issue have begun to be taken into consideration. Not only states, but also non-governmental organizations are on the field. Geoengineering has accelerated. Manipulating the earth's atmosphere by physically blocking the sun's heating rays or absorbing carbon dioxide directly from the sky is on the agenda. Their social media literacy has also improved. Activists often emphasize the desire to restore nature. In order to limit warming, invitations are being made to global companies. Global companies have started to become acquainted with green management. Green funds are formed. Shares of environmentally friendly companies may be more accepted. In other words, protecting forests, keeping oceans clean, preserving wetlands and the existence of other ecosystems has become a concern for everyone. If these happen, it will be easier to absorb excess carbon. When these disappear, the fight against climate change may be lost (Gibbens, 2024). This is why it is very important for global companies to establish environmental management units. The concept of CSR should be disseminated in business organizations. Sensitivity to ecological structure is necessary for everyone.

5. CONCLUSION AND GENERAL EVALUATION

Earth is the common living unit of all living things. Any event that makes the earth and the atmosphere negative also threatens the life of living things. The right to life of every living creature is sacred. Actions and decisions that will make this negative should be strongly rejected. Deterioration in ecological structure is harmful to everyone. Depleting the ozone layer is not in anyone's interest. Depletion of rainforests may provide economic benefits to a certain group, perhaps in a short time. However, many states or societies may be harmed in the medium term. In the long run, all living things may suffer losses. Unfortunately, today the natural structure has been severely damaged. Harmful behaviors and actions here still continue. This returns to us as various problems. For example, we are faced with unexpected rains and floods.

The thing to do is to make the world more livable. Every problem that threatens living beings should be seen as a common problem of humanity. Carbon footprint should be monitored. One should be at peace with nature. Recycling should be supported. Climate change must also be combated. Adaptation strategies to climate changes are needed. Undoubtedly, this is a multidimensional event. The topic

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

includes macro and micro levels. Countries, societies and cultures must join hands. In this study, the subject is evaluated more within the scope of microeconomics. The most active elements of the market order are businesses. These are units that produce and market to meet human needs. They have economic, social, technical and financial structures. Economies of scale are variable and range in size. In our topic, we focused on global enterprises. The activities of businesses of this size can affect the ecological structure more. Production activities are especially common. They are powerful enough to drive societies towards constant consumption. They also negatively affect natural resources through management, production and logistics activities.

Profitability is very important for advanced industries and large-scale enterprises. This situation can also be accepted as a requirement of a capitalist economic order. However, the world does not only belong to them. In other words, it belongs to all living things. Therefore, sensitivity is required. Maximum profit cannot always be achieved. Social responsibility is more important. Being sustainable does not mean producing and consuming without limits. Natural resources should be protected. Emission rates should be reduced. Some future problems, especially climate change, should be well diagnosed. Increasing risks can threaten every living thing. Making the world more livable is not only the duty of voluntary organizations. Cooperation between states, public institutions and global companies is needed. Unfortunately, there are also signals of some undesirable developments. “The United States of America (USA) has decided to withdraw from the Paris Agreement in accordance with the United Nations (UN) Framework Convention on Climate Change. This notification has been forwarded to the UN-General Secretariat under Annex-A. The ambassador here has initiated the correspondence. In addition, authority has been transferred to the Secretary of State and the Secretary of the Treasury. In other words, financial commitments under the UN Framework Convention on Climate Change will be stopped. Or, it will be cancelled” (USA, 2025). UN Spokesperson Stephane Dujarric also announced this situation in his daily press conference. Dujarric stated that “USA officially forwarded the withdrawal document to Guterres by letter”. He also shared that this country “will be a party to the Paris Climate Change distribution as of January 27, 2026” (Reuters, 2025). This decision is a negative development for The United Nations Environment Programme (UN-UNEP). Because there may be deviations in the UN’s goal of limiting global warming to 1.5 degrees.

There are those who make an effort to protect the environment. They should definitely be appreciated. Unfortunately, there are also those who do not. They should be heavily criticized. In fact, neutrals have also emerged. They should also be criticized. Because neutrality is not nice when it comes to protecting the environment. Unfortunately, both those who cause harm and those who are neutral are not in small numbers. In some way, joint action cannot be taken. This increases the environmental threats to living beings. Still, there is some hope. Although not fully sufficient, there are some global organizations with which solidarity can be established. Joint projects should be prepared with “Universities, research institutes, World Meteorological Organization (WMO), Food and Agriculture Organization (FAO), World Health Organization (WHO), International Fund for Agricultural Development (IFAD), The United Nations Educational, Scientific and Cultural Organization (UNESCO), UN-UNEP, The United Nations Economic Commission for Europe (UNECE), International Bank for Reconstruction and Development (IBRD), The Global Water Partnership (GWP), The WATER4All, non-governmental organizations, non-profit organizations and activists”. Action plans developed to make the world more livable should be supported. There are also various special duties that fall to global companies. First of all, they should open R&D services for ecological structure to these organizations. They should start education and training programs. At the same time, they should transfer certain funds they set aside from their profits to these institutions.

Profitability is very important for advanced industries and large-scale businesses. This situation can also be accepted as a requirement of a capitalist economic order. But the world is not just for them. In other words, it belongs to all living things. So, sensitivity is required. Maximum profit may not always be achieved. Social responsibility is more important. Being sustainable means; It is not about producing unlimitedly and consuming unlimitedly. Natural resources must be protected. Emission rates should be reduced. Some future problems, especially climate changes, must be diagnosed well. Increasing risks can threaten every living thing. Making the world more livable is not only the duty of volunteer

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

organizations. Cooperation of states, public institutions and global companies is needed. There are also a wide variety of global organizations with which we can cooperate in this regard.

This study was prepared based on the literature. In other words, the literature on “global companies, climate changes, the effects of global companies on climate changes” was evaluated. It is aimed to produce useful information with the help of the current dimension and some selected applications. However, the study has a fundamental limitation in itself. That is because it did not include field research. In order to overcome this, a survey can be conducted for global companies and field practices. Case studies can also be carried out on multinational and global companies.

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**KAN-TESTİS BARIYERİNİN OLUŞUMUNUN BİYOBELİRTECİ ANDROGEN-
BAĞLAYICI PROTEİN FİZYOLOJİSİ VE ÜREMEDEKİ ROLÜNÜN
İNCELENMESİ**

**INVESTIGATION OF THE ROLE OF THE FORMATION OF THE BLOOD-
TESTICULAR BARRIER IN BIOMARKER ANDROGEN-BINDING PROTEIN
PHYSIOLOGY AND REPRODUCTION**

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ÖZET

Androjen Bağlayıcı Protein (ABP), testosteron ve dihidrotestosteron (DHT) gibi androjen steroid hormonlarını bağlayan bir proteindir. ABP, esas olarak karaciğerde üretilir ve testislerdeki sertoli hücreleri tarafından salgılanan 37 kDa moleküler ağırlığa sahip bir proteindir. ABP, testostereona bağlanarak testostereonu seminifer tübül sıvısı içerisinde epididime taşımaktadır. ABP, testisteki sertoli hücresi tarafından sentezlenir, burada yaklaşık %80'i lüminal sıvıya ve %20'si ise interstisyel bölme salgılanır ve sistemik dolaşıma salınması sonrası testosteron, epitel 5 α -redüktaz tarafından Dihidrotestosterona dönüştürülmektedir. ABP'nin fizyolojik işlevi, androjen hormonlarını (özellikle testosteron) taşımak ve sperm gelişimi için gerekli olan uygun ortamı sağlamaktır. ABP, testosteronu bağlar ve onu seminifer tübül sıvısında epididimise taşınmaktadır. Böylece testislerde üretilen testosteronu hedef hücrelere taşınması ile epididimiste sperm olgunlaşması için gerekli olan uygun androjen konsantrasyonunu sağlamaktadır. Ayrıca, sertoli hücre fonksiyonları ve androjen metabolizmasında önemli rolü bulunmaktadır. ABP fonksiyonu ve düzeyindeki sorunlar, birçok endokrin ve androloji hastalığı, infertilite ve üreme ile ilgili hastalık ve sağlık sorunlarına neden olabilmektedir. Bu çalışma, kan-testis bariyerinin oluşumunun biyobelirteci ABP fizyolojisi ve üremedeki rolünün incelenmesi hedeflenmiştir. ABP'lerin, üreme sistemi üzerindeki etkilerinin daha iyi anlaşılması, infertilite tedavilerinin geliştirilmesine katkı ve fayda sağlayacağı düşünülmektedir.

Anahtar Kelimeler: Androjen Bağlayıcı Protein, Testosteron, Dihidrotestosteron, Testis, Üreme

ABSTRACT

Androgen Binding Protein (ABP) is a protein that binds androgen steroid hormones such as testosterone and dihydrotestosterone (DHT). ABP is a protein with a molecular weight of 37 kDa that is produced mainly in the liver and secreted by sertoli cells in the testicles. ABP binds

to testosterone and transports testosterone to the epididymis in the seminiferous tubular fluid. Testosterone is synthesized by the Sertoli cell in the testis, where approximately 80% of it is secreted into the luminal fluid and 20% into the interstitial compartment, and after its release into the systemic circulation, testosterone is converted into Dihydrotestosterone by epithelial 5 α -reductase. The physiological function of ABP is to transport androgen hormones (especially testosterone) and provide the appropriate environment necessary for sperm development. ABP binds testosterone and transports it to the epididymis in seminiferous tubular fluid. Thus, by transporting testosterone produced in the testicles to the target cells, it provides the appropriate androgen concentration necessary for sperm maturation in the epididymis. In addition, Sertoli has an important role in cell functions and androgen metabolism. Problems in the function and level of ABP can cause many endocrine and andrological diseases, infertility and reproductive-related diseases and health problems. This study aimed to investigate the role of the formation of the blood-testicular barrier in biomarker ABP physiology and reproduction. It is thought that a better understanding of the effects of ABPS on the reproductive system will contribute and benefit the development of infertility treatments.

Keywords: Androgen Binding Protein, Testosterone, Dihydrotestosterone, Testis, Reproduction

1.GİRİŞ

Androjen bağlayıcı protein (ABP), androjenleri yüksek afiniteyle bağlayan ve bunları epididime taşıyan bir testis glikoproteinidir (Danzo ve Black, 1990). ABP, seminifer tübüllerdeki sertoli hücreleri tarafından üretilen glikoproteinlerdir (Munell ve ark., 1994). Bu proteinler, testosteron ve diğer androjenlere spesifik olarak bağlanarak testislerin içindeki konsantrasyonunu artırmaktadır. ABP'nin Sertoli hücreleri tarafından üretilen bir parakrin faktör olarak hareket edebileceği ve germ hücresi olgunlaşmasında rol oynamaktadır (Gerard ve ark., 1994). ABP'nin seks steroidlerini bağladığı, taşıdığı ve yoğunlaştırdığı ve ayrıca bunları testis sıvılarındaki katabolizmadan koruduğu bilinmektedir (Hagenäs ve ark., 1975, Bardin ve ark., 1981, Joseph, 1994).

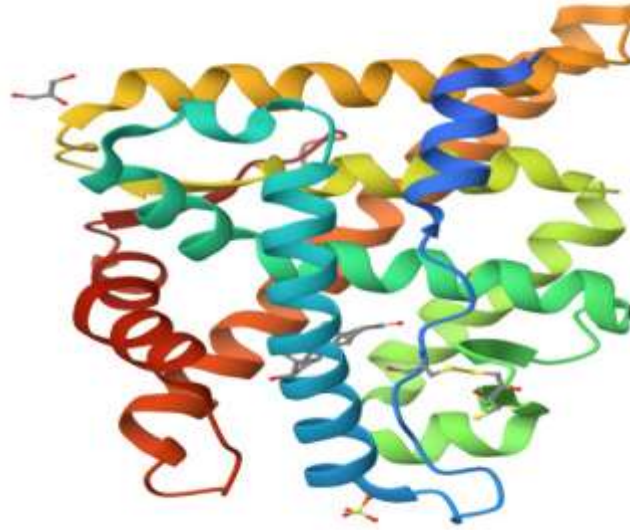
Testosteron, testisteki Leydig'in interstisyel hücrelerinde sentezlenen lipofilik bir steroid moleküldür. Androjen Bağlayıcı Protein (ABP), testosteronu izole eder ve çözündürerek taşımayı ve biyoyararlanımını kolaylaştırmaktadır (Fortunati, 1999). Çoğu memeli türü, yüksek afiniteyle androjen T/DHT'ye (dihydrotestosteron) özgül olarak bağlanan bir testis proteini ifade etmektedir (Munell ve ark., 2002). Bununla birlikte, intratestiküler testosteronun dolaşımdaki seviyeden birkaç kat daha yüksek bir seviyede depolanma mekanizması, henüz tanımlanmayı beklemektedir. İzole edilen androjenlerin ABP'den ayrılma hızı, bunun testis Androjen Reseptörlerinde DHT biyoyararlanımını düzenlediği bildirilmektedir (Fortunati, 1999). Hem testosteron hem de aktif metaboliti dihydrotestosteron (DHT), X kromozomundaki tek kopya gen tarafından kodlanan ligand aktifli transkripsiyon faktörleri ailesinin bir üyesi olan androjen reseptörüne bağlanarak aktive etmektedir (Lubahn ve ark., 1988).

2. KAN-TESTİS BARIYERİNİN OLUŞUMUNUN BİYOBELİRTECİ ANDROGEN-BAĞLAYICI PROTEİN FİZYOLOJİSİ VE ÜREMEDEKİ ROLÜNÜN İNCELENMESİ

Androjen Bağlayıcı Protein (ABP), testosteron ve dihydrotestosteron (DHT) gibi androjen steroid hormonlarını bağlayan bir proteindir (Barahona ve ark., 1980). ABP, esas olarak karaciğerde üretilir ve testislerdeki sertoli hücreleri tarafından salgılanan 37 kDa moleküler ağırlığa sahip bir proteindir (Joseph ve ark., 1997). Androjen Bağlayıcı Protein (ABP), testisteki

sertoli hücreleri tarafından sentezlenen, testosterona bağlanan ve onu seminifer tübül sıvısı içerisinde epididimise taşıyan bir proteindir (Hagenäs ve ark., 1975).

Kan-testis bariyeri, en sıkı kan-doku bariyerlerinden birisi olmakla birlikte seminifer tübülün seminifer epitelindeki bazal membrana yakın sertoli hücreleri arasındaki özelleşmiş bağlantılardan oluşmaktadır (Cunha-Vaz, 2004). ABP, sertoli hücreleri tarafından üretilen bir parakrin faktör olarak hareket edebileceği ve germ hücresi olgunlaşmasında rol oynamaktadır (Bedjou ve ark., 1995).



Şekil 1. Androgen-Bağlayıcı Protein 3 boyutlu molekül yapısının görünümü (PDB, 2025).

ABP'nin, testis germinal epitelinde androjenlerin birikimini ve dağılımını ve androjenlerin testisten epididime taşınmasını etkileyen bir taşıyıcı işlevi bulunmaktadır (Danzo ve ark., 1991). Epididimis, fetal yaşam sırasında gelişimi ve olgun erkekteki işlevi için tamamen androjenik hormonlara bağımlıdır. ABP, farklı şekilde glikozlanmış protomerleri içeren bir dimer olarak bulunmaktadır. ABP, karboksil terminalindeki Asparagin Asn'nin ikisi ve amino terminalindeki O-glikozilasyonun biri üç korunmuş glikozilasyon bölgesi bulunmaktadır (Hammond ve ark., 1989; Hammond, 2011).

3.SONUÇ

Androjen bağlayıcı protein (ABP), androjenleri yüksek afiniteyle bağlayan (ve bunları epididimise taşıyan bir testis glikoproteinidir). ABP ise testosteron hormonunu bağlayarak, sperm olgunlaşması için gerekli olan hormonal ortamı oluşturmaktadır. Spermatogenez, androjene bağımlı bir süreçtir, ancak androjenlerin etkilerinin moleküler mekanizmaları yeterince anlaşılmamış olması nedeniyle nedeniyle fizyolojik mekanizmaların aydınlatılması yönünde daha fazla sayıda ve kapsamlı araştırmalara ihtiyaç duyulmaktadır.

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INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

ADİPOLİN HORMONU FİZYOLOJİSİ VE OBEZİTEDEKİ ROLÜNÜN İNCELENMESİ

INVESTIGATION OF ADIPOPINE HORMONE PHYSIOLOGY AND ITS ROLE IN OBESITY

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ÖZET

Adipolin (C1q/TNF ile ilişkili protein 12 (CTRP 12)), glukoz metabolizmasını iyileştiren bir adipokin olarak işlev gören, glukoneogenezi baskılayarak ve hepatositlerde ve adipoz doku hücrelerinde glukoz alımını teşvik ederek insülin duyarlılığını artırıcı etkilere sahip bir adipokindir. Adipoz doku tarafından salgılanan yeni bir adipokin olan adipolin, insülin duyarlılığını artırıcı ve anti-inflamatuar özelliklere sahiptir ve adiponektinin bir paralogudur.

Adipolin, oligomerik yapılarda farklılık gösteren iki izoformu bulunmaktadır. Tam uzunluktaki adipolin izoformu trimerler ve daha büyük kompleksler oluşturur ancak parçalanmış globular adipolin izoformu esas olarak dimerlerden oluşmaktadır. Adipolinin tam formdaki parçalanmamış izoformları insülin duyarlılığını artırır ve glikoz alımını uyarır. Adipolin, kromozom 1p36'da bulunan FAM132A geni tarafından kodlanmaktadır. özellikle yağ hücreleri olmak üzere yağ dokusunda yüksek oranda ifade edilen bir adipokindir. Adipolin, insülin duyarlılığı ve glisemik kontrol üzerinde yararlı etkiler gösterebilen, metabolik ve vasküler bozuklukların gelişimini önleyebilen bir antienflamatuvar adipokin gibi davranmaktadır.

Bu kapsamda, metbolizma düzenleyicisi Adipolin hormonu fizyolojisi ve obezitedeki rolünün incelenmesi hedeflenmektedir. Ayrıca, özellikle Adipolin ile ilişkili obezite, diyabet hastalıklarındaki fizyolojik rolünün aydınlatılması yönündeki araştırmalara katkı sağlayacağı düşünülmektedir.

Anahtar Kelimeler: Adipolin, Adiponektin, Adipokin, Glikoz metabolizması, Antienflamatuvar, Obezite

ABSTRACT

Adipolin (C1q/TNF-related protein 12 (CTRP 12)) is an adipokine that functions as an adipokine that improves glucose metabolism, suppresses gluconeogenesis, and promotes glucose uptake in hepatocytes and adipose tissue cells, with insulin-sensitizing effects.

Adipolin, a novel adipokine secreted by adipose tissue, has insulin-sensitizing and anti-inflammatory properties and is a paralog of adiponectin. Adipolin has two isoforms that differ in their oligomeric structures. The full-length adipolin isoform forms trimers and larger complexes, but the fragmented globular adipolin isoform mainly consists of dimers. The unfragmented isoforms of adipolin increase insulin sensitivity and stimulate glucose uptake. Adipolin is encoded by the FAM132A gene located on chromosome 1p36. It is an adipokine that is highly expressed in adipose tissue, especially in fat cells. Adipolin acts as an anti-inflammatory adipokine that can have beneficial effects on insulin sensitivity and glycemic control and prevent the development of metabolic and vascular disorders. In this context, it is aimed to examine the physiology of the metabolism regulator Adipolin and its role in obesity.

In addition, it is thought that it will contribute to the research on the elucidation of the physiological role of Adipolin in obesity and diabetes diseases.

Keywords: Adipolin, Adiponectin, Adipokine, Glucose metabolism, Anti-inflammatory, Obesity

1.GİRİŞ

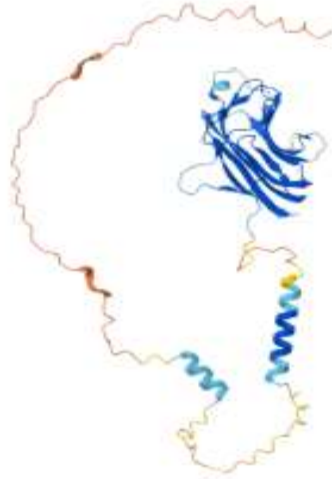
Obezite, tip 2 diabetes mellitus (T2DM), hipertansiyon ve arteriyel intima'da aşırı kolesterol birikimi ve köpük hücrelerinin oluşumu ile karakterize kronik bir hastalık olan ateroskleroz gibi hastalık ve sağlık sorunlarıyla ilişkili olan önemli halk sağlığı sorunlarından birisidir. Obezite, insülin direnci ve tip 2 diyabet dahil olmak üzere çeşitli metabolik bozuklukların gelişimi için önemli bir risk faktörüdür. Ateroskleroz, Adipokinler, adipoz dokudan salgılanan adipolin, obez ve insüline dirençli fenotiplerle ilişkili olan bu adipokinler arasındadır.

Obezite, metabolik işlev bozukluğunu destekleyen TNF α dahil olmak üzere çok sayıda proinflamatuvar adipokinlerin yukarı regülasyonuna yol açarken, aynı zamanda obez komplikasyonlara karşı koruyucu olan çeşitli adipokinlerin aşağı regülasyonuna da katkıda bulunmaktadır (Scherer, 2006).

Obezitede adipokinlerin salınımı düzensizleşerek çeşitli metabolik ve kardiyovasküler hastalıklara yol açmaktadır. Son zamanlarda obezite tarafından aşağı düzenlenen bir adipokin olarak adipolin/CTR12, obez farelerde yağ dokusundaki inflamatuvar yanıtları baskılayarak glikoz metabolizmasını iyileştirdiği bildirilmektedir. Adipolin ekspresyonu, inflamasyon ve Endoplazmik retikulum stresi indükleyicileri tarafından kültürlenmiş yağ hücrelerinde baskılanmaktadır (Enomoto ve ark., 2011). Adipolin ekspresyonu ayrıca obezite ve diyabetin kemirgen modellerinde yağ dokusunda azalmaktadır (Enomoto ve ark., 2011; Wei ve ark., 2012).

2. ADİPOLİN HORMONU FİZYOLOJİSİ VE OBEZİTEDEKİ ROLÜNÜN İNCELENMESİ

Adipolin (C1QTNF12), glukoz ve insülin seviyelerinin düzenlenmesinde önemli rol oynayan bir adipokindir (Barbe ve ark., 2024). Adipolin, mitojenle etkinleşen protein kinaz (MAPK), glukoz metabolizması, apoptoz, hücre proliferasyonu, transkripsiyon ve hücre göçü gibi çoklu hücrel süreçlerde kilit rol oynayan üç serin/reonin spesifik protein kinaz Akt olarak da bilinen protein kinaz B ve insan hücrelerinin insülin yanıtında önemli bir ligandı. İnsülin reseptör substratı (IRS) gibi proteinlerin fosforilasyonunu artırarak insülin sinyalizasyonunda rol oynamaktadır (Sargolzaei ve ark., 2018).



Şekil 1. Adipolin 3 boyutlu molekül yapısının görünümü (PDB, 2025).

Adipolinin, peptit sinyali, NX motifine uyan üç N-glikozilasyon bölgesi, bir CYS (globular N-terminal domain) kalıntısı ve polibazik kesme motifi KKXR'ye sahip N-terminal bölgeleri, GXY'nin altı tekrarına sahip kolajen bölgeleri ve C-terminal bölgesinde iki N-glikozilasyon bölgesi ve üç CYS kalıntısına sahip C1q küresel benzeri bir bölge olmak üzere dört ayrı bölgesi bulunmaktadır (Yan ve Lennarz, 2005;Booth ve ark., 2016).

Adipolin bağımlı sinyal yollarının düzenlenmesinde furin enzimi, adipolinin N-terminal alanındaki polibazik motif KKSR'de lizin ve serin arasında ayırım yapabilir ve bu da ayrılmış gCTRP12 izoformunun oluşumuyla sonuçlanmaktadır. Ayrılmış gCTRP12 izoformu adipolin ve tam uzunluktaki protein adipolin her biri belirli bir sinyal yolunu kullanmaktadır (Enomoto ve ark., 2012).

Adipolin, bir C1q/TNF ile ilişkili proteinler (CTRP) proteinleri ailesidir ve diğer CTRP'ler arasında adiponektinin minimum homologudur (Enomoto ve ark., 2012). Yeni keşfedilen adipolin, FAM132A/CTRP12 geni tarafından kodlanır. Bu adipokin, yağ hücrelerinden salgılanan bir hormon türüdür ve glisemik kontrole ve insülin duyarlılığına katkıda bulunmaktadır (Booth ve ark., 2016). Sistemik adipolin kullanılarak diyetle indüklenen obezitenin fare modeli, makrofaj infiltrasyonunu azaltır ve adipolin düzeyini azaltır, adipoz dokudaki inflamatuvar proteinler insülin direncini iyileştirmektedir.

Adipolin ekspresyonlu hücrelerin kültür ortamı kültürlenmiş makrofajlara eklenirse, inflamasyonla indüklenen proinflamatuvar mediatörler baskılanır, adipolin antiinflamatuvar bir rol oynar ve insülin duyarlılığını artırır ve insülin direncini iyileştirme amacıyla kullanılabilirliği bildirilmektedir (Tan ve ark., 2016; Bai ve ark., 2017). Adipolin, hem in vitro 3T3-L1 adipositlerindeki FAM132A ekspresyonunu hem de endoplazmik retikulum stresini azaltmaktadır. 3T3-L1 adipositleri, risk faktörlerine ve inflamasyona maruz kalma durumunda adipolin ekspresyonunun miktarını azaltmaktadır. Adipolinin obezite ve tip 2 diyabet (T2DM) ile yakın bir ilişkisi vardır ve yağ diyeti kaynaklı obez farelerde insülin ve glikoz toleransını önemli ölçüde iyileştirmektedir (Tan ve ark., 2013).

3.SONUÇ

Adipolin, insülin duyarlılığı ve glikoz metabolizması üzerinde yararlı etkiler gösteren yeni tanımlanmış bir adipokindir. Son zamanlarda yapılan bir çalışma, tam ancak parçalanmamış

adipolin formunun adipositlerde insülin kaynaklı glikoz alımını desteklediği bildirilmekle birlikte bu da tam ve parçalanmış adipolin formlarının farklı insülin duyarlılaştırıcı etkilere sahip olduğu bildirilmektedir.

Adipolin, vücut ağırlığı, glikoz metabolizması ve inflamasyon gibi birçok önemli fizyolojik süreçte önemli bir rol oynamaktadır. Obezitenin insülin duyarlılaştırıcı tam adipolin formunun baskılanması yoluyla insülin direncinin gelişimini artırması olası olduğu bildirilmektedir. Ancak, tam adipolinin ve parçalanmış izoformunun canlı organizmada farklı biyolojik özelliklere sahip olup olmadığı henüz netlik kazanmamakla birlikte obezite ile birlikte bir çok hastalık ve sağlık sorunlarıyla ilişkili rolündeki fizyolojik mekanizmaların aydınlatılması yönünde daha fazla sayıda ve kapsamlı araştırmalara ihtiyaç duyulmaktadır.

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INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

TESTİS VE OVARYUM GELİŞİMİNİN OTOKRİN/PARAKRİN MODÜLATÖRÜ AKTİVİN HORMONU FİZYOLOJİSİ VE ÜREMEDEKİ ROLÜNÜN İNCELENMESİ PHYSIOLOGY OF ACTIVIN HORMONE, AN AUTOCRINE/PARACRINE MODULATOR OF TESTIS AND OVARIUM DEVELOPMENT AND INVESTIGATION OF ITS ROLE IN REPRODUCTION

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ÖZET

Aktivin, gonadlarda, hipofizde ve plasentada sentezlenen ve etkisi ön hipofizden folikül uyarıcı hormonun (FSH) sentezini ve salgılanmasını uyararak gösteren transforme edici büyüme faktör-beta (Transforming Growth Factor-beta, (TGF- β)) ailesi üyesidir gonadlarda üretilen ve testis fonksiyonunun otokrin ve/veya parakrin düzenleyicisi hormondur.

Aktivinler, aktivin A, aktivin B veya aktivin AB izoformlarını oluşturan iki β (beta) alt biriminin (en yaygın olarak β A ve β B) homodimerleridir. Aktivin, yumurtalık foliküllerinin gelişimi, olgunlaşması ile granüloza hücre steroidogenezis süreçlerini düzenlemektedir. Ayrıca, menstrüasyon, desidualizasyon ve gebeliğin devamı ile endometriyal onarımında önemli fizyolojik rolü bulunmaktadır. Erkeklerdeki fizyolojik rolü ise sertoli hücreleri ve leydig hücreleri gibi testis hücrelerinin fonksiyonlarını düzenleyerek testislerde sperm üretimi yani spermatogenezis sürecini desteklemektedir. Aktivin düzeylerindeki anormallikler, ovulasyon sorunları ve sperm kalitesinde azalma ile infertilite ve diğer üreme sorunlarına neden olabilmektedir.

Bu çalışma, testis ve ovaryum gelişiminin otokrin/parakrin modülatörü aktivin fizyolojisi ve üremedeki rolünün incelenmesi hedeflenmiştir. Aktivinler, üreme sistemi üzerindeki etkilerinin daha iyi anlaşılması, infertilite tedavilerinin geliştirilmesine katkı ve fayda sağlayacağı düşünülmektedir. Aktivinlerin üreme sistemi üzerindeki rolü hakkında yapılan araştırmalar devam etmesi ve önem arz etmesi nedeniyle, üreme sistemindeki fizyolojik rolünün aydınlatılması yönündeki araştırmalara katkı sağlayacağı düşünülmektedir.

Anahtar Kelimeler: Aktivin, Transforme Edici Büyüme Faktör-Beta, Testis, Ovaryum, Üreme

ABSTRACT

Aktivin is a member of the transforming growth factor-beta (TGF- β) family, which is synthesized in the gonads, pituitary gland and placenta and shows its effect by stimulating the synthesis and secretion of follicle-stimulating hormone (FSH) from the anterior pituitary gland. It is a hormone produced in the gonads and is an autocrine and/or paracrine regulator of

testicular function. Activins are homodimers of two β (beta) subunits (most commonly βA and βB) that form activin A, activin B, or activin AB isoforms. Activin regulates the development and maturation of ovarian follicles and granulosa cell steroidogenesis processes. In addition, it has an important physiological role in menstruation, decidualization, pregnancy maintenance, and endometrial repair. Its physiological role in men is to support sperm production, that is, spermatogenesis, in the testes by regulating the functions of testicular cells such as Sertoli cells and Leydig cells. Abnormalities in activin levels can cause ovulation problems and decreased sperm quality, as well as infertility and other reproductive problems. This study aimed to investigate the physiology of activin, an autocrine/paracrine modulator of testicular and ovarian development, and its role in reproduction. It is thought that a better understanding of the effects of activins on the reproductive system will contribute to the development of infertility treatments. Since the research on the role of activins on the reproductive system is ongoing and important, it is thought that it will contribute to the research on the elucidation of its physiological role in the reproductive system.

Keywords: Activin, Transforming Growth Factor-Beta, Testis, Ovarium, Reproduction

1. GİRİŞ

Hayvancılık, insanlık tarihi boyunca dünya genelinde önemli bir ekonomik faaliyettir ve besin ihtiyacının karşılanmasında büyük bir rol oynamaktadır. Üreme, sürdürülebilir ve karlı hayvancılığın devamlılığı ve gelişimi için kritik öneme sahiptir. Testis ve ovaryum gelişiminin otokrin/parakrin modülatörü etkisi olan aktivinler, büyüme ve farklılaşma faktörlerinin Transforming growth factor beta (Dönüştürücü Büyüme Faktörü Beta, TGF β) süper ailesi içinde yer alan dimerik proteindir. İki disülfür bağlı β alt biriminden oluşurlar. Sırasıyla βA , βB , βC ve βE olarak adlandırılan dört memeli aktivin β alt birimi tanımlanmıştır. İki βA alt biriminin homodimeri olan aktivin A, üreme biyolojisi, embriyonik gelişim, inflamasyon ve doku onarımında önemli düzenleyici işlevleri bulunmaktadır (Wijayarathna ve De Kretser, 2016; Winters ve ark., 2018). TGF- β sitokinleri hücre farklılaşmasını, apoptozu, hematopoezi, anjiyogenez, steroid sentezini, adezyonu, göçü ve hücre dışı matris üretimini aktive etmektedir (Massagué ve Wotton, 2000; Miyazono ve ark., 2001; Dennler ve ark., 2002). TGF- β ligandları, hücrel çoğalmanın güçlü inhibitörleri olarak etki eder ve sinyal yolunun bozulması, hücrel dönüşüm ve onkogenez ile ilişkilidir (Massagué ve ark., 2000; Pasche, 2001).

Aktivinler, 1980'lerin ortalarında hipofiz FSH salgılanması üzerindeki etkilerine dayanarak foliküler sıvıda tanımlanmıştır (Schwall ve ark., 1989). Aktivin, follistatin ve aktivin reseptörlerinin birçok dokuda yaygın olarak ifade edildiği ve üreme dahil olmak üzere çeşitli fizyolojik süreçlerin otokrin/parakrin düzenleyicileri olarak işlevin yanı sıra hem farklılaşmış hem de embriyonik kök hücrelerde çeşitli biyolojik ve tümör oluşumu dahil olmak üzere birçok hücrel süreçte fizyolojik rolleri bulunmaktadır (Woodruff, 1998; Payano ve ark., 2023).

Aktivin, eritropoez, karaciğer proliferasyonu, bağışıklık fonksiyonu, kemik oluşumu, cilt morfogenez ve kutanöz yara onarımı ve anjiyogenez üzerinde güçlü etkilere sahiptir. Merkezi sinir sisteminde, aktivinler oksitosin ve GnRH üretimini uyarıcı etkileri bulunmaktadır. Aktivinler bazı durumlarda, nöronal hayatta kalma faktörleri olarak davranır ve bazı nöronların terminal farklılaşmasını indükleyici rolü bulunmaktadır (Petraglia ve ark., 2004). Aktivinler ve inhibitörler gonadlarda ve plasentada hormon üretimini değiştirebilir ve yumurtalık ve testis gametogenezini düzenlemektedir (Mather ve ark., 1990).

2. TESTİS VE YUMURTALIK GELİŞİMİNİN DÜZENLEYİCİSİ AKTİVİN FİZYOLOJİSİ VE ÜREMEDEKİ ROLÜNÜN İNCELENMESİ

Aktivinler, hipofiz folikül uyarıcı hormon (FSH) salınımını uyaran proteinler olarak gonadal sıvılardan saflaştırılan sitokinlerin transforming growth factor-beta (TGF- β) süper ailesinin pleiotrofik ailesinin üyesi ve disülfür bağlı dimerik proteindir (Rodgarkia-Dara ve ark., 2006; Bilezikjian ve ark., 2006; Bilezikjian ve ark., 2012).

Aktivinler, inhibin β alt birimlerinin, β A, β B ve β C'nin disülfürle bağlı dimerleridir (Vale ve ark., 1986; Nakamura ve ark., 1992). β alt birimlerinin türüne göre, bir dizi aktivin tanımlanmıştır. Bunlardan en iyi çalışılmış olanlar aktivin A (β A β A) ve aktivin B'dir (β B β B). Çalışmalar ayrıca aktivin C (β C β C) (Hotten ve ark., 1995; Loveland ve ark., 1996), aktivin D (β D β D) (Oda ve ark., 1995) ve aktivin E'nin (β E β E) (Fang ve ark., 1996) varlığını da göstermiştir.

Toplam aktivin A ve follistatin, gebelik boyunca maternal dolaşımında da bulunur. Aktivin A düzeyleri, preeklampsi, fetal büyüme kısıtlaması ve gebelik hipertansiyonu gibi anormal gebeliklerde artar. Plasenta, vasküler endotel hücreleri ve aktive edilmiş periferik mononükleer hücreler (PBMC), preeklampsideki aktivin A düzeylerinin yükselmesine katkıda bulunabilirken, preeklamptik plasenta, PBMC'ler veya vasküler endotel hücrelerinde değişmemiş follistatin, bu hücrelerde biyolojik olarak aktif olabilecek 'serbest' aktivin A'nın mevcudiyetini düşündürmektedir.

Aktivinler, büyüme ve farklılaşma faktörlerinin TGF β süper ailesinin üyeleridir ve inhibinin iki β alt biriminin kovalent dimerizasyonu yoluyla oluşmaktadır.

Aktivinler, sitokinlerin transforme edici büyüme faktörü-beta (TGF- β) süper ailesinin pleiotrofik ailesine aittir ve başlangıçta FSH salınımını indüklemeye kapasiteleri için izole edilmişlerdir (Ling ve ark., 1987). Aktivinler, inhibin β alt birimlerinin, β A, β B ve β C'nin disülfürle bağlı dimerleridir (Nakamura ve ark., 1992). β alt birimlerinin türüne göre, bir dizi aktivin tanımlanmıştır. Bunlardan en iyi çalışılmış olanlar aktivin A (β A β A) ve aktivin B'dir (β B β B). Çalışmalar ayrıca aktivin C (β C β C) (Hotten ve ark., 1995; Loveland ve ark., 1996), aktivin D (β D β D) (Oda ve ark., 1995) ve aktivin E'nin (β E β E) (Fang ve ark., 1996) varlığını da göstermiştir.

Bu aktivin alt birimleri, 250-350 kalıntıdan oluşan bir NH₂-terminal prodomain ve bir COOH-terminal olgun domain [4] içeren öncü polipeptitler olarak üretilir. Bu öncül polipeptit, furin benzeri proteazlar tarafından biyolojik olarak aktif olgun alanı serbest bırakmak üzere parçalanır [6] (Şekil 1). İnsanlarda ve diğer memelilerde, aktivinin dört alt birimi tanımlanmıştır: β A, β B, β C ve β E [7]. Aktivin A (β A/ β A), aktivin B (β B/ β B), aktivin AB (β A/ β B), aktivin C (β C/ β C) ve aktivin E (β E/ β E) memelilerde izole edilmiştir ve aktivin A, B ve AB şu ana kadar en iyi tanımlanmış biyolojik aktiviteye sahiptir [2,3,8-10].



Şekil 1. Aktivin 3 boyutlu molekül yapısının görünümü (PDB, 2025).

Aktivinler ve TGF β süper ailesinin diğer üyeleri, biyolojik etkilerini, artık reseptör serin kinazlar olarak adlandırılan, içsel serin/treonin kinaz aktivitelerine sahip iki tip transmembran reseptörü (tip I ve tip II) ile etkileşime girerek şekillenmektedir (Mathews, 1994; Heldin ve Moustakas, 2016; Tzavlaki ve Moustakas, 2020; Abarca-Buis ve ark..2021).

Aktivin sinyallemedeki ilk adım, aktivinin bir tip II reseptörü olan ActRII veya ActRIIB'ye bağlanmasını ve ardından tip I reseptörleriyle ilişkilendirilmesi süreçlerini içermektedir (Mathews, 1994; Tsuchida ve ark., 2004; Lodberg, 2021). Tip II reseptörleri, her biri hücre dışı bir ligand bağlanma alanı, tek bir transmembran alanı ve tip II reseptörü tarafından juxtamembran bölgesinde fosforilasyon sonucu aktive edilen bir kinaz alanı içeren büyük bir sitoplazmik bölgeye sahip dimerik membran molekülleri olarak bulunmaktadır. Reseptör serin kinaz sinyalleri, Smads (Smad1, 2, 3, 5 ve 8) adı verilen sitoplazmik proteinler aracılığıyla iletilir; bunlar, bir tip I kinaz tarafından fosforilasyonu takiben, ortak Smad (Smad4) ile ilişki kurar ve çok sayıda genin transkripsiyonunu modüle ettikleri çekirdeğe geçmektedirler. Bunun yanı sıra spesifik Smads'ın fosforilasyonunu bloke eden iki inhibitör Smads (Smad6 ve Smad7) bulunmaktadır (Hill, 1999; Miyazawa ve ark., 2002). ActRII/aktivin/ALK kompleksi, Smad2 veya Smad3 aracılığıyla sinyal verir ve Smad7 tarafından inhibe edilebilmektedir. Aktivin sinyalizasyonu, tip II reseptörleri olarak ActRII veya ActRIIB'yi, tip I reseptörü olarak ALK4'ü ve Smad2 veya Smad3'ü kullanmaktadır (Tsuchida ve ark., 2008). TGF β 'lerin kendi tip II ve tip I (ALK5) reseptörlerine sahip olmaları, ancak aktivinlerle Smad2 ve Smad3 kullanılmaktadır. Aktivinler, tip II reseptörlerini birçok kemik morfogenetik proteinleri (Bone Morphogenic Proteins, BMP) ile paylaşmaktadır. Tüm BMP'ler ActRII'lere yüksek afiniteyle bağlanmakla birlikte ancak BMP'ye özgü tip I reseptörleri ve Smad'ler aracılığıyla sinyal vermektedir. Bu nedenle, her seviyede karışıklık olmasına rağmen, genel olarak aktivinler, TGF β 'ler ve BMP'ler için eşsiz bir sinyal yolağı içermektedir (Heldin ve Moustakas, 2016).

3. SONUÇ

Gonadal bir protein olan aktivin A, sadece hipofizi folikül uyarıcı hormon (FSH) salgılaması için uyarmakla kalmaz, aynı zamanda hücre çoğalması, farklılaşma, apoptoz, geç ve invazyon

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

gibi çeşitli hücre davranışlarını düzenlemede de önemli bir rol oynayan bir hormondur. Aktivin düzeyleri ile yapısındaki bozukluklar, başta infertilite olmak üzere üreme ile ilgili hastalık ve sağlık sorunları meydana gelmektedir. Bu nedenle, aktivinin fizyolojisinin aydınlatıldığı üreme sağlığı sorunlarının anlaşılması ve tedavi edilmesi süreçleri yönünden önemli bir konu olmakla birlikte aktivin proteini fizyolojisinin ayrıntılı olarak incelendiği daha fazla sayıda kapsamlı araştırmalara ihtiyaç duyulmaktadır.

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DEKORİN FİZYOLOJİSİ VE OBEZİTEKİ ROLÜNÜN İNCELENMESİ INVESTIGATION OF DECORINE PHYSIOLOGY AND ITS ROLE IN DIABETES AND OBESITY

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ÖZET

Dekörin, küçük lösin açısından zengin proteoglikan (Small leucine rich proteoglycans, SLRP) ailesi içerisinde yer alan metabolizmayı etkileyen çok işlevli proteoglikan ailesi içerisinde 90 - 140 kilodalton (kDa) moleküler ağırlığa sahip hücre dışı matris proteindir.

Kondroitin sülfat veya dermatan sülfat içeren bir glikozaminoglikan zincirine sahip lösin tekrarları içeren bir protein çekirdeğinden oluşmaktadır. Dekörin, rezistin için adiposit progenitörleri üzerindeki reseptör işlevi aracılığıyla metabolizma ile adipoz doku genişlemesini etkilemektedir. Tip VI, XII ve XIV kollajen, fibronektin ve elastin gibi yapısal proteinler ve EGF, TGFβ, TNFα ve miyostatin gibi büyüme faktörleri de dahil olmak üzere hücre dışı matriste bulunan moleküllerle etkileşime girmektedir. Bu etkileşim sayesinde hücre dışı matrisi stabilize etmenin yanı sıra bu büyüme faktörlerinin reseptörlerindeki metabolizmayı ve aktivitesinin düzenlenmesinde rolü bulunması nedeniyle adipoz doku işlevi ile obezite patofizyolojisinde önemli bir rol oynamaktadır. Obezitede dekörin ekspresyonu belirgin şekilde artmasıyla adipoz doku, glukoz homeostazındaki rolü nedeniyle diyabet hastalığı ile obezite patofizyolojisinde rolü bulunmaktadır. Dekörin, β-hücre sağkalımını desteklemesi ve insülin üretimindeki düzenleyici rolü nedeniyle diyabet tedavisinde terapötik etkiye sahip potansiyel bir moleküldür.

Bu kapsamda, dekörin fizyolojisi ve diyabet hastalığı ile obezitedeki rolünün incelenmesi hedeflenmiştir. Ayrıca, özellikle dekörin ile ilişkili hastalıklardaki fizyolojik rolünün aydınlatılması yönündeki araştırmalara katkı sağlayacağı düşünülmektedir.

Anahtar Kelimeler: Dekörin, Küçük Lösin Açısından Zengin Proteoglikan, Diyabet, Obezite

ABSTRACT

Decorin is an extracellular matrix protein with a molecular weight of 90-140 kilodaltons (kDa) belonging to the small leucine-rich proteoglycan (SLRP) family of multifunctional proteoglycans that affect metabolism.

It consists of a protein core containing leucine repeats with a glycosaminoglycan chain containing chondroitin sulfate or dermatan sulfate. Decorin affects adipose tissue expansion by

metabolism through its receptor function on adipocyte progenitors for resistin. It interacts with molecules found in the extracellular matrix, including structural proteins such as type VI, XII and XIV collagen, fibronectin and elastin, and growth factors such as EGF, TGF β , TNF α and myostatin. This interaction plays an important role in the function of adipose tissue and the pathophysiology of obesity due to its role in regulating the metabolism and activity of the receptors of these growth factors as well as stabilizing the extracellular matrix. With the significant increase in decorin expression in obesity, adipose tissue plays a role in the pathophysiology of diabetes and obesity due to its role in glucose homeostasis. Decorin is a potential molecule with a therapeutic effect in the treatment of diabetes due to its support for β -cell survival and its regulatory role in insulin production.

In this context, it is aimed to examine the physiology of decorin and its role in diabetes and obesity. In addition, it is thought that it will contribute to the studies on the elucidation of its physiological role in diseases related to decorin.

Keywords: Decorin, Small Leucine-Rich Proteoglycan, Diabetes, Obesity

1.GİRİŞ

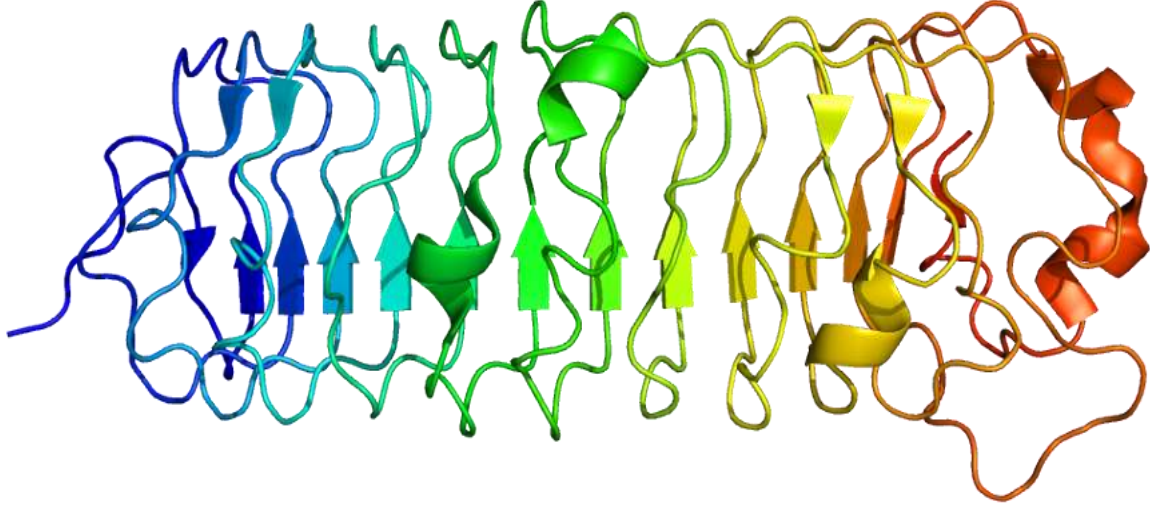
Küçük lösün açısından zengin proteoglikan gen ailesinin arketipal bir üyesi olan dekorin, kolajenler ve büyüme faktörleri gibi matris yapısal bileşenlerini, özellikle de dönüştürücü büyüme faktörü- β ligand süper ailesine ait olanları kapsayan geniş bir bağlanma repertuarına sahiptir. Küçük lösün açısından zengin proteoglikanlar (SLRP), kolajenler, büyüme faktörleri ve hücre yüzey reseptörleri gibi diğer proteinlerle etkileşime girmektedir (Chen ve Birk, 2013). Temel yapı olarak lösün açısından zengin tekrarların dışında N terminalinde kovalent olarak bağlı bir glikozaminoglikan zinciri veya yüklü amino asit bulunan bir çekirdek proteinden oluşmaktadır. Heparin sülfat, kondroitin sülfat, keratin sülfat ve hiyaluronik asit dört tip glikozaminoglikan zinciri bulunmaktadır (Ruoslahti, 1988). Beş sınıf (I-V) SLRP vardır. Sınıflar, kromozomlardaki gen konumuna, hem DNA hem de protein düzeylerinde korunma ve homolojiye ve tanımlanmış aralıklı karakteristik N-terminal sistein açısından zengin kümelerin varlığına dayanmaktadır (Schaefer ve Iozzo, 2008). Sınıf I-III kanoniktir ve sınıf IV-V kanonik olmayan gruplamalardır (Schaefer ve Iozzo, 2008). Sınıf I-III'ün ayırt edici bir özelliği, uzunluğu değişen ancak her zaman lösün açısından zengin tekrar bölgesinde bulunan bir tekrar bölgesidir (Scott ve ark., 2004; Schaefer ve Iozzo, 2008; Chen ve Birk, 2013). Her SLRP, SLRP'ye bağlı ligandlarla ilgili farklı tipte bağlanma yeteneklerine sahiptir (Chen ve Birk, 2013). Küçük lösün açısından zengin proteoglikanlar, inflamasyon, diyabet, fibroz ve metabolik yollarda rol oynamaktadır. Ekzon organizasyonuna ve oldukça korunmuş intron/ekon bağlantılarına sahip diğer sınıf I SLRP'ler arasında biglikan, asporin, hücre dışı matris proteini 2 ve hücre dışı matris proteini (Schaefer ve Iozzo, 2008; Iozzo ve Schaefer, 2015).

Obezite, yüksek kalorili beslenme, aşırı kalori tüketimi ve azaltılmış fiziksel aktivite neticesinde giderek prevalansı artış gösteren ve vücut kitle indeksinin (VKİ) ≥ 30 kg/m² olmasıyla birlikte bir halk sağlığı sorunudur (Ogden, 2017).

Küçük lösün açısından zengin proteoglikan dekorin (Dcn), birçok dokuda ECM'nin bir bileşenidir. Yağ dokusunda yüksek oranda ifade edilir ve deri altı yağ dokusu depolarına kıyasla viseral depolarında daha yüksek oranda bulunmaktadır (Su ve ark., 2004; Bolton ve ark., 2008). Obezite ve glikoz intoleransı olan kemirgenler ve insanlar üzerinde yapılan önceki çalışmalar, tüm yağ dokusunda dekorin mRNA ifadesinin ve plazmada salgılanan dekorin proteininin arttığı bildirilmektedir (Zhang ve ark., 2007).

2. DEKORİN FİZYYOLOJİSİ VE OBEZİTEKİ ROLÜNÜN İNCELENMESİ

Dekorin, küçük lösin açısından zengin proteoglikan (Small leucine rich proteoglycans, SLRP) ailesi içerisinde yer alan metabolizmayı etkileyen çok işlevli proteoglikan ailesi içerisinde 90 - 140 kilodalton (kDa) moleküler ağırlığa sahip hücre dışı matris proteinidir (Şekil 1), (Tucker, 2017). Dekorin, küçük lösin zengini proteoglikanların ailesi: matriks montajının ve hücrel büyümenin ana düzenleyicisidir (Iozzo, 1997).



Şekil 1. Dekorin 3 boyutlu molekül yapısının görünümü (PDB, 2025).

Dekorin, %80'ine kadarını oluşturan çekirdek proteini, 24 amino asit kalıntısı alanının 12 tekrarından oluşmaktadır. dekorin NH2 terminalinde tek bir glikozaminoglikan zinciri taşır. Dekorin, çeşitli büyüme faktörleri ve plazma membranında bulunan reseptörlerle etkileşime girebilmektedir. İnsülin benzeri büyüme faktörü-1'e bağlandığı ve tümör nekroz faktörü- α ile etkileşime girmekle birlikte epidermal büyüme faktörü reseptörünün hızlı fosforilasyonuna ve mitogenle aktive olan protein kinaz sinyal yolunun aktivasyonuna neden olmaktadır (Tufvesson ve ark., 2002; Moscatello ve ark., 1998; Schönher ve ark., 2005).

Dekorinin, çekirdek proteinin yanı sıra glikozaminoglikan zinciri tarafından da aracılık edilebilen çeşitli farklı işlevlere sahiptir. Dekorin, obezite ve tip 2 diyabetle ilişkili salgılanan bir proteindir (Bolton ve ark., 2008).

Dönüştürücü büyüme faktörü- β (TGF- β), serin/treonin kinaz aktivitesine sahip hücre yüzeyi transmembran reseptörleri ve Smad proteinleri de dahil olmak üzere sitoplazmik efektörler aracılığıyla çekirdeğe sinyal gönderen çok işlevli bir sitokindir. TGF- β reseptörlerine bağlanmada, Smad protein fosforilasyonunda veya Smad-4 nükleer translokasyonunda değişiklik olmadan gerçekleşmesi iki yeni modülatörünü, lipoprotein reseptör ilişkili protein (LRP-1) ve dekorin sayesinde gerçekleşmektedir (Cabello-Verrugio ve Brandan, 2007).

Dekorin, İnsülin benzeri büyüme faktörü 1 reseptörü (IGF1R) yoluyla sinyal göndererek veya Dönüştürücü Büyüme Faktörü Beta 1 (TGFB1)'i Dönüştürücü büyüme faktörü beta reseptörü I (TGFB1R)'den ayırarak ve aşağı akış etkilerini önleyerek hücre çoğalmasını artırmaktadır. Dekorin, TGFB1'in TGFB1R'ye bağlanıp onu aktive ederek p15 düzeyinin artmasına yol açan dekorin bağımsız bir yolla hücre çoğalmasını azaltabilmektedir. Dekorin, hücre döngüsü durmasını indükleyecek ve Beta (β)-katenini azaltacak olan glomerular filtrasyon hızı (HGFR)'nin internalizasyonunu indükleyerek dekorin, Glomerüler filtrasyon oranı (EGFR)

yoluyla sinyal göndererek hücre çoğalmasını azaltabilmektedir. Dekorinin hücre çoğalması üzerindeki düzenleyici etkileri, bilinen hücresel yollar aracılığıyla aracılık edilmektedir (Cabello-Verrugio ve Brandan, 2007).

3.SONUÇ

Dekorin, hücre dışı matriste önemli bir yapısal proteindir. Obezitede, dekorin seviyelerindeki değişiklikler, adipoz doku yapısı, inflamasyon ve fibrozis gibi süreçleri etkilemesi nedeniyle obezite gibi karmaşık bir hastalıkta birçok fizyolojik süreçte önemli rol oynayan bir proteindir. Dekorinin obezitedeki tam rolü henüz tam olarak anlaşılmamış olsa da, bu proteinin obezite bir çok hastalığıdaki rolü ve terapötik etki potansiyeline sahip dekorin fizyolojisinin ayrıntılı olarak incelendiği daha fazla sayıda kapsamlı araştırmalara ihtiyaç duyulmaktadır.

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INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

GALANİN HORMONU FİZYOLOJİSİ VE KOGNİTİF PERFORMANSTAKİ ROLÜNÜN İNCELENMESİ

INVESTIGATION OF THE PHYSIOLOGY OF GALANIN HORMONE AND ITS ROLE IN COGNITIVE PERFORMANCE

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ÖZET

Galanin, GAL geni tarafından kodlanan prepro galanin olarak bilinen 123 amino asitlik bir proteinin bölünmesiyle üretilen 29 amino asitlik bir zincirden oluşan 12 kDa moleküler ağırlığa sahip bir nöropeptittir.

Galanin, ağırlıklı olarak merkezi sinir sistemi ve gastrointestinal sistemde bulunur. Merkezi sinir sistemi içinde en yüksek konsantrasyonlar hipotalamusta, daha düşük seviyeler ise korteks ve beyin sapında bulunmaktadır. Nöropeptidler nöronlar arası iletişimi hücre yüzeyindeki reseptörler sayesinde gerçekleştirir. Bir nöropeptid olan Galanin etkilerini ise farklı işlevsel bağlantıya sahip üç G proteinine bağlı GALR1, GALR2 ve GALR3 olmak üzere üç reseptör aracılığıyla gerçekleştirmektedir. Galanin, nöronlardaki aksiyon potansiyellerinin düzenlenmesi ile inhibisyonunda önemli rolü bulunmaktadır. Galanin, öğrenme, hafıza ve kognitif performans olmak üzere stres yanıtı, nosisepsiyon, uyanma ve uyku düzenlemesi, ruh halinin düzenlenmesi, iştah ile kan basıncının düzenlenmesi gibi birçok önemli fizyolojik süreçte rol oynamakla birlikte trofik bir faktör olarak hareket etmektedir. Galanin, bilişsel performansa katılır ve öğrenme ve bilişi zayıflatmaktadır. Galanin, locus coeruleus nöronlarının ateşleme oranını inhibe etmektedir. Galanin aşırı ekspresyonu, kolinerjik nöronların kaybı, amiloid plakların birikmesi ile birlikte Alzheimer hastalığında olduğu gibi hafıza eksikliklerine neden olmaktadır. Ayrıca, epilepsi ve depresyon, yeme bozuklukları, kanser ve bağımlılık dahil olmak üzere bir çok hastalıkla ilişkisi bulunmaktadır. Bu kapsamda bir nöropeptid olan galanin fizyolojisi ve kognitif performanstaki rolünün incelenmesi hedeflenmiştir. Ayrıca, bu alanda gerçekleştirilecek araştırmalar ve araştırmacılar için katkı sağlayacağı düşünülmektedir.

Anahtar Kelimeler: Galanin, Locus coeruleus, Kognitif Performans, Nöropeptid, Nöron, Beyin

ABSTRACT

Galanin is a neuropeptide with a molecular weight of 12 kDa consisting of a 29 amino acid chain produced by the cleavage of a 123 amino acid protein known as prepro galanin, encoded by the GAL gene.

Galanin is found predominantly in the central nervous system and gastrointestinal system. The highest concentrations in the central nervous system are in the hypothalamus, while lower levels are found in the cortex and brainstem. Neuropeptides communicate between neurons through receptors on the cell surface. Galanin, a neuropeptide, exerts its effects through three G protein-dependent receptors with different functional connections: GALR1, GALR2, and GALR3. Galanin has an important role in the regulation and inhibition of action potentials in neurons. Galanin plays a role in many important physiological processes such as learning, memory, and cognitive performance, as well as stress response, nociception, arousal and sleep regulation, mood regulation, appetite, and blood pressure regulation, and also acts as a trophic factor. Galanin participates in cognitive performance and impairs learning and cognition. Galanin inhibits the firing rate of locus coeruleus neurons. Overexpression of galanin causes memory deficits such as in Alzheimer's disease, along with loss of cholinergic neurons and accumulation of amyloid plaques. It is also associated with many diseases including epilepsy and depression, eating disorders, cancer and addiction.

In this context, it is aimed to examine the physiology of galanin, a neuropeptide, and its role in cognitive performance. It is also thought to contribute to research and researchers in this field.

Keywords: Galanin, Locus coeruleus, Cognitive Performance, Neuropeptide, Neuron, Brain

1.GİRİŞ

Galaninerjik sistem (GAL ve GAL reseptörleri (GALR'ler)), hipofiz bezi, paravertebral sempatik ganglionlar, miyenterik pleksus, glial hücreler, dorsal kök ganglionu, omurilik, beyin sapı, talamus, hipotalamus, hipokampus, amigdala), gastrointestinal sistemi, testis, yumurtalık, rahim, böbrek ve kalp ve bağışıklık, endokrin, periferik ve merkezi sinir sistemleri (örneğin, endokrin pankreas, tarafından yaygın olarak bulunmaktadır (Bennet ve ark., 1991; Gustafson ve ark., 1996; Smith ve ark.,1997; Waters ve Krause, 1999). Galanin'in plazmadaki yarı ömrü yaklaşık beş dakikadır ve GAL enkefalin, vazopressin, kalsitonin gen ilişkili peptid, madde P, nöropeptid Y, kolesistokinin, büyüme hormonu, luteinize edici hormon salgılatıcı hormon, dopamin, glutamat, noradrenalin, serotonin, asetilkolin gibi birçok başka nöroaktif maddeyle birlikte bulunmaktadır (Melander ve ark., 1986; Zhang ve ark., 1993; Zhang ve ark., 1995; Perumal ve Vrontakis, 2003;Landry ve ark., 2003).

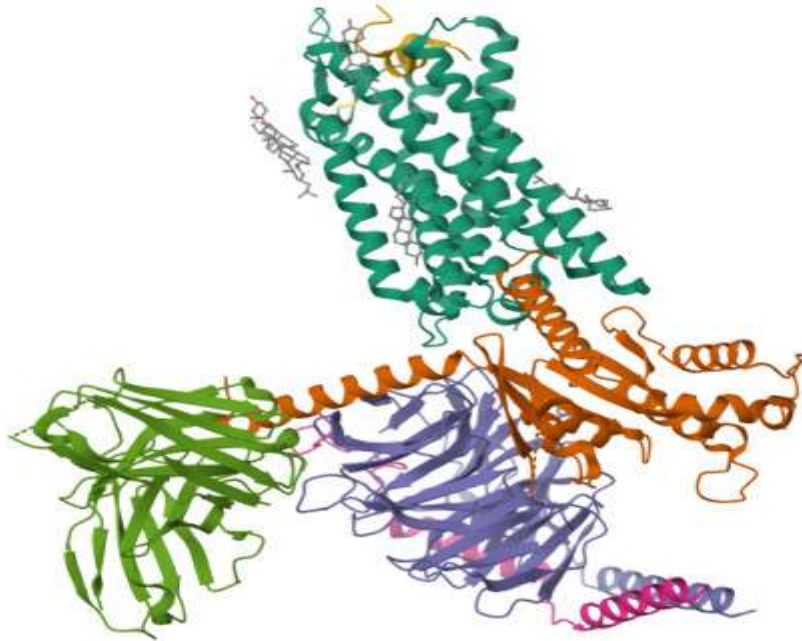
Galaninerjik sistemin tüm vücutta yaygın bir şekilde dağılması nedeniyle, Galanin spesifik G proteinine bağlı reseptörlere bağlandıktan sonra bellek, biliş, öğrenme, düz kas kasılması, asetilkolin salınımının inhibisyonu, enerji metabolizması, yiyecek ve su alımı, hiperglisemi, ozmotik ve metabolik homeostaz, spinal refleksler, nosisepsiyon, üreme, uyarılma, uyku, sinirsel büyüme, glikoz kaynaklı insülin salınımının inhibisyonu ve solunum, kardiyovasküler, nöroendokrin ve gastrointestinal mekanizmalar gibi birçok fizyolojik süreçte yer almaktadır (McKnight ve ark., 1992; Elliott-Hunt ve ark.,2004; Hökfelt ve Tatamoto, 2008; Hobson ve ark., 2010). Galanin, büyüme hormonu, prolaktin, dopamin, pankreas peptidi, luteinize edici hormon, luteinize edici hormon salgılatıcı hormon, somatostatin ve insülin seviyelerini düzenlemektedir. Ayrıca BDNF, deksametazon, progesteron, tiroid hormonu, NGF, lösemi inhibitör faktörü, vazoaktif intestinal peptid ve gonadotropin salgılatıcı faktör tarafından hücre tipi-spesifik bir şekilde düzenlenmektedir (Lang ve ark., 2015).

Kognitif fonksiyon (Bilişsel işlev), bilgi edinme, bilginin işlenmesi ve akıl yürütmeye ilgili zihinsel süreçlerdir. Bilişsel işlevler, algı, bellek, öğrenme, dikkat, karar verme ve dil yetenekleri alanlarını içermektedir (Kiely,2014).Nöropeptidler, bilişsel' yolların düzenleyicileri olarak tanınmaktadır, ancak aynı zamanda anksiyete ve depresyonda sürekli rol oynamaktadır

(Heilig ve ark., 1994, Holmes ve ark., 2002).Galanin, öğrenme ve hafıza gibi bilişsel işlevlerde de rol oynamaktadır (Diez ve ark.,2003).

2. NÖROPEPTİD GALANİN FİZYOLOJİSİ VE KOGNİTİF PERFORMANSTAKİ ROLÜNÜN İNCELENMESİ

Galanin, GAL geni tarafından kodlanan prepro galanin olarak bilinen 123 amino asitlik bir proteinin bölünmesiyle üretilen 29 amino asitlik bir zincirden oluşan 12 kDa moleküler ağırlığa sahip merkezi ve periferik sinir sistemlerinde ve endokrin sistemde yaygın bulunan bir nöropeptittir. Galanin, olarak dağılmış biyolojik olarak aktif bir nöropeptittir (Vrontakis, 2002;Zhu ve ark., 2022).Galaninerjik sistem (peptid galanin ve reseptörleri: galanin 1, 2 ve 3) tümör oluşumunda, birçok kanser türünde tümör evresi/alt tipleri, metastazda, tümör hücrelerinin istila ve göçünde ve anjiyogeneizde rol oynamaktadır (Sánchez ve Coveñas, 2022). Galanin reseptör ailesi şu anda hepsi G-protein-bağlantılı reseptörler olan GalR1, GalR2 ve GalR3 olmak üzere 3 üyeden oluşmaktadır (Gopalakrishnan ve ark., 2021).



Şekil 1. Galanin 3 boyutlu molekül yapısının görünümü (PDB, 2025).

Galanin, 29 amino asitli, C-terminal amidlenmiş bir peptittir. N-terminal 1-15 amino asit oldukça korunmuştur, ancak insan galanini, N-terminalinde amidleşme olmadan 30 amino aside sahip olmasıyla benzersiz özelliğe sahiptir (Evans ve Shine, 1991).Galanin öncüsünün 104 amino asit (aa) kalıntısı uzunluğunda olduğunu ve C-terminusta olgun bir galanin peptidi (aa 33-62) ve galanin mesaj ilişkili peptid (GMAP; aa 63-104) içermektedir (Şekil1), (Sánchez ve Coveñas, 2022).

Hipotalamus, hipofiz ve omurilik dahil olmak üzere merkezi sinir sisteminde ve nöronlar içindeki diğer nöronal peptitlerle birlikte yer almaktadır. Galanin bir nörohormon ve bir nörotransmitterdir ve nöroendokrin eksen için yiyecek alımını, insülin seviyesini ve somatostatin salınımını düzenleme gibi çok yönlü fizyolojik roller oynamaktadır.Ayrıca, öğrenme ve hafızayı, nosisepsiyon, ruh hali, beslenme davranışını ve ilişkili patolojileri

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

düzenlemektedir (Mazarati ve ark., 1992; Hokfelt ve ark., 1998). Galanin, öğrenme ve hafıza, epileptik aktivite, nosisepsiyon, spinal refleksler ve beslenme gibi diğer nöronal işlevlerde yer almaktadır. Galanin, büyüme hormonu, prolaktin ve luteinize edici hormon seviyelerini artırdığı, glikoz kaynaklı insülin salınımını engellediği ve gastrointestinal motiliteyi etkilemektedir (Vrontakis, 2002). Galanin ekspresyonu östrojen uygulaması, nöronal aktivasyon, sinirsizleştirme ve/veya sinir hasarının yanı sıra gelişim sırasında da yükselmektedir. Galanin, sinir sistemi ve nöroendokrin eksen içinde hücreler arası iletişim için önemli bir habercisidir (Kuteeva, 2007). Galanin benzeri peptit (GALP), galanine benzer bir yapıya sahiptir ve metabolizmayı ve üremeyi, yiyecek alımını ve vücut ağırlığını düzenlemek için hipotalamik bir nöropeptit gibi davranmaktadır.

Galanin'in hipokampus içi uygulanması, bilişselliğin hipokampüsteki işlenmesindeki rolü hakkında bilgi sunmaktadır. Ventral hipokampüse infüze edilen galanin, yüzme yeteneğini etkilemeden su labirenti görevinde mekansal öğrenmeyi ve hafızayı bozduğu bildirilmiştir (Ögren ve ark., 1996, Schött ve ark., 1998b, Schött ve ark., 1998a).

Mekansal öğrenme üzerindeki bozucu etki, hipokampüsteki infüze edilen peptidin zamansal kinetiği ile korelasyon gösterdiği bildirilmektedir (Schött ve ark., 1998a). Ayrıca, galanin'in kronik bir mikrodializ kanülü yoluyla infüzyonu, dozlarda ventral hipokampüsteki bazal asetilkolini doza bağlı bir şekilde azaltması neticesinde mekansal öğrenmeyi bozduğu bildirilmiştir (Ögren ve ark., 1996).

3.SONUÇ

Galanin, öğrenme ve hafıza, epileptik aktivite, nosisepsiyon, spinal refleksler ve beslenme gibi diğer nöronal işlevlerde yer almaktadır. Ayrıca Galanin, nosisepsiyon, Alzheimer hastalığı, yeme bozuklukları, alkolizm, diyabet ve omurilik rahatsızlıkları gibi çeşitli nöroendokrin rahatsızlıklarındaki rolü ve terapötik etkisi nedeniyle fizyolojik mekanizmaların aydınlatılması yönünde daha fazla sayıda ve kapsamlı araştırmalara ihtiyaç duyulmaktadır.

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ÜREME FONKSİYONUNUN MODULATÖRÜ NÖROKİNİN B FİZYOLOJİSİ PHYSIOLOGY OF NEUROKIN B MODULATOR OF REPRODUCTIVE FUNCTION

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ÖZET

Nörokinin B, hipotalamustan pulsatil gonadotropin salgılatıcı hormon (GnRH) salgılanması ile pubertanın nöroendokrin kontrolünde yer alan hipotalamik arkuat çekirdeğin nöronlarında ekspres edilen takininin ailesinin bir üyesi bir proteindir.

Takininler, esas olarak merkezi ve periferik sinir sistemlerinde sentezlenen yapısal olarak ilişkili bir grup peptittir. Madde P, nörokinin A, nörokinin B ve hemokinin-1, Phe-Xaa-Gly-Leu-Met-NH₂ yapısı ile karakterize edilen ortak bir C-terminal bölgesini paylaşmaktadır. Nörokinin B etkisini Nörokinin 3 reseptörü aracılığıyla göstermektedir. Nörokinin B, başta gonadlar olmak üzere adipoz doku, kalp, retina, karaciğer,bağırsak gibi çok sayıda organda bulunmaktadır. Nörokinin B, arkuat çekirdekte kisspeptin ile birlikte ifade edilir ve kisspeptinin atımlı salgılanmasını senkronize etmektedir. Özellikle hipotalamus-hipofiz-gonad ekseninde gonadotropin salgılatıcı hormon (GnRH) veya LH salınımı gibi üreme işlevlerinden sorumlu olması nedeniyle üreme fonksiyonunun süreçlerinde modülatör görevi yapmaktadır.

Nörokinin B, gonadal dokularda da karakterize edilmekle birlikte halen gonadlardaki rolü yeterince anlaşılmamıştır.Bu kapsamda, üreme fonksiyonu modülatörü Nörokinin B fizyolojisinin incelenmesi hedeflenilmiştir. Ayrıca, üreme sistemindeki fizyolojik rolünün aydınlatılması yönündeki araştırmalara katkı sağlayacağı düşünülmektedir.

Anahtar Kelimeler: Nörokinin B, Takinin, GnRH, Hipotalamus-Hipofiz-Gonad Aksı, Üreme

ABSTRACT

Neurokinin B is a protein that is a member of the tachykinin family and is expressed in neurons of the hypothalamic arcuate nucleus, which is involved in the neuroendocrine control of puberty by pulsatile gonadotropin-releasing hormone (GnRH) secretion from the hypothalamus.

Tachykinins are a group of structurally related peptides that are mainly synthesized in the central and peripheral nervous systems. Substance P, neurokinin A, neurokinin B, and hemokin-1 share a common C-terminal region characterized by the Phe-Xaa-Gly-Leu-Met-NH₂ structure. Neurokinin B exerts its effect through the Neurokinin 3 receptor. Neurokinin B is found in many organs, especially the gonads, adipose tissue, heart, retina, liver, and intestine. Neurokinin B is expressed together with kisspeptin in the arcuate nucleus and synchronizes the

pulsatile secretion of kisspeptin. It acts as a modulator in the processes of reproductive function, especially because it is responsible for reproductive functions such as gonadotropin-releasing hormone (GnRH) or LH secretion in the hypothalamus-pituitary-gonadal axis.

Although Neurokinin B has also been characterized in gonadal tissues, its role in the gonads is still not sufficiently understood. In this context, it is aimed to examine the physiology of the reproductive function modulator Neurokinin B. In addition, it is thought to contribute to the studies on the elucidation of its physiological role in the reproductive system.

Keywords: Neurokinin B, Takikinin, GnRH, Hypothalamus-Pituitary-Gonadal Axis, Reproduction

1.GİRİŞ

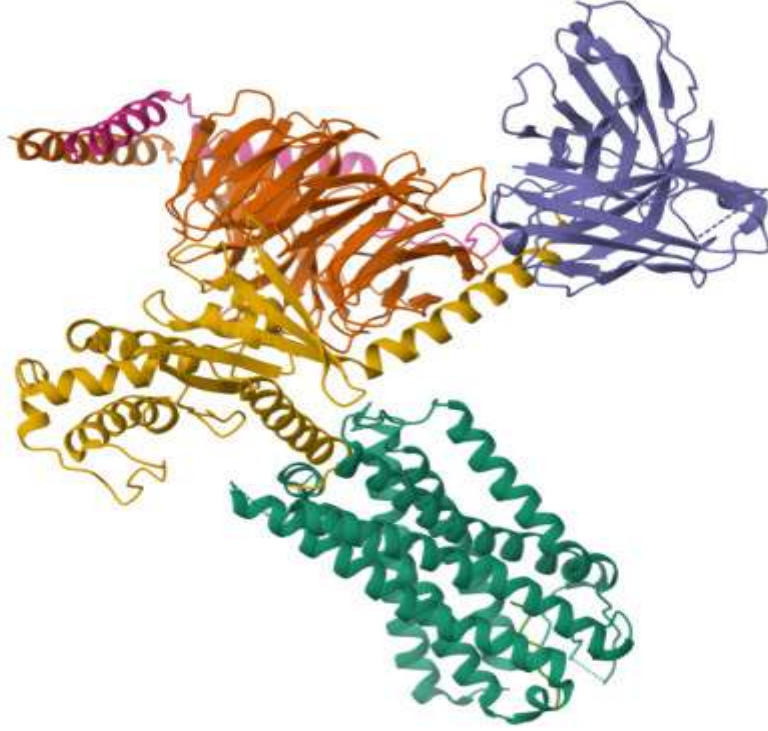
Nörokinin B, hipotalamik gonadotropin salgılatıcı hormon (GnRH) nöronal aktivitesini ve GnRH salgılanmasını düzenleyerek üreme endokrin eksenini yöneten nöropeptitlerdir (Prashar ve ark., 2023). GnRH, hipotalamus-hipofiz-gonadal eksene iletmektedir. GnRH'nin ara sıra salınması, normal üreme fonksiyonu için gerekli olan Luteinleştirici hormon (LH) salınımını düzenlemektedir (Karsch, 1987). GnRH sisteminin aktivitesi, nöronal etkileşimler (kisspeptin, KNDy, nitrik oksit sentaz (nNOS), gonadotropin inhibitör hormonu (GnIH), vazoaktif intestinal peptid (VIP), arginin vazopressin (AVP), hücrel etkileşimler (astroitler, tanisitler ve vasküler endotel hücreleri), protein-ligand etkileşimleri (leptin, grelin, adiponektin), nörotransmitterler (nitrik oksit, γ -aminobütirik asit (GABA), uyarıcı amino asit), gonadal steroidler ve peptit olmayanlar (dopamin, serotonin, epinefrin, norepinefrin, histamin) dahil olmak üzere çeşitli faktörler tarafından düzenlenmektedir (Spergel, 2019). GnRH'nin bifazik salınımı, yani tonik ve dalgalanma, pozitif ve negatif geri bildirim mekanizmaları aracılığıyla gonadal steroidlerin kontrolü altında gerçekleşmektedir (d'Anglemont de Tassigny ve ark., 2007).

Nörokinin B, nörokinin 3 (NK3) reseptörü üreme ekseninin temel unsuru olmakla birlikte kisspeptin, dinorfin, NK3 reseptörü ve östrojen reseptörü α 'yı birlikte eksprese eden hipotalamik infundibular (arkuat) çekirdekdeki nöronlar tarafından gerçekleştirilmektedir. Arkuat Nörokinin B nöronları ağının, nabız atan GnRH salgılanmasını düzenlemek için gonadlardan gelen geri bildirim bilgilerini iletmektedir. Nörokinin B, hipotalamik termoregülasyon merkezini uyarmada çeşitli üreme bozukluklarının tedavisinde potansiyel olarak kullanımına sahiptir (Patel ve ark., 2024).

Kisspeptin, nörokinin B ve dinorfin (KNDy hücreleri) birlikte ifade eden hipotalamik arkuat çekirdekdeki (ARC) nöronlar, GnRH salgılanmasının temel düzenleyicileri olarak memeli üremesi için gereklidir (Moore ve ark., 2019).

2. ÜREME FONKSİYONUNUN MODULATÖRÜ NÖROKİNİN B FİZYOLOJİSİ

Nörokinin B, GnRH salgılanmasında rolü bulunan üreme fonksiyonunun önemli bir düzenleyicisi ve takikinin ailesinin üyesi bir proteindir. Takikininler, ortak bir C-terminal amino asit dizisi (Phe-X-Gly-Leu-Met-NH₂) ile karakterize edilmektedir (Şekil 1), (Skorupskaite ve ark.,2018). Nörokinin B, preprotakikinin-B geninden sentezlenen tek takikininidir (Helke ve ark., 1990; Page ve ark., 2001; Almeida ve ark., 2004).



Şekil 1. Nörokinin B boyutlu molekül yapısının görünümü (PDB, 2025).

TAC3 öncül mRNA'sı yedi ekzon, beşi preprotakikinin B peptidini oluşturmak üzere çevrilmiştir. Bu prepropeptit, pronörokinin B'yi ve ardından Nörokinin B'yi oluşturmak için enzimatik bölünmeye uğramaktadır. Son aktif peptidin birincil amino asit dizisi ekzon 5 tarafından kodlanmaktadır (Kotani ve ark., 1986; Bonner ve ark., 1987;Page ve ark., 2000). Nörokinin B ,TACR3 geni tarafından kodlanan Nörokinin B reseptörüne öncelikli olarak bağlanmaktadır. Üç reseptör (NK1R, NK2R ve NK3R), G-protein-bağlantılı reseptörlerin rodopsin benzeri ailesine aittir ve önemli yapısal homolojiyi paylaşmaktadır (Takahashi ve ark., 1992; Almeida ve ark., 2004). Nörokinin B, NK1R, NK2R ve NK3R için güçlü öncelikli bağlanma gerçekleştirmektedir, her biri yeterince yüksek konsantrasyonlarda reseptörlerde bir agonist olarak etki edebilmektedir (Regoli ve ark., 1994; Linden ve ark., 2000, Pennefather ve ark., 2004). TAC3 mRNA ekspresyonunun beyinde ağırlıklı olarak serebral korteks, hipokampus, amigdaloid kompleksler, stria terminalis, ventral, pallidum, habenula, olfaktör soğan, dorsomedial çekirdek, ventromedial çekirdek, lateral hipotalamik alan, kaudat-putamen, medial preoptik alan, ARC ve lateral mamiller cisimlerde bulunmaktadır (Navarro ve ark., 2011). TAC3 öncül mRNA varyantları tanımlanmış olmakla birlikte Nörokinin B peptidi omurgalılar arasında yaygın olarak korunmuştur (Page ve ark., 2009).

3.SONUÇ

Nörokinin B, üreme sistemi üzerinde çok yönlü etkileri olan önemli bir neuropeptid olmasının yanı sıra üreme fonksiyonlarının düzenlenmesinde önemli bir fizyolojik rolü bulunmaktadır. Ayrıca, Nörokinin B ve reseptörleri antagonistlerinin endometriozis gibi üreme sağlığı ile ilgili hastalıklarda terapötik etkisi nedeniyle araştırmaların nedeniyle fizyolojik mekanizmaların aydınlatılması yönünde daha fazla sayıda ve kapsamlı araştırmalara ihtiyaç duyulmaktadır.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

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INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

PLASENTAL DİSFONKSİYON VE FETAL BÜYÜME BİYOBELİRTECİ PLASENTAL BÜYÜME FAKTÖRÜ GEBELİKTEKİ ROLÜNÜN İNCELENMESİ PLACENTAL DYSFUNCTION AND FETAL GROWTH BIOMARKER PLACENTAL GROWTH FACTOR INVESTIGATION OF ITS PHYSIOLOGICAL ROLE IN PREGNANCY

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ÖZET

Plasental Büyüme Faktörü (Placental growth factor (PLGF), plasenta tarafından üretilen ve fetal büyüme ile ilişkili moleküler ağırlığı, farklı izoformlarına göre değişiklik göstermekle birlikte yaklaşık olarak 10-20 kDa moleküler ağırlığa sahip, anjiyogenez ve vaskülogenez süreçlerinde önemli bir fizyolojik rolü bulunan vasküler endotel büyüme faktörü (VEGF) ailesine ait bir proteindir.

Gebelik sırasında PLGF'nin ana kaynağı plasental trofoblast olmakla birlikte villöz trofoblast da dahil olmak üzere birçok başka dokuda da eksprese edilmektedir. PLGF, anjiyogenez ve damar geçirgenliğini artırarak plasentanın kan akışını düzenler ve böylece fetusa oksijen ve besin maddelerini iletilmesini sağlamaktadır. Plasental disfonksiyon yada uteroplazental vasküler yetersizlik, plasentanın normal görevlerini yerine getirememesi nedeniyle yeterli oksijen ve besin sağlayamaması durumudur. Özellikle yüksek riskli gebeliklerde, düşük PLGF seviyeleri, erken doğum veya fetal büyüme kısıtlanması riskini artırabilmektedir. PLGF, hayvancılık sektöründe özellikle doğum ağırlığı, süt verimi ve üreme sağlığı gibi ekonomik öneme sahip özelliklerle yakından ilişkilidir. PLGF düzeylerinin belirlenerek değerlendirilmesi, hayvancılıkta daha verimli ve sağlıklı üretim için katkı ve fayda sağlayabilecek bir parametredir. Ayrıca, özellikle PLGF ile ilişkili hastalıklardaki fizyolojik rolünün aydınlatılması yönündeki araştırmalara katkı sağlayacağı düşünülmektedir.

Anahtar Kelimeler: Plasental Büyüme Faktörü, Fetal Büyüme, Vasküler Endotel Büyüme Faktörü, Gebelik

ABSTRACT

Placental growth factor (PLGF) is a protein belonging to the vascular endothelial growth factor (VEGF) family, which is produced by the placenta and associated with fetal growth, with a molecular weight of approximately 10-20 kDa, although its molecular weight varies according to its different isoforms, and has an important physiological role in angiogenesis and vasculogenesis processes.

The main source of PLGF during pregnancy is the placental trophoblast, but it is also expressed in many other tissues, including the villous trophoblast. PLGF regulates placental blood flow by increasing angiogenesis and vascular permeability, thus ensuring the delivery of oxygen and nutrients to the fetus. Placental dysfunction or uteroplacental vascular insufficiency is the condition in which the placenta cannot provide adequate oxygen and nutrients due to its inability to perform its normal functions. Especially in high-risk pregnancies, low PLGF levels can increase the risk of premature birth or fetal growth restriction. PLGF is closely related to economically important traits in the livestock sector, especially birth weight, milk yield and reproductive health. Determining and evaluating PLGF levels is a parameter that can contribute and benefit to more efficient and healthy production in livestock. It is also thought to contribute to research on the elucidation of its physiological role in diseases related to PLGF.

Keywords: Placental Growth Factor, Fetal Growth, Vascular Endothelial Growth Factor, Pregnancy

1.GİRİŞ

Plasental büyüme faktörü (PLGF), vasküler endotelial büyüme faktörü A'nın (VEGF-A) ilk karakterize edilen, yapısal olarak ilişkili büyüme faktörleri ailesinin bir üyesidir. Vasküler endotelial büyüme faktörü-A (VEGF-A), vasküler sızıntı ve geçirgenliği indüklemeye yeteneğinin yanı sıra vasküler endotelial hücre proliferasyonunu ve göçünü desteklemeye yeteneğine sahip disülfür bağlantılı homodimer bir proteindir. Ayrıca, endotelial hücreler üzerinde özel olarak etki eden ve artan vasküler geçirgenliği aracılık etme, anjiyogenez, vaskülogenez, endotelial hücre büyümesini uyarıcı etki, hücre göçünü teşvik etme ve apoptozun engellenmesi süreçlerinde önemli etkilere sahip glikozile edilmiş bir mitojendir (Mattei ve ark., 1996).

Anjiyojenik faktörler olarak sınıflandırılan VEGF ailesinin diğer üyeleri, VEGF-B (Olofsson ve ark. 1996), VEGF-C (Joukov ve ark. 1996), VEGF-D (Orlandini ve ark. 1996) ve VEGF-E (Wise ve ark. 1999) dimerik glikozlanmış proteinler olarak aktiftir. Aktif dimerlerin oluşumu, sekiz karakteristik aralıklı sistein kalıntısı arasında zincir içi ve zincirler arası disülfür bağları oluşturarak "sistein düğümü" üretilmesi sürecini kapsamaktadır. VEGF reseptörü VEGFR-1 ve VEGFR-2, yedi immünooglobulin benzeri alandan, bir transmembran bölgeden ve bir tirozin kinaz alanından oluşmaktadır. VEGFR-1 ayrıca yedi immünooglobulin benzeri alandan oluşan çözünür bir formda bulunmaktadır (Sato ve ark., 2000).

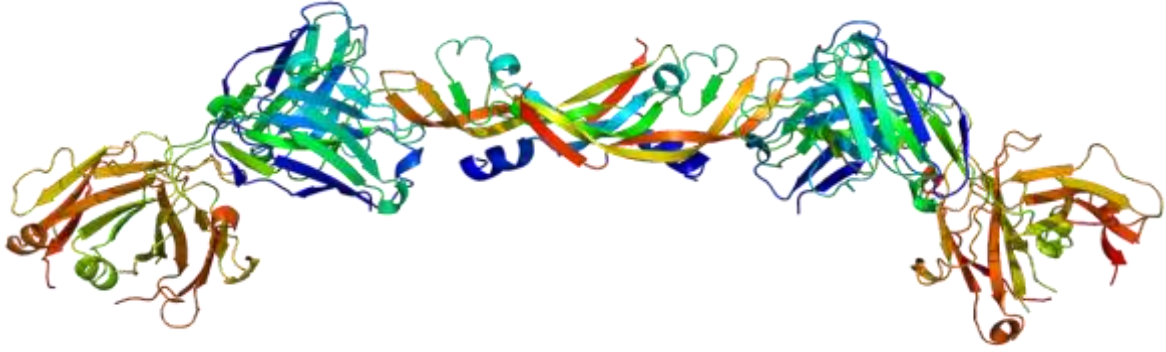
Nöropilin-1 reseptörü, bir hücre dışı bölge, bir transmembran bölge ve bir sitoplazmik bölgeden oluşmaktadır. Hücre dışı alanda, tamamlayıcıya (a/CUB) homolog olan üç alt alanı, pıhtılaşma faktörü V/VIII'i ve reseptör proteini-tirozin fosfataz mu (MAM) alanını tanımaktadır. Çözünebilir form yalnızca a/CUB ve pıhtılaşma faktörü V/VIII alanlarından meydana gelmektedir. VEGFR-1'in iki formu belirtilen tüm homodimerler tarafından, Neuropilin-1'in iki formu yalnızca PLGF ve VEGF-A tarafından tanınır ve VEGFR-2 yalnızca VEGF-A tarafından tanınmaktadır. PLGF, VEGF-A ve VEGF-B, sinyal iletim yollarının başlatılması için iki tirozin kinaz hücre yüzeyi reseptörüyle etkileşime girmektedir. Reseptörler artık VEGFR-1 ve VEGFR-2 olarak adlandırılmaktadır (Sato ve ark., 2000). Dimerik aktif VEGF-A hem VEGFR-1'e hem de VEGFR-2'ye bağlanabilmesine rağmen, homodimerik PLGF ve homodimerik VEGF-B yalnızca VEGFR-1'i tanımaktadır (Park ve ark., 1994). Nöropilin-1 ve nöropilin-2, PLGF ve VEGF-A'ya bağlandığı ve öncelikli olarak tirozin kinaz reseptörlerine bağlanmayı düzenlemede rol oynamaktadır (Soker ve ark., 1998). Nöropilinler, sinir sisteminde ilk kez tanımlanan transmembran glikoproteinlerdir; semaforin/kollapsin ailesinin birkaç üyesi için

koreseptör olarak ve nöronal yönlendirmenin ise negatif aracılığı olarak işlev görmektedirler (Fujisawa ve Kitsukawa 1998). Nöropilin-semaforin kompleksi daha sonra geniş pleksin reseptörleri ailesinin üyelerine bağlanabilmektedir (Tamagnone ve ark., 1999).

2. PLASENTAL DİSFONKSİYON VE FETAL BÜYÜME BİYOBELİRTECİ PLASENTAL BÜYÜME FAKTÖRÜ GEBELİKTEKİ ROLÜNÜN İNCELENMESİ

Plasental büyüme faktörü (PLGF), karboksil ucundaki oldukça bazik 21 amino asitlik bir bölümün eklenmesiyle farklılık gösteren PLGF-1 ve PLGF-2 (veya ayrıca PLGF131 ve PLGF152), PLGF-3 ve PLGF-4 olarak adlandırılan 4 izoformu bulunmaktadır (Maglione ve ark., 1991; Maglione ve ark., 1993; Hauser ve ark., 2003). PLGF-1, moleküler kütlesi ~46 kDa olan ve monomer başına 131 amino asit kalıntısından oluşan dimerik bir proteindir. PLGF-2, sinyal peptidi (uzunluk olarak 18 amino asit kalıntısı) bölünmesinden önce 170 amino asit kalıntısından oluşmaktadır (Ribatti, 2011).

PLGF ve VEGF-A'nın yalnızca %42 amino asit dizisi özdeşliği ve önemli işlevsel farklılıklar göstermesine rağmen PLGF'nin yapısı VEGF-A'nın yapısına dikkat çekici bir benzerlik göstermektedir. PLGF, iki disülfür bağıyla kovalent olarak bağlanmış bir homodimer olarak kristalleşmektedir. VEGF-A, trombosit kaynaklı büyüme faktörü B, TGF β 2 ve sinir büyüme faktörü gibi diğer ilgili büyüme faktörlerinde karakteristik olarak bulunan sistein düğümü motifi bulunmaktadır. Bu motif, simetrik olarak zıt konumlanmış bir zincirler arası ve üç zincir içi disülfür bağı tarafından oluşturulan sekiz kalıntılı bir halkadan oluşmaktadır (McDonald ve Hendrickson 1993).



Şekil 1. Plasental büyüme faktörü 3 boyutlu molekül yapısının görünümü (PDB, 2025).

PLGF, yetişkinlikte kalp, tiroid, akciğerler ve kasları içeren patolojik süreçte çeşitli organ ve dokularda bulunmaktadır (Persico ve ark., 1999). Bunun yanı sıra, birçok hücre uyarıldığında bu büyüme faktörünü salgılar: endotel hücreleri, vasküler düz kas hücreleri, lökositler, bronşiyal epitel hücreleri, fibroblast, kemik iliği hücreleri, nöronlar, keratinositler ve birçok tümör hücresi (Huang ve ark., 2023). PLGF, özellikle embriyogenez sırasında anjiyogenez ve vaskülogenezde önemli rol oynayan bir proteindir.

PLGF, endotel hücrelerinin büyümesini, göçünü ve hayatta kalmasını uyarır, vazodilatasyonu başlatır ve kollateral damar büyümesini, anjiyogenez yeteneğine sahip miyeloid progenitör hücrelerin toplanmasını uyarır ve olgunlaşmasını destekler ve makrofajları anjiyogenik ve lenfanjiyogenik molekülleri serbest bırakmaları için aktive etmektedir (Ribatti, 2011).

3.SONUÇ

Plasenta, ana ile yavru arasında besin, oksijen ve atık madde alışverişini sağlayan hayati bir organdır. Plasentanın normal işleyişinde meydana gelen herhangi bir bozukluk, plasental disfonksiyon olarak adlandırılmaktadır. Bu durum, fetusun büyüme ve gelişimi üzerinde olumsuz etkilere neden olmaktadır. PLGF, plasenta tarafından üretilen ve hem anne hem de fetal dolaşımında bulunan bir proteindir. Bu protein, plasentanın büyümesi, gelişimi ve fetüsün beslenmesi için oldukça önemlidir. PLGF, plasentanın büyümesi ve gelişimi için kritik öneme sahip bir proteindir. PLGF, gebelik sırasında plasentanın sağlıklı şekilde çalışması için önemli bir proteindir. PLGF düzeyleri, anne ve fetal faktörler, gebelik komplikasyonları ve çevresel faktörler gibi birçok etmenden etkilenmektedir. Düşük PLGF seviyeleri, plasental disfonksiyon ve fetal büyüme geriliği gibi ciddi komplikasyonların erken tanısında kullanılabilir. Bu kapsamda, riskli gebelikler daha yakından takip edilebilmesi ile gerekli müdahaleler daha erken yapılabilmesinde fayda sağlayabilecek bir parametre olmasıyla birlikte PLGF gebelik süreçlerindeki fizyolojik mekanizmaların aydınlatılması yönünde daha fazla sayıda ve kapsamlı araştırmalara ihtiyaç duyulmaktadır.

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**HÜCRESEL YAŞLANMA BİYOBELİRTECİ SİRTUİN-1 FİZYOLOJİSİ İLE
BESLEME ARASINDAKİ İLİŞKİ**
**RELATIONSHIP BETWEEN CELLULAR AGING BIOMARKER SIRTUIN-1
PHYSIOLOGY AND NUTRITION**

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ÖZET

Hücreler yaşlandıkça, DNA'larında hasarlar birikir, mitokondriyal fonksiyon bozulur ve hücre bölünme kapasitesi azalmaktadır. Hücresel yaşlanma süreçlerinin yavaşlatılarak hücrelerin daha uzun süre sağlıklı kalmasında önemli rolü bulunan Sirtuinler, lizin kalıntılarına deasetile eden nikotinamid adenin dinükleotid bağımlı enzim, ADP-riboziltransferaz aktivitesine sahip geniş spektrumlu metabolik ve stres toleransı özelliklerine sahip olan lipid metabolizmasını düzenleyen NAD (Nikotinamid Adenin Dinükleotid)-bağımlı deasetilazlardır.

Sirtuinlerin deasetilaz aktivitesi hücresel [NAD⁺]/[NADH (Nikotinamid Adenin Dinükleotid Hidrid)] oranı tarafından kontrol edilir, yani NAD⁺ bir aktivatör olarak çalışırken, nikotinamid ve indirgenmiş NADH aktivitesini inhibe etmektedir. Sirtuinler, trikostatin A tarafından inhibe edilmez ve asetillenmiş protein substratlarını NAD⁺ kullanan bir reaksiyonda deasetillenmiş bir proteine, nikotinamite ve asetil ester metabolitleri 2'-O- ve 3'-O-asetil-ADP ribozu dönüştürülür ve asetil grubunun NAD⁺'nin ADP-riboz kısmına aktarılmasıyla oluşmasıyla metabolik süreçleri düzenlemektedirler. Sirtuinlerin en önemli fizyolojik rollerinden birisi de, hücrenin hasar görmesini önlemek ve onarılması ile yaşlanma sürecini yavaşlatılması üzerinedir. Yaşlanma sürecinde sirtuin aktivitesinin azalması, hücresel hasarın artmasına ve yaşa bağlı hastalıkların gelişmesine neden olabilmektedir. Bu nedenle, sirtuin aktivitesini artırmak, yaşlanmayla ilişkili birçok hastalığın tedavisinde umut verici bir yaklaşım olarak bildirilmektedir.

Sirtuin 1, sınıf III nikotinamid adenin dinükleotid (NAD⁺) bağımlı histon deasetilaz olup önemli bir enerji sensörüdür. SIRT1, endotel hücrelerinden nitrik oksit (NO) üretimini artıran endotelial nitrik oksit sentaz (eNOS) deasetilasyonunda rolü sayesinde endotelial nitrik oksit sentaz (eNOS) enzimini aktive ederek nitrik oksit üretimini artırmaktadır. Nitrik oksit ise kan damarlarını genişleterek kan basıncını düşürür ve kalp sağlığını korumaktadır. Bu süreç, kalp hastalıkları, hipertansiyon ve ateroskleroz gibi birçok kardiyovasküler hastalığın önlenmesinde önemli bir rol oynamaktadır. Diğer yandan SIRT1 aktive edilerek, böbrek tübül hücrelerinin oksidatif strese karşı direncini artırmaktadır.

SIRT1 ile yaşlanma süreci, metabolik homeostazın kontrolü, inflamasyon ve yaşlılarda yetersiz beslenme ile ilişkili olarak biyobelirteç olarak kullanılması gibi bir çok fizyolojik süreçteki

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önemli rolü nedeniyle sirtuin 1 ile ilişkili hastalıklardaki fizyolojik rolünün aydınlatılması yönündeki araştırmalar için katkı sağlayacağı düşünülmektedir.

Anahtar Kelimeler: Sirtüinler, Sirtuin 1, Deasetilaz, eNOS, Hücresel Yaşlanma, Beslenme

ABSTRACT

As cells age, damage to their DNA accumulates, mitochondrial function deteriorates, and cell division capacity decreases. Sirtuins, which play an important role in slowing down cellular aging processes and keeping cells healthy for longer, are NAD-dependent deacetylases that regulate lipid metabolism with broad-spectrum metabolic and stress tolerance properties, having nicotinamide adenine dinucleotide-dependent enzyme and ADP-ribosyltransferase activity that deacetylates lysine residues.

The deacetylase activity of sirtuins is controlled by the cellular [NAD⁺]/[NADH] ratio, i.e., NAD⁺ works as an activator, while nicotinamide and reduced nicotinamide adenine dinucleotide (NADH) inhibit their activity. Sirtuins are not inhibited by trichostatin A and their acetylated protein substrates are converted to a deacetylated protein, nicotinamide, and the acetyl ester metabolites 2'-O- and 3'-O-acetyl-ADP ribose in a reaction that uses NAD⁺ and they regulate various metabolic processes by transferring the acetyl group to the ADP-ribose moiety of NAD⁺. One of the most important physiological roles of sirtuins is to prevent and repair cell damage and slow down the aging process. The decrease in sirtuin activity during the aging process can lead to increased cellular damage and the development of age-related diseases. Therefore, increasing sirtuin activity is reported as a promising approach in the treatment of many diseases associated with aging. Sirtuins are molecules that have therapeutic effects in combating metabolic, neurodegenerative and proliferative diseases due to their role in many physiological processes and cellular functions, from delaying cellular aging and controlling metabolic activity to controlling the cell cycle and apoptosis and energy homeostasis. Sirtuin 1 is a class III nicotinamide adenine dinucleotide (NAD⁺)-dependent histone deacetylase and an important energy sensor. SIRT1 increases nitric oxide production by activating the endothelial nitric oxide synthase (eNOS) enzyme through its role in endothelial nitric oxide synthase (eNOS) deacetylation, which increases nitric oxide (NO) production from endothelial cells. Nitric oxide, on the other hand, dilates blood vessels, lowers blood pressure and protects heart health. This process plays an important role in the prevention of many cardiovascular diseases such as heart disease, hypertension and atherosclerosis. On the other hand, SIRT1 is activated, increasing the resistance of renal tubular cells to oxidative stress.

SIRT1 is thought to contribute to research on the physiological role of sirtuin 1 in diseases related to aging, control of metabolic homeostasis, inflammation and malnutrition in the elderly due to its important role in many physiological processes such as biomarker.

Keywords: Sirtuins, Sirtuin 1, Deacetylase, eNOS, Cellular Aging, Nutrition

1.GİRİŞ

Mitokondriler, ökaryotik hücrelerde metabolik enerjinin üretiminde kritik bir rol oynayan hücrenin biyokimyasal reaksiyonlarını güçlendirmek için gereken kimyasal enerjinin çoğunu üreten zarla çevrili hücre organelleridir. Mitokondriler besinleri hücresel solunum yoluyla enerjiye dönüştüren hücrenin başlıca enerji kaynakları olmakla birlikte tarafından üretilen kimyasal enerji, adenozin trifosfat (ATP) adı verilen küçük bir molekülde depolanmakla ve

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

oksidatif fosforilasyon süreciyle ATP'ye dönüştürülen karbonhidratların ve yağ asitlerinin parçalanmasından elde edilen yararlı enerjinin çoğundan sorumludurlar (Wallace, 2005). Bozulmuş mitokondriyal fonksiyon, metabolik ve kardiyovasküler sistemler de dahil olmak üzere çok sayıda hastalıkla ilişkilendirilmiştir (Petersen ve ark., 2003). İnsülin direnci, oksidatif tip 1 ile tip 2 glikolitik tip kas liflerinin düşük olması, mitokondriyal oksidatif kapasitenin ve ATP sentezinin azalmasıyla ilişkilidir (Mootha ve ark., 2003; Patti ve ark., 2003; Petersen ve ark., 2003).

PGC-1 α , PGC-1'in enerji metabolizmasının düzenlenmesinde ve adaptif termojenezde rol oynayan, pleiotropik işlevlere sahip bir koaktivatördür (Knutti ve Kralli, 2001; Lin ve ark., 2005). En önemlisi, PGC-1 α , kaslarda lif tipi değişimi (Lin ve ark., 2002), termogenez (Puigserver ve ark., 1998) ile mitokondriyal biyogenez ve işlevini kontrolünde görevlidir.

Sirtuinler, sınıf III histon deasetilazlara (HDAC'ler) ait evrimsel olarak korunan proteinler olup yedi üyeden oluşur. SIRT'ler bir NAD⁺-bağlayıcı katalitik alanı paylaşır ve dahil oldukları biyolojik süreçlere bağlı olarak farklı substratlar üzerinde spesifik olarak etki edebilmektedirler. Sirtuinler, hem N- hem de C-terminal alanlarında dizi ve uzunluk bakımından farklılık gösterir ve bu da farklı lokalizasyonlarını ve işlevlerini kısmen açıklar. SIRT'ler hem deasetilasyonu hem de ADP-ribozilasyonu katalize edebilmektedirler. Sirtuinler, 1–7 izoformaları ile aktiviteleri için NAD⁺'ya bağımlı deasetilazlardır (Tablo 1), (Carafa ve ark., 2012).

Sirtuinler, prokaryotlarda ve ökaryotlarda önemli metabolik yolları düzenleyen NAD⁺-bağımlı histon deasetilazlardır ve hücre sağkalımı, yaşlanma, çoğalma, apoptoz, DNA onarımı, hücre metabolizması ve kalorik kısıtlama gibi birçok biyolojik süreçte yer almaktadırlar (Zhang ve Sauve, 2018).

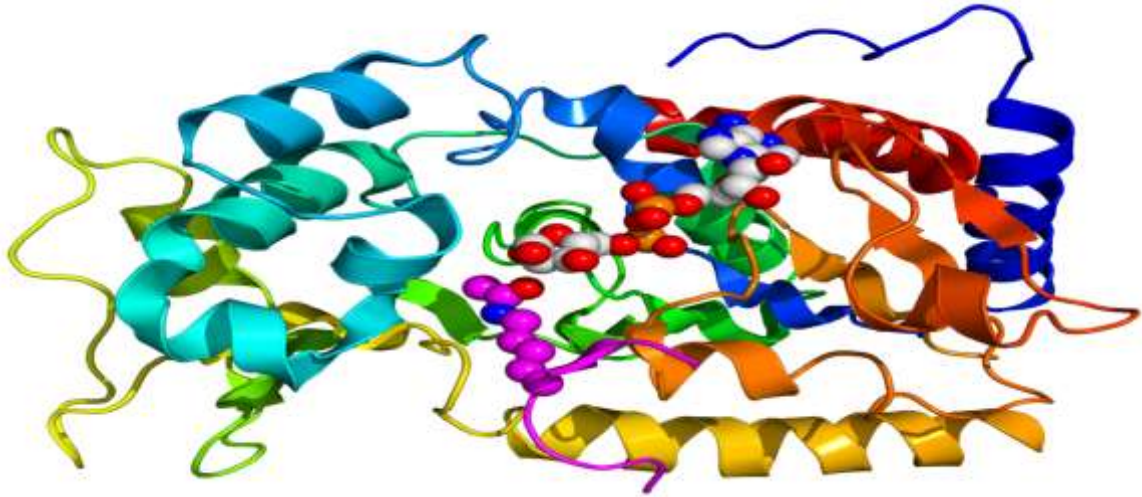
Tablo 1. Sirtuin İzoformları ve Başlıca Fizyolojik Fonksiyon Özellikleri

Sirtuin İzoformları	Hücre İçi Lokalizasyon	Aktivitesi	Hedefi	Fizyolojik Fonksiyonları
SIRT1	Çekirdek	Deasetilaz	PGC-1 α , FOXOs, NF κ B	Metabolizma/inflamasyon/nörodejenerasyon
SIRT2	Sitoplazma	Deasetilaz	H4, α -tubulin	Hücre döngüsü/tümör oluşumu
SIRT3	Çekirdek ve mitokondri	Deasetilaz	AceCS2	Metabolizma
SIRT4	Mitokondri (matrix)	ADP-ribozil transferaz	GDH	İnsülin sekresyonu
SIRT5	Mitokondri	Deasetilaz	Bilinmiyor	Bilinmiyor
SIRT6	Çekirdek (heterokromatik bölge)	ADP-ribosyl transferase	DNA polimeraz β	DNA tamiri
SIRT7	Çekirdek	Bilinmiyor	RNA polimeraz I	rDNA transkripsiyonu

Sirtuin 1, p53 aktivitesini aşağı düzenleyerek yaşam süresini, hücre sağkalımını ve nöroproteksiyonu artırır; ayrıca peroksisom proliferatörle aktive edilen reseptör- γ ve onun koaktivatörü 1α 'yı deasetilleyerek yağ mobilizasyonunu uyarmaktadır. Sirtuinler besin bulunabilirliğini ve enerji metabolizmasını birbirine bağlamaktadır. Yaşam süresini artıran ve yaşa bağlı bozukluklarda faydalı olan kalori kısıtlaması sirtuini aktive etmektedir (Bhatt ve Tiwari, 2023).

2. HÜCRESEL YAŞLANMA BİYOBELİRTECİ SIRTUİN-1 FİZYOLOJİSİ İLE BESLEME ARASINDAKİ İLİŞKİ

Sirtuinler (SIRT'ler), prokaryotlarda ve ökaryotlarda kritik sinyal yollarını düzenleyen nikotin adenin dinükleotid(+)-bağımlı histon deasetilazlardır. Sınıf III histon deasetilazlara ait korunmuş proteinler olan sirtuin (SIRT) protein ailesi yedi üyeden oluşmaktadır (Şekil 1), (North ve Verdin, 2004).



Şekil 1. Sirtuin-1 proteini 3 boyutlu molekül yapısının görünümü (PDB, 2025).

Sirtuin 1, nöroprotektif bir etki gösterir ve hayatta kalma, nöropatoloji ve beyinden türetilen nörotrofik faktörün ifadesinde rol oynamaktadır (Jeong ve ark., 2012). Nöronal süreçteki katılımı (Li ve ark., 2013), Alzheimer hastalığı, Parkinson hastalığı ve Huntington hastalığı gibi nörolojik bozuklukların etiopatogenezinde rolü bulunmaktadır (Qin ve ark., 2006). Sirtuinler başlangıçta sınıf III HDAC'ler olarak kategorize edilmiştir. Sınıf I ve II HDAC'ler kofaktör olarak çinko kullanırken ve trikostatın A tarafından inhibe edilirken (Lamming ve ark., 2000), sirtuinler trikostatın A tarafından inhibe edilmez ve asetillenmiş protein substratlarını NAD^+ kullanan bir reaksiyonda deasetillenmiş bir proteine, nikotinamite ve asetil ester metabolitleri 2'-O- ve 3'-O-asetil-ADP ribozuna dönüştürülmesiyle asetil grubunun NAD^+ 'nin ADP-riboz kısmına aktarılmasıyla oluşmaktadır (Landry ve ark., 2000; Smith ve ark., 2000; Borra ve ark., 2004).

Sirtuinlerin deasetilaz aktivitesi hücrel $[NAD^+]/[NADH]$ oranı tarafından kontrol edilmektedir. NAD^+ bir aktivatör olarak çalışırken, nikotinamid ve indirgenmiş nikotinamid adenin dinükleotidi (NADH) bunların aktivitesini inhibe etmektedirler (Lin ve ark., 2002; Anderson ve ark., 2003; Lin ve ark., 2004; Revollo ve ark., 2004). Sirtuinler tarafından deasetillenen AceCS2 ve PGC- 1α gibi protein substratlarının birçoğunun metabolizmada yer alması nedeniyle metabolik rolünü göstermektedir (Hallows ve ark., 2006; Schwer ve ark., 2006). Sirtuin 1, metabolik olarak rolü mitokondriyal biyogenezin ana düzenleyicisi olan

kofaktör PGC-1 α ile gerçekleştirilmektedir. PGC-1 α , Sirtüin 1 aracılı deasetilasyonla aktive edilmektedir (Nemoto ve ark., 2005; Rodgers ve ark., 2005). Karaciğerde, PGC-1 α 'nın aktivasyonu hepatosit nükleer faktör 4 α 'nın glukoneojenik aktivitesini kolaylaştıracak ve hepatik glikoz çıkışı uyarılmaktadır (Rodgers ve ark., 2005). Deasetilaz aktivitesi için Sirtüin 1, hücresel enerji durumunu yansıtan hücresel NAD⁺ seviyelerine kesinlikle bağımlıdır. Sirtüin 1 deasetilaz aktivitesini etkileyen hücresel NAD⁺ seviyelerindeki değişiklikler, PGC-1 α 'yı hücresel enerji durumu hakkında bilgi vermektedir (Lagouge ve ark., 2006).

Sirtuinler, hücresel yaşlanmayı geciktiren ve metabolik aktiviteyi kontrol etmenin yanı sıra hücre döngüsünün ve apoptozun kontrolüne ve enerji homeostazına kadar çeşitli birçok fizyolojik süreç ve hücresel işlevde rol oynamaları nedeniyle metabolik, nörodejeneratif ve proliferatif hastalıklarla mücadele için terapötik etkiye sahip moleküllerdir (Guarente, 2006; Outeiro ve ark., 2008; Verdin ve ark., 2010; Villalba ve Alcaín, 2012).

3.SONUÇ

Sirtuinler, esansiyel bir kofaktör olarak nikotinamid adenin dinükleotid (NAD⁺) gerektiren üçüncü deasetilaz sınıfı içerisinde enzimdir. Sirtüin 1, hücre yaşlanma ve uzun ömürlülük ile yakından ilişkili metabolik süreçlerin kontrolü, apoptoz ve hücre sağkalımı ve DNA onarımı, gelişimi, inflamasyon ve nöroproteksiyon ile ilişkilidir. SIRT1 aktivatörleri, yaşlanma veya stres, diyabet, obezite, nörodejeneratif hastalıklar, kardiyovasküler hastalık, kan pıhtılaşma bozuklukları ve inflamasyonla ilişkili olanlar da dahil olmak üzere çok çeşitli hastalık ve bozukluklarının tedavisi ile önlenmesine umut vaat eden molekül olması nedeniyle fizyolojik mekanizmaların aydınlatılması yönünde daha fazla sayıda ve kapsamlı araştırmalara ihtiyaç duyulmaktadır.

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INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

KANSER BİYOBELİRTECİ SURVİVİN FİZYOLOJİSİ İLE BESLEMEDEKİ ROLÜNÜN İNCELENMESİ

INVESTIGATION OF THE PHYSIOLOGY AND ROLE OF NUTRITION OF CANCER BIOMARKER SURVIVIN

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ÖZET

Survivin (apoptozis tekrarı içeren 5'in baküloviral inhibitörü veya BIRC5 olarak da adlandırılan), hücre bölünmesi, çoğalması ve yaşlanması ile kaspaz aktivasyonunu bloke ederek apoptozu engellemede önemli rolleri olan apoptoz inhibitörü protein ailesinin en küçük üyesi bir proteindir. Survivin, BIRC5 geni tarafından sentezlenen ve kromozomun 17q25 bölgesinde yer alan 14,7 kb uzunluğunda olan ve 142 aminoasitlik, 16,5 KD ağırlığına sahiptir. Survivin, hücre döngüsü sırasında kromozomların farklı bölgelerinde dinamik olarak yerleşmiştir. Mitoz sırasında survivin mitotik iğ ipliğine yerleşir, burada tubulin ile etkileşime girer ve mitozu düzenlemede önemli bir rol oynamaktadır. Survivin, akciğer, pankreas ve meme kanserleri gibi çoğu insan kanserinde normal dokulara göre yüksek oranda eksprese edilmektedir. Aşırı survivin ekspresyonu, tümör hücresi proliferasyonu, ilerlemesi, anjiyogenez, terapötik direnç ve kötü prognozla ilişkili olması nedeniyle kanser biyobelirteci olarak kullanılmaktadır. Survivin sitokinez ve hücre döngüsü ilerlemesinin düzenlenmesi ile p53, Wnt, hipoksi, dönüştürücü büyüme faktörü beta (TGF- β) ve Notch sinyal yolları gibi çeşitli sinyal yollarında yer almaktadır. Antioksidanlar, serbest radikallerin neden olduğu hücre hasarını önleyerek kanser riskini azaltabilmesi nedeniyle antioksidan içeriği yüksek bazı besinler ile bitkilerin içeriğinde yer alan antikanserojenik bileşikler sayesinde survivin ekspresyonunu etkilediğini bildiren geleneksel ve tamamlayıcı tıp alanında fitoterapi ile ilgili araştırmalar bulunmakla birlikte halen tam olarak aydınlatılamamıştır. Kanserle ilişkili olarak biyobelirteç ve bir çok fizyolojik süreçteki önemli rolü nedeniyle survivin ile ilişkili hastalıklardaki fizyolojik rolünün aydınlatılması yönündeki araştırmalar için katkı sağlayacağı düşünülmektedir.

Anahtar Kelimeler: Survivin, BIRC5, Apoptoz, Kanser, Beslenme, Fitoterapi

ABSTRACT

Survivin (also called baculoviral inhibitor of apoptosis repeat-containing 5 or BIRC5) is a protein that is the smallest member of the apoptosis inhibitor protein family, which has important roles in cell division, proliferation and aging, and in preventing apoptosis by blocking caspase activation. Survivin is synthesized by the BIRC5 gene and is located in the 17q25

region of the chromosome, is 14.7 kb long, has 142 amino acids, and has a KD weight of 16.5. Survivin is dynamically localized in different regions of the chromosomes during the cell cycle. During mitosis, survivin localizes to the mitotic spindle fiber, where it interacts with tubulin and plays an important role in regulating mitosis. Survivin is highly expressed in most human cancers, such as lung, pancreatic and breast cancers, compared to normal tissues. Overexpression of survivin is used as a cancer biomarker because it is associated with tumor cell proliferation, progression, angiogenesis, therapeutic resistance and poor prognosis. Survivin is involved in the regulation of cytokinesis and cell cycle progression and is involved in various signaling pathways such as p53, Wnt, hypoxia, transforming growth factor and Notch signaling pathways. Antioxidants can reduce the risk of cancer by preventing cell damage caused by free radicals, so there are studies on phytotherapy in the field of traditional and complementary medicine, which have reported that some foods with high antioxidant content and plants affect survivin expression thanks to the anticarcinogenic compounds in their content, but they are still not fully elucidated. It is thought that it will contribute to the studies on the elucidation of the physiological role of survivin in diseases related to cancer due to its important role as a biomarker and in many physiological processes.

Keywords: Survivin, BIRC5, Apoptosis, Cancer, Nutrition

1.GİRİŞ

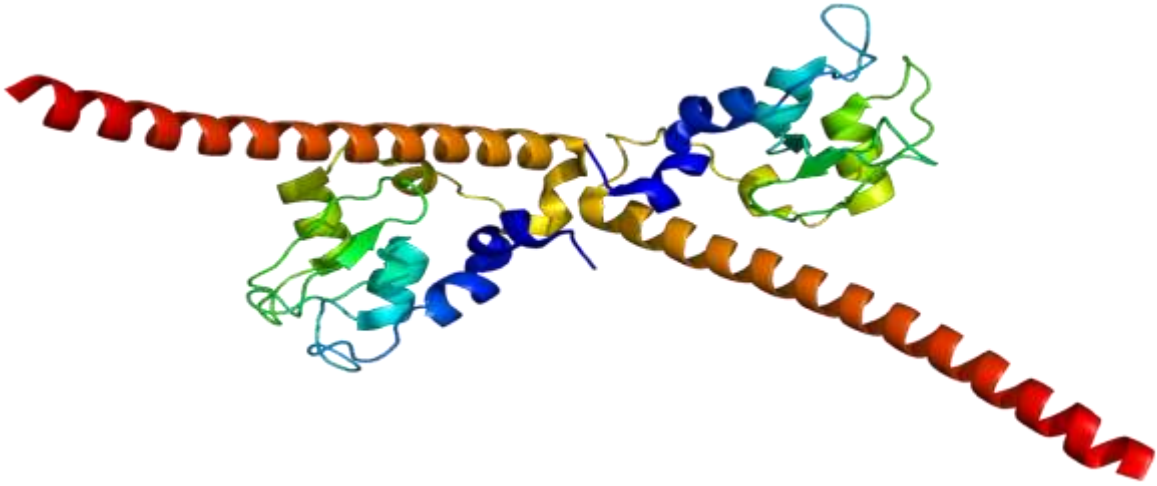
Kanser, vücuttaki hücrelerin sürekli ve hızlı bir şekilde kontrolsüz bir şekilde çoğalarak vücudun diğer doku ve bölgelerine metastaz yaparak yok eden, anormal hücre gelişimi ile karakterize, normal hücrelerin işlevlerini bozarak çeşitli sağlık sorunlarına ve ölüme kadar gidebilen bir hastalık grubudur (Carlsson ve ark., 2025). 2024 yılı Küresel Kanser İstatistiklerine göre, 2022 yılında 20 milyon kanser vakası yeni teşhis edildi ve dünya çapında 9,7 milyon kişi bu hastalıktan öldüğü 2050'ye kadar kanser vakası sayısının 35 milyona ulaşması beklenilmektedir (Siegel ve ark., 2024).

Apoptozis, oldukça düzenlenmiş ve kontrollü bir süreçtir ve programlanmış hücre ölümünün bir biçimini temsil eder. Kusurlu ve yetersiz apoptozis süreçleri, kontrolsüz hücre çoğalması ve kansere neden olabilir. Apoptozis, içsel veya dışsal yolağın aktive edilmesiyle başlatılır ve kaspazlar tarafından yürütülür. İçsel yol, mitokondriden Sitokrom c (Cyt-c) salınımına bağlı olan endojen stres sinyalleri veya ışınlama ile aktive edilir. Bunun aksine, dışsal yol (ölüm reseptörü yolu olarak da bilinir) mitokondriden bağımsızdır ve hücre yüzeyi ölüm reseptörlerine bağlanan hücre dışı ligandlar tarafından aktive edilmektedir (Galluzi ve ark., 2018). Apoptozis, apoptozis proteinlerinin inhibitörleri (IAP'ler) gibi endojen proteinler tarafından bloke edilebilir. IAP proteinleri ilk olarak bakulovirüslerde tanımlanmıştır. Burada enfekte böcek hücrelerine karşı konakçının savunma apoptotik yanıtını inhibe edebilir ve viral replikasyonu artırmaktadırlar (Crook ve ark., 1993). İnsan IAP'leri yapısal ve işlevsel olarak ilişkili sekiz protein ailesidir. Tüm IAP ailesi üyeleri, antiapoptotik işlevin ana aracısı olan ~70 amino asitlik bir alan olan bakulovirüs IAP tekrarının (BIR) bir ila üç kopyasına sahiptir. Survivin, IAP'lerin en küçük üyesidir ve yalnızca bir BIR alanına sahiptir (Muchmore ve ark., 2000).

Survivin, hem mitoz için gerekli olan hem de apoptozu inhibe edebilen çok yönlü bir proteindir. Kısmen yalnızca kanser hücreleri gibi en hızlı bölünen hücrelerde ifade edilirken, farklılaşmış normal hücrelerde ifadesi çok düşük olduğundan, kanser için potansiyel bir terapötik etkiye sahiptir. Survivin tümör hücresi sağ kalımını ve kanser metastazını desteklemede rol oynamaktadır.

2. SURVİNİN ÜREME SİSTEMİ ÜZERİNDEKİ FİZYOLOJİK ROLÜNÜN İNCELENMESİ

Apoptozis protein inhibitörleri (IAP'ler) ailesinin en küçük üyesi olan Survivin, 16,5 kDa'lık bir proteindir ve kaspaz inhibitör işlevi için gerekli olan BIR alanının tek bir tekrarını içeren proteindir (Ambrosini ve ark., 1997). PI3K/AKT/mTOR (Rapamisin protein kompleksinin memeli hedefi) yolu, hücre döngüsünün düzenlenmesinde önemli olan bir hücre içi sinyal yoludur (Cuyàs ve ark., 2014). Survivin, 142 amino asit kalıntısı içermekle 16,5 kDa moleküler ağırlığa sahip küçük bir proteindir (Şekil 1). Survivin, Fosfoinositid-3 Kinaz (PI3K)/Akt yolu, mTOR yolu, ERK yolu, tümör baskılayıcılar (p53, PTEN) ve onkojenik (Ras, Bcl-2) sinyal yolları gibi birkaç önemli sinyal yolunda yer alan bir alt hedef protein olarak işlev görmektedir (Kanwar ve ark., 2011).



Şekil 1. Survivin 3 boyutlu molekül yapısının görünümü (PDB, 2025).

Survivin, antiapoptotik bir protein ve temel mitotik proteindir (Knauer ve ark., 2007). Sitoplazmik survivin ve mitokondriyal survivin apoptozu engellerken, nükleer survivin hücre bölünmesini düzenlemektedir (Song ve ark., 2003). Crm1, survivinin çekirdekten sitoplazmaya aktarılmasını sağlamaktadır. Survivin, içsel apoptotik yolu engellemede önemli bir rol oynamaktadır (Ishizawa ve ark., 2015). Apoptotik yol, endojen stres sinyalleri veya ışınlama ile aktive edilir ve mitokondriden Cyt-c salınımına bağlıdır. Cyt-c, pro-kaspaz-9'a bağlanan ve apoptozom olarak bilinen bir protein kompleksi oluşturan Apaf-1 ve ATP ile bağlanmaktadır (Shakeri ve ark., 2017). Pro-kaspaz-9, apoptozom tarafından aktif formu olan kaspaz-9'a ayrılır ve bu da efektör kaspaz-3/6/7'yi aktive ederek hücre apoptozuna neden olmaktadır. Survivin, XIAP'ı stabilize ederek ve Smac'ın XIAP'ı antagonize etmesini engellemektedir (Wei ve ark., 2008; Philchenkov ve Miura, 2016). Survivin–XIAP kompleksi kaspaz-9'u bloke eder ve apoptozu engellemektedir. Survivin–HBXIP ayrıca pro-kaspaz-9'u baskılayarak ve kaspaz-9'un aktivasyonunu engellemektedir (Marusawa ve ark., 2003). Survivin–AIP kompleksi survivini stabilize edererek ve mitokondrilerdeki anti-apoptotik işlevini desteklemektedir (Kang ve ark., 2011).

Survivin, en yaygın malignitelerin çoğunda yüksek oranda ifade edilir ve apoptozu önleyerek ve hücre döngüsünü düzenleyerek kanser gelişiminde önemli bir rol oynamaktadır. Survivin'in baskın sitoplazmik ve mitokondriyal lokalizasyonu, anti-apoptotik aktivitesi için gereklidir (Rafatmanesh ve ark.,2020). Mitoz sırasında Survivin, profaz/metafaz sırasında sentromerlere yerleşir, anafaz/telofaz sırasında iğ ipliğinin orta bölgesine taşınır ve telofazın sonunda kaybolmaktadır. Survivin, embriyonik ve fetal gelişim sırasında yaygın olarak ifade edilir ve

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

hem nöroenezde hem de hematopoez; çeşitli kanserlerde de ifade edilmektedir (Knauer ve ark., 2007).

Adipositlerde survivin ekspresyonu beslenme stresiyle düzenlenmektedir. Birc5 geni tarafından kodlanan Survivin, apoptoz inhibitörü protein ailesinin bir üyesidir ve apoptozu inhibe etme ve hücre bölünmesini teşvik etme işlevi görmektedir (Fukuda ve Pelus, 2006). Survivin, en yaygın malignitelerin çoğunda yüksek oranda ifade edilir ve apoptozu önleyerek ve hücre döngüsünü düzenleyerek kanser gelişiminde önemli bir rol oynamaktadır (Rafatmanesh ve ark., 2020). Mekanik rapamisin hedefi (mTOR) kritik bir enerji sensörü olarak bilinir; ancak, son çalışmalar mTOR'un titreme olmayan termojenezi ve kahverengi/bej yağ hücrelerinin gelişimini de düzenlediğini göstermiştir (Ye ve ark., 2019). İnsülin yağ hücrelerinde PI3K/mTORC1 sinyal yolunu aktive ederek survivin ekspresyonu güçlü bir şekilde artırmaktadır.

Kanser kaşeksisi, metabolik değişiklikler, sistemik inflamasyon ve iştah azalmasının bir kombinasyonundan kaynaklanan karmaşık bir çok faktörlü sendromdur. Geleneksel beslenme desteğiyle geri döndürülemeyen, istemsiz sürekli kilo kaybı ve iskelet kas kütlesi kaybı ile, yağ kütlesi kaybıyla veya kaybı olmaksızın karakterizedir (Fearon ve ark., 2011).

Kanser, genler ve çevre arasındaki çoklu etkileşimlerden kaynaklanan karmaşık bir hastalıktır ve dünya çapında şu anda önde gelen ölüm nedenlerinden biri olarak kabul edilmektedir (Fearon ve ark.,2011; Mattox, 2017). Metabolik ve beslenme değişiklikleri yetersiz beslenme, sarkopeni ve kaşeksi kanser hastalarının hayatta kalmasını ve iyileşmesini etkilemektedir (Brown ve ark.,2018).

Yetersiz beslenme, anoreksiyayı ve dolayısıyla kilo kaybını destekleyen bir inflamatuvar durumdan kaynaklanmaktadır. Kanser hastalarında oldukça yaygındır ve kanser hastaların %15 ila %40'ı tanı sırasında kilo kaybı bildirmektedir (Wigmore ve ark., 1997). . Tüm kanser hastalarının %40 ila %80'inin hastalık süresince yetersiz besleneceği tahmin edilmektedir. Dahası, yetersiz beslenme tedavi sonuçlarını etkileyebilir, yara iyileşmesini geciktirebilir, kas fonksiyonunu kötüleştirir ve ameliyat sonrası komplikasyon riskini artırabilir. Ayrıca antineoplastik tedavilere karşı toleransı ve yanıtı da bozabilir, bu da hastanede kalma süresinin uzamasına, tedavi kesintileri riskini artırmaya ve olası sağ kalımın azalmasına neden olabilmektedir (Belghiti ve ark.,1983; Mantzourou ve ark., 2017). Antioksidanlar açısından zengin besinler tüketmek, bazı kanser türlerinin riskini azaltabileceği düşünülmektedir (Visioli ve ark., 2004). Örneğin resveratrol, kanser başlangıcını ve ilerlemesini engellediği gösterilen bir antikanser besindir (Jang ve ark., 1997). Resveratrol, seçici bir östrojen reseptör modülatörü (SERM) olarak etki eder ve p53 ve Rb/E2F, siklinler, siklin bağımlı kinazlar (CDK'lar) ve bunların inhibitörleri gibi DNA sentezi ve hücre döngüsünde yer alan proteinleri düzenler. Resveratrol, NF-kB, AP1 ve Egr1 gibi çoğalma ve stres tepkilerinde yer alan transkripsiyonel faktörlerin aktivitesini etkiler. Bu olayların bir kısmı mitogenle aktive olan protein kinazlar (MAPK'lar) ve tirozin kinazlar (örn. Src) tarafından aracılık edilir ve sağkalım ve apoptotik faktörlerin [örn. Bcl2 ailesi üyeleri, apoptoz inhibitörleri (IAP'ler), seramid] ve karsinogenezde yer alan enzimlerin [siklooksijenazlar (COX'ler), nitrik oksit sentaz (NOS), faz I ve II enzimleri] modülasyonuna yol açar. Dahası, resveratrol p300 ve sirtuin 1 gibi kotranskripsiyonel faktörlerin ekspresyonunu ve aktivitesini etkilemektedir.

Al Dhaheri ve ark. (2013) tarafından yapılan araştırmada *Origanum majorana* ekstraktıyla meme kanseri hücrelerinde mitotik durma ve apoptozis: tnf- α 'nın yukarı düzenlenmesi ve survivin ve mutant p53'ün aşağı düzenlendiğini bildirmişlerdir. Yapılan araştırmada *Origanum majorana* (OME) 150 ve 300 μ g/mL konsantrasyonları, mitotik olarak durdurulmuş ve siklin bağımlı kinaz inhibitörü p21 ve apoptoz inhibitörü survivin'i aşırı ifade eden apoptoza dirençli hücre popülasyonunun birikmesine neden olduğu, OME konsantrasyonları (450 ve 600 μ g/mL),

tümör nekroz faktörü- α (TNF- α), kaspaz 8, kaspaz 3 aktivasyonu ve PARP'in kesilmesi, survivinin aşağı düzenlenmesine yol açtığı bildirilmiştir. Böylece OME'nin nın özellikle yüksek derecede invaziv üçlü negatif p53 mutant meme kanseri için kansere karşı umut verici bir kemopreventif ve terapötik etkiye sahip olduğu bildirilmiştir (Al Dhaheri ve ark., 2013).

3. SONUÇ

Kanser, tüm dünyada prevalansı giderek artış gözlenmesi nedeniyle global düzeyde etkileyen bir sağlık sorunudur. Kanser vakalarındaki artışı önlemek ve sağlıklı beslenme ile yaşam kalitesini artırmak için erken teşhis ve önleme büyük önem taşımaktadır. Kanser tedavisinde hormon tedavisi, hedefli terapi ve immünoterapi gibi yaklaşımlar, kanser hücrelerindeki belirli proteinleri hedefleyerek hastalığın kontrol altına alınmasına yardımcı olabilmektedir.

Survivin, apoptozis proteinleri ailesinin bir üyesi olarak apoptozis süreçlerinde baskılayıcı olarak görevinin yanı sıra hücre bölünmesinde önemli rol oynamaktadır. Beslenme alışkanlıkları ve antioksidan içeriği yüksek besinler, survivin ekspresyonunu etkileyerek kanser riskini azaltılmasında önemli bir rolü bulunmaktadır. Ancak kanser de biyobelirteç olmasının yanı sıra terapötik etki potansiyeline sahip survivin fizyolojisinin ayrıntılı olarak incelendiği daha fazla sayıda kapsamlı araştırmalara ihtiyaç duyulmaktadır.

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INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

TAU PROTEİNİ VE ÖĞRENME VE HAFIZA SÜREÇLERİNDEKİ FİZYOLOJİK ROLÜNÜN İNCELENMESİ

INVESTIGATION OF TAU PROTEIN AND ITS PHYSIOLOGICAL ROLE IN LEARNING AND MEMORY PROCESSES

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ÖZET

Tau proteini, mikrotübüllere bağlanarak onların stabilitesini sağlayarak ve işlevlerini yerine getirmelerine yardımcı olan, 40-70 kDa moleküler ağırlığa sahip bir proteindir. Serebral korteks ve merkezi sinir sisteminde yer alan nöronlarda yoğun olarak bulunmakla birlikte sırasıyla astrositlerde ve oligodendrositlerde bulunmaktadır. Nöronlar hasar gördüğünde nöronlar Tau proteini salgılanır. Bu nedenle Tau proteini düzeylerinin incelenmesi, nöronal hasarın derecesi serum veya beyin omurilik sıvısında düzeyi hakkında bilgi sunmaktadır. Öğrenme ve hafıza süreçlerindeki rolü hala tam olarak aydınlatılamamış olsa da, Tau proteini, mikrotübüllerin stabilitesindeki rolüyle nöronların iletişim kurması ve bilginin işleminde katkıda bulunarak beyinin fonksiyonlarının sağlıklı bir şekilde ait gerçekleştirmesinde önemli rolü bulunmaktadır. Tau proteini yapısındaki anormallikler, öğrenme ve hafıza sorunları ile Alzheimer gibi nörodejeneratif hastalıkların etiopatogenezi de rolü bulmaktadır. Nörodejeneratif bir hastalıklardan birisi olan Alzheimer hastalığında, beyinde anormal bir protein birikimi (amiloid ve tau proteini) sonucu beyin fonksiyonlarının zarar görüp ve ölmesiyle, hastalığa yakalanan bireyler yeni bilgiler öğrenmekte, eski anılarını hatırlamakta ve günlük aktivitelerini yerine getirmekte zorlanmaktadırlar. Alzheimer hastalığında Tau proteini anormal şekilde değişime uğramasıyla mikrotübüllerden ayrılır ve kendi kendine kümeleşerek nöronların içinde "nörofibriler yumaklar" adı verilen yapılar oluşturmaktadırlar. Bu nörofibriler yumaklar, nöronların işlevini bozar ve zamanla ölümüne neden olmaktadır. Bu kapsamda tau proteini ve öğrenme ve hafıza süreçlerindeki fizyolojik rolünün ile Tau proteini fizyolojisinin incelenmesi hedeflenmiştir. Ayrıca, bu alanda gerçekleştirilecek araştırmalar ve araştırmacılar için katkı sağlayacağı düşünülmektedir.

Anahtar Kelimeler: Tau proteini, Mikrotübül, Öğrenme, Hafıza, Nöron, Beyin

ABSTRACT

Tau protein is a protein with a molecular weight of 40-70 kDa that binds to microtubules, provides their stability and helps them perform their functions. It is found in large amounts in neurons located in the cerebral cortex and central nervous system, and is found in astrocytes and oligodendrocytes, respectively. When neurons are damaged, neurons secrete Tau protein.

Therefore, examining Tau protein levels provides information about the degree of neuronal damage and its level in serum or cerebrospinal fluid. Although its role in learning and memory processes has not yet been fully elucidated, Tau protein plays an important role in the healthy performance of brain functions by contributing to the communication of neurons and the processing of information through its role in the stability of microtubules. Abnormalities in the structure of tau protein play a role in the etiopathogenesis of learning and memory problems and neurodegenerative diseases such as Alzheimer's. In Alzheimer's disease, which is one of the neurodegenerative diseases, brain functions are damaged and killed as a result of an abnormal protein accumulation (amyloid and tau protein) in the brain, and individuals with the disease have difficulty learning new information, recalling old memories and performing daily activities. In Alzheimer's disease, tau protein undergoes abnormal changes and separates from microtubules and self-clusters to form structures called "neurofibrillar tangles" inside neurons. These neurofibrillary tangles disrupt the function of neurons and cause their death over time. In this context, it is aimed to examine tau protein and its physiological role in learning and memory processes and tau protein physiology. In addition, it is thought to contribute to research and researchers in this field.

Keywords: Tau protein, Microtubule, Learning, Memory, Neuron, Brain

1.GİRİŞ

Nöronlar, iki tip sitoplazmik uzantı, aksonlar ve dendritler geliştiren çok karmaşık bir morfolojiye sahip hücrelerdir. Bir nöronun morfolojik farklılaşmasının, hücrenin şeklini korumaktan sorumlu olan sitoskeletonun kapsamlı bir şekilde yeniden düzenlenmektedir. Sitoskeleton, mikrotübüller, mikrofilamentler ve ara filamentler üç ana bileşenden oluşmaktadır. Mikrotübüller çok dinamik yapılardır ve nöroblastlar gibi çoğalan hücrelerde, bir araya gelme olasılıkları her yönde depolimerizasyon olasılığıyla aynıdır (Mitchison ve Kirschner, 1988; Murrell ve ark., 1999). Bir nöroblastın bir nörona farklılaşması sırasında, mikrotübüller belirli yönlerde stabilize olur ve böylece akson ve dendritler olacak sitoplazmik uzantılar oluşmaktadır (Craig ve Banker, 1994).

Mikrotübül ilişkili proteinler (MAP'ler), mikrotübüller beyin homojenatlarından re-po-limerize edildiğinde tübülünle birlikte saflaştırılan heterojen bir molekül grubudur. Çeşitli veriler, bunların aksonlar ve dendritlerdeki mikrotübüllerin stabilitesini düzenlemede, nöronal şekli belirleme ile nöronal süreçlerde sertlik ve esneklik arasındaki dengeyi düzenlemede rol oynamaktadır. Spesifik proteinlerin mikrotübülleri ve mikrotübül ilişkili proteinler (veya MAP'ler) MAP1A, MAP1B, MAP2 ve Tau gibi proteinler ile stabilize edilebildiği bildirilmektedir (Matus, 1988). MAP'lerin asimetric dağılımı görülür ve tau tercihen aksonlarda yerleşmiştir (Binder ve ark., 1985). Bir nöronun aksonunda bulunmasının yanı sıra, tau işlevi ve işlev bozukluğu, hem tek başına hem de diğer MAP'lerle sinerji içinde aksonel mikrotübül işleviyle ilişkilendirilmektedir (Matus ve 1988).

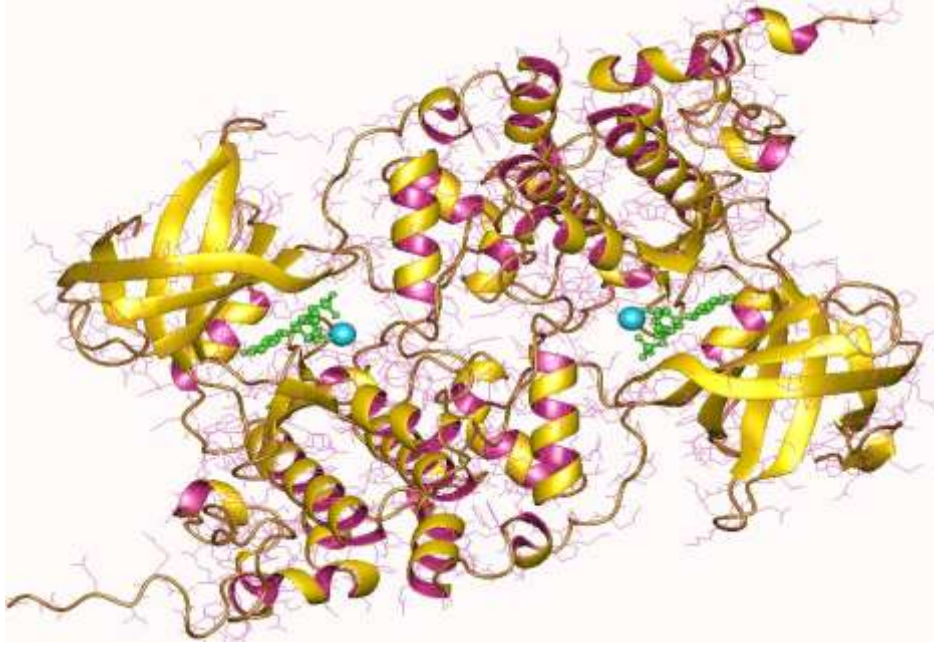
2. TAU PROTEİNİ VE ÖĞRENME VE HAFIZA SÜREÇLERİNDEKİ FİZYOLOJİK ROLÜNÜN İNCELENMESİ

Tau proteini, esas olarak nöronlarda bulunan, mikrotübül birleşimine yardımcı olarak sitoskeletal ağının sürdürülmesi için önemli olan mikrotübülle ilişkili bir proteindir. Akson hasarıyla ilişkili çeşitli merkezi sinir sistemi bozukluklarında önemli bir biyobelirteç olarak kabul edilmektedir (Avila ve ark., 2004). Sinir hücrelerinde tau normalde aksonlarda bulunur, ancak tauopatilerde hücre gövdesine ve dendritlere yeniden dağıtılmaktadır. Normal yetişkin

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

insan beyninde, alternatif mRNA eklemesiyle tek bir genden üretilen altı Tau izoformu bulunmaktadır (Goedert ve ark., 1989).

Tau proteini, mikrotübül yüzeyinden çıkıntı yapan bir amino-terminal alan ve karboksi-terminal mikrotübül bağlanma alanı olmak üzere alt bölümlere ayrılabilir (Şekil 1). Taksolle stabilize edilmiş mikrotübüllere bağlandığında, Tau'nun mikrotübül protofilamentlerinin dış sirtları boyunca yerleştiği bulunmaktadır (Al-Bassam ve ark., 2002).



Şekil 1. Tau proteini boyutlu molekül yapısının görünümü (PDB, 2025).

Tau, 17. kromozomda bulunmakla birlikte 100 kb'den fazla yer kaplar ve en az 16 ekzon içerimekle birlikte GC açısından zengin bir 5'-bölgesini takiben, tek bir çevrilmemiş ekzon bulunmaktadır (Neve ve ark., 1986). Tau, taksol yokluğunda mikrotübüllere bağlandığında, mikrotübülün iç yüzeyine, β -tubulin üzerindeki taksol bağlanma bölgesine yakın bir yere bağlanmaktadır (Kar ve ark., 2023). Taksol, α -tubulinin sekiz amino asitlik korunmuş ekstra bir halkasının olduğu β -tubulin üzerindeki bir bölgeye bağlanır. İlginç bir şekilde, bu genişletilmiş halkanın tau tekrarlarıyla önemli bir dizi homologisi bulunmaktadır (Goedert ve ark., 2004).

Tau, memeli beynindeki nöronal aktivite için önemli bir proteindir (Li ve ark., 2007). Tau proteini yapısındaki sorunlar, gelişimsel eksikliklere yol açarken (Sennvik ve ark., 2007), Tau eklenmesindeki değişiklikler (Conrad ve ark., 2007) nörodejenerasyon ve bilişsel eksikliklere yol açar (Ramsden ve ark., 2005) anormal yapıda ve kümelenmiş Tau protein birikimiyle ilişkili olduğu bildirilmektedir (Berger ve ark., 2007).

Tau proteini, Alzheimer hastalığı, ilerleyici supranükleer palsi, kortikobazal dejenerasyon, Pick hastalığı, kromozom 17 ile bağlantılı kalıtsal frontotemporal demans ve parkinsonizm hastalıklarının etiyopatogenezinde rolü bulunmaktadır (Goedert, 2004). Alzheimer hastalığı en yaygın nörodejeneratif hastalıktır (St George-Hyslop ve ark., 2001). Nöropatolojik olarak, β -amiloid peptidinden oluşan bol miktarda ekstraselüler nöritik plak ve mikrotübül ilişkili protein Tau'dan oluşan intranöronal nörofibriler lezyonların bulunması ile karakterize bir hastalıktır (Lee ve ark., 2001).

Tau proteini, beyin işlevlerindeki rolü, özellikle biliş, öğrenme ve hafızanın altında yatan işlevleri daha iyi anlamak önemlidir. Tau öğrenme ve hafızanın altında yatan normal nöronal işlevler için önemli işlevi bulunmaktadır (Biundo ve ark., 2018). $Mapt^{-/-}$ fareler, hafızanın altında yattığı düşünülen uzun vadeli bir sinaptik esneklik mekanizması olan bozulmuş uzun vadeli potansiyasyon bozulmuş sinaptik fonksiyon sergilerlemektedir (Regan ve ark., 2015). Sinaptik bağlantıları güçlendiren ve öğrenme ve hafızanın altında yattığı düşünülen Tau'nun long-term potentiation (LTP)'deki rolü belirsizdir. $Mapt^{+/-}$ ve $Mapt^{-/-}$ arasındaki hafıza eksikliklerindeki belirgin fark, Tau seviyelerinin azaltarak toksik Tau formlarını azaltmayı amaçlayan terapötik yaklaşımların, aşırı Tau seviyelerindeki azalmanın istenmeyen sonuçları olmadan faydalı etkilerin ortaya çıkabileceği değerli bir terapötik faydaya sahip olabileceği bildirilmektedir (Biundo ve ark., 2017).

Asetillenmiş tau, mitokondriyal homeostaziye bozarak öğrenme ve hafıza bozukluğunu şiddetlendirmektedir (Liu ve ark., 2023). Liu ve ark., (2023) araştırmalarında K274/K281'de asetillenmiş tau'nun (TauKQ), vahşi tip ve asetillenmemiş tau'dan daha şiddetli nörotoksisiteye sahip olduğunu, mitokondriyal biyogenezi azaltarak ve mitokondriyal dinamik dengeyi bozarak mitokondriyal disfonksiyona neden oldu ve böylece bilişsel eksikliklere yol açtığını belirlemiştir.

3.SONUÇ

Tau, mikrotübülleri stabilize eden ve patolojik durumlarda kendi kendine kümelenen bir mikrotübül ilişkili proteindir. Son yıllarda hücre dışı çözümler tau oligomerleri, hafıza kaybı ve sinaptik işlev bozukluğunun olası bir nedeni olarak kabul edilmektedir.

Sonuç olarak Tau proteini, beyin sağlığı ve özellikle öğrenme ile hafıza süreçleri için kritik bir öneme sahiptir. Tau proteinindeki anormallikler, birçok nörodejeneratif hastalığın temel etyopatogenezinde rolü bulunmasının yanı sıra terapötik etkiye sahip olması nedeniyle fizyolojik mekanizmaların aydınlatılması yönünde daha fazla sayıda ve kapsamlı araştırmalara ihtiyaç duyulmaktadır.

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INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

IMMERSION IN COLD WATER ON EPIPHANY: MEANINGS

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ABSTRACT

The purpose of this paper is to present traditions and rituals on the Boboteaza holiday in Romania, which can be translated as Epiphany, and their connection with pagan and other cultures' similar traditions. While there is a religious core to the holiday, under the form of commemorating Jesus' baptism in the Jordan River, there are other rituals and practices on this occasion which can remind of fairy-tales, at first sight. As an example, we can mention how the priest throws a wooden cross in the cold waters of a river in the village, since it is the beginning of January, and how brave young men dive to get it back. The ritual of immersing oneself in water and diving to get back the cross is rooted both in Christian and in pre-Christian or pagan rituals. Faith, courage and devotion are involved in going after the cross, as it symbolizes following the footsteps of Christ, who can be viewed as a fairy-tale hero based on Campbell's theory of the hero's journey. Water is a symbol of spiritual cleansing and renewal, and rituals involving water were also present in pre-Christian Europe in honouring deities and looking for blessings for a good, prosperous new year. Pagan festivals in midwinter included such acts of purification, where the immersion in cold water means overcoming hardships and death, and moving on with nature towards rebirth. Immersion and blessings of water can be found on Epiphany in Greece, Russia, and Bulgaria. Similar water immersion rituals for renewal can be found in India and Thailand, independent from Epiphany. Cultural analysis is the methodological framework.

Keywords: Symbol, Christian, Pagan, Renewal

INTRODUCTION

The Boboteaza holiday in Romania is celebrated on January 6. From a religious point of view, it marks the moment when Jesus Christ was baptized by John the Baptist in the Jordan River. It is one of the most significant holidays for Christians in this country, marking a major moment in their faith and in the year from a religious point of view.

It is well-known that Christian rituals and practices include or intersect with pagan ones, or have taken over pre-Christian elements (Repiciuc, 2011). In this way, we can claim that such a moment marked by the Christian Boboteaza holiday is a universal one, and one having with timeless issues in the life of mankind and in the cycle of the seasons.

Baciu (2012) devises the culture identity manifestations grid, which includes symbols, values, rituals, traditions, practices and personalities. The rituals and traditions dimension of the Epiphany or Boboteaza holiday can be considered as part of the world cultures' heritage, based on the immersion in cold water which means, universally, purification. The start of a new year should be a fresh start, and what better illustration of a fresh start could be given than the one related to the immersion in a literally fresh, cold water? The renewal of the year is a clear one, clearly and literally illustrated. The very process of baptism in Christian religion, related to a child, reenacts this story. The child begins it all afresh, and the child is also a symbolic renewal and fresh start for all adults in the family. The moment of rebirth or renewal can be tied to the new beginning of a new year. Nature's cycle is going on its course, and restarting. In the middle of winter, there is always the hope for nature to be reborn during spring. In this way, this ritual of going into cold water during winter time could be regarded as a symbol of hope, of purification,

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

of waiting for a new beginning. The purification can be considered to take place both physically and psychologically.

Rituals and practices, as well as traditions, can be approached from a variety of points of view, including anthropological, cultural, religious, and psychological.

What can we say about the rituals, traditions and practices taking place of Boboteaza, or Epiphany Day? Epiphany suggests a moment of enlightenment, or revelation. What revelation could we speak about during the rituals, traditions and practices on the Romanian holiday of Boboteaza?

MATERIALS AND METHODS

The main practice during the Romanian holiday of Boboteaza is the one of immersing oneself in cold water. In a village, traditionally, the young men who considered themselves fit and brave enough would dive in cold waters to bring back to the shore the cross thrown into the waters by the priests. This practice showed that the young men trusted and were protected by God well enough to be well after diving in cold waters to bring back the cross. According to the tradition, they were considered to have been protected by God to bring back the cross safely, and also to reenact the moments Jesus Christ went through. The young men go through the same process of baptism Jesus went through, and they can be considered the protectors of the village, as they are fit enough to be reliable for the community. They suggest that they can very well protect the community, since life in the village relied on this. There was a collectivist mindset (Brewer & Venaik, 2011) in the traditional villages, where each and every individual was supposed to know each other and to help each other. This was what made survival possible.

We can see something magic, or fairy-tale-like, in the ritual of having young men dive to get the wooden cross from the cold waters. It is an act of courage and of magic, since, in spite of the cold, they come back unharmed and healthy. It is an extreme act, and one which may be considered completely unrealistic, and related to the domain of the fantastic or of magic. Religious faith has, in this sense, connections to the realm of fairy-tales. Miracles can be considered similar to magic and to fairy-tales.

The young men diving after the wooden cross can be considered to bring protection to the community, since this is the symbolism of the cross. They can be considered to be heroes, going on the journey that Jesus Christ has gone. Their path can be considered along the lines of the hero's journey according to Campbell (2003), since the young men of the village receive a call to adventure, as the cross is thrown into the water. However, the call needs to be accepted right away, as there is no time to go through the stage of refusal of the call, or at least not for a too long time, as Campbell's (2003) journey of the hero stages can go. If we are able to analyse this tradition and this religious story based on the pattern set out by Campbell (2003), it means it can be considered within the context of universal myths.

Another practice adding a touch of fairy-tale references is that of using basil to place under the pillow by young girls to dream about their future husbands. This is another instance of magic brought into the religious ritual of Epiphany. Such prophetic dreams can be considered miraculous, and the ability of dreams to predict the future can be considered alongside the idea that life has a meaning, that it has a beginning, middle and end, and also that there are stages in life through which each and every individual should go on. The one regarding wondering who we are going to marry, or who has been destined to be the love of our life is part of the maturing stage, when children grow into adults and are expected to start forming their own families. The one that they choose to marry is the one that is expected to be next to them throughout their lives, and to go on through good and worse times.

Getting purified, starting anew, combines very well with finding love and starting anew by going on through a new stage in life, or going from one age to another. Moving on from one stage or age to another in life has to do with a new beginning in itself.

We can also consider that getting into a fresh stage in life, or starting anew, should be a natural process, since we are always in a process of change. We cannot remain the same, yet change is visible once we look in retrospect at who we used to be. The cleansing, or purifying ritual of immersing into cold waters can be regarded as a way to accept change as both natural and as an act of courage. The process of

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

change can also be considered as being encouraged by the community, as the young men who are brave enough dive into cold waters to get the cross and bring it back. This can be considered as one of the hero's trials, which he goes through with no helpers. In fairy-tales, there are various characters that are called helpers along the way, who support and do some of the work for the hero. They are there to help encourage the hero to continue by using his own forces and to become independent, in the same way in which in our real life we receive education, help and emotional support from parents and other figures of authority. In the end, it does matter a lot how we help each other, and as we have mentioned previously, in the village, help among villages was a means of survival and one of the main aspects in a community based on a collectivist mindset.

The waters are blessed by the priests during Boboteaza or Epiphany Day, a ritual which can be considered to be the equivalent of receiving approval and support from someone that is an important figure in our lives. The priests are both figures of authority and figures offering emotional support and comfort. They offer a sense of security to those who are faithful, and they are also figures that ensure a certain sense of order. They may be the ones offering encouragement to the young men diving after the cross, making the young men think that it is safe to go after the cross, since the priests are protective figures and have blessed the cross and the waters.

This ritual becomes a larger symbol of the power of religious faith. Once someone is faithful, he or she believes that nothing can happen to them. It is all a matter of trust, the same way in which a young child trusts his parents and believes that they are all powerful (Granqvist & Kirkpatrick, 2013). They feel very safe with their parents, and they believe that, once they say they can do something, then nothing can happen to them and that it is perfectly all right.

With the immersion in cold water, any sense of risk is disregarded, once the religious ritual claims that this is the way young men should behave, that they should bravely dive in and that nothing bad will happen to them.

While such a belief seems magical, childish, and unrealistic, it is symbolic of the power given by faith. In psychoanalytic terms, the transference is very powerful, since the priests are invested to a high sense of power and are seen as providers of security and order.

The cultural studies (Jameson, 2014) and psychoanalysis based interpretation of this ritual goes hand in hand with the presence of water being considered to stand for spiritual cleansing, as well as renewal, in rituals that took place in the Europe before the arrival of Christianity, when deities were honoured and when blessings were sought in view of a very good, and prosperous new year. In midwinter, acts of purification were present withing Pagan festivals. In these festivals, the cold water immersion representing getting over hardships in life and overcoming death, while human beings would go on a process of rebirth in line with the course and rhythm of nature.

The immersion in cold water, together with the effects of blessing coming as a result can be noticed in rituals, traditions, and practices in various countries, not just Romania. On Epiphany Day, these rituals, traditions and practices can be found in countries such as Greece, Russia, and Bulgaria. Independently from Epiphany, similar rituals including immersion in cold water in view of renewal can be noticed in countries such as India and Thailand. Water becomes, thus, a symbol and element which has universal meaning across cultures and across religious traditions. It is, therefore, not tied to Christian religion.

The analysis carried out by Repciuc (2011) of the rituals, traditions and practices of Epiphane relies

[...] on the name of the processions made by the priest in villagers' homes in order to proclaim the Christian feast of the Baptism of Jesus, namely Chiraleisa. Greek liturgical formula Kyrie eleison generated in Romanian language the term Chiraleisa, occurred primarily in northern Romanian rural world. In these regions, celebrating Chiraleisa is synonymous to the priest walking with the cross or with the Jordan appears to be a type of singing Christian carols, that copies and duplicates laic carols. In the oldest attested variants in Romanian ethnographic literature, the role of the priest announced by children who cries Chiraleisa, seems to have variants that indicate a function for removing demons, through the sound of bells and movements of encircling the domestic space. Indicating a link with ancient animist water rites,

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

there are investigated the meanings of liturgical term as procession to invoke the rain and as a name of a water demon.

This analysis by Repciuc (2011) shows the many interrelated traditions of immersion in water, and involving water as a benefic, cleansing, and protective elements. It can also remind, in this sense, based on its magic and miraculous properties, of the magic water found in fairy-tales, and which is called, in Romanian fairy-tales, living water (or apa vie). Next to living water there is also dead water (apa moarta), and they work together in bringing back to life the dead hero. The similarities with the Resurrection of Jesus Christ are very clear. In addition, the dying and then reviving of the hero, using water, reminds of the process of renewal and change that the young men go through when going after the cross in cold waters. The cold waters suggest not just danger, but also death, since death means that the body of the living person becomes cold. In addition, the diving into water suggests going into another realm, from which the young men return. It is as if they go through a journey beyond, coming back psychologically refreshed. The physical, concrete form of the diving, or the adventure of the hero, is in strong connection with the psychological change. Change occurs, therefore, at both physical and spiritual level, a process with which we are familiar when children grow up physically and mature emotionally. It mirrors, therefore, the natural process of birth, when we change naturally. The process of diving into cold water after the wooden cross suggests a certain purpose, or meaning, mirroring the meaning of life. The young men have a specific goal, that of getting the cross and bringing it back to the community. In the meantime, their adventure is watched publicly by the members of the community, and also approved. The diving into cold waters after the cross can be regarded as a coming of age ritual, which is present in all societies, pre-Christian and pagan ones included.

The baptism of Christ in itself can be considered a coming of age ritual, where the change from one life stage to another is accepted by the community, and ensures that the person going through this ritual becomes a part of the community, once he adheres to its norms, rituals, traditions, practices, and values. It is a time when the person going through the coming of age ritual proves that he has internalized the values and principles of the community he is part of and can now be a responsible member of this community.

Chiraleisa is related to the priests' going to sanctify water in the Christians' homes (Repciuc, 2011). In addition, in churches Christians can take home sanctified water. This water is invested with magic, or miraculous, curing properties, once again reminding of the water in fairy-tales with these properties.

Immersing oneself in water on Epiphany Day seems to take this belief to an extreme, literally making those diving after the cross change. They change by showing how brave they can be and by resorting to action. While the practice can be considered a symbolic one, being literally acted can suggest even more power to it and definitely a higher impact. It is well-known that we retain the largest amount of information by visual means, which explains why there is such a large impact in a visual practice like young men in the village diving in cold waters to get back the wooden cross thrown by the priests. This scene can be considered one from fairy-tales, where such scenes can be considered symbolic. However, since villagers are very much used to growing up and telling and also listening to fairy-tales all their lives, at least based on the image we have formed of them from the storytellers in the fairy-tales themselves, we expect such practices to have a high impact on them. Likely, they can also reflect or have, in the past, long reflected on such rituals. In the past, seasons had a high impact on the lives of human beings, since in villages they lived in small communities and depended on each other for survival and on the cycles of nature. The weather also allowed them to grow crops and to have them. They could also lose their crops and resources if the weather conditions were not favourable. Since life during old times depended so much on the natural cycle, and also on the weather conditions, people could only hope for the best, since there were many events beyond their control. This can explain the strong presence of magic rituals and of various traditions including them. Good and evil fight in fairy-tales, as much as these two forces fight within rituals, traditions, and practices, both pagan and Christian. We can see this in the ritual described by Repciuc (2011) during Boboteaza or Epiphany Day. Water becomes a means of protection against evil and it also ensures cleansing, spiritual renewal and a sense of personal rebirth.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

We cannot easily delimit fantasy from reality, since they are both part of our lives, as much as we cannot easily delimit pagan and Christian rituals, traditions, and practices. After all, pagan and Christian rituals and beliefs both rely on a sense of fantasy and magic, suggesting hope in what can go on in our lives for the best. This is natural in order to feel confident and think positively so that we can go through the course of life. Optimism helps us to function, and we can consider that it is present to a large extent in the ritual of immersion into cold water to get back the wooden cross.

RESULTS

The analysis of the Romanian Epiphany Day (Boboteaza) rituals, traditions, and practices has revealed significant insights into their religious, cultural, and psychological dimensions. The following results can be mentioned regarding the immersion into cold water to get the wooden cross:

1. The practice has **religious and spiritual significance, as it** is a reenactment of Christ's baptism in the Jordan River and it represents a profound act of faith. The belief that participants are protected by divine power reinforces the connection between religious rituals and personal spirituality.
- 2.. The practice has **cultural and anthropological aspects**. It represents a collectivist mindset specific to villages. The young men participating in the ritual symbolize strength, bravery, and responsibility for their community's well-being.
3. **The practice involves symbolism of water, related to renewal**. The cold water immersion represents the overcoming of hardships, personal purification, and the anticipation of new beginnings. This interpretation connects Boboteaza practices to pre-Christian traditions and other water-related rituals, emphasizing a shared understanding of renewal and transformation.
4. The practice has been considered based on **psychological and mythological interpretations**. From a psychoanalytic perspective, the ritual reflects desires for security, guidance, and transformation. The role of the priest as a figure of authority offering reassurance is similar to the parental role in child development. Additionally, the association of Boboteaza rituals with fairy-tale motifs, such as magical water and the hero's trials, suggests a strong connection between religious belief and mythological structures and their role in shaping human perception and behavior.
5. **The practice shows the continuity of pagan and Christian traditions**. We notice the coexistence of Christian and pre-Christian elements in Boboteaza. Practices such as using basil under pillows for prophetic dreams and invoking divine protection through ritualistic chanting (Chiraleisa) demonstrate the blending of older animistic and magical traditions with Christian beliefs. This fusion highlights the adaptive nature of religious practices, where older customs are preserved within new theological frameworks.

DISCUSSION AND CONCLUSIONS

The practice analysed in this paper shows an example of social, community cohesion. The collective nature of the Boboteaza celebration reinforces communal bonds. The public witnessing of the cross retrieval ritual and the ritual of blessed water emphasize unity. This suggests that beyond personal faith, the rituals serve as a means of strengthening communal ties and preserving cultural heritage.

The Romanian Boboteaza, while considered at present part of Christian belief, functions as a ritual including elements of mythology, social cohesion, psychological transformation, and cultural continuity. The symbolic power of water, the courage of the young men, and the integration of magical traditions are all part of Epiphany Day and reflect values and principles, not just traditions, rituals, and practices.

Culture and everyday life practices are not removed from our psychological features and sense of security.

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INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

APPLICATIONS OF ARTIFICIAL INTELLIGENCE IN GEOTECHNICAL ENGINEERING PROBLEMS: A CASE STUDY OF EXCAVATION SUPPORT SYSTEM EVALUATION BASED ON PYTHON PROGRAM

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ABSTRACT

In urban centers, the population density is increasing, and every piece of land continues to be viewed as a potential construction site. This circumstance adds complexity and importance to already difficult soil issues. Nowadays, understanding ground problems is not only about the safety of the structure to be built on that ground but also about the safety of the surrounding structures. The protection of life and property in this context is undoubtedly linked to the national income of countries in a positive way. By better understanding and predicting the variable nature of soil behavior, we can construct safer buildings. In order to create innovative methods, we now see the application of artificial intelligence technology beyond conventional techniques for predicting soil behavior. In geotechnical engineering, we encounter the use of artificial intelligence-machine learning (AI-ML) methods in various areas such as soil liquefaction, foundation system designs, and slope stability problems. As seen within the study; new solution-oriented approaches are being developed with AI-ML in various fields of geotechnics. This paper presents a literature review of these innovative approaches. Additionally, this study examines the use of machine learning algorithms based on Python programming to predict possible displacements of excavation support systems, which directly affect the stability of the building foundation pit. It has been found that machine learning can provide the most accurate results in a short time for foundation pit safety data. Accordingly, cases obtained from 126 site data were trained with artificial neural networks and linear regression models. Among the models created, artificial neural networks provided the closest result to the real displacement in excavation support systems with a prediction accuracy of 86.75%. As supported by other research, the close match between ML predictions and previously observed displacements indicates that ML can effectively understand the complex behavior of soils.

Keywords: Artificial Intelligence (AI), Machine Learning (ML), Data Processing, Linear Regression, Excavation Support Systems, Geotechnical Engineering.

1. INTRODUCTION

As society's requirements have changed throughout time and as industry has advanced, more people are moving from rural to urban areas, which has changed land use and transformed cities. The fact that almost any kind of land may now be assessed as a possible construction site has been highlighted by the growth of construction activities toward city centers as well as developments in civil engineering and other engineering fields. This, in turn, highlights the growing importance of addressing soil mechanics and geotechnical engineering challenges. In this regard, Engineers and scientists are forced by technological improvements to create innovative solutions and fresh strategies to address emerging problems. For this reason, software packages are widely used in solving geotechnical engineering problems today. But with the development of artificial intelligence technology, knowing how to program has become just as important as being able to use such software. Compared to software packages, solutions developed through programming languages appear to offer greater flexibility in addressing complex engineering challenges. Today, applications of Python, considered the trendsetting language

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

of the digital age, are widely used in various engineering disciplines, including civil engineering, computer engineering, and mechanical engineering (Korkmaz, 2020).

As a result, it may be claimed that the range of applications for artificial intelligence models created using computer languages is growing. In the foreword of his 2019 book "Artificial Intelligence," which was published by Harvard Business Review Press, Thomas H. Davenport calls AI "the most significant general-purpose technology of our civilization." The development of contemporary, effective, economical, and dependable geotechnical designs is also made possible by the efficient application of software and artificial intelligence technologies in geotechnical engineering, as in many other scientific fields. Additionally, by enabling quick decisions on the spot, these technologies adjust to the changing and dynamic surroundings.

For these reasons, within the scope of this study;

- A compilation and examination of various artificial intelligence methods applied in geotechnical engineering were conducted as a literature review,
- The prediction of potential horizontal displacement parameters in excavation support systems was performed using artificial intelligence tools,
- During the prediction process, both linear algorithmic models and non-linear artificial neural network (ANN) models were discussed within the Python programming environment.

2. ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING IN GEOTECHNICAL ENGINEERING

The concept of artificial intelligence dates back to the 1950s. In his 1950 paper "Computing Machinery and Intelligence", Turing addressed the question, "Can machines think?" and opened the discussion on whether machines could emulate human-like intelligence. The term "Artificial Intelligence" (AI), as a recognized scientific discipline, emerged at the 1956 Dartmouth Conference organized by Marvin Minsky, John McCarthy, Claude Shannon, and Nathan Rochester. A year later, following the introduction of the perceptron, American computer scientist Arthur Samuel coined the term "machine learning". On the other hand, deep learning was first conceptualized in 1965 when Ukrainian mathematician Alexey Grigorevich Ivakhnenko ve V.G. Lapa stacked several perceptrons, inspired by the neural networks (NNs) of the human brain, resembling modern deep learning architectures.

In the 1980s, DE Rumelhart et al. introduced "backpropagation," a mechanism for self-optimizing artificial neural networks without human intervention. This advancement enabled the adjustment of weights in neural network nodes across multiple layers. In 1989, Yann LeCun et al. presented the Convolutional Neural Network (CNN) for image recognition. In 1991, Sepp Hochreiter introduced the Recurrent Neural Network (RNN) for sequential tasks. In 1992, Bernhard E. Boser, Isabelle M. Guyon, and Vladimir N. Vapnik developed Support Vector Machines (SVMs), facilitating natural language processing by improving sensitivity and understanding in speech classification. By 1997, Hochreiter and Jürgen Schmidhuber introduced Long Short-Term Memory (LSTM) for enhanced speech-to-text translation. In 2006, Hinton pre-trained a network using the Deep Belief Network before applying backpropagation and coined the term "deep learning" (Ergen, 2019). As described in Artificial Intelligence by Brynjolfson and McAfee (2019), Harvard Business Review Press defines machine learning as the ability of machines to independently perform tasks and improve their performance over time without human assistance. Tolon (2007) likened the function of AI to human decision-making based on inferences drawn from personal or others' experiences. Just as humans synthesize information from lived, observed, read, or listened-to experiences to make decisions, AI systems also make decisions by processing and analyzing data. Today, the benefits and drawbacks of AI are widely debated. Thomas H. Davenport (2019) described AI as "the most significant general-purpose technology of our civilization" in the Introduction to Artificial Intelligence by Harvard Business Review Press.

The integration of AI technology into engineering, which began with the emergence of expert systems in the late 20th century, has evolved significantly since the 1950s. Positive technological advancements and the increasing diversity of algorithms have enhanced AI capabilities. These advancements have led

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

to the adoption of neural networks and deep learning models in geotechnical engineering for tasks such as soil classification and stability analysis (Yaghoubi, Elaheh, et al, 2024).

2.1. THE USE OF DEEP LEARNING MODELS IN GEOTECHNICS

The development of technologies that can carry out activities that call for human intelligence is commonly referred to as artificial intelligence (AI). A branch of artificial intelligence called machine learning (ML) is concerned with creating algorithms that let computers learn from data and forecast future events. Traditional approaches have been transformed by the incorporation of AI and ML into engineering fields, especially geotechnical engineering, which now provides more precise and effective solutions. On the other hand, machine learning is used in many data science fields, including trend prediction, dominating parameter identification, image processing and classification for cancer cell diagnosis, and alerting people to dangers like fall hazards on building sites. AI models function as efficient helpers and speed up decision-making in certain situations. Multilayer neural networks are used in deep learning to analyze geotechnical data. Through the extraction of intricate patterns from huge datasets, this method enables more precise predictions. For example, using multidimensional data to represent ground conditions helps to lower design process uncertainty (Ahi and Canpolat., 2021). An analysis of the use of DL algorithms in the geotechnical domain was carried out by Zhang et al. in 2021. The review came to the conclusion that DL algorithms have become increasingly popular in the geotechnical engineering literature. Table 1 shows how deep learning has evolved historically in geotechnical engineering from the 1990s to the present.

Another application is deep learning for geotechnical data processing. Preprocessing and data cleaning are essential steps for these models to succeed. In geotechnical engineering, procedures include identifying outliers and completing missing data enhance data quality and guarantee the precision of analysis findings (Yildiz, 2019). Geotechnical data collection is the first step in the data processing cycle. After being gathered, the data is put into a software application for processing. The data is initially unprocessed. Because raw data can have gaps, inconsistencies, outlier characteristics, and other problems, the results obtained from it are frequently inaccurate. Furthermore, raw data may contain unintended observations. Raw data must be refined for these reasons. Unwanted observations are eliminated, useful values are added to dataset gaps, outlier analysis is carried out, and data manipulation is done in accordance with the analysis's findings. The dataset is deemed prepared for machine learning following these data changes. Analyzing and visualizing the data is required right before the learning process. Choosing the right algorithm to employ is one of the most important choices based on these analysis and visualizations. Python and other technologies are also used to control this procedure.

Table 1 The History of Deep Learning in Geotechnical Engineering

Type of Deep Learning	Initial Study Year	Topics	Contribution to the Literature
Artificial Neural Networks (ANN)	1990s	Predictive Modeling, Classification, Pattern Recognition	Introduced ANN applications for geotechnical data analysis, improving predictive accuracy.
Convolutional Neural Networks (CNN)	2010s	Image Recognition, Remote Sensing	Advanced the use of CNNs for interpreting geotechnical images and remote sensing data.
Recurrent Neural Networks (RNN)	2000s	Time-Series Forecasting, Geotechnical Monitoring	Improved predictions for time-dependent geotechnical phenomena, such as ground settlement.
Deep Reinforcement Learning (DRL)	2010s	Optimization, Automation of Geotechnical Design	Pioneered the use of DRL in optimizing geotechnical designs and construction processes.
Generative Adversarial Networks (GAN)	2010s	Data Augmentation, Synthetic Data Generation	Introduced GANs to generate synthetic geotechnical data, helping to overcome data scarcity.

Dave (2023) recently published an exemplary study in which he described critical procedures for making geotechnical datasets ready for deep learning modeling. The literature is often referred to as follows and

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

the study is based on the Python program. The software used, Python, is now one of the most popular programming languages for geotechnical AI applications in both corporate and academic sectors (Dong et al., 2018). It has become quite prominent in civil engineering in recent years. This study used Python and related libraries such as Pandas and NumPy for data processing, Matplotlib and Seaborn for data visualization, and Scikit-learn for machine learning. The importance of Python in civil engineering is increasingly widely recognized. For example, to simulate the relationship between soil moisture and capillary pressure, Memari and Clement (2021) used Python to create an empirical soil-water retention function.

The following is the route used during this geotechnical investigation. First, geotechnical engineers use laboratory tests to assess soil and/or rock quality. Typically, these tests produce significant numbers that indicate the physical properties of the soil. Before training the AI model, the generated data is pre-processed and formatted. This includes quality control, data cleaning, and normalization to improve data accuracy and consistency. Second, real-time data is collected from geological formations and construction sites using geotechnical devices such as piezometers, inclinometers, and slump plates. Ongoing observation provides important information about how the soil behaves in many scenarios. Field measurements, just like laboratory data, are pre-processed, which includes filtering, noise reduction, and synchronization when necessary. Third, remote sensing technology such as drones, LiDAR (Light Detection and Ranging), and satellite photography can be used to collect geographic data. These data sources provide a comprehensive understanding of the environmental and geological conditions. Remote sensing data is pre-processed for AI models using image processing methods such as georeferencing, image registration, and feature extraction. Fourth, it combines various geographic layers such as Geographic Information Systems (GIS) data, topography, land use, geological maps, and hydrological data to produce comprehensive geotechnical datasets. Spatial analysis, interpolation, and data fusion are all part of preprocessing GIS data for AI applications. By combining several geographic features, the combination of AI and GIS increases the accuracy of geotechnical estimates (Mao et al., 2021). Fifth, the process of cleaning the data and ensuring its quality is initiated. Geotechnical datasets often contain human error, missing numbers, and outliers. To ensure dataset reliability, data cleaning requires finding and correcting such errors. Reducing measurement errors in field data requires quality assurance practices, including sensor and instrument calibration. Sixth, it is very important to standardize or normalize the data. This makes it easier to train an AI model. The learning process is greatly affected by the scaling of the data according to the dependent variables. Logarithmic transformations, z-score normalization, and min-max scaling are among the common techniques depending on the needs of AI models and the distribution of the data. Seventh; Data augmentation strategies can be used when there is a lack of data. With these methods, pre-existing samples are artificially added to the data sets by cropping, transposing, freezing, etc., and the amount of data in the data set can be artificially increased by an external intervention. Data augmentation; increases the generalization success of AI models while reducing overfitting. Finally, feature engineering techniques are used to extract valuable information. Feature engineering is the process of selecting, improving, or modifying raw data. Thanks to these methods and stages; It involves creating artificial intelligence models that can understand soil problems in nonlinear relationships, extracting texture elements from soil photographs and/or synthesizing hydrological and geotechnical parameters from remote sensing data.

Python's popularity and versatility in academic and corporate sectors has led to its widespread use as a programming language in geotechnical deep learning applications (Dong et al., 2018). These features have led to the increased use of Python in civil engineering in recent years. In a paper published in 2021, S. Memari and Prabhakar Clement used Python to estimate the empirical link between capillary pressure and soil moisture. After analyzing their findings using three different algorithms—Levenberg-Marquardt, Trust Region Reflective, and Dog Box—they concluded that while all three algorithms performed almost equally, the Trust Region Reflective approach produced the best results. They also noticed that the Levenberg-Marquardt algorithm had trouble maintaining accuracy when noise was added to the datasets. This highlights how important data preprocessing is for the deep learning process.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

In addition, Sáenz et al. (2002) emphasized that Python can be used to perform general data processing tasks in challenging geotechnical fields. Similarly, Tolon (2007) investigated the effect of different parameters on slope stability using artificial neural networks (ANN). Using five separate ANN-based models, he improved the prediction accuracy for engineering projects including terrain analysis to determine the main parameters controlling slope behavior and their relative dominance. Yousefpour et al. (2024) used AI-ML techniques to evaluate soil erosion and deformation, which helps in bridge foundation construction and maintenance. This application demonstrates how field inspections can be optimized using AI and ML, improving the sustainability and safety of civil engineering projects. Ozsagir et al. (2022) aimed to predict soil liquefaction by machine learning methods by analyzing the data obtained from Standard Penetration Tests (SPT) carried out in the Sakarya region and their findings were extremely positive.

2.2. THE USE OF ARTIFICIAL INTELLIGENCE MODELS IN GEOTECHNICS

Concerns about soil stability are fundamental to the sustainability and safety of construction projects for us engineers. Applications of AI in this field include landslide risk assessment and threshold stability prediction. Proactive steps to reduce risks are made possible for us by the ability of machine learning models trained on historical data to predict possible ground failures (Pradhan, 2019). Therefore, geotechnical engineering is interested in studying the behavior of soil materials and using scientific techniques to construct buildings. Applications of AI in this sector have become preferred because they can manage massive data sets and complex, nonlinear challenges. Artificial intelligence (AI) techniques provide creative ways to predict soil behavior, increase design accuracy, and reduce project risks (Yaghoubi, Elaheh, et al, 2024). Table 2 shows how AI has historically evolved in geotechnical engineering from the 1990s to the present.

Table 2 The History of Artificial Intelligence in Geotechnical Engineering

Type of Artificial Intelligence	Initial Study Year	Topics	Contribution to the Literature
Artificial Neural Networks (ANNs)	1994	Estimation of soil properties, bearing capacity analysis, soil stability	Provided high accuracy in modeling complex geotechnical problems.
Fuzzy Logic	1997	Soil classification, risk analysis, decision support systems	Offered flexibility in evaluating geotechnical data with uncertainties.
Genetic Algorithms (GAs)	2000	Optimization problems, foundation design, soil improvement	Accelerated optimization processes in geotechnical engineering.
Support Vector Machines (SVMs)	2005	Modeling soil behavior, liquefaction potential analysis	Delivered high performance with small datasets.
Decision Trees and Random Forests	2010	Landslide risk analysis, soil classification	Enhanced interpretability in data interpretation.
Deep Learning	2015	Big data analysis, image-based soil identification	Demonstrated exceptional performance with large and complex datasets.

Ebid (2021) examined 626 theses and articles from 1984 to May 2019 discussing the use of artificial intelligence (AI) approaches in geotechnical engineering, naturally ignoring unpublished online studies. His research shows that since the initial use of AI in geotechnical engineering, various methods based on logical, statistical and mathematical ideas have been created. It can be concluded that the solution of geotechnical engineering problems has been greatly influenced by the remarkable developments in these methodologies. The survey found that the number of publications on this topic has increased almost exponentially, with Artificial Neural Networks (ANN) and its derivatives accounting for almost half of the most popular AI techniques. In addition, the primary focus of approximately 30% of the research is the correlation of soil and rock properties.

Baghbani et al. (2022) reviewed a total of 1235 academic studies in the literature review and provided us with a comprehensive assessment of the effectiveness of AI techniques and algorithms applied to geotechnical engineering. According to their findings, the main areas where AI techniques are applied are: rock mechanics, subgrade soils and pavements, landslides and soil liquefaction, slope stability,

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

frozen and thermal soil properties, tunnel boring and tunnel boring machines, dams, unsaturated soils and shallow and pile foundations and again according to their findings, 52% of the reviewed studies used Artificial Neural Networks (ANN), making them the most popular and widely used AI technique (Baghbani et al., 2022). Their analysis showed us that the success and accuracy of AI applications depend on the number and type of datasets, as well as the choice of input parameters.

Another study, Sivri (2019), examined the relationships between one or more independent soil factors and dependent variables such as maximum dry unit weight and ideal water content using both simple and multiple linear regression analytical techniques. In this study, the author selected maximum dry unit weight as the dependent variable and used ideal water content, proctor compaction energy and standard modified energies as independent variables. Accordingly, after comparing the prediction findings of the models with the findings of other models presented in the literature, it was concluded that the predictions were close to realistic values, meaningful and reliable enough.

Tizpa et al. (2014) proposed artificial neural network prediction models to show the correlations between compression properties, permeability, shear strength and soil index properties. Within the scope of this research, a database consisting of 580 data sets was created. The results of the created models were compared with the experimental data to develop predictions and a 95% confidence interval was obtained.

Trivedi et al. (2013) wanted to estimate the amount of soil stabilization provided by the addition of fly ash for a particular subgrade soil and on the other hand, to estimate the amount of fly ash required to achieve the California Bearing Ratio (CBR), which is a measure of subgrade soil stabilization. In this context, they created Genetic Algorithm (GA) based models for prediction. According to a series of studies conducted by renowned experts in the industry, it was observed that the highest CBR value that can be achieved by incorporating fly ash in various soil types varies between 15% and 20%. Such geotechnical engineering sub-research topics have been the subject of various studies. The primary ones are listed below with their respective subject headings.

Artificial Intelligence in Problems Affecting Soil Bearing Capacity: Naturally, an important issue in foundation design is the bearing capacity of the soil. Especially, compared to traditional empirical approaches, Artificial Intelligence (AI) models, primarily neural networks, are promising for more accurate bearing capacity estimates. These models evaluate various variables by taking into account site-specific factors (Yaghoubi et al, 2024). In a study conducted by Yousefpour et al. (2024), soil deformation-erosion was evaluated for bridge foundation design and maintenance and geotechnical site characterization was examined using AI and Machine Learning (AI-ML) techniques. In a different study, Goh (1996) examined piles in clayey soils. It is seen as the output of the constructed model, which also takes into account input factors such as friction resistance, pile diameter and length, effective stress and undrained shear resistance. It was determined that the training and test correlation coefficients were reliable with values of 0.99 and 0.96, respectively. On the other hand, the regression analysis of Semple and Ridgen (1986) produced lower correlation coefficients with training and testing of 0.97 and 0.88 respectively. The CAPWAP tool was also used by Teh et al. (1997) to model and predict the static capacity of reinforced concrete piles. In this study, an incredibly low Mean Square Error (MSE) value of 0.0003 was obtained.

Artificial Intelligence in Ground Characterization: The determination of the physical and chemical properties of the soil required for design and construction is referred to in the literature as soil characterization. By categorizing soil types according to different properties, artificial intelligence (AI) techniques such as Principal Component Analysis (PCA) and K-means clustering naturally facilitate the characterization process (Zhau et al., 1994). Similarly, Aydin (2019) used Image Processing (IP) techniques to evaluate grain sizes in granular soils. Images of the samples were taken and conventional techniques such as sieve analysis tests were consulted as a guide. With an accuracy of 95.22%, the results of the IP technique were almost the same as the results of sieve analysis. Ellis et al. (1996) used Artificial Neural Networks (ANN) to model the stress-strain relationship of sands with different grain sizes and stress histories. Eight different sands were subjected to a series of controlled undrained triaxial compression tests, and the neural network was used for both training and testing. It is concluded that a

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

feedback ANN outperforms a conventional feedforward ANN in simulating the soil stress-strain relationship. It can be concluded that a good approach would be to develop a generalized ANN model that takes into account the stress history effects and particle size distribution. Sezer (2008) used Image Processing (IP) techniques to determine the microstructural properties of various soils. He investigated the grain shapes and their relationships with soil index properties. It is also seen that the maximum unit weight and relative density of sands are estimated using fuzzy logic techniques and artificial neural networks.

In a study conducted by Sivrikaya et al. in 2004, two comparable ANN models were developed for undrained shear strength using water content, liquid limit, plasticity index, effective stress, Standard Penetration Test (SPT) and N_{60} parameters. They obtained R^2 values of 0.78 and 0.81, respectively. Onalp and Arel (2011) analyzed soil profiles obtained from Cone Penetration Test (CPT) data at depths of 2 to 7 meters in Adapazarı using artificial neural networks (ANN). It is understood that the ANN model, which was created using a database of 117 CPT data points and 3236 readings collected every 2 cm, achieved a success rate of 92% in predicting soil properties at randomly selected locations. On the other hand, its potential for land characterization was thus demonstrated. In 2006, Kurup and Griffin used a multilayer feedforward General Regression Neural Network (GRNN) algorithm to estimate soil composition (percentages of sand, silt and clay) based on CPT parameters such as cone resistance (q_c), friction ratio (R_f), total overburden pressure (σ_{v0}), effective stress (σ'_{v0}) and equilibrium pore water pressure (u_0). The soil composition profiles estimated by GRNN were generally consistent with the actual grain size distribution profiles. Another point, there is a correlation of 86% in classifying soils as coarse-grained or fine-grained. Urgancı (2025) focused on estimating engineering parameters such as bearing capacity and internal friction angle from SPT-N values. Three different AI algorithms were developed and the performance of AI models was generally positive. However, some models did not give satisfactory results in certain cases. These unsatisfactory results were attributed to the statistical distribution of the data set being incompatible with the tested situation in the discussion section.

Artificial Intelligence in Soil Liquefaction Problems: In Soil Liquefaction Problems, the liquefaction problem is simply expressed in the literature as a situation where the pressure force of water in the soil during dynamic loading causes the water to leak between the soil particles and disrupt the force transfer mechanism between the soil grains. As a result, the liquefaction problem occurs. It is presented in various studies that artificial intelligence is a highly effective approach to estimate this potential. Özsagir et al. (2022) investigated the applicability of seven different machine learning algorithms on a dataset obtained from the Standard Penetration Test (SPT) for Adapazarı soil to address the soil liquefaction problem. In their study, the applicability of these seven machine learning algorithms was tested. They examined different architectures using decision trees, logistic regression, support vector machines, k-nearest neighbors, stochastic gradient descent, random forest and artificial neural networks on a dataset obtained from field tests (SPT) carried out in the Sakarya/Adapazarı region. As a result of this study, the decision tree algorithm showed the best performance on the dataset with 90% overall accuracy. According to the results of the decision tree model, the average particle size of the soil (D_{50}) has the most significant effect on the liquefaction potential, which is presented in the discussion section of the study.

Samui and Sitharam (2011) proposed two different types of machine learning methods, namely Artificial Neural Networks (ANN) and Support Vector Machines (SVM), to predict the liquefaction susceptibility of soils based on SPT data obtained from the 1999 Chi-Chi, Taiwan earthquake. The first machine learning technique in the study used a multilayer perceptron (MLP) based on the Levenberg-Marquardt backpropagation algorithm. The second technique used Support Vector Machine (SVM) based on statistical learning theory using a classification technique. The developed ANN and SVM models were also applied to various case histories available globally. The paper also highlights the capabilities of SVM over ANN models. Baziar et al. (2014) proposed a new prediction model using genetic programming to predict the amount of stress-energy density required to trigger liquefaction in sand-silt mixtures. Based on the study, the model was developed using a relatively large test database (triaxial, torsional and simple shear) collected from previously published studies. The input variables of the model were selected based on the existing understanding from previous studies on liquefaction potential

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

assessment based on strain energy. Two validation data sets were used and the behavior of the model was specifically monitored to avoid overfitting. The findings show that the proposed model is in good agreement with the previously reported experimental observations. It can be seen from the study that as the initial effective top load pressure, relative density and average particle size increase, the strain energy required to initiate liquefaction also increases with the developed model.

Artificial Intelligence in Soil Settlement: As in other complex issues in geotechnical engineering, the prediction of shallow foundation subsidence is highly affected by uncertainty in engineering judgment. For this reason, a group of researchers investigated the use of Artificial Neural Networks (ANN) for subsidence prediction to overcome this. A similar study was conducted by Shahin et al. (2000) in an effort to predict the subsidence of shallow foundations in cohesionless soils. 272 data records were used for modeling in their study. Soil compressibility, pressure applied to the foundation, foundation width and foundation length were taken as the input variables that were thought to have the greatest effect on the subsidence prediction. Then, the results of the ANN model were compared with the three most commonly used traditional approaches: Schmertmann et al. (1978), Schultze and Sherif (1973) and Meyerhof (1965). According to the findings in the study, artificial neural networks outperformed traditional techniques and it was concluded that they provide a viable strategy for predicting the subsidence problem of shallow foundations in cohesionless soils. For similar purposes, Artificial Neural Networks were also used by Sivakugan et al. (1998). They conducted a study to predict the collapse of shallow foundations in coarse grained granular soils. The findings in the discussion section can be considered promising. Since the five input parameters used are applied net pressure, average SPTN, foundation width, foundation shape and foundation depth. To create the dataset, 79 collapse records were collected from the literature; 69 of the records were used to train the neural network while the remaining 10 were used for testing. The results of the two traditional approaches were compared with the projections.

Artificial neural networks were proposed in their study by Alkroosh and Nikraz (2011) as an alternative to predict the load-collapse behavior of pile foundations embedded in sand or mixed soils and subjected to axial loads. In this sense, three artificial neural network (ANN) models were created: two for driven piles (one for steel piles and one for concrete piles) and one for drilled piles. Cone Penetration Test (CPT) findings and a series of field pile load tests are presented as data collected from the literature and used to create the ANN models. The data of each model is divided into two subgroups. An independent validation set is available for model validation and a training set is available for model calibration. The predictions made by the ANN models are compared with the predictions made by currently used load transfer techniques and experimental findings. The performance of the models is verified using statistical analysis. It can be said that the findings show that the created ANN models are quite capable of simulating the nonlinear behavior of soils under loads. On the other hand, four separate deep learning-based artificial neural network architectures were created by Kim et al. (2024) to evaluate how well they predict the characteristics of soil consolidation. In order for the foundation design to be successful, the soil compaction under the planned construction must be accurately predicted. The collection included 916 samples with variables such as natural water content (w), liquid limit (LL), plasticity index (PI), and compression index (C_c). The researchers predicted that soil consolidation tests can be solved more quickly and cost-effectively by using this method. The results show that deep learning models provide great potential for use in geotechnical engineering and are a useful tool for predicting the consolidation of fine-grained soils. This study contributes to a more accurate prediction of soil consolidation, which is critical for the long-term stability of structural designs.

Artificial Intelligence in Pile Design: In terms of Geotechnical Engineering, pile foundations are known to be used to support structures in weak soil conditions. AI applications in predicting pile capacity and settlement behavior improve design performance through machine learning models trained on field data (Yildiz, 2019). Lee and Lee (1996) aimed to predict the ultimate bearing capacity of piles by using pile loading test results as input to Artificial Neural Networks (ANN). Five input variables represented the penetration depth ratio, the average standard penetration number along the pile shaft, the average standard penetration number near the pile tip, the pile set, and the hammer energy. The pile bearing capacity was selected as the output parameter. In situ pile loading test results obtained from the

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

literature review were used to verify the applicability. The results showed that the maximum prediction error did not exceed 25%, except for some biased data. The results were then compared with the Meyerhof equation based on the average standard penetration (Meyerhof, 1976). At this point, new findings have shown that neural networks provide much better predictions of the measured values than those derived from the Meyerhof equation. Park and Cho (2010) selected 165 data points from dynamic pile loading tests in various areas to develop an ANN model to predict the resistance of driven piles in dynamic load tests. The results of the research showed that the ANN model serves as a reliable and simple prediction tool to predict the resistance of driven piles with correlation coefficient values close to 0.9.

Maizir et al. (2015) developed ANN model to predict the axial capacity of a driven pile based on pile driving analyzer test data. Approximately 300 high quality test datasets were obtained from dynamic loading tests. Model input independent variables included pile properties (diameter, length and compressive and tensile capacities), pile set and hammer properties. Artificial neural network (ANN) model was used to predict overall pile capacity, shaft resistance and end bearing capacity for different pile and hammer properties using a computer-based intelligence system. The reliability of the model as a driven pile resistance estimator was obtained by showing that the mean square error (MSE) was less than 1% and the correlation coefficient (R) values were close to 0.9 after 15,000 iterations. In the context of the authors' work; the findings are important for engineering judgment.

Artificial Intelligence in Seismic Risk Analyses: There are various changes in geotechnical risk assessment with Machine Learning (ML), one of the benefits of the digital age. Herrera et al. (2022) Using the latest datasets and comprehensive case studies, they discuss how these changes in geotechnical risk assessment procedures are capable of predicting geotechnical problems by using the relationship between machine learning and geotechnical engineering. Japan, located in the Pacific Ring of Fire, is at constant risk of earthquakes. Accurately predicting damage to infrastructure during earthquakes can save both resources and lives. The University of Tokyo launched a study using machine learning to achieve this goal. The researchers used a dataset that included post-earthquake damage, architectural details, and decades of seismic activity. They modeled deep learning networks to quickly find significant damage to the tallest structures at the time of the earthquake. The model accurately predicted structural damage during simulations of previous major earthquakes, providing critical information for disaster management and urban planning. The model can also suggest evacuation routes using real-time data from seismic sensors.

Yang et al. (2019) studied the early warning system and landslide prediction for the Three Gorges Reservoir Area (TGRA). There is a nonlinear and continuously changing mechanism in the complex process of landslide formation. The authors propose a dynamic model for landslide displacement prediction using long short-term memory (LSTM) neural networks and time series analysis. An LSTM model is used to predict periodic displacement. The connections between precipitation, reservoir water levels, and landslide deformation are studied. The findings show that the LSTM approach more accurately depicts the dynamic aspects of landslides than static models and makes better use of historical data. The two-stage landslides of Baishuihe and Bazimen landslides confirmed the success of the model in TGRA. The application of the model to these two landslides showed that the LSTM model was more accurate in measured displacements and landslide displacement predictions compared to the static support vector machine (SVM) model. The proposed model was effectively used to predict the displacement of staged landslides in TGRA.

Artificial Intelligence in Slope Stability Analysis: Serious concerns arise when slope instability affects both life and property. If the ecological balance is not maintained, landslide can be one of the biggest and most widespread natural disasters. Therefore, it is very important to use artificial intelligence solutions to take reliable and rapid preventive measures. Chauhan et al. (2010) proposed a new method for landslide susceptibility mapping by categorizing the causal factors obtained using a neural network model. These ratings showed how each category affects landslide events. The study was conducted in a landslide-prone region in the Himalayas. The ratings were divided into seven factors: slope, slope direction, relative topography, lithology, structural features (such as thrusts and faults), land use and land cover, and drainage density. The best out of 42 categories was found to be the structural buffer

category with 376.5 m between 0-500 m. The evaluation of landslide intensity analysis and landslide susceptibility mapping through best quadratic curves and receiver operating characteristic curves clearly demonstrated the effectiveness of the proposed method and provided an accurate representation of the real landslide scenarios of the study area.

In this context, Ural and Tolon (2008) conducted a study in which they analyzed 170 slope conditions using an artificial intelligence approach. Five neural network architectures were used, namely backpropagation neural network architecture, general regression neural network (GRNN), data processing group method, Kohonen learning paradigm and probabilistic neural network architectures. Backpropagation neural network architecture and general regression neural network showed better applicability to the slope stability problem. Nine input parameters and one output parameter were used in the analysis. The output parameter is the safety factor of the slopes and the input parameters include slope height, slope angle, water table height, solid base depth, soil cohesion, soil friction angle and soil unit weight, while horizontal and vertical seismic coefficients are important input parameters. The importance of seismic coefficients for slope stability safety is discussed. A sensitivity study is carried out to evaluate the importance of slope and dynamic input parameters. Among all the established models, the GRNN model performed better than the others. The best models had generalization success rates of $R^2=0.9250$ and $R^2=0.9034$. With this study, they demonstrated the applicability of artificial intelligence tools in slope stability problems.

A methodical approach to assess slope safety using multi-source monitoring data was given by Peng et al. (2014). The safety factor, various monitoring indicators, and their influencing factors (such as friction angle and cohesion) were first incorporated into a Bayesian network with continuously distributed variables for a slope. Then, the prior probability for the model, parameter, and Bayesian network uncertainties were measured. Then, the probability distributions of soil or rock model parameters and the safety factor were updated using a Markov Chain Monte Carlo simulation using multi-source monitoring data. According to the findings of the study, the approach can update soil or rock properties, slope safety factors, and failure probabilities with integrated monitoring data and combine multi-source information based on slope stability mechanisms.

These examples show how artificial intelligence (AI) and deep learning methods are transforming geotechnical engineering as well as various other fields by providing creative answers and facilitating decision-making. The continuous integration of AI technologies promises to improve efficiency, accuracy, and sustainability in many areas, from infrastructure design to environmental assessments and beyond. In this study, we first present the historical development of AI and Deep Learning from past to present. Following this, we present the general model of the Python Programming Based Excavation Support System that we have considered within the scope of the study, together with its main findings and results.

3. METHOD AND DEVELOPED MODELS

3.1. METHOD

The artificial intelligence models established in this study were developed using geotechnical data from the appendices of Yıldız's (2019) doctoral thesis titled "Examination of Excavation Support Structures with Data Mining Principles." A database was created using parameters related to excavation support systems within the thesis study which is the main reference source of the study. Prediction models were generated using artificial neural networks and linear regression, which are information processing methods. The artificial intelligence models created with the raw dataset consist of 5 input parameters and 1 output parameter. These are: excavation support spacing (mm), lateral stiffness (KN.m²/m), excavation depth, vertical displacement measurement value, and support system type. The support system type was later categorized, and the model continued with 27 input variables and 1 output variable. Data processing techniques were applied before the model development.

The techniques/methods used include:

Local Outlier Factor Algorithm (LOF): This algorithm focuses on the neighborhoods of each data point, effectively creating a proximity-based clustering, and identifying data points that lie outside of

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

this cluster as outliers. The method's ability to evaluate data relative to each other distinguishes it from other techniques.

Outlier Detection with 2-Sigma Methods: This method considers any independent variable in the dataset that deviates more than two standard deviations from the mean as an outlier. Although the general practice is to treat deviations beyond three standard deviations as outliers, this decision should be made by examining the homogeneity of the data's distribution.

Outlier Detection with Box-Plotlib: The Box-Plotlib method is calculated individually for each independent variable. The dataset is sorted in ascending order and divided into quartiles. According to this:

Q1: The first 25% value (first quartile).

Q2: The value representing the middle 50% (median).

Q3: The last 75% value (third quartile).

Interquartile Range (IQR): This represents the range between the first and third quartiles and is calculated as $IQR = Q3 - Q1$.

The minimum and maximum values refer to the lowest and highest values in the dataset, respectively.

As illustrated in **Figure 1**, values below $(Q1 - 1.5 \times IQR)$ and above $(Q3 + 1.5 \times IQR)$ are considered outliers.

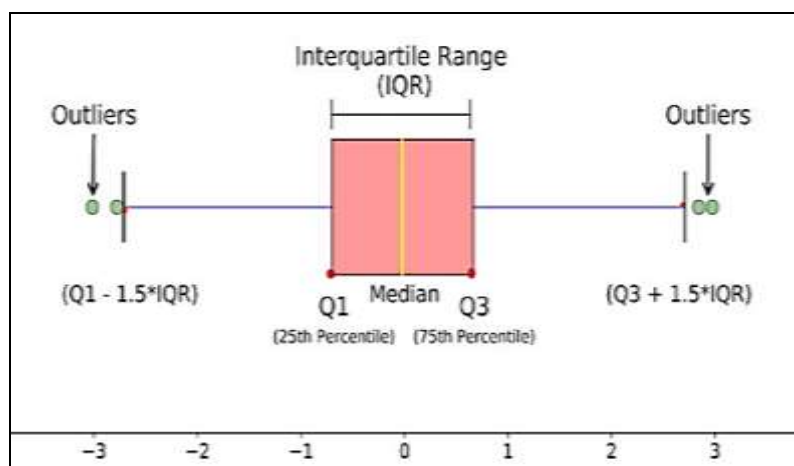


Figure 1. Box-Plotlib Outliers Detection Method

As a result of these outlier value analyses, 45 cases have been identified as outliers. The process of developing artificial intelligence models has been initiated based on data from 81 cases in the dataset.

3.2. DEVELOPED MODELS

To define the multiple linear regression established for the models: it is a method of representing the dependent variable with a line based on the independent variables in the dataset. This process can also be referred to as fitting a line, in mathematical terms. In doing so, the objective is to minimize the error between the actual output and the predicted output while attempting to fit the line. In **Figure 2**, a figure attempting to fit the line of linear regression is shown. This approach was adopted and implemented within the scope of the study.



Figure 2 Linear Regression Graphics

When examining the working mechanisms and architecture of artificial neural network models, it can be observed that the artificial neural network cell consists of five components. These components are inputs, weights, summation function, activation (transfer) function, and outputs. In comparison with a real neural cell, the axons represent the outputs, the dendrites correspond to the summation function, the nucleus represents the activation function, and the synapses signify the weights. With these characteristics, artificial neural networks (ANNs) can be closely compared to real neural cells (Kaftan, 2010). This approach was naturally followed when creating working models. This approach is presented in Figure 3.

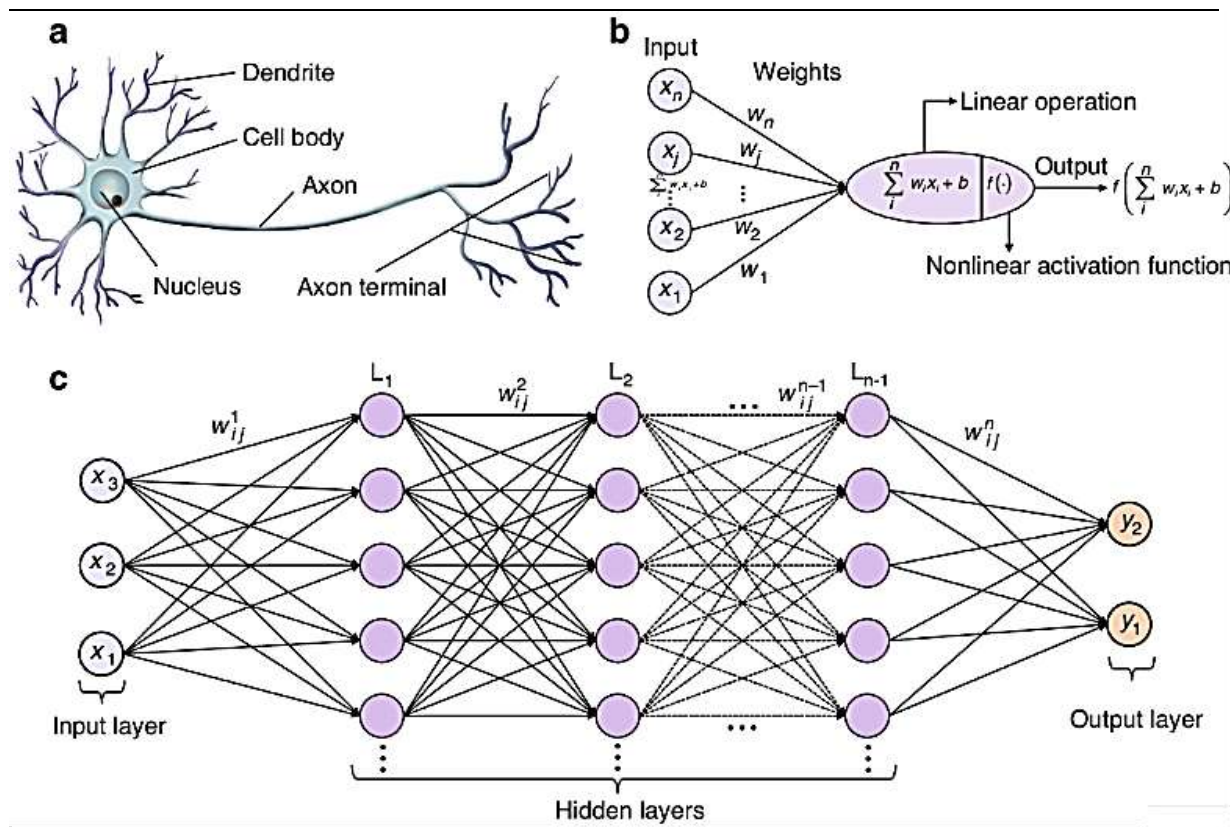


Figure 3 Nature and Artificial Neural Network.

- (a) Nature Neuron Structure, (b) Artificial Neural Network Structure,
- (c) Mechanism of Multi-Layer Perceptron Artificial Neural Network (Fu et al. 2024).

In Figure 3(a), the structure of a natural nerve cell is shown, while in Figure 3(b), the structure of an artificial neural cell is presented. The cells in an artificial neural network work similarly to natural nerve cells by attempting to convert external inputs into meaningful outputs. In this process, the incoming inputs ($x_{(i,n)}$) are multiplied by specific weight values (ω) and transmitted to the neurons, where the information undergoes a linear function, i.e., the summation function ($\sum_i^n \omega_i * x_i + b$) and then exposed

to a nonlinear activation function. As a result of this cycle, the processed information either produces the final output (y) or continues as input to the next neuron. In **Figure 3(c)**, it can be observed that a neural network cell with multiple hidden layers can generate multiple outputs.

The models addressed in this study were developed through the examination of linear regression followed by non-linear regressions. The process involved observing the handling of outliers, the differing distributions of training and test data during the data splitting, and the effects of hyperparameters.

4. RESULT AND DISCUSSION

The developed models were examined for their impact on achieving the target success rate, focusing on the optimization of linear regression parameters and the hyperparameters of the MLP Regression algorithm in the sklearn library, random selection of data during the training phase, and the differentiation of data processing methods within the developed code. Comparisons were made based on error values, score, and R^2 score. According to this, in terms of horizontal displacement, which is an important parameter for the safety of structural foundations, it was found that the prediction performance of artificial neural networks was significantly better than that of linear regression models. This is an expected outcome, as ground-related problems are non-linear, not linear.

One of the key takeaways from the models established in this study is the importance of the data processing process. By interpreting data through data visualization, evaluating the distribution of data through descriptive statistics, and correctly selecting parameters and hyperparameters, machine learning models can be developed to predict the potential horizontal displacements of structural foundations with high accuracy.

In terms of the geotechnical engineering approach,

- A near-neutral negative relationship was observed between horizontal displacement and lateral stiffness, reflecting a relationship that was expected for this data set but could be more pronounced in general.
- A positive relationship was observed between horizontal displacement and excavation depth, although this relationship would have been expected to be stronger according to Rankine Theory, the data distribution affected this situation.
- A strong positive relationship was observed between horizontal displacement and vertical displacement, consistent with Terzaghi's observation of changes in soil pressure in supported soil.
- The processing of outliers leads to drastic changes, especially in vertical displacement data, and this situation emphasizes the importance of expert opinion in correctly analyzing the data.
- The intervention of outlier data in the analysis directly affects the relationships between independent variables; therefore, expert advice is required.

It was also seen in this case study that, with the advancement of artificial intelligence technologies in the future, solutions to many geotechnical problems will be achievable with great precision. When reviewing all the studies explored within the scope of this work, AI models have demonstrated remarkable accuracy and efficiency. These findings have the potential to transform the profession by offering more reliable and data-driven solutions. However, it is critical to acknowledge the challenges and limitations brought by these findings. Data quality, interpretability, and model generalization remain critical challenges. The lack of high-quality geotechnical data and the interpretability of complex AI models are issues that need further attention. Moreover, ethical concerns and the correct application of AI in geotechnical engineering require continuous monitoring.

We believe that this study has proven that Artificial Neural Networks (ANN) are one of the fundamental building blocks of deep learning. A branch of artificial intelligence called "deep learning" automatically extracts features from large data sets using multi-layer networks and predicts results for us. As can be understood from the literature in the study, ANNs are one of the oldest and most popular types of these networks. They consist of artificial neurons that cooperate mathematically and their structures are

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

modeled according to the connections between neurons in the human brain. Thus, in order to enable more effective modeling in engineering judgments, deep learning takes these networks and creates deeper, more complex and multi-layered versions of them. In other words, while ANNs form the basis of deep learning, deep learning improves these networks by increasing the number and complexity of layers and addressing challenging problems. Therefore, it can be said that ANNs are indispensable for the advancement and use of deep learning. As obtained in this study, deep learning models have proven to be incredibly accurate and effective. They provide more reliable and evidence-based treatments. However, it is important to recognize the difficulties and limitations associated with these results. Interpretability, model generalization, and data quality remain major obstacles in developing ANN models for geotechnical engineering problems. Interpretability of complex DL models and scarcity of high-quality geotechnical data are issues that require increased focus. Furthermore, ongoing monitoring is necessary to address ethical issues and ensure the proper application of DL in geotechnical engineering.

In conclusion, additional studies have also made obvious how important and necessary the subjects covered in this study are, especially when it comes to time, money, and engineering design safety. It is believed that the results obtained through the analysis will contribute to the adaptation of these findings in the construction industry.

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BENCHMARKING STREAMFLOW PERFORMANCE OF GR4J AND TUW MODELS USING ERA5 AND EOBS DATA OVER BARTIN RIVER

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ABSTRACT

Hydrologic models are indispensable tools to predict floods and droughts in operation hydrology. The models require good quality meteorological inputs as they affect the model simulations significantly. This study focuses on investigating the performance of two lumped models i.e. TUV and GR4J for Bartın River. For that two well-known global precipitation datasets were retrieved from Copernicus system i.e. EOBS and ERA5. We used satellite based meteorological variables from Copernicus system such as daily total precipitation (P), potential evapotranspiration (PET) and average temperature (Tavg) spanning from 2014 to 2022 over the basin. It should be noted that TUV model has 15 parameters and snow melt process included whereas GR4J model has only 4 parameters and it does not include snow module so that it does not require Tavg data as input. The observed daily discharge time series (Q) from gauge D13A081 is used to calibrate and validate these hydrologic models. We calculated spatially averaged data from netCDF files using Climate Data Operations (CDO) program from Max Planck Institute. The data from 2014 to 2018 are used to estimate model parameters (calibration) and the data from 2018-2022 are used to validate the model performance. Validation results indicate that the TUV model outperforms GR4J when using ERA5 data with Nash-Sutcliffe Efficiency (NSE) and Kling-Gupta Efficiency (KGE) values of [0.51, 0.67] compared to GR4J's [0.43, 0.65]. Similarly, GR4J demonstrated slightly better performance using ERA5 data i.e. 0.48 NSE vs 0.45 NSE using EOBS data during calibration period. These findings highlight the sensitivity of hydrological model performance to meteorological datasets and show the importance of selecting appropriate models and datasets for accurate streamflow simulations in the Bartın River Basin. From the results it is clear that NSE is highly sensitive to high flows whereas KGE focuses on average flows. Since all results of TUV are above 0.5 NSE threshold i.e. a common practice to accept model results, future studies can consider this model with ERA5 inputs to predict high flows in Bartın River.

Keywords: TUV model, GR4J, ERA5, EOBS, Bartın River, Hydrological Modelling

Introduction

Hydrological models play a crucial role in understanding water dynamics, enabling flood and drought predictions, evaluating climate change effects on river basins, and supporting the sustainable planning of infrastructure (Demirel et al., 2019). Based on their spatial resolution, these models are divided into three groups: fully distributed, semi-distributed, and lumped models. Lumped conceptual models like GR4J, HYMOD, and TUW rely on catchment-averaged meteorological inputs to simulate hydrological processes through empirical relationships, estimating water exchanges without accounting for spatial variations within the catchment. Semi-distributed models use sub-basin-level inputs to estimate discharges at user-defined hydrological response units. In a fully distributed model, numerical methods solve differential equations to simulate mass, energy, and momentum conservation in detail for each terrain cell (Demirel et al., 2018; Koch et al., 2018).

Selecting an appropriate hydrological model for streamflow simulation is challenging due to the vast variety of available models and the dependence on prior experience and accessibility in the decision-making process (van Esse et al., 2013). However, the best model cannot be agreed upon as the performance varies across diverse climatic and geographical conditions (Marshall et al., 2005). Therefore, comparative studies assessing the performance of various hydrological models across diverse catchments are essential (Gao et al., 2016).

Rivers like Bartın play a critical role in sustaining ecosystems, supporting local economies, and supplying water (Ibrahim Gurer & Hamza Ozguler, 2004). Understanding the behaviour of these rivers is important for managing water resources, preventing floods, and planning infrastructure. In Türkiye, however, there is a lack of studies comparing lumped and distributed hydrological model performance over different geographical regions (Ergün & Demirel, 2023). Therefore, this study aims to fill this gap by analyzing the performance of two lumped conceptual models, GR4J and TUW, for simulating streamflow in the Bartın River Basin. Both models were implemented in R and calibrated using the DeOptim algorithm. This study evaluates the strengths and weaknesses of these models to improve hydrological modeling practices in Türkiye and contribute to better model selection for improved streamflow prediction and water resource management.

1. Study Area and Data

2.1. Study area

One of the major subbasin of Bartın River Basin was chosen as a study area (Figure 1). Bartın River Basin is located in northwest Türkiye in the Black Sea Region. The river gets its start from the Ulus and Arit streams, has a catchment area of 2,142 km², and stretches to 110 km whereas the subbasin has a 590 km² catchment area. Bartın River region has a humid climate with average annual precipitation of 1,000 mm. Hydrological patterns are affected by changes in seasonal precipitation, with peak flows occurring during the rainy months from October to March (Akbaş & Özdemir, 2022).

The Bartın River Basin is essential to the region's socio-economic activities, such as agriculture, water supply, and flood control. However, anthropogenic factors are impacting the hydrological regime of the area, and studies have revealed that the basin is vulnerable to flooding, especially during high-flow periods, which calls for strong hydrological modeling and management techniques (Ibrahim Gurer & Hamza Ozguler, 2004).

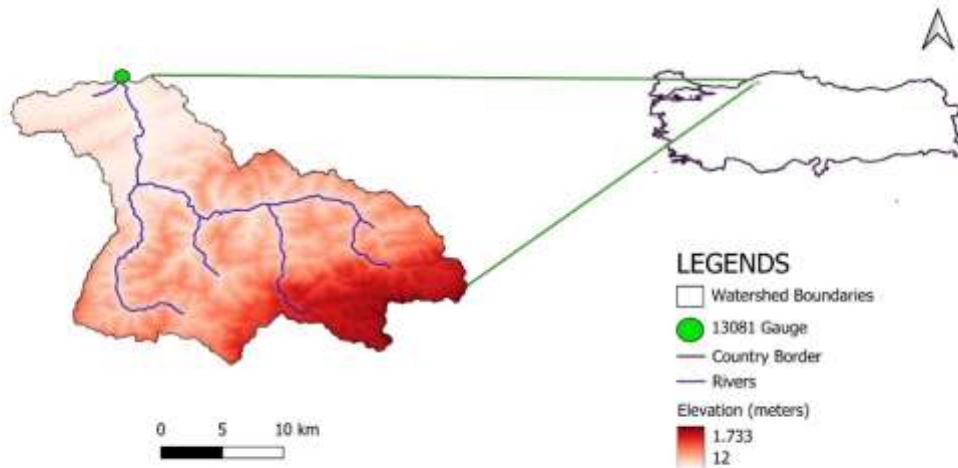


Figure 1 Major Subbasin of Bartın River Basin

2.2. Data

The hydrological models use precipitation (P), potential evapotranspiration (PET), and average air temperature (T_{avg}) as meteorological inputs. These records are taken from the Copernicus Climate Change Service (C3S) ERA5 reanalysis dataset. The General Directorate of State Hydraulic Works (DSI) of Türkiye supplied the observed daily discharge data (Q) for the Bartın River at the designated gauge point. DSI provided meteorological information over a constant time period, including temperature and precipitation. **Hata! Başvuru kaynağı bulunamadı.** gives a summary of the hydrological and meteorological data used in the hydrological models.

Table 1 Overview of the Hydrologic Model Inputs

DATA	DEFINITION	SPATIAL RESOLUTION	UNIT	SOURCE
Q	River Discharge	Point	m ³ /s (cms)	DSI
P	Precipitation	0.25° x 0.25°	mm/day	ERA5
P	Precipitation	0.1° x 0.1°	mm/day	EOBS
PET	Potential Evapotranspiration	0.25° x 0.25°	mm/day	ERA5
T_{avg}	Average Air Temperature	0.25° x 0.25°	°C	ERA5

2. Methodology

This study presents the performances of two different lumped hydrological models, namely GR4J and TUW, applied in the major subbasin of Bartın River Basin. These models represent a considerable gradient regarding model structure, spatial complexity and type of input data adopted for hydrological simulations. Due to the fact that these models are open source and consequently free to use, they have been selected with different design concepts. Nash-Sutcliffe Efficiency and Kling-Gupta Efficiency metrics will be used for model goodness-of-fit testing. To this end, two aforementioned metrics are considered in order to compare the simulated and observed discharge data with each other to investigate the accuracy and reliability of the models.

3.1 GR4J Model

GR4J - Génie Rural à 4 paramètres Journalier is a lumped daily rainfall-runoff model, which was developed for simulating hydrological processes without considering snowmelt (Perrin et al., 2003). The GR4J model uses precipitation, P, and potential evapotranspiration, PET, but does not require temperature data as an input since does not include snowmelt processes. GR4J can be widely used in many subbasins due to advantages in computation efficiency, calibration simplicity, and the proficiency of simulating runoff under a great variety of climatic conditions (Edijatno et al., 1999).

3.2 TUW Model

The TUW model is a conceptual, lumped rainfall-runoff model. It was developed for the simulation of hydrological processes in catchments with diverse climatic and hydrological conditions, such as snow. As the name suggests, it was designed at the Vienna University of Technology. The main inputs of the TUW model are precipitation (P) data and potential evapotranspiration (PET) data. It also considers snowmelts with the addition of giving better performance in snow-related regions (Bawden et al., 2014). The TUW model is known for flexibility and adaptiveness; therefore, it is suitable for catchments of varying data availability, complexity, and particularly snow.

3.3 Nash-Sutcliffe Efficiency (NSE)

The Nash-Sutcliffe Efficiency (NSE), calculates how closely predicted discharge data matches with the observed data. It starts by comparing the deviation or variance of the prediction errors (also known as residuals errors) to the variance of the observed values. Because NSE uses mean squared differences in its calculation, it generally tends to place more focus on larger errors which makes it highly sensitive to high flows. This means that high deviations in peak flows will result in lower NSE values. NSE values can range from $-\infty$ to 1, where 1 indicates a good match between predictions and observations, while lower values suggest poor performance (Nash & Sutcliffe, 1970).

NSE = 1 indicates a perfect match between simulated and observed data.

NSE = 0 suggests the model is as accurate as the mean observed discharge.

NSE < 0 indicates the model is less accurate than using the mean observed value.

The formula for NSE is:

$$NSE = 1 - \frac{\sum_{t=1}^T (Q_o^t - Q_s^t)^2}{\sum_{t=1}^T (Q_o^t - \bar{Q}_o)^2}$$

Where:

Q_o^t = observed discharge at time t

Q_s^t = simulated discharge at time t

\bar{Q}_o = mean observed discharge

T = total number of time steps

3.4 Kling-Gupta Efficiency (KGE)

KGE evaluates the accuracy of simulated discharge by measuring its agreement with observed data. KGE enhances NSE by considering three key components: correlation, bias, and variability, providing a more comprehensive assessment of model performance. This allows for a more balanced evaluation of performance across different flow conditions. This includes low and high flows (Gupta et al., 2009). KGE values range from $-\infty$ to 1, with:

KGE = 1 representing perfect agreement between observed and simulated data.

KGE < 1 reflecting deviations in correlation, bias, or variability.

The formula for KGE is:

$$KGE = 1 - \sqrt{(r - 1)^2 + (\alpha - 1)^2 + (\beta - 1)^2}$$

Where:

r = correlation coefficient between observed and simulated discharge

$\alpha = \frac{\sigma_s}{\sigma_o}$ (ratio of simulated to observed variability)

$\beta = \frac{\bar{Q}_s}{\bar{Q}_o}$ (bias ratio – mean simulated to mean observed discharge)

This formulation evaluates:

r – the linear relationship between observed and simulated flows

α – whether the simulated discharge has the same variability as the observed

β – whether the model underestimates or overestimates flows

3.5 Model Calibration and Validation

Model calibration is a post-processing of model output probabilities such that it better corresponds to the observed outcomes. Model validation involves making sure the model serves the intended purpose. In this study, 2014-2018 was selected as the calibration period, while 2018-2022 was considered as the validation period.

4 Results and Discussion

In this study, we compared the calibration and validation performance of two hydrological lumped models in terms of NSE and KGE values considering hydrographs based on different datasets. Table 2 shows the calibration results of two models using two different precipitation data. It should be noted that we calibrated each model for each precipitation input. In other words, we calibrated TUW and GR4J models for ERA5 and EOBS data separately. This allowed us to deal with input uncertainties from different precipitation sources. From the table it is clear that TUW model with 15 parameters perform better than GR4J model with 4 parameters.

Table 2 Calibration results for the period of 2014-2018

CAL [NSE, KGE]	EOBS	ERA5
GR4J	[0.45, 0.52]	[0.48, 0.60]
TUW	[0.53, 0.52]	[0.55, 0.57]

It can be said that the ERA5 dataset gives better results in the calibration period. In terms of NSE, the TUW model performs better with an NSE value of 0.55, while in terms of KGE, the GR4J model performs better with a value of 0.60. The graph comparing the simulated discharge values with the observed values using ERA5 dataset during the calibration period is given in **Hata! Başvuru kaynağı bulunamadı..**

When the EOBS dataset is used, it is seen that the TUW model gives better results than the GR4J model with an NSE value of 0.53. In both models, the KGE value was 0.52. The graph showing the discharge values obtained with the EOBS dataset is given in **Hata! Başvuru kaynağı bulunamadı..**

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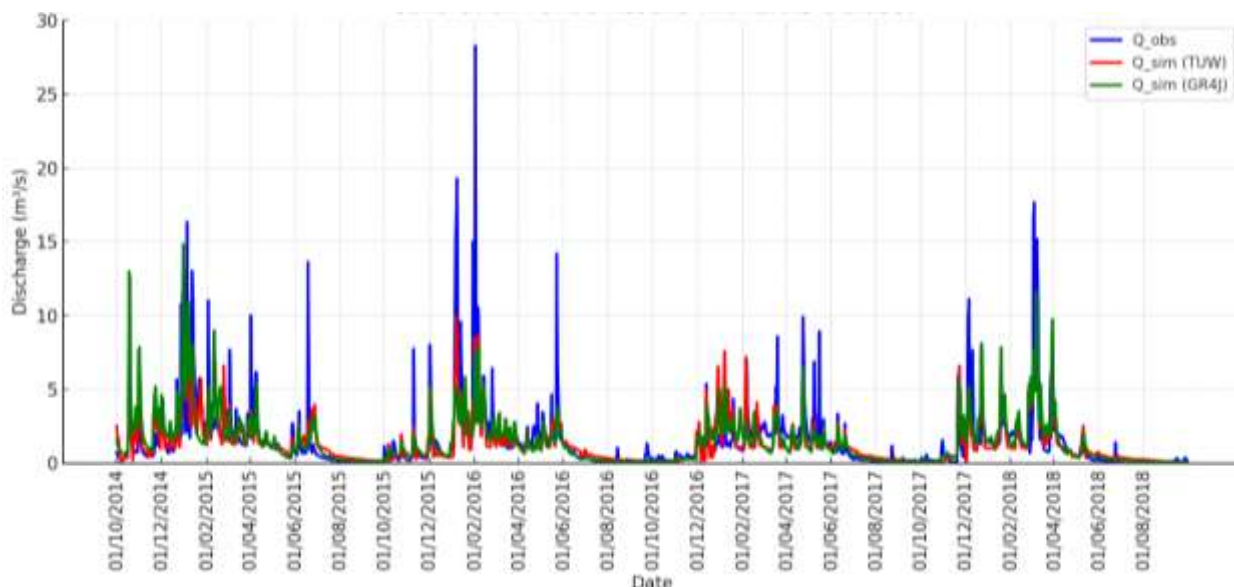


Figure 2 Observed discharge (blue) and simulated discharge using TUW (red) and GR4J (green) model for calibration period with ERA5 dataset

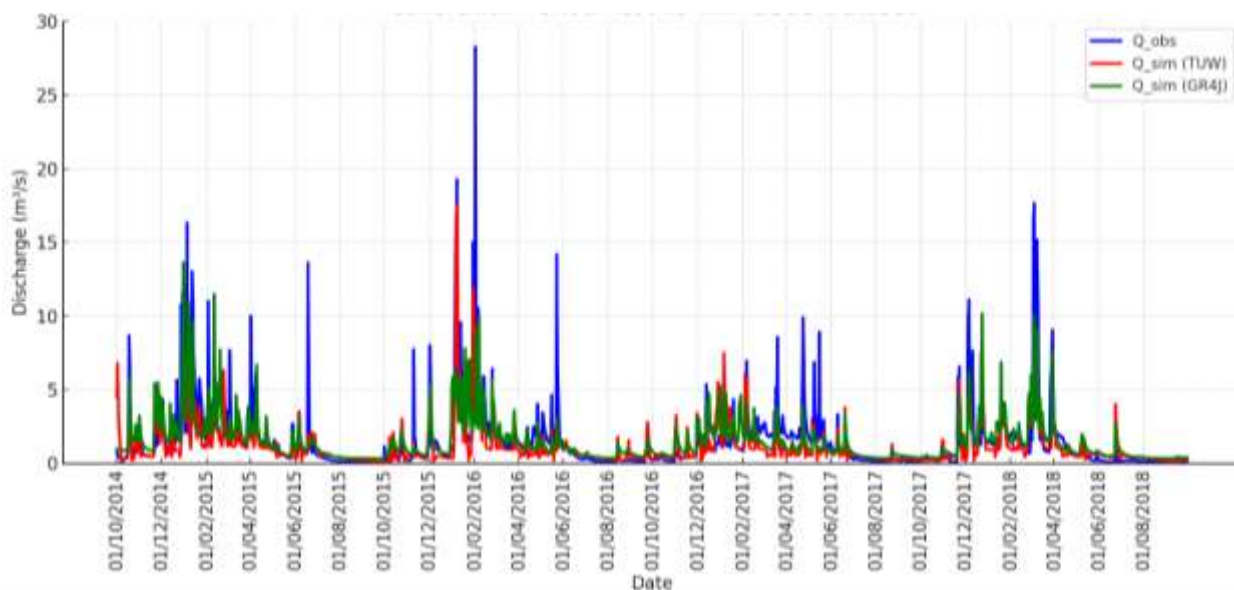


Figure 3 Observed discharge (blue) and simulated discharge using TUW (red) and GR4J (green) model for calibration period with EOBS dataset

Table 3 shows the validation results of two hydrologic models. What stands out in this table is that both models are more successful in simulation average flows than high flows based on the KGE results.

Table 3 Validation results for the period of 2018-2022

VAL [NSE, KGE]	EOBS	ERA5
GR4J	[0.35, 0.63]	[0.43, 0.65]
TUW	[0.44, 0.68]	[0.51, 0.67]

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The TUW model, which was run with the ERA5 dataset during the validation period, stands out as the model with the highest NSE value with 0.51 NSE value. Although the KGE values are close, the TUW model gives better results than the GR4J model. The graph of the discharge values obtained during the validation period using the ERA5 dataset is given in **Hata! Başvuru kaynağı bulunamadı..**

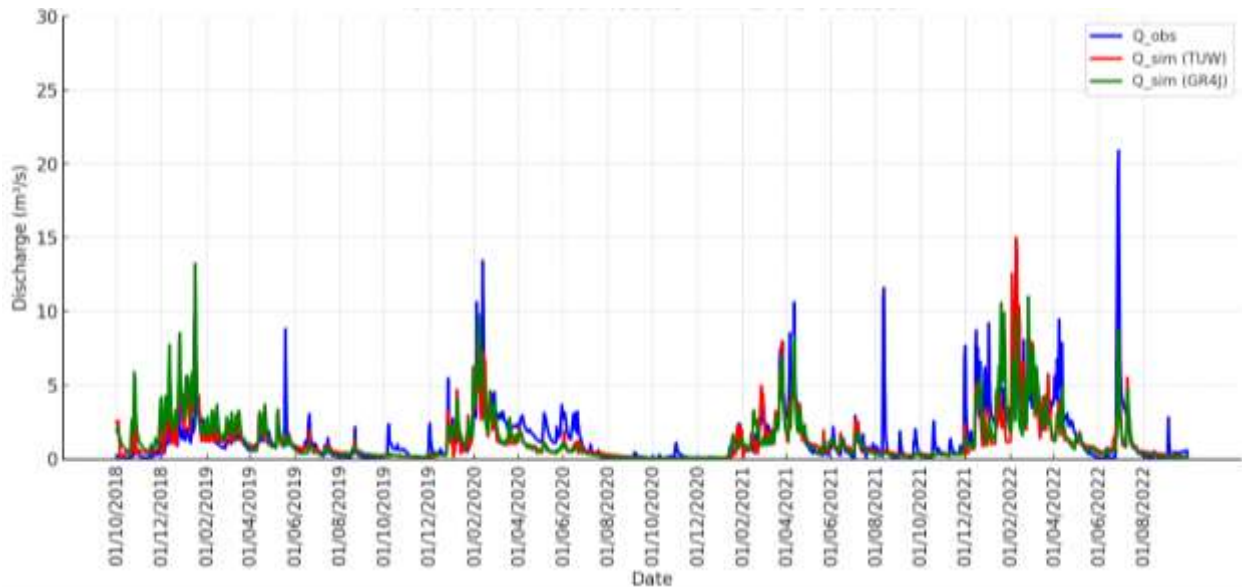


Figure 4 Observed discharge (blue) and simulated discharge using TUW (red) and GR4J (green) model for validation period with ERA5 dataset

Similarly, the TUW model gives superior results compared to the GR4J model in the EOBS dataset. It is seen that the KGE values are higher in NSE values in both models. The graph of discharge values calculated with EOBS data is given in Figure 5.

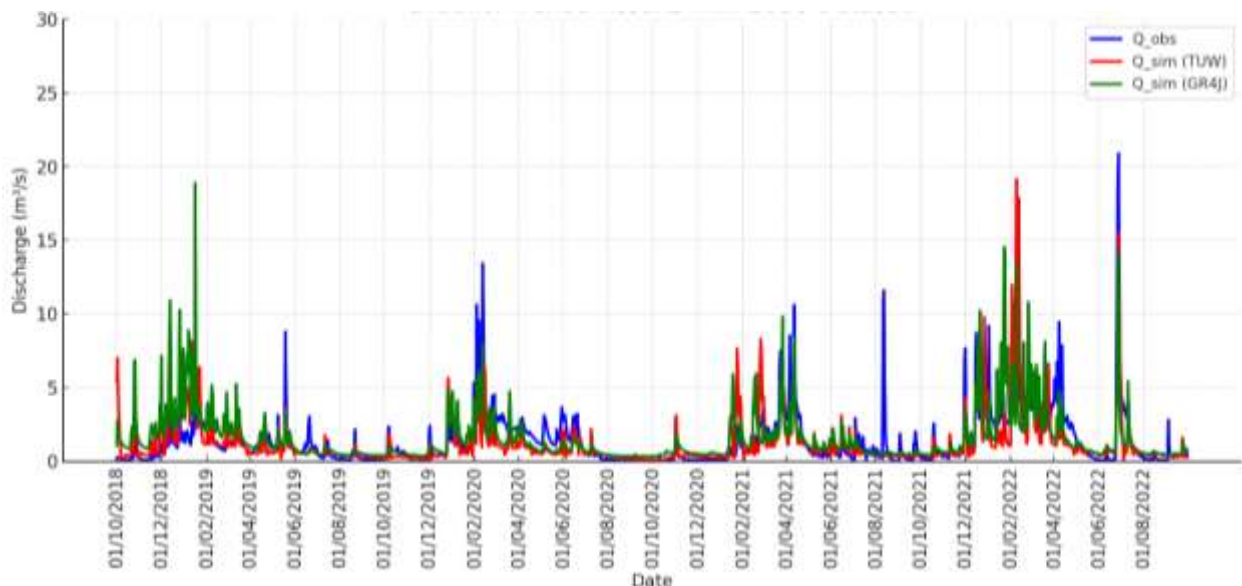


Figure 5 Observed discharge (blue) and simulated discharge using TUW (red) and GR4J (green) model for validation period with EOBS dataset

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When the calibration and validation results are evaluated together, it is seen that the GR4J model produced low values in the validation period in both datasets in terms of NSE values. Although the TUW model showed a decrease in the values it produced during the validation period, it showed a more stable performance. In general, it can be said that the TUW model performs better than the GR4J model in terms of NSE. In terms of KGE, it is seen that the values increase in both models during the validation period.

As a result, it can be said that the ERA5 dataset produces better results in both calibration and validation periods. The use of the ERA5 dataset with the TUW model stands out as the model with the best performance. Although the model performance of the EOBS dataset is lower, it is seen that it provides high values in terms of KGE and therefore can better perform the average flow variability.

5 Conclusion

This paper compares the performances of the TUW and GR4J hydrological models in simulating streamflow for the major subbasin of the Bartın River Basin with ERA5 and EOBS precipitation datasets over the calibration and validation period. Calibration results show that TUW, with 15 parameters, outperforms the 4-parameter GR4J model. Specifically, the TUW model has higher NSE values with both data sets. TUW model with ERA5 data gave 0.55 NSE value during calibration, which is higher than derived from the GR4J model, which is 0.48. The validation results confirm the performance of the TUW model to be superior to that of GR4J, though it also contains variation. TUW model has higher NSE and KGE values with both datasets than GR4J model. During the validation period, KGE values increased compared to the calibration period. Presented figures demonstrate the results where the observed discharge agreed very well with the simulated discharge by the TUW model, especially during the calibration period. Though the high-flow events were underestimated by the models, TUW gave much better simulations for average flow conditions for both calibration and validation periods.

This study tries to address these input uncertainties due to different data sources by calibrating the models separately for each precipitation dataset. Results showed that the selection of precipitation data considerably affects the model performance, and generally ERA5 produces better predictive accuracy in the model outputs than EOBS. However, the TUW model performs very well on both datasets, indicating its suitability for hydrological modeling in the Bartın River Basin.

This study demonstrates the superiority of a more parameterized hydrological model, the TUW model, for better streamflow simulation in the complex catchments. Although GR4J offers computational efficiency, the lower performance metrics from the model depict some shortcomings of the model to capture the details of streamflow dynamics in the study area. Therefore, future studies should be performed to integrate more data sources and develop better model calibration techniques for improving the predictive accuracy of both models for better forecasting, especially extreme flow events. The study is an attempt to contribute to advancing practices in hydrological modeling by insight into the comparative performance of lumped conceptual models and addressing input uncertainty within the framework of the Bartın River Basin.

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INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

THE INFLUENCE OF DIGITAL EPISTEMOLOGICAL BELIEFS ON LEARNING AND KNOWLEDGE CONSTRUCTION

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ABSTRACT

In an era dominated by digital information, understanding how individuals perceive, evaluate, and utilize knowledge in online contexts has become crucial. This study delves into digital epistemological beliefs, which refer to individuals' conceptions about the nature, source, and justification of knowledge in digital environments. By integrating foundational theories of epistemology and recent advancements in educational technology, the paper examines the profound impact of these beliefs on digital literacy, critical thinking, and collaborative learning. Key issues addressed include how digital epistemological beliefs shape learners' ability to assess the credibility of online sources, navigate misinformation, and engage in constructive knowledge construction.

This study also emphasizes the significant challenges posed by cognitive biases, the role of digital tools in shaping online experiences, and the unequal access to digital resources that hinder equitable learning opportunities. By addressing these obstacles, the paper offers practical strategies to enhance learners' abilities to critically evaluate and effectively use digital information. It bridges traditional and digital epistemological frameworks to provide actionable insights for improving digital education through innovative curriculum design, effective teaching strategies, and robust assessment tools. Ultimately, fostering advanced digital epistemological beliefs is presented as a key pathway to empowering individuals as both critical thinkers and active contributors to the digital knowledge landscape.

Keywords: Digital epistemological beliefs, digital literacy, critical thinking.

1. Introduction

In the digital age, the sheer volume of available information and its varying levels of credibility have heightened the need for individuals to develop sophisticated approaches to evaluating and utilizing knowledge. Digital epistemological beliefs, which define how individuals perceive the source, nature, and justification of digital knowledge, have a profound influence on their ability to navigate this complex information landscape (Wineburg et al., 2017; Kahne & Bowyer, 2017). These beliefs determine not only how individuals discern reliable from unreliable information but also how they critically engage with diverse perspectives and integrate new knowledge into existing frameworks.

Recent studies underline the importance of these beliefs in educational contexts. For instance, McGrew et al. (2018) found that learners with advanced epistemological beliefs were significantly better at identifying credible sources and rejecting misinformation compared to their peers with less developed beliefs. The increasing influence of algorithms in curating online experiences further complicates this

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

landscape, necessitating a deeper understanding of the interplay between technology and individual epistemic cognition (Lewandowsky et al., 2017). This paper seeks to explore these dimensions by integrating traditional epistemological theories with contemporary challenges posed by digital environments.

2. Method

The aim of this study is to discuss the impact of Digital Epistemological Beliefs on learning processes and knowledge construction. Based on this objective, the study has been designed in a qualitative perspective that is suitable for analyzing events and phenomena in a multifaceted and in-depth manner (Punch, 2005; Balyer, 2016). In terms of data collection and analysis, the study has been conducted using the literature review method and documentation analysis techniques (document scanning, document examination). According to the literature (Yıldırım & Şimşek, 2013), these methods and techniques are more suitable for qualitative research that focuses on description, interpretation, and inference rather than quantitative approaches. Documentation analysis is a qualitative research technique used to examine the content of written documents related to the research topic in detail and systematically (Wach, 2013).

In documentation analysis, it is important to read, describe, and interpret the data obtained from the existing documents in the literature in an unbiased manner (Karasar, 2009). In such studies, the scope of the documents scanned includes all types of written documents related to the research topic (Balci, 2009). However, for qualitative studies, the scientific selection of these documents is of critical importance (Sönmez & Alacapınar, 2016). In this context, academic books, articles, theses, and conference papers scanned in this study have been selected according to the methodology (Baloğlu, 1999; Yıldırım & Şimşek, 2013). In line with these conditions, the scientific validity, reliability, and credibility of the documents that form the data source were carefully evaluated.

To ensure the reliability of the study, approaches recommended for the reliability of qualitative research (Kirk & Miller, 1986) were followed. According to these principles, researchers must observe the subject of the study as it is and in an unbiased manner. In this regard, the role of the researchers has been clearly defined, and in order to eliminate research bias, the researchers' role is defined as "reading the selected documents according to the study's purpose and specific criteria, describing, interpreting, and drawing conclusions in an unbiased manner." In accordance with this, the selected and scanned documents (documents) have been analyzed according to the nature of qualitative research and descriptive analysis (Miles & Huberman, 1994; Glesne, 2016). The interpretations derived from this process were systematically organized and presented to the reader.

3. Theoretical Framework

3.1 Traditional Epistemology

Epistemology traditionally concerns the nature and justification of knowledge and provides a fundamental lens for examining how individuals' beliefs about knowledge develop. Epistemology is defined as a branch of philosophy that seeks answers to fundamental questions such as the limits, sources, and nature of knowledge (Deryakulu, 2004). Epistemological beliefs express individuals' personal views about the essence, truth, source, structure, and acquisition of knowledge (Hofer, 2001). These beliefs encompass personal evaluations formed by individuals regarding the nature of knowledge and how the process of acquiring knowledge occurs (Schommer, 1990).

Epistemological beliefs not only encompass different dimensions of knowledge but also include individual views on how the learning process takes place. Perry's (1970) epistemological development model summarizes a progression from dualistic views where knowledge is seen as absolute to relativistic perspectives that accept the contextual and constructed nature of knowledge. Similarly, Schommer (1990) defines these beliefs as subjective and personal ideas about the nature of knowledge, learning, and knowing processes. Furthermore, these beliefs serve as a function of making sense of and interpreting the information individuals encounter in their lives (Demir, 2009).

3.2 Digital Epistemological Beliefs

While traditional models provide valuable insights, the digital age requires a broader conceptualization of epistemological beliefs. Digital epistemological beliefs address how individuals interact with the unique advantages and challenges of online information environments. In this context, digital epistemological beliefs are defined as beliefs (assumptions) that reflect perspectives on the transition of knowledge, which is the subject of instruction, from its current analog form to its digital version (Gökçen, 2024). These beliefs also encompass the evaluation of source reliability, the recognition of the fluidity of online information, and the validation of claims in a digital context (Greene & Azevedo, 2010; Metzger & Flanagin, 2013).

Recent research emphasizes the impact of algorithms and social media on epistemic cognition. For example, Kahne and Bowyer (2017) note that algorithmic regulation often reinforces existing biases, thus requiring learners to develop epistemic vigilance to balance these effects. Additionally, Lankes (2016) highlights the participatory nature of digital information, where individuals are both consumers and contributors, which complicates the dynamics of information evaluation.

4. The Role of Digital Epistemological Beliefs in Learning

4.1 The Impact on Digital Literacy

Traditional literacy refers to the ability of an individual to read, understand, and write the common language of a particular culture. Digital literacy, on the other hand, encompasses the skills of accessing information, analyzing it, organizing it, communicating and producing information, evaluating, and reading and writing digital texts through the use of digital technologies (Akkoyunlu & Soyly, 2010). Arslan (2019) defined digital technology literacy as "the ability to effectively manage digital technology materials encountered in both real life and virtual platforms."

Digital literacy encompasses the ability to locate, evaluate, and effectively use digital information. Learners with advanced digital epistemological beliefs are better equipped to navigate the complexities of online environments. Studies by Mason et al. (2011) and Wineburg et al. (2017) demonstrate that such learners are more adept at discerning credible sources, identifying bias, and synthesizing conflicting information. This ability is crucial for fostering informed digital citizenship and combating the spread of misinformation. In addition, in Gökçen's (2024) doctoral thesis titled "Examining the Relationship Between Faculty Members' Digital Epistemological Beliefs and Digital Technology Literacy," it was found that digital epistemological beliefs influence digital technology literacy.

4.2 The Impact on Critical Thinking

Beliefs about the justification of knowledge significantly influence students' critical thinking skills. Some important studies examining the impact of digital epistemological beliefs on critical thinking have shown that these beliefs play a significant role in learning processes and thinking skills. **Hofer & Pintrich (1997)** stated that individuals with advanced epistemological beliefs are more likely to engage in deeper reflective thinking and construct sound arguments. These thinking processes have a significant impact on the development of critical thinking skills. **Chen & Wu. (2023)** emphasized that in digital contexts, students' capacity to evaluate different perspectives, integrate new evidence, and adapt to the process of knowledge construction has increased. This process is a crucial component of critical thinking. Additionally, **Schommer (1990)** examined the relationship between epistemological beliefs and learning processes, discussing how individuals' beliefs about knowledge influence their critical thinking skills, and argued that these beliefs shape students' learning processes and their ability to question information.

4.3 The Impact on Collaborative Learning

Digital environments provide essential tools that transform collaborative learning processes while also shaping students' digital epistemological beliefs. Digital epistemological beliefs refer to how individuals access, evaluate, and perceive the process of knowledge production through digital tools and online resources. These beliefs directly influence how students interact with one another and contribute to collective knowledge production in a collaborative learning context. For instance, students' beliefs about

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

digital tools can lead them to engage more actively and efficiently in online learning environments or, conversely, to passively consume digital resources (Bates, 2015). Digital epistemological beliefs can encourage students to adopt a more flexible and open-minded approach to knowledge or, alternatively, to adhere rigidly to traditional and linear understandings of knowledge. This, in turn, becomes a crucial factor in the success of collaborative learning.

Digital epistemological beliefs also determine whether students take on more responsibility in online interactions, how they share information, and the level of collaboration within a group. In this regard, epistemological beliefs have profound effects on individuals collaborating in digital platforms. Digital learning tools, in particular, help students understand different perspectives and engage more extensively with diverse information sources. This creates an environment where students can develop their epistemological beliefs while also fostering a more critical and constructive approach to knowledge. The process of information sharing and collective knowledge production in digital environments allows students to test and refine their epistemological beliefs through innovative learning strategies (Nesbit & Adesope, 2006). Therefore, digital epistemological beliefs play a key role in the success of collaborative learning, as they determine how effectively students can collaborate in online environments and contribute to knowledge production processes.

5. Educational Implications

5.1 Curriculum Design

Educational science is shaped around the concept of "knowledge" in terms of purpose, scope, and validity, and in this context, digital epistemology plays a critical role in understanding how processes of accessing and evaluating knowledge are transformed through digital environments. Education, in its most fundamental sense, is a process in which an individual's deficiencies are completed through knowledge (Akpınar, 2020). However, in the digital age, this process of completion occurs through digital tools and online resources, rather than the traditional understanding of knowledge. Digital epistemological beliefs determine individuals' perceptions of digital information and how they evaluate it. In digital education, knowledge is not merely content transmission but also the process through which individuals develop the skills to produce, share, and question information in online environments. In this context, the development of digital epistemological beliefs in alignment with educational programs enables students to approach digital information critically and use it effectively.

The integration of digital epistemological beliefs into curriculum design is essential for preparing learners to critically engage with digital information and navigate complex online environments. As digital literacy becomes a fundamental skill, educational frameworks must emphasize the development of students' abilities to assess the credibility of sources, recognize misinformation, and construct knowledge collaboratively. According to Koehler and Mishra (2009), the **Technological Pedagogical Content Knowledge (TPACK)** framework provides a comprehensive approach to integrating technology into education, ensuring that students develop both domain-specific expertise and digital literacy. By embedding digital epistemological considerations into curricula, educators can foster a culture of inquiry, where students actively question, analyze, and synthesize digital content. This approach not only enhances critical thinking skills but also equips learners with the necessary tools to engage in ethical and responsible information consumption.

Furthermore, curriculum design should incorporate interdisciplinary strategies that connect digital epistemology with broader educational goals. Research by Greenhow, Robelia, and Hughes (2009) highlights the importance of social and participatory learning environments in shaping students' digital literacy and epistemological development. Digital platforms that promote collaboration, knowledge co-construction, and engagement with diverse perspectives can strengthen students' epistemic awareness and critical reasoning abilities. Project-based learning, digital simulations, and case studies on misinformation and bias should be integrated into curricula to provide hands-on experiences that challenge students to evaluate and produce knowledge critically. By fostering an epistemologically aware learning environment, educators can empower students to become discerning consumers and responsible contributors to the digital knowledge ecosystem.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

5.2 Instructional Strategies

Educators can play a significant role in shaping students' digital epistemological beliefs. Hofer & Pintrich (1997) suggest that teachers should encourage practices that help students recognize and question their cognitive biases regarding knowledge. Such practices enable students to question their assumptions about the reliability and validity of the information they encounter in digital environments. Additionally, promoting projects that require students to evaluate different sources can lead to a deeper understanding of digital epistemology. Rheingold (2012) emphasizes that allowing students to engage with different perspectives strengthens their ability to critically evaluate online content. Incorporating real-life experiences into teaching is another strategy for teaching the complexities of online information. In this context, Greene et al. (2010) argue that authentic learning experiences help students recognize the fluid and dynamic nature of knowledge in the digital world and develop skills for verifying and assessing the reliability of information.

5.3 Assessment Tools

Various assessment tools can be used to better understand and support the digital epistemological development of students and educators. Schraw et al. (2012) developed the Epistemic Beliefs Inventory, which measures beliefs about the nature of knowledge and the process of knowing. This tool provides valuable insights into students' epistemological profiles and can inform instructional practices aimed at developing critical thinking and information evaluation skills. Another important tool is the Digital Epistemological Beliefs Scale, developed by Gökçen (2024), which focuses specifically on educators' beliefs about digital knowledge, including faculty, teachers, and teacher candidates. Metzger & Flanagin (2013) note that such assessments help teachers identify gaps in students' understanding and evaluation of digital information and guide interventions aimed at developing digital literacy skills. These tools assist educators in designing targeted strategies that effectively enhance students' critical thinking skills, navigation abilities in digital environments, and evaluation of the reliability of online sources.

6. Discussion, Conclusion, and Recommendations

Digital epistemological beliefs significantly shape how individuals assess the complexities of online information. As digital environments continue to evolve, these beliefs determine how students evaluate the reliability, validity, and accuracy of digital knowledge. The growing importance of digital tools and resources requires a deeper understanding of how epistemological beliefs interact with technology-enhanced learning (Hofer & Pintrich, 1997; Schommer, 1990). These beliefs influence critical thinking and the ability to synthesize information (Chen & Wu, 2023; Rheingold, 2012).

To effectively leverage digital epistemological beliefs, educators must cultivate these beliefs through a conscious pedagogical approach. In this context, utilizing digital epistemological beliefs effectively requires educators to develop them through a deliberate pedagogical strategy. This necessitates the integration of innovative educational programs that encourage students to interact critically with digital content and evaluate digital information. The transformation brought about by the digital age is not limited to the integration of technology into educational processes but is also directly related to how educational programs structure the access to and evaluation of knowledge. As emphasized by Akpınar (2017), educational programs are fundamental elements that determine how knowledge is organized and transmitted. Therefore, curriculum designs aimed at developing digital epistemological beliefs should be structured to support students' digital literacy, critical thinking, and collaborative learning skills.

The prevalence of misinformation in the digital age also highlights the need for educational interventions that address epistemological beliefs in depth. Lewandowsky et al. (2017) emphasize the importance of developing accurate information verification skills and fostering skepticism toward unverified claims. To effectively combat misinformation, students and educators need to develop the ability to distinguish between reliable and unreliable sources. Friggeri et al. (2014) note that misinformation spreads rapidly through social media, underscoring the need for educational initiatives focused on digital literacy, critical thinking, and the ability to recognize biased or misleading content. Furthermore, Pennycook & Rand (2018) suggest that training in the psychological mechanisms driving the spread of misinformation can make individuals less susceptible to false information. These approaches can be incorporated into

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

educational programs aimed at enhancing epistemic awareness by improving students' skills in evaluating the reliability of online sources. Students can be trained to recognize fake news, pseudoscience, and manipulated media content. Case studies and simulations designed around misinformation and disinformation can enhance students' ability to identify false information (Harris, 2022). Additionally, techniques for verifying sources, analyzing bias, and assessing the reliability of information can be taught to encourage a critical approach to knowledge. Fallis (2020) examines how fake content affects the credibility of information and emphasizes that digital literacy is a crucial tool for mitigating these threats. Similarly, providing students with tools to question their assumptions about knowledge enables them to evaluate different perspectives, critically analyze sources, and think more deeply (Hofer & Pintrich, 1997; Schommer, 1990).

Moreover, the integration of effective assessment tools is critical in determining students' and educators' digital epistemological beliefs and in implementing targeted interventions. These tools guide educators in designing instructional strategies that enhance critical thinking and digital literacy skills.

Inequities in access to digital resources and skills present significant barriers to the development of advanced digital epistemological beliefs. Lupton (2020) highlights that access to digital resources and digital literacy education is often unevenly distributed, deepening social inequalities. The digital divide creates barriers for students from low socioeconomic backgrounds, rural areas, and marginalized communities, limiting their ability to develop digital epistemological beliefs. Bridging the digital divide requires not only providing technology but also offering digital literacy education to ensure students can use these tools effectively. Warschauer (2004) notes that overcoming the digital divide is not just about providing devices and internet access, but also ensuring that students have the skills to use these tools effectively for information gathering and problem-solving. Interventions aimed at increasing access to digital education and inclusivity in education will be crucial in enabling all students to critically evaluate digital information and interact responsibly.

Finally, expanding research on digital epistemological beliefs is necessary. As Metzger & Flanagin (2013) suggest, longitudinal studies provide deeper insights into how these beliefs evolve over time and across different contexts. Given the constant change and development in the digital world, it is crucial to conduct long-term research to understand how digital epistemological beliefs evolve and how these processes operate. Such research can help us understand how digital epistemological beliefs are shaped by technological changes, access to information, and social environments. Moreover, research should examine how digital epistemological beliefs intersect with other cognitive and socio-emotional factors such as identity, motivation, and socio-economic status, as well as their impact on learning outcomes. Mason et al. (2011) stress the importance of researching the role of social media in shaping epistemological beliefs, highlighting that these platforms not only provide information but also influence the social interactions that construct and share knowledge. Expanding the scope of research can help us better understand the complex dynamics of digital epistemology and develop more effective educational strategies that meet the needs of different student populations or educators. Mason et al. (2011) argue that such research is necessary to make educational strategies more efficient and to enhance students' ability to cope with the information they encounter in the digital world.

In conclusion, shaping digital epistemological beliefs through effective educational practices is vital for raising informed digital citizens. By addressing cognitive biases, reducing access inequalities, and using effective assessment tools, educators can enable students to approach digital knowledge critically and contribute to collective knowledge creation. As digital education continues to evolve, future research and initiatives should prioritize strategies to develop these fundamental beliefs in diverse populations.

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INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

OVER EXPRESSION RECOMBINATION STAPHYLOKINASE WITH R HUMAN GROWTH HORMONE (SAK-PET21a-rhGH)

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ABSTRACT

Recombinant proteins played a prominent role in the drug production process. Large protein molecules in living systems have demonstrated broad biological functions. When a foreign gene is introduced into coliform bacteria, it loses temporal control over the process of gene expression and thus the possibility of forming inclusion bodies that cause a great burden during the protein expression process because some of them may be toxic or may cause an imbalance in the vital processes and thus cause the bacteria to be killed. In the paper we will study the process of fusion of recombinant SAK-pET 21a with recombinant human growth hormone expressed by Escherichia coli. The fusion tag is developed by amplifying the synthesis. The isolated plasmid pET-SAK was used as a fusion vector in evaluating the ability of the SAK tag to transfer solubility into a recombinant human protein, the growth hormone (rhGH) gene was cloned into the fusion vector. To achieve this, the rhGH gene was amplified using PCR and the synthetic gene was used as a template. The amplicons were digested with EcoRI and HindIII enzymes and cloned into our synthesized expression vector pET-SAK vector. The hormone fuses with the vector by polymerase chain reaction (PCR) and bacterial stimulation of E PTG for the purpose of overexpression. A significant portion of the expressed protein was shown to be Finally, it was shown that the fusion markers represented by the pET-SAK vector act as a solubility enhancer in various recombinant proteins.

Key words: Escherichia coli, pET21a vector, Staphylococcus aureus, BL21DE3, DH5 α .

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

OPTIMUM DESIGN OF REINFORCED CONCRETE CANTILEVER MFO OPTIMIZATION ALGORITHM

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ABSTRACT

In this paper, the optimization of reinforcement cantilever concrete retaining walls are performed by MFO algorithm for wall cost and weight. This algorithm has been inspired from intelligent foraging behavior of the MFO. In order to investigate the capability of this algorithm, the obtained results are compared with the other literature. Based on these results, the MFO algorithm is able to minimize the wall cost and weight. Another research is performed to investigate the effect of optimization in comparison with conventional manual design. It shows that the optimization can significantly reduce the cost and weight of the wall. Moreover, two kinds of reinforcement concrete cantilever retaining walls with more variables and constraints are presented and compared with each other. The suggested walls are T-shape wall with variables thickness in stem and normal T-shape wall. These comparisons are performed for two objective function; cost and weight of the wall. In addition, the effect of initial parameters such as unit weight of soil and stem height are investigated by sensitivity analysis. All results show that the MFO algorithm is robust to optimize the cost and weight of reinforcement concrete cantilever retaining wall.

Keywords: reinforcement concrete cantilever retaining wall, MFO algorithm, optimization, sensitivity analysis, objective functions, wall cost and weight, T-shape walls.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

THE USE OF ANTIBIOTICS IN ORAL SURGERY

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ABSTRACT

The judicious application of antibiotics in oral surgery is pivotal in preventing postoperative infections and ensuring optimal patient outcomes. Antibiotic prophylaxis aims to mitigate the risk of infections particularly in surgeries involving osseous manipulation, dental implant placement, or in immunocompromised patients. This abstract elucidates the indications, benefits, and potential complications associated with antibiotic administration in oral surgical procedures.

Antibiotics are crucial in high-risk scenarios, such as patients with systemic comorbidities, extensive surgical interventions, or when foreign materials are utilized within the oral cavity. Frequently prescribed antibiotics include beta-lactams (e.g., penicillin), lincosamides (e.g., clindamycin), and nitroimidazoles (e.g., metronidazole), selected based on their efficacy against common oral pathogens.

The inappropriate use of antibiotics can precipitate adverse outcomes including the emergence of antimicrobial resistance, hypersensitivity reactions, and dysbiosis of the gastrointestinal flora. Hence, adherence to evidence-based guidelines is imperative for oral surgeons to determine the necessity and appropriateness of antibiotic prophylaxis. Current literature underscores the importance of precise dosing regimens, optimal timing, and appropriate duration of antibiotic therapy to balance efficacy against potential adverse effects.

In summary, antibiotics constitute an integral component of infection control in oral surgery, providing a prophylactic shield against postoperative infections. However, their use must be circumspect and individualized to prevent the propagation of antibiotic resistance and other related complications. Ongoing research should aim to refine antibiotic protocols and explore adjunctive strategies to enhance antimicrobial stewardship in the context of oral surgical practice

Key words: infection, prophylaxis , antibiotic resistance

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

COLD-ACTIVE MICROBIAL CELLULASE: NOVEL APPROACH TO UNDERSTAND MECHANISM AND ITS APPLICATIONS IN FOOD AND BEVERAGES INDUSTRY

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ABSTRACT

Cellulose, a carbohydrate mainly found in plant cell walls, is most abundant biopolymer on the Earth. Biodegradation of cellulose is carried out by a group of enzymes known as cellulases. These enzymes play important roles in food processing and used in food industry. In the present era, cold-active enzymes are preferred instead of meso- and thermo-philic counterparts due to less energy requirement for their optimal activity and easy inactivation. The present study includes evaluation of cold-active cellulase from *Pseudoalteromonas haloplanktis* for its industrial applications in comparison to mesophilic and thermophilic cellulases, through molecular docking method. The binding energy of cold-active cellulase with the substrate cellulose was -126.60 KCals/mole. However, the energy for thermo- and mesophilic cellulase found to be -93.29 and -75.54 KCals/mole, respectively. The results concluded that cold-active cellulase has more efficacy compared to its counterparts and may be used in food processing industry at commercial level.

Keywords: Cellulase; cellulose; cold-active enzymes; food industry, *Pseudoalteromonas haloplanktis*, psychrophile

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

EFFECTS OF PROBIOTICS ON ORAL MICROBIOLOGICAL ENVIRONMENT, GINGIVAL HEALTH AND DENTAL PLAQUE; A META-ANALYSIS

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ABSTRACT

Background:

The oral microbiome, comprising over 700 bacterial species, plays a crucial role in oral health. Key microorganisms like *Streptococcus mutans* and *Porphyromonas gingivalis* contribute to biofilm formation, leading to conditions such as gingivitis, periodontitis, and dental caries. Conventional treatments, including fluoride and professional cleaning, focus on plaque control, but probiotics are gaining attention as potential adjunct therapies for their ability to modulate the oral microbiome, reduce inflammation, and limit harmful bacteria.

Objective:

To evaluate the effects of probiotics on gingival health, plaque accumulation, and the oral microbiological environment.

Materials and Methods:

A meta-analysis was conducted according to PRISMA guidelines. After thorough web search, thirteen studies from 2009 to 2024 were included, comprising of 321 participants. Random effects models were used for statistical analysis, and the Cochrane Risk Assessment tool was applied to assess bias.

Results:

Probiotics significantly improved the Gingival Index (WMD=0.27, 95% CI=0.02–0.52, p=0.04). However, no significant changes were found in Plaque Index (p=0.64), Bleeding on Probing (p=0.92), or Gingival crevicular Fluid volume (p=0.94). While IL-1 β concentration in GCF increased (p=0.02), bacterial counts, including *Aggregatibacter actinomycetemcomitans* and *Porphyromonas gingivalis*, showed no significant reduction.

Conclusion:

Probiotics may offer benefits by improving gingival health, though their effects on plaque and bacterial counts remain limited. Strain-specific effects, dosage, and individual variability could explain the inconsistent findings. Further research is needed to optimize probiotic interventions for oral health.

Keywords: dental plaque, gingiva, oral microbiota, probiotics

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

INTEGRATED PLAY-BASED LEARNING IN LEBANESE PRE-PRIMARY EDUCATION: ENHANCING ACADEMIC COMPETENCES AND SOCIOEMOTIONAL DEVELOPMENT

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ABSTRACT

This study aims to advance the understanding of implementing an integrated play-based learning approach in the Lebanese pre-primary education to enhance learners' readiness for their academic future. Play-based learning has been widely recognized in the milieu of education, yet a gap in the literature remains regarding implementing an integrated play-based learning approach to enhance both academic competences and socioemotional development. The literature shows abundant research regarding the benefits and advantages of both free play and guided play. However, there is a gap in research regarding exploring how an integrated play-based learning approach can enhance pre-primary learners' academic competences and socioemotional development. By filling this gap, the study aims to provide valuable insights for educators, principals, school teams, and policymakers, informing evidence-based practices and policies.

The research questions that emerged from the gaps in the literature regarding the implementation and outcomes of integrated play-based learning are the following:

How can Lebanese pre-primary educators implement an integrated play-based learning approach to enhance learners' academic competences?

How can Lebanese pre-primary educators implement an integrated play-based learning approach to enhance learners' socioemotional development?

Regarding the study's methodology, the study adopts a qualitative case study design with mixed-method elements. Purposeful sampling will be used to select two pre-primary schools in Lebanon, focusing on educators and learners in the private sector. Data collection tools and methods include semi-structured interviews, classroom observations, field notes, document analysis, surveys, and pre and post-assessments. Thematic analysis will be employed to analyze qualitative data, while descriptive statistics and comparative analysis will be used for quantitative data.

Keywords: Integrated play-based learning, academic competences, socioemotional development, pre-primary education

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

HARNESSING ARTIFICIAL INTELLIGENCE TO ACHIEVE SUSTAINABLE DEVELOPMENT GOALS: OPPORTUNITIES, CHALLENGES, AND ETHICAL CONSIDERATIONS

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ABSTRACT

This critical analysis examines the role of artificial intelligence (AI) in attaining the Sustainable Development Goals (SDGs), emphasizing its potential advantages and related problems. AI technologies can markedly improve resource efficiency, optimize public service delivery, and stimulate economic growth and development, thereby advancing multiple Sustainable Development Goals (SDGs), including poverty alleviation, responsible consumption and sustainable urban development. The incorporation of artificial intelligence brings ethical challenges, including the potential for perpetuating biases and aggravating inequality, which may impede progress toward sustainable development. This assessment underscores the necessity of responsible deployment of Artificial Intelligence, promoting strong governance frameworks, collaborative efforts among multiple stakeholders, and focused investments in education and capacity building to minimize poverty significantly. By connecting artificial intelligence research and uses with the Sustainable Development Goals and ensuring equal access to its advantages, stakeholders may leverage AI as a potent instrument for sustainable development. In conclusion, leveraging the revolutionary potential of AI for sustainable development necessitates a multi-stakeholder approach that includes governments, researchers, civil society, and the corporate sector. This collaboration must emphasize the establishment of strong governance frameworks, the involvement of data management specialists, the assurance of algorithmic transparency and accountability, and the facilitation of equal access to AI technologies. This study ultimately advocated for a balanced strategy that optimizes the beneficial effects of AI while mitigating its problems to promote a more sustainable and equitable future for all citizens.

Keywords: Artificial Intelligence, Sustainable Development Goals, poverty alleviation, inequality reduction, decent employment and economic advancement.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

AVAILABILITY AND UTILIZATION OF VIRTUAL AND AUGMENTED REALITY TOOLS FOR TEACHING SENIOR SCHOOL PHYSICS IN ILORIN, NIGERIA

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ABSTRACT

The study focused on the availability and utilization of virtual and augmented reality tools for teaching science concepts in secondary schools in Ilorin Nigeria. The study employed a descriptive survey design. Simple random sampling technique was used to select 100 secondary school science teachers. Four research questions and two hypotheses were formulated to guide the study. Data for the study were collected using a structured questionnaire titled “Availability and Utilization of Virtual and Augmented Reality Tools Questionnaire (AUVARTQ)”. The descriptive statistics of mean and standard deviation was used to answer the research questions while the Chi-square was used to test the hypotheses at 0.05 level of significance. The findings from the study revealed that, secondary schools in Ilorin have ample virtual reality tools for teaching science concepts however the augmented reality tools are unavailable. The study revealed also that, secondary school science teachers extensively integrate virtual reality tools into their instruction to enhance the teaching of science concepts. Finally, the study revealed that, the extent to which science teachers utilize virtual reality tools in teaching science concepts is heavily influenced by the availability of these tools. The study recommended among others that, government and policy makers should advocate for policies that support the integration of immersive technologies like VR and AR into secondary school science education.

Keyword: Augmented Reality, Virtual Reality, Availability and Utilization

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

ASSOCIATION OF RISK MANAGEMENT PRACTICES AND FINANCIAL PERFORMANCE OF MICROFINANCE INSTITUTIONS IN ETHIOPIA: A TWO-STEP SYSTEM GENERALIZED METHOD OF MOMENTS APPROACH

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ABSTRACT

The objective of this study is to analyze the association of risk management practices and financial performance of Microfinance Institutions (MFIs) in Ethiopia. A mixed research approach was used, incorporating qualitative and quantitative approaches and explanatory research designed. This study collected secondary data from audited financial statements from 24 sample MFIs from 2013 to 2022. The study utilized STATA version 15 software to address dynamic endogeneity bias, unobserved heteroskedasticity and autocorrelation within individual units' errors in dynamic panel data using the generalized method of moments (GMM) estimator. According to the findings of this study, both lagged dependent variables of return on assets and return on equity were positively associated with the financial performance of MFIs in Ethiopia. Financial leverage, interest rate risk, and cash to total deposit are negatively associated with financial performance indicators of return on asset and return on equity of MFIs in Ethiopia. Loan loss provisions, loans, and advances are negatively and significantly associated with return on asset, not with return on equity. Loan-to-deposit ratio is positively associated with financial performance indicators, while there is no significant association between non-performing loan and the financial performance of MFIs in Ethiopia.

Key words: Risk, Risk Management, Financial Performance, Microfinance Institutions, Ethiopia

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

PERSPECTIVE USE OF STONE MASTIC ASPHALT IN GEORGIA

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ABSTRACT

Stone Mastic Asphalt (SMA) is a durable and high-performance road surfacing material widely used in road construction due to its exceptional rutting resistance, long-term durability, and noise-reducing properties. This report discusses the composition, benefits, challenges, and potential applications of SMA, highlighting its role in modern infrastructure. SMA's unique mix design, comprising a coarse aggregate skeleton, rich binder content, and stabilizing additives, makes it a preferred choice for heavy-traffic roads and extreme climate conditions.

Keywords: Asphalt, Road Pavement, Stone Mastic Asphalt.

Introduction

Stone Mastic Asphalt was first developed in Germany in the 1960s to address issues of rutting and deformation caused by heavy vehicle loads. Its success in Europe led to its adoption worldwide. The unique design of SMA involves a gap-graded aggregate structure, where coarse aggregates provide strength, and high binder content enhances flexibility and durability. Stabilizing additives such as cellulose or mineral fibers prevent binder drainage during mixing and laying. SMA has become a popular choice for highways, urban roads, and airports, offering long-term performance and reduced maintenance costs.

Main Part:

Composition of SMA:

- Coarse Aggregates: Form the skeleton structure, providing load-bearing capacity and resistance to deformation.
- Fine Aggregates and Filler: Fill voids between coarse aggregates, ensuring a tight and durable mix.
- Binder: Bitumen is used to bind aggregates together. Polymer-modified bitumen is often preferred for enhanced performance.
- Stabilizers: Cellulose or mineral fibers prevent binder drainage and improve mix stability during transport and application.

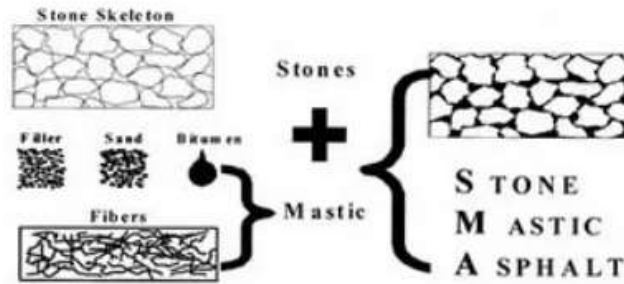


Figure 1. Composition of SMA

Advantages of SMA:

- **Durability:** Long-lasting performance with reduced maintenance frequency.
- **Rutting Resistance:** High stability under heavy traffic and high temperatures.
- **Noise Reduction:** Reduces tire-road noise due to its surface texture.
- **Weather Adaptability:** Performs well in both hot and cold climates, with resistance to thermal cracking and weather-related damage.
- **Sustainability:** Allows incorporation of recycled materials such as reclaimed asphalt pavement (RAP) or rubber.



Figure 2. Stone mastic asphalt (SMA) advantages.

Challenges in SMA Implementation

- **Cost:** Initial costs are higher due to higher binder content and stabilizer additives.
- **Specialized Equipment:** Requires advanced machinery and trained personnel for proper mixing, transportation, and laying.
- **Drainage Management:** Proper design is needed to ensure drainage and prevent water damage.

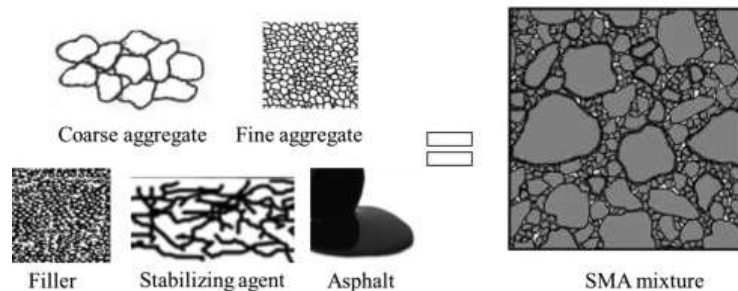


Figure 3. Stone mastic asphalt (SMA).

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Applications of SMA

- Highways and Expressways: Handles heavy traffic and load stresses effectively.
- Urban Roads: Provides a quieter and smoother ride quality.
- Airports and Industrial Roads: Suitable for areas exposed to extreme loads and stresses.
- Bridge Decks: Resistant to cracking under dynamic loads.



Figure 4. Stability in SMA mix

Conclusion

Stone Mastic Asphalt represents a significant advancement in road construction technology, offering superior performance compared to traditional asphalt mixtures. Its unique design makes it ideal for demanding applications such as highways and airports, where durability and resistance to deformation are critical. Although SMA involves higher initial costs and requires specialized handling, its long-term benefits in terms of durability, safety, and sustainability outweigh these challenges. As infrastructure development increasingly emphasizes longevity and environmental responsibility, SMA is poised to play a central role in modern road construction.

It is important to use this type of product in the construction of road networks in Georgia. This technology will improve and simplify the construction process. It will also significantly affect financial costs, which will allow us to direct the saved finances to the implementation of other infrastructure projects.

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TESTING OF A CdS/g-C₃N₄/TiO₂ TERNARY PHOTOCATALYSTS FOR PHOTOCATALYTIC APPLICATIONS

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ABSTRACT

This study investigated ternary CdS/g-C₃N₄/TiO₂ heterojunction photocatalysts for the degradation of synthetic dyes and hydrogen production from aqueous media through visible-light-initiated photocatalytic reactions. Graphitic carbon nitride, titanium dioxide, and cadmium sulphide were combined in different mass ratios through a simple sol-gel method to create CdS/g-C₃N₄/TiO₂ composite photocatalysts. The prepared heterojunction catalysts were studied using XRD, FTIR, EDX, SEM, and UV-visible spectroscopy analysis for their crystal structures, functional groups, elemental composition, microtopography, and optical properties. The rhodamine B dye was then degraded using fully characterized photocatalysts. The maximum dye degradation efficiency of 99.4% was noted in these experiments. The evolution rate of hydrogen from the aqueous solution with CdS/g-C₃N₄/TiO₂ photocatalyst remained 2950 molh⁻¹g⁻¹, which is considerably higher than CdS, g-C₃N₄, CdS/g-C₃N₄ and g-C₃N₄/TiO₂ catalyzed reactions. This study also proposes a photocatalytic activity mechanism for the tested ternary CdS/g-C₃N₄/TiO₂ heterojunction photocatalyst.

Keywords: CdS/g-C₃N₄/TiO₂, ternary photocatalysts, synthetic dyes, hydrogen production, water splitting.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

ANTICANCER DRUG DISCOVERY BASED ON NATURAL PRODUCTS: FROM COMPUTATIONAL APPROACHES TO CLINICAL STUDIES

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ABSTRACT

Globally, malignancies cause one out of six mortalities, which is a serious health problem. Cancer therapy has always been challenging, apart from major advances in immunotherapies, stem cell transplantation, targeted therapies, hormonal therapies, precision medicine, and palliative care, and traditional therapies such as surgery, radiation therapy, and chemotherapy. Natural products are integral to the development of innovative anticancer drugs in cancer research, offering the scientific community the possibility of exploring novel natural compounds against cancers. The role of natural products like Vincristine and Vinblastine has been thoroughly implicated in the management of leukemia and Hodgkin's disease. The computational method is the initial key approach in drug discovery, among various approaches. This review investigates the synergy between natural products and computational techniques, and highlights their significance in the drug discovery process. The transition from computational to experimental validation has been highlighted through in vitro and in vivo studies, with examples such as betulinic acid and withaferin A. The path toward therapeutic applications have been demonstrated through clinical studies of compounds such as silvestrol and artemisinin, from preclinical investigations to clinical trials. This article also addresses the challenges and limitations in the development of natural products as potential anti-cancer drugs. Moreover, the integration of deep learning and artificial intelligence with traditional computational drug discovery methods may be useful for enhancing the anticancer potential of natural products.

Keywords: Natural product , anticancer drug delivery ,computational drug design,clinical trails,molecular dynamics ,drug design.

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RUMINANT MANAGEMENT: PHYTOCHEMICALS AS A SOURCE OF MEDICINE

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ABSTRACT

Animal husbandry must include ruminant management because it is essential to agriculture and food production. For farming to be sustainable and successful, ruminants must be kept in good health. Utilizing plant-derived phytochemicals as a source of natural medications to improve the well-being and productivity of ruminants is one new area of interest. Phytochemicals are bioactive substances that are present in a variety of plant species. Alkaloids, flavonoids, tannins, saponins, and essential oils are only a few of the many substances. These organic substances have proven to have exceptional therapeutic qualities in both humans and animals. Phytochemicals are becoming more widely acknowledged in ruminant management for their ability to improve an array of features related to livestock performance and health.

In managing ruminants, phytochemicals have been applied for enhancing digestive performance, manage common health problems, reduce internal parasites, and enhance immune responses. These substances can affect the rumen's microbiome, boosting effective nutrient utilization and lowering methane emissions, which helps support more environmentally friendly livestock farming techniques. Taking into account when applying phytochemical-based interventions in ruminant management, including dosage, safety, and standardization concerns. In order to fully utilize phytochemicals' potential for boosting ruminant health and productivity, research, knowledge exchange, and collaboration between scientists, veterinarians, and livestock producers are essential.

In conclusion, phytochemicals show significant potential as natural remedies for managing ruminants, providing viable and sustainable alternatives to conventional drugs. The use of phytochemicals presents an intriguing route for enhancing the health and well-being of ruminant cattle while contributing to more ethical and successful livestock production as the demand for organic and eco-conscious agricultural techniques rises.

Keywords: Phytochemical, animal, health, ruminant

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ANTİMİKROBİYAL ETKİLİ VE İMMÜN SİSTEM DESTEKLEYİCİ Evelik Otu (*Rumex patientia L.*) BİTKİSİNİN ÖZELLİKLERİNİN İNCELENMESİ

INVESTIGATION OF THE PROPERTIES OF THE HERB HOUSELEEK (*RUMEX PATIENTIA L.*), WHICH HAS ANTIMICROBIAL ACTIVITY AND SUPPORTS THE IMMUNE SYSTEM

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ÖZET

Evelik otu (*Rumex patientia L.*) Polygonaceae (karabuğdaygiller) familyasına ait besin değeri yüksek saplardan oluşan çok yıllık otsu bir bitkidir. Genellikle üst kısımda dallanmış ve 50 cm yüksekliğe ulaşabilen ince kırmızımsı bir dik gövdeye sahiptir. Bitkinin yetişme yeri olarak fundalık ve çayırlarda asidik kumlu topraklarda iyi bir şekilde yetişebilmektedir. Birçok kullanımının yanı sıra alternatif tıpta sindirim sistemi bozukluklarında, bağışıklık sisteminin güçlendirilmesinde, enfeksiyonlara karşı antimikrobiyal ve immün sistemleri destekleyici gibi birçok sağlık sorunlarının tedavisinde kullanılan değerli bir bitkidir. Özellikle doğu bölgesinde yöre halkı tarafından sebze olarak değerlendirildiği için birçok salata ve yemekleri yapılmaktadır.

Evelik otu içeriğinde bulunan flavonoidler, fenolik bileşikler, organik asitler ve tanenler sayesinde antioksidan, anti-enflamatuar ve antimikrobiyal özellik olarak modern tıpta destekleyici olarak değerlendirilebilmektedir. Ayrıca bitkinin antiviral ve antifungal aktiviteleri sayesinde bağışıklık sistemini destekleyici özelliği de bulunmaktadır. Bitkide karotenler, C ve A vitaminleri, flavonoidler, tokoferoller, fenolik bileşikler gibi önemli bileşikler bulunmaktadır. Evelik otunun sağlık açısından ateş düşürücü, idrar söktürücü, müshil etkisi, yanık tedavisinde, iltihap ve kanın temizlenmesinde gibi birçok sağlık problemlerinin tedavisinde kullanılabilir. Her ne kadar şifalı bir bitki olsa da içeriğinde bulunan oksalik asit ve oksalatlar nedeniyle aşırı tüketilmesi durumunda toksik etki yaparak zehirlenmelere yol açabilir.

Sonuç olarak, evelik otu antimikrobiyal ve immün sistemini destekleyen önemli bir tıbbi bitkidir. Fakat toksin özelliği göz önüne alındığında klinik deneyler ile daha fazla bilimsel araştırmaların yapılmasına ihtiyaç vardır. Bu bağlamda böylesine değerli bir bitkinin gün yüzüne çıkarılması ve değerlendirilmeye alınması hem ekonomik açıdan hem de bulunduğu coğrafyada iş olanağı açısından değerlendirilebileceği kanaatindeyiz.

Anahtar Kelimeler: Evelik otu, *Rumex patientia L.*, antimikrobiyal, immünomodülatör, antioksidan.

ABSTRACT

The Evelik (*Rumex patientia L.*) is a perennial herbaceous plant of the family Polygonaceae (buckwheat family) consisting of stems with high nutritional value. It usually has a thin, reddish, erect stem branched at the top and can reach a height of 50 cm. The plant can grow well in acidic sandy soils in heathlands and meadows. In addition to its many uses, it is a valuable plant used in alternative medicine to treat many health problems, such as digestive system disorders, strengthening the immune system,

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antimicrobial against infections, and supporting immune systems. Especially in the eastern region, many salads and dishes are made because it is considered vegetables by the local people.

Thanks to the flavonoids, phenolic compounds, organic acids, and tannins in the content of evelik, it can be evaluated as a supportive in modern medicine as antioxidant, anti-inflammatory, and antimicrobial properties. The plant also supports the immune system thanks to its antiviral and antifungal activities. The plant contains important compounds such as carotenes, vitamins C and A, flavonoids, tocopherols, and phenolic compounds. Evelik herb can treat many health problems such as antipyretic, diuretic, laxative effect, burn treatment, inflammation, and blood purification. Although it is a medicinal plant, it can cause poisoning by toxic effects if consumed excessively due to oxalic acid and oxalates in its content.

As a result, evelik is an important medicinal plant that supports the antimicrobial and immune systems. However, considering its toxin properties, there is a need for more scientific research with clinical trials. In this context, such a valuable plant should be unearthed and evaluated both economically and in terms of job opportunities in the geography where it is located.

Keywords: Evelik grass, *Rumex patientia* L., antimicrobial, immunomodulatory, antioxidant.

GİRİŞ

Doğada bulunan şifalı bitkiler alternatif tıpta kullanılmalarının yanı sıra modern tıpın da kaynağını oluşturmaktadırlar. Dünya üzerinde 500.000 bitki türü bulunmakta olup, bunların ortalama 80.000'den fazlası tedavi edici özelliği nedeniyle tıbbi olarak kullanılmaktadır (Larid ve ark., 2022). Nitekim ilk çağlardan günümüze insanoğlu çeşitli sağlık problemlerinin tedavisi için doğada bulunan bitkilerden faydalanmaya çalışmaktadırlar. İnsanların bitkilere olan ilgisini Dünya Sağlık Örgütü (WHO) dünya nüfusunun ortalama %80'i halen alternatif tıpta kullanılan bitkilerden sağladığını ifade etmektedir (Ramesh ve Palaniappan, 2023).

Bitkilerin faydalı yönleri göz önüne alındığında genellikle bitkilerde bulunan sekonder metabolitler alternatif tıpta kullanılan değerli kaynaklardır. Bu kaynaklar ve kombinasyonları her bitki türüne veya cinsine göre değişim gösterdiği için tıbbi olarak etkileri de değişim göstermektedir (Wink, 1999). Bitkilerin sekonder metabolitleri tarihsel süreç içerisinde bitkilerin üretimi ve bakımı sürecinde herhangi bir rolü olmayan kimyasallar olarak bilinse de son yıllarda yapılan araştırmalarda sekonder metabolitlerinin bitkinin eko fizyolojisinde önemli bir rolü olduğu için patojenlerin saldırısında, bitkiler arasındaki rekabette koruyucu, tozayıcılar ve ortakyaşarlar gibi faydalı organizmalara karşı çekici özelliği olduğu belirtilmiştir (Kaufman ve ark., 1999). Sekonder metabolitler bu özellikleri sahip olmalarının yanı sıra insanlar için potansiyel antioksidan, antibakteriyel, antimikrobiyal, antidepresan, antikanser gibi birçok hastalığın tedavisinde faydalı olabilmektedir (Kaufman ve ark., 1999).

Bitki türlerinin etnomedikal olarak kullanılmaya başlanması ile birlikte farmakolojik olarak çoğu bitki türüne ait türev bileşiklerinin %70'i keşfedilip kullanılmaya başlanmıştır. Bu değerli bitki cinslerinden birisi olan *Rumex* Polygonaceae familyasına ait bitkiler alternatif tıpta mikrobiyal enfeksiyonlar olan dermatoloji problemleri, dizanteri, askariasis gibi farklı hastalıkların tedavisinde kullanılmaktadırlar (Zhang ve ark., 2012; Vasas ve ark., 2015). Kars yöresinde yöre halkının yaygın bir şekilde tüketmiş olduğu *Rumex patientia* L. bitkisi üst solunum yolu enfeksiyonlarının tedavi ettiğine inanmaktadırlar. *Rumex* cinsi dünya genelinde yenilebilir özelliği sayesinde halk tarafından tüketilmesinin yanı sıra çeşitli hastalıkların tedavisinde kullanılmaktadır. Bu yüzden dünya üzerinde 200'den fazla türü bulunmakla birlikte, ülkemizin çoğu bölgesinde yaygın olarak yetişmektedir (Keskin ve Severoğlu, 2023). Bu bitki türleri sekonder metabolitler olarak içeriğinde kinonlar, flavonoidler, tanenler, stilbenler, naftalinler, terpenler, diterpen alkaloidler, lignanlar ve diğer bileşenleri içermektedir. Bitki türlerinin antimikrobiyal, anti-enflamatuar, antiviral, renal ve gastrointestinal koruyucu etkiler, antioksidan, antitümör ve anti-diyabet etkileri bulunmaktadır (Li ve ark., 2022).

Bu derlemede doğada doğal olarak yetişen *Rumex patientia* L. genel özelliklerini, bitkisinin kimyasal içeriklerini, antioksidan, antidiyabetik, antikolinesteraz, antikanser aktivitelerini ve faydalarını bir araya

getirerek bitkinin farkındalığını ortaya çıkarmaktır. Bu sayede ülkemiz çiftçilerine ve tüm araştırmacılara yararlı olabilecek ve ülke ekonomisine büyük katkı sağlayacak bitki hakkında detaylı bilgi verilmesi amaçlanmıştır.

***Rumex patientia* L. TÜRÜNÜN GENEL ÖZELLİKLERİ**

Rumex patientia L. olan evelik bitkisi kara buğdaygiller (Polygonaceae) familyasına ait çok yıllık, boyu iki metre kadar uzayabilen otsu bir bitkidir. Genellikle 1500 m rakıma sahip yerlerde yetişmektedirler. Bu bitki türleri genellikle Avrupa, Asya, Afrika ve Kuzey Amerika ile Kuzey Yarım Küre’de yayılış göstermektedir. Bu bitki türleri dünyanın hemen hemen her yerinde sebze olarak tüketilme özelliğine sahip olduğu için tıbbi olarak ta değerlendirilmiştir (Baytop, 1999; Vasas ve ark., 2015). Ülkemizde genellikle nemli ve verimli toprakların olduğu sulak alanlar, dere kenarları, tarla ve yol kenarları, ormanlık, dağlık, çayır ve mera alanlarında kolay bir şekilde yetişmektedir. Genellikle yaz başı ve sonbahar başlangıcı olan Haziran ve Eylül aylarında yetişmektedir (Güner ve ark., 2012).

Halk arasında bölgeden bölgeye değişen çok farklı isimlerle bilinen evelik genellikle efelek, duvelik, labada, gegeş, dağ pazısı, avelik, ılıbada gibi çok değişim isimler ile bilinmektedir. Eksi olan yapraklı türler kuzukulağı olarak ifade edilirken, yaprakları ekşi olmayan türler ise evelik olarak ifade edilmektedir. Evelik yaprakları farklı dalgalı veya kıvrılmış kenarları olan sarmal dizimli, geniş ve damarlı düz yapraklara sahip olup, bazı yaprakları ise yumurta şeklinde ve küt uçludur. Yaz ortalarında bir çiçeklenme veya çiçek sapı üretir. Çiçekler sap üzerinde çiçekler ve tohumlar kümeler halinde pul şeklinde oluşmaktadır. Çiçekleri küçük yeşilimsi kırmızı renkte oluşmaktadır. Tohumları parlak, kahverengi ve çiçeğin kaliks ile kaplıdır. Gövdesi dik olup silindirik dallanmış bir yapıya sahiptir. (Şekil 1), (Baytop, 1999; Davis, 1982).



Şekil 1. *Rumex patientia* L. ait genel görüntüler

Rumex patientia L. (Evelik veya Labada), içerik bakımından biyoaktif bileşenler bulduran önemli bir tıbbi ve yenilebilir bitkidir. Bitkinin içeriğinde kimyasal bileşik olarak flavonoidler, fenolik bileşikler, organik asitler, vitaminler ve mineral maddeler oldukça fazladır (Baytop, 1999; Öztürk ve ark., 2012). Fenolik bileşikler ve flavonoidler bitkinin antioksidan özellik göstermesini sağlayan önemli bileşiklerdir. Flavonoidler olarak genellikle quercetin, kaempferol, rutin, luteolin, epicatechin ve myricetin türevlerini içermektedir. Bu bileşikler genellikle bitkinin anti-inflamatuar, antimikrobiyal ve antikanser özelliklerini ön plana çıkarmaktadır (Güvenç ve ark., 2012; Kumar ve ark., 2020). Fenolik bileşikler olarak gallik asit, klorojenik asit, kafeik asit, p-kumarik asit ve ferulik asit içerikleri oksidatif stresle mücadele ve hücre korumada ön plana çıkmaktadır (Orhan ve ark., 2012). Evelik bitkisinin içerik olarak emodin, aloe-emodin, krizofanol ve physcion gibi antrakinon türevleri bakımından zengin olduğu için müshil etkisine sahiptir. Genellikle kabızlık tedavisinde kullanılabilir (Öztürk ve ark., 2012). C (Aksorbik asit), A (β -Karoten ve Retinoidler) ve E (**Tokoferoller**) vitaminleri A bakımından oldukça zengin olduğu için önemli bir antioksidan özelliği vardır. Ayrıca β -karoten gibi karotenoidler içerdiği için göz sağlığı ve cilt için oldukça faydalıdır (Baytop, 1999; Güner ve ark., 2012). Bitki mineral içeriği bakımından değerlendirildiğinde demir, kalsiyum, magnezyum ve potasyum bakımından oldukça zengindir. Genellikle anemi rahatsızlığı, kemik sağlığı, kas ve sinir sistemi, kalp ve kas fonksiyonlarının

düzenlenmesi gibi tedaviler için oldukça faydalıdır (Orhan ve ark., 2012; Öztürk ve ark., 2012). Bitkinin yaprak ve kökleri çok az miktarda uçucu yağ içermektedir. Fakat bu uçucu yağlar tıp alanında değerlidir. İçeriğinde çok az bulunan linoleik asit, α -linolenik asit ve oleik asit anti-inflamatuar ve antioksidan özelliği ile dikkat çekmektedir (Kumar ve ark., 2020).

***Rumex patientia* L. TÜRÜNÜN TAMAMLAYICI TIPTA KULLANIMI**

Evelik bitkisi alternatif tıpta eskilerden beri kullanılan değerli bir bitkidir. Halk hekimliğinde yaygın bir şekilde kullanılan bitki genellikle sindirim sistemi rahatsızlığında, cilt hastalığında, iltihaplanmalarda ve demir eksikliği tedavisinde kullanılmaktadır (Orhan ve ark., 2012). Evelik bitkisinin zengin fenolik, flavonoid, antrakinin bileşikler ve minareller içerdiği için farmakolojik etkiye sahiptir (Güvenç ve ark., 2012).

Rumex patientia L. bitkisinin alternatif tıpta kullanım şekillerinden bir tanesi müshil etkisidir. Bitkinin kök ve yaprakları antrakinin türevleri sayesinde müshil etkisi yapmaktadır. İçeriğinde bulunan bu madde bağırsak kaslarını uyararak kabızlığı olan kişilerin rahatlamasını sağlar (Orhan ve ark., 2012; Öztürk ve ark., 2012). Genellikle bitkinin kökleri kaynatılarak çay şeklinde içilerek kullanılmaktadır (Davis, 1982). Bir diğer etkisi karaciğeri korumasıdır. Bitkinin içeriğinde bulunan flavonoidler ve fenolik bileşikler sayesinde karaciğeri koruma özelliği mevcuttur. Özellikle karaciğer içerisinde bulunan toksit maddeleri temizleyerek koruyucu özellik göstermektedir (Orhan ve ark., 2012). Bitkinin yaprakları çay gibi demlenerek içilir. Bu şekilde karaciğer rahatsızlıklarını ve safra akışını artırmaktadır (Baytop, 1999).

Evelik bitkisinin içerisinde bulunan yüksek miktarda demir anemi (kansızlık) tedavisinde faydalı olmaktadır (Güner ve ark., 2012). Genellikle taze yaprakları sebze olarak veya çay şeklinde içilerek kullanılması kan değerlerinin iyileşmesine yardımcı olmaktadır (Öztürk ve ark., 2012; Kumar ve ark., 2020). Bitkinin içeriğindeki fenolik bileşikler sayesinde antioksidan ve anti-inflamatuar etkisi bulunmaktadır. Ayrıca hipertansiyonu önlediği için kalp damar sağlığını da korumaktadır (Davis, 1982; Güvenç ve ark., 2012).

Cilt hastalığı olan yara ve egzamalara karşı tedavi edici özelliğini içeriğinde bulunan anti-bakteriyel ve anti-fungal bileşikler sayesinde sağlamaktadır. Genellikle taze yaprakları ezilerek lapa haline getirilir ve cilt üzerine sürülür (Baytop, 1999; Öztürk ve ark., 2012). Bitkinin içeriğinde bulunan β -karoten ve C vitamini cildi güneş yanıklarına karşı koruyucu veya tedavi edici özelliği bulunmaktadır (Kumar ve ark., 2020).

Bitkinin içeriğinde bulunan flavonoidler ve fenolik bileşikler vücudun bağışıklık sistemini destekleyerek enfeksiyonlara karşı koruyucu etki gösterebilmektedir (Orhan ve ark., 2012).

***Rumex patientia* L. TÜRÜNÜN FARMAKOLOJİK AÇIDAN DEĞERLENDİRİLMESİ**

***Rumex patientia* L. bitkisi üzerine yapılan çeşitli araştırmalar sonucu** antioksidan, antiinflatuar, hepatoprotektif, antimikrobiyal, laksatif, antianemik, antikanser ve kardiyovasküler koruyucu etkilerinin olduğu ortaya konulmuştur (Kumar ve ark., 2020). Bitkinin içeriğinde bulunan quercetin, rutin, myricetin, klorojenik asit, kafeik asit ve gallik asit gibi flavonoid ve fenolik bileşiklerin güçlü bir antioksidan etki yarattığı ortaya konmuştur. Anti-oksidanlar vücuttaki serbest radikalleri nötralize ederek oksidatif stresi azaltarak hücre hasarını önlemektedir (Güvenç ve ark., 2012; Orhan ve ark., 2012). Orhan ve ark. (2012) evelik bitkisi ile ilgili yapmış oldukları bir çalışmada içeriğinde bulunan fenolik bileşenlerin DPPH serbest radikal temizleme aktivitesi gösterdiğini ortaya koymuşlardır. Nitekim oksidatif stres kanser, diyabet, nörodejeneratif hastalıklar ve kardiyovasküler hastalıkların gelişiminde önemli bir faktör olduğu, antioksidan özellik gösteren *Rumex patientia* L. bitkisinin bu hastalıkların oluşumunu da engellediğini ve destekleyici bir unsur olduğunu ifade etmiştir (Kumar ve ark., 2020).

Bitkinin anti-inflamatuar etkisi içeriğinde bulunan luteolin, quercetin ve klorojenik asit gibi flavonoid bileşiklerden sağlamaktadır (Öztürk ve ark., 2012). Bitkinin içeriğinde bulunana flavonoidler siklooksijenaz (COX) ve lipooksijenaz (LOX) enzimlerini inhibe ederek intihap oluşumunu engellemektedirler (Orhan ve ark., 2012). Güner ve ark. (2012) evelik bitkisinden elde ettikleri içerik

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

ile yapmış oldukları çalışmada **romatoid artrit, bağırsak inflamasyonu ve cilt hastalıkları gibi iltihaplı durumların tedavisinde kullanılabileceğini ifade etmişlerdir.**

Rumex patientia L. bitkisi anti-mikrobiyal etkisi sayesinde birçok mikroorganizmaların zararlı etkilerine karşı koruyucu etki göstermektedir (Öztürk ve ark., 2012). Bitki içerisinde bulunan tanenler ve flavonoidler mikroorganizmaların hücre zarını bozarak çoğalmalarını engellemektedir (Orhan ve ark., 2012). Bazı araştırmacılar evelik bitkisinden elde edilen özütlerinin anti bakteriyel ve antifungal etki gösterdiğini belirtmişlerdir (Güven ve ark., 2012; Öztürk ve ark., 2012).

Karaciğer vücudumuzda biriken toksik maddeleri temizlemek için gerekli organlarımızdan bir tanesidir. Evelik bitkisi içeriğinde bulunan polifenoller ve flavonoidler bileşikler karaciğeri koruduğu görülmektedir (Orhan ve ark., 2012). Evelik bitkisinin içeriğinde bulunan bileşenler vücutta serbest radikal bileşen oluşumunu azaltarak karaciğerde koruyucu etki yaratmaktadır. Glüten seviyesini artırarak antioksidan savunma mekanizmalarını güçlendirmektedir. Ayrıca Hepatotoksik madde oluşumunu önleyerek koruyucu etki yaratmaktadır (Yücel ve ark., 2000).

Evelik bitkisi kardiyovasküler koruyucu etkisi sayesinde kolesterol ve kalbi koruyucu etkisi bulunmaktadır. Bitki içerisinde bulunan flavonoidler damar genişlemesini sağlayarak kan basıncını düzenlerler. Klorojenik asit ve quercetin, LDL-kolesterol seviyesini düşürmektedir. Ayrıca potasyum içeriği sayesinde kan basıncı düzenlenir (Orhan ve ark., 2012; Kumar ve ark., 2020).

Günümüz tedavisi zor hastalıklardan birisi olan kanser bitkinin emodin, aloe-emodin ve quercetin gibi bileşikler sayesinde engellenebileceği bilinmektedir. Bitkinin içeriğinde bulunan maddeler sayesinde anti kanser etki oluşturarak kanser hücrelerinin oluşumunu engellemektedir. Apoptoz mekanizmalarını aktif ederek DNA hasarına karşı oluşan oksidatif stresi azaltmaktadır (Güner ve ark., 2012; Orhan ve ark., 2012).

SONUÇ

Evelik otu (*Rumex patientia* L.) ülkemizde yöre halkı tarafından sebze olarak kullanılan ve içeriğinde bulunan bir takım biyoaktif bileşikler sayesinde alternatif tıpta yaygın olarak kullanılan değerli şifalı bitkilerden bir tanesidir. Evelik otunun antioksidan, antibiyotik, immün sistemleri destekleyici, antikanser gibi birçok hastalıklara karşı destekleyici özelliği sayesinde fitoterapi alanında dikkat çeken ürünlerden bir tanesidir.

Evelik otu içerdiği flavonoidler, tanenler, fenolik bileşikler ve organik asitler bitkinin antimikrobiyal yönden önemini açıkça ortaya koymaktadır. Ayrıca bitkinin içeriğinde bulunan C vitamini, beta-karoten, flavonoidler ve polifenoller güçlü bir antioksidan özellik göstererek vücut içerisinde serbest radikallerin oluşturduğu hücresel zararların minimize edilmesine olanak sağlayarak vücut içerisinde oluşabilecek enfeksiyonlara karşı vücudu dirençli hale gelmesini sağlamaktadır. Bu sayede gribal enfeksiyon ve bağışıklık sisteminin zayıfladığı dönemlerde vücudun güçlü kalmasını sağlayan doğal destekleyici olarak görev yapmaktadır.

Evelik otu ayrıca diüretik, sindirim sistemi düzenleyici, vücutta oluşan toksinleri atarak karaciğer fonksiyonlarını düzenleyici, mide rahatsızlıkları, bağırsak enfeksiyonları ve deri hastalıkları gibi çok geniş bir alanda da yaygın olarak kullanılmaktadır.

Sonuç olarak; Evelik otu (*Rumex patientia* L.) antimikrobiyal, immün sistem destekleyicisidir. Ayrıca hastalıkların oluşumunun engellenmesi ve bağışıklık sisteminin güçlendirilmesi açısından değerli olduğu söylenebilir. Fakat içeriğinde yüksek oranda oksalat bulunduğu için aşırı tüketimi önerilmemektedir. Aşırı tüketilmesi durumundan böbrek sağlığını olumsuz etkileyebileceği için kontrollü bir şekilde tüketilmesi gerekmektedir. Bitki hakkında yapılan bilimsel çalışmalar bitkinin güçlü tıbbi potansiyelini desteklemekle birlikte evelik otunun sağlık üzerine etkileri hakkında daha fazla klinik çalışmalara ihtiyaç duyulmaktadır.

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INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

BÖBREK FONKSİYONUNU DESTEKLEYİCİ GILABURNU (*Viburnum opulus* L.) BİTKİSİNİN ÖZELLİKLERİNİN İNCELENMESİ

INVESTIGATION OF THE PROPERTIES OF GILABURN (*Viburnum opulus* L.) PLANT SUPPORTING KIDNEY FUNCTION

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ÖZET

Doğanın insanlığa sunduğu şifalı bitkiler arasında yer alan Gilaburu (*Viburnum opulus* L.) Caprifoliaceae (hanımeligiller) familyasına ait 2 ila 4 metre arasında uzayabilen çalı bitkisi olan tıbbi ve aromatik bir bitkidir. Bu bitkinin genellikle meyveleri parlak kırmızı renkte, buruk tatlı ve genellikle yemiş turşu ve reçel olarak kullanılmaktadır. Alternatif tıp veya geleneksel tıp olarak bilinen alanlarda en belirgin bilinen böbrek sağlığını koruyan ve iyileştiren özelliğidir. Gilaburu bitkisine ait meyveleri, yaprakları ve kabuğu çeşitli tıbbi amaçlar için kullanılmaktadır. Ayrıca bu bitkinin bulunduğu coğrafyada meydana gelen hava ve toprak kirliliğini azaltıcı veya önleyici etkisi bulunmaktadır.

Gilaburu içeriğinde zengin fenolik bileşikler, flavonoidler, organik asit, minerel içerikler, antioksidan kapasitesi bileşikler barındırmaktadır. Bu kadar zengin bir içeriğe sahip bitkinin oksidatif stresi azaltmada, anti-enflamatuar etkisi sayesinde böbrekleri koruyucu, idrar söktürücü, böbrek taşı oluşumunu engelleyici, üst solunum yolu hastalıkları, sindirim sorunları, diyabet, kalp hastalığı, hipertansiyon, kanser, kardiyovasküler ve cilt hastalıkları gibi birçok hastalığın tedavisinde kullanılabilir. Gilaburu bitkisinin meyvesi içeriğinde bulunan saponinler, glikozitler ve vinburnin denen toksit maddeler nedeniyle çiğ olarak yendiğinde acı bir tada sahiptir. Bu yüzden genellikle meyvesi reçel, marmelat veya içecek şeklinde tüketilmektedir. İçeriğinde bulunan biyoaktif bileşenler antimikrobiyal özellik gösterdiği için patojenlere karşı mücadelede kullanılabilir özelliktedir. İçerisinde bulunan fenolik bileşenler sayesinde renk maddesi olarak ta değerlendirilebilmektedir.

Sonuç olarak gilaburun bitkisinin geleneksel kullanımının yanı sıra bilimsel çalışmalar ile birlikte desteklenmesi ile netroprotektif ajan olarak değerlendirilmesi sağlanabilir. Ayrıca bu tarz değerli bitkilerin tarımının yapılmasını teşvik ederek ülke ekonomisine ve işgücüne büyük katkı sağlayacağı kanaatindeyiz.

Anahtar Kelimeler: Gilaburu, *Viburnum opulus*, antioksidan, anti-enflamatuar, antimicrobial

ABSTRACT

Gilaburu (*Viburnum opulus* L.), which is among the medicinal plants offered by nature to humanity, is a medicinal and aromatic plant that is a shrub plant that can grow between 2 and 4 meters belonging to the Caprifoliaceae (honeysuckle) family. The fruits of this plant are usually bright red, astringent sweet, and are usually used as pickles and jams. In the fields known as alternative medicine or traditional medicine, the most prominent feature is its ability to protect and improve kidney health. The fruits, leaves, and bark of the Gilaburu plant are used for various medicinal purposes. In addition, this plant has the effect of reducing or preventing air and soil pollution in the geography where it is located.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

Gilaburu contains rich phenolic compounds, flavonoids, organic acids, mineral contents, and antioxidant capacity compounds. The plant with such a rich content can be used in the treatment of many diseases, such as reducing oxidative stress, protecting the kidneys thanks to its anti-inflammatory effect, diuretic, preventing kidney stone formation, upper respiratory tract diseases, digestive problems, diabetes, heart disease, hypertension, cancer, cardiovascular and skin diseases. The fruit of the Gilaburu plant has a bitter taste when eaten raw due to the saponins, glycosides, and toxic substances called viburnum. For this reason, the fruit is usually consumed as jam, marmalade or drink. Since the bioactive components in its content show antimicrobial properties, it can be used in the fight against pathogens. Thanks to the phenolic components it contains, it can also be used as a color substance.

In conclusion, besides the traditional use of the gilaburun plant, it can be evaluated as a neuroprotective agent by supporting it with scientific studies. In addition, we believe that encouraging the cultivation of such valuable plants will greatly contribute to the national economy and labor force.

Keywords: Gilaburu, Viburnum opulus, antioxidant, anti-inflammatory, antimicrobial

GİRİŞ

İnsanlığın varoluşu ile birlikte dünya üzerindeki yaşam mücadelesi hiç bitmemiştir. İnsanlık hayatta kalabilmek için gıda barınmanın ötesinde hastalıklarla da mücadele içerisinde olmuşlardır. Bu süreç zarfında hastalıklara karşı tedavi olabilmek ve hastalıklardan korunabilmek için birtakım yöntemlere başvurmuşlardır. İlk zamanlar hastalıkların tanrısal olduğu ve tanrılar tarafından iyileştirilebileceklerini onlara birtakım kurbanlar vererek veya sihirler yaparak iyileşme yoluna gitmişlerdir. Bu uygulamaların başarısızlığı, doğayla iç içe yaşam ve bitkilerin iyileştirici özelliklerinin keşfiyle birlikte bitkiler tedavi amaçlı kullanılmaya başlanmıştır (Dağcı ve ark., 2005). Bu süreç birçok medeniyetin doğanın gözlemlenmesi ve doğada bulunan bitkilerin deneme yanılma yöntemleri ile birtakım hastalıkların tedavisinde veya koruyucu olarak kullanılabilmesini ortaya koyarak birçok şifalı bitkiyi gün yüzüne çıkarmışlardır. Birtakım arkeolojik kazılar ile birlikte hitler döneminden kalma bitki isimlerinin yazılı olduğu yazıtlar, İbni Sina ve İbni Baytar'a ait olan eserlerde Anadolu'da halkın tedavi amaçlı kullandığı bazı bitki isimleri bunlara kanıt olarak gösterilebilmektedir. (Dağcı ve ark. 2005).

Ülkemiz bitki çeşitliliği ve yayılış bakımından dünyanın en zengin ülkelerinden bir tanesidir. Ülkemizde alternatif tıpta kullanılan yaklaşık 1000 adet bitki türü bulunmakla birlikte her gün yeni bir bitki buna dahil olmaktadır. Önemli tıbbi bitkilerden bir tanesi de Gilaburu (*Viburnum opulus* L.) bitkisidir. (Hızlısoy, 2009). Bu tür Türkiye'de halk arasında gilaburu, giraoğlu, giligili, dağdağan, dağdığın, geleboru, gilabada, gildar gibi isimlerle bilinmektedir (Ecevit-Genç ve Yıldırım, 2018). Gilaburu çalılıklar arasında büyüyen ve ortalama 300 yıl yaşayabilen çok yıllık bir bitkidir. Gilaburu dünya üzerinde Avrupa, Amerika, Sibiryaya, Ermenistan, Türkmenistan, Avrasya ve Kuzey Afrika ormanları nehir yataklarında doğal olarak yetişen bir bitkidir. Gilaburu ülkemizde Doğu ve Orta Karadeniz şeridinde, Doğu Anadolu Bölgesinde, İç Anadolu Bölgesinde, Ege, Akdeniz gibi Türkiye'nin hemen her bölgesinde doğal olarak yetişebilmektedir (Sagdic ve ark., 2006).

Gilaburu insan beslenmesinde ve tıbbi olarak kullanılabilen değerli bitkilerden bir tanesidir. Bu özellikleri dikkate alındığında farmakoloji, meyve suyu, reçel, marmelat, turşu, sirke, gıda takviyesi, çay gibi çok geniş alanlarda kullanılmaktadır (Taşkın ve ark., 2019). Böylesine önemli bir bitkinin araştırılması ile birlikte birtakım faydaları da gün yüzüne çıkarılmaktadır. Nitekim yapılan bazı araştırmalarda kolan kanseri, böbrek taşı, jinekolojik bozukluklar, antikanser etkisi gibi birçok faydası gün yüzüne çıkarılmış, çıkarılmaya da devam edilmektedir (Ulger ve ark., 2013; Tuğlu ve ark., 2014; Saltan ve ark., 2016; Ceylan ve ark., 2018).

Bu derleme kapsamında doğada kendiliğinden yetişen gilaburu bitkisinin genel özelliklerinin ve faydalarının bir araya getirilmesi bitkinin farkındalığını ortaya koyarak çiftçilere ve araştırmacılara ilham kaynağı olması ve bitkiden ülke ekonomisine katkı sağlayacak yeniliklerin ortaya konması hedeflenmiştir.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

GİLABURUN BİTKİSNİN GENEL ÖZELLİKLERİ

Gilaburu (*Viburnum opulus* L.) Adoxaceae familyasına ait dünyanın ılıman iklimine sahip yerlerde yetişebilen ve tıbbi ve aromatik özelliği olan değerli bir bitkidir (Karabulut ve Kaynarca, 2024). Ülkemizde İç Anadolu Bölgesinde yer alan özellikle Kayseri ve çevresinde yaygın olarak yetişmektedir. Bu bölgede halk tarafından meyve suyu hem de tıbbi olarak birçok hastalığın tedavisinde kullanılmaktadır (Gündoğar, 2013).

Morfolojik özellikleri

Gilaburu bitkisi çalı özelliği gösteren ortalama 2-4 metre arası boylanabilen ve ortalama 300 yıl yaşayabilen bir bitkidir. Son baharda dökülme özelliği gösteren yaprakları genel itibari ile 3ila 5 loptan oluşmaktadır. Yaprak kenarları testere gibi dişli ve karşılıklı dizilim şeklindedir (Taşkın ve ark., 2019). Bahar ayında açan çiçekleri beyaz renkli olup, şemsiye benzeri salkım şeklinde görüntüsü olmaktadır. Çiçekler genellikle 5-10 cm çapında ve çiçeklerin iç kısmında yeşilimsi beyaz fertil çiçekler bulunmaktadır. Son baharda olgunlaşan meyveleri parlak kırmızı, oval, sulu, lezzetsiz ve asidik özellik göstermektedir. Meyve çapları ortalama 8mm, ağırlığı 0,7 g dır (Taşkın ve ark., 2019).



Şekil 1. Gilaburu bitkisine ait morfolojik özellikler (Wikipedi, 2025)

Ekolojik İstekleri

Gilaburu büyük oranda nemli bölgeleri sever. Bu yüzden taban suyu yüksek sulak alanlar yetişmesi için en uygun alanlardır. Toprak yapısı bakımından organik maddece zengin, nemli killi topraklarda gayet iyi bir şekilde yetişebilmektedir. Bu denli suyu sevmesinden dolayı su kenarlarında ve bataklık alanlarda doğal olarak yetişebilmektedir. Yetiştiriciliği yapılan yerlerde sulama imkânı yoksa yetiştirilmesi imkansızdır (Sabur ve Güneş, 2023). İklimsel özelliği göz önüne alındığında genellikle yazları ılıman kışları ise serin geçen bölgelerde yetişmektedir. Yazları aşırı kurak ve sıcak kışları ise soğuk ve sert geçen bölgelerde gelişimi sınırlı kalmakta hatta yetişmemektedir.

Kimyasal İçeriği ve Besin Değeri

Gilaburu bitkisi zengin bir kimyasal içeriğe sahiptir. Gilaburu meyveleri fenolik bileşikler, flavonoidler, organik asitler (malik ve sitrik asit gibi) C vitamini ve antosiyaninler bakımından oldukça zengindir. Bu içeriği sayesinde büyük oranda antioksidan özellik göstermektedir. Meyvesinde karotenoidler, uçucu yağlar, steroidler ve saponinler pektin ve protein mevcuttur. Bir başka özelliği olan fitokimyasallar sayesinde iltihap giderici ve kas gevşetici olarak etkisinin olduğu söylenebilir (Sagdic ve ark., 2006; Oğul ve ark., 2019). Son yıllarda yapılan araştırmalar neticesinde bünyesinde yüksek oranda triterpenoid, diterpenoid, seskiterpen ve iridoid içeriği olduğu görülmüştür (Kalyoncu ve ark., 2013).

GİLABURUNUN TAMAMLAYICI TIPTA KULLANIMI

Gilaburu dünyada genelinde yaygın olarak bulunan ve tıbbi amaçlı kullanılan değerli bir bitkidir. Ülkemizde genellikle Kayseri bölgesinde halk tarafından yaygın olarak meyve suyu olarak kullanılmaktadır (Hızlısoy, 2009).

Ayrıca meyveleri turşu, reçel gibi ürünlere dönüştürülerek tüketimi yapılmaktadır. Gilaburu bitkisinin en önemli özelliklerinden bir tanesi de böbrek taşlarının düşürülmesinde, mide, prostat ve idrar kesesi rahatsızlıklarında, diyabet, kabakulak, romatizma, hemoroit, sinir sistemlerinde, hipertansiyon, adet düzensizliği gibi hastalıkların tedavisinde kullanılmaktadır (İlhan ve ark., 2014; Çam, 2005). Gilaburunun en bariz öne çıkan özelliği böbrek taşı yok etmesidir. Gilaburu meyvesinin değişik şekillerde kullanılması sonuç böbreklerdeki taş ile reaksiyona girerek taşın eriyip idrarla birlikte rahat bir şekilde atılmasına yardımcı olmaktadır. Bu şekilde idrar söktürerek idrar yollarında rahatlamasına, kadınların rahim hastalıklarında rahatlama sağlamaktadır (Yürüker, 1993).

Gilaburu bir diğer önemli özelliği ise kas spazmlarında rahatlatıcı ve kasılmayı giderici özelliğinden faydalanılmaktadır. Bu özelliği nedeniyle bitkiye İngilizce "cramp bark" olarak ifade edilmektedir (Zarifikhosroshahi, 2015). Gilaburu meyvesi ve tohumunda yüksek oranda antimikrobiyal özellik belirlenmiştir (Cesoniene ve ark., 2012). Bitkinin ağaç kabuklarının kurutulup öğütüldükten sonra tereyağı ile karıştırıldığında elde edilen kremi dermatolojik yaralarda kullanıldığı, çiçek ve meyveleri suda kaynatıldıktan sonra boğaz diş ve ağız iltihabına iyi geldiği bilinmektedir (Aksoy ve ark., 2004). Gilaburu içeriği gallik asit, protokateşik asit, kafeik asit, p-kumarik asit, elajik asit ve kolorojenik asitleri bulunmaktadır (Turek ve ark., 2007).

GİLABURUNUN FARMAKOLOJİK AÇIDAN DEĞERLENDİRİLMESİ

Gilaburu bitkisinin meyve, tohum, yaprak, kabuk, çiçek gibi toprak üstü her kısmı tıbbi amaçlı kullanılmaktadır. Bu bitki genellikle diüretik, müshil, antispazmotik, yatıştırıcı, mide, safra ve karaciğer rahatsızlıklarında, jinekolojik hastalıklarda, böbrek taşı tedavisinde kullanılmaktadır (Bae ve ark., 2010).

Halk arasında böbrek ilacı olarak bilinen bitkinin böbrek taşlarının düşürülmesinde kullanılmaktadır. Meyvelerinden elde edilen renk pigmentleri mürekkep endüstrisinde kullanılmasının yanı sıra tohumları linoleik ve oleik yağ asitleri, organik asitler, inorganik ve keton bileşikler açısından oldukça zengindir. Ayrıca yaprakları kabukları K içeriği bakımından oldukça zengindir (Yang ve ark., 2011). Gilaburu hakkında yapılan araştırma sonucu bitkinin antiviral, antioksidan, antitümoral, vazodilatör, etkileri bulunmaktadır (Zayachkivskace ve ark., 2006). Bitkinin bir diğer yararlı özelliği diüretik, analjezik ve sedatif, karsinojenik tümörleri ve üriner enfeksiyonları azaltmaktadır (Çam, 2005).

Gilaburu bitkisinin önemini yapılan bir çalışmada bitkinin özütünün güçlü bir antioksidan özelliklere sahip olduğunu göstermiştir. Bu sonuçlar nörodejeneratif hastalıklar, kardiyovasküler bozukluklar ve yaşlanma süreçlerinde ortaya çıkan oksidatif stresi azaltmada önem arz etmektedir. Antiinflamatuvar etkisinin nedeni önemli olduğunu hayvan deneyleri ile elde edilen sonuçlar bitkinin inflamatuvar etkileri baskılayarak eklem iltihabı, romatoid artrit gibi hastalıklara karşı yararlı olduğunu göstermiştir. Bu sonuçlar gilaburu bitkisinin inflamasyon hastalıklarına karşı ajan olarak kullanılabileceğini ifade etmişlerdir (Şahin, 2021). Gilaburu özütünün bazı kanser hücrelerinin proliferasyonunu inhibe ettiğini ve apoptozisin indüklenmesine katkıda bulunabileceğini belirtmiştir (Ceylan ve ark., 2018)

SONUÇ

Tıbbi ve aromatik özellikleri bakımından değerli bir bitki olan Gilaburu (*Viburnum opulus L.*) incelenmesi sonucu bitkinin farmakolojik ve aromaterapi potansiyeli göz önüne alındığında kullanım açısından önemli bulgular ortaya konulmuştur. Gilaburu bitkisinin zengin biyoaktif bileşenleri içermesi nedeniyle antioksidan, antiinflamatuvar ve diüretik etkiler göstermektedir. Gilaburu bitkisi tıbbi amaçlı birçok faydası olan değerli bir bitkidir. Bitki böbrek fonksiyonlarını destekleyici özelliklerinin incelenmesi, içeriğinde bulunan zengin biyoaktif bileşenler sayesinde böbrek sağlığını koruma açısından umut verici özelliği ortaya koymuştur. Gilaburu bitkisi antioksidan, antiinflamatuvar özellikleri sayesinde oksidatif stresin ve inflamasyonun yol açtığı böbrek hastalıklarında yararlı olacağını göstermiştir.

Gilaburu bitkisi içerdiği uçucu yağlar, aromatik bileşenler sayesinde rahatlatıcı ve sinir sistemini onarıcı özelliği bulunmaktadır. Geleneksel tıpta değerli bir bitki olan gilaburu bitkisi modern tıpta yapılan birçok araştırmalar ile desteklenmekle birlikte bitkinin hem içsel tıbbi etkileri hem de dışsal aromatik uygulamalarda değerli olabileceğini göstermektedir. Bunun yanı sıra bitkinin modern tıpta kullanılması için optimal dozu, süresi gibi konularda kapsamlı bir şekilde klinik çalışmaların yapılmasını

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

gerekliliğini de ortaya koymaktadır. Preklinik veriler, düşük toksisite profili ve çok yönlü farmakolojik etkileriyle umut vaat etmekle birlikte, moleküler mekanizmaların daha detaylı incelenmesi ve izole aktif bileşenlerin karakterizasyonu, bitkinin tıbbi ve aromatik uygulamalardaki etkinliğini daha net ortaya koyacaktır.

Sonuç olarak; Gilaburu bitkisi tıbbi ve aromatik özellikleri ile modern tıbbın ve alternatif tedavi yöntemlerinin önemli bir potansiyeli olma özelliğine sahiptir. Bitki ile ilgili yapılmış olan laboratuvar ve hayvansal deneylerden olumlu sonuçlar elde edilmesi ileriki süreçte yapılacak araştırmalarla desteklenecek etkili ve güvenli kullanım protokollerinin geliştirilmesine imkân sunacaktır. Bu bağlamda, gelecekte yapılacak kapsamlı çalışmalar, Gilaburu'nun farmasötik ve aromaterapötik potansiyelinin klinik uygulamalara entegrasyonunu sağlayarak hem hastalıkların tedavisinde hem de ruhsal ve fiziksel rahatlama alternatif ve tamamlayıcı tedavi seçenekleri sunacaktır. Ayrıca bu kadar değerli olan gilaburu bitkisinin teşvik edilerek ülke genelinde kültüre alınmasına olanak sağlanmalıdır. Bu amaçla yapılan derlemede Gilaburu bitkisi hakkında bilgi verilerek ileriye dönük yapılan çalışmalara yardımcı olacağı düşünülmektedir.

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INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

FEATURE ENGINEERING AND DATA FUSION: A COMPREHENSIVE APPROACH TO BRAIN STROKE PREDICTION USING CLINICAL AND IMAGING DATA

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ABSTRACT

Stroke is a leading cause of morbidity and mortality worldwide, necessitating timely and accurate prediction for effective intervention. This paper presents a comprehensive approach to stroke prediction that integrates clinical data and imaging data through advanced feature engineering and data fusion techniques. By employing various feature extraction and selection methods, we identify the most relevant predictors from both clinical and imaging datasets. Data fusion techniques are then applied to create a unified representation of the data, enabling the model to capture complex relationships between features. Our experimental results demonstrate significant improvements in prediction accuracy compared to traditional methods, highlighting the potential of this integrated approach in clinical settings. This research contributes to the growing body of knowledge on stroke prediction and underscores the importance of combining diverse data sources for improved patient outcomes. This study presents a comprehensive approach to stroke prediction that integrates clinical and imaging data through advanced feature engineering and data fusion techniques. We collected a diverse dataset comprising clinical variables such as demographics, medical history, and laboratory results, alongside imaging data from MRI and CT scans. Data fusion methods, including early and late fusion strategies, were applied to create a unified dataset that captures the complex relationships between clinical and imaging features. Stroke is a leading cause of disability and death worldwide, making accurate prediction and timely intervention critical for improving patient outcomes. This study presents a comprehensive approach to stroke prediction that integrates clinical and imaging data through advanced feature engineering and data fusion techniques. We collected a diverse dataset comprising clinical variables such as demographics, medical history, and laboratory results, alongside imaging data from MRI and CT Scans. We developed and evaluated several machine learning models, including Logistic Regression, Random Forests, and Neural Networks, using k-fold cross-validation to ensure robustness..

This research highlights the potential of combining diverse data sources for stroke prediction and emphasizes the importance of interdisciplinary collaboration in advancing healthcare analytics. The findings suggest that our comprehensive approach can facilitate early detection of stroke risk, ultimately leading to better clinical decision-making and improved patient outcomes.

Keywords: Cerebral Micro hemorrhage, Smart Medical Devices, Intelligent Diagnostic Systems, Deep learning, U-Net Framework

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

PROCEDURAL FEATURES OF THE MECHANISM FOR CONCENTRATING EVIDENCE IN VARIOUS FORMS OF ACCELERATED PROCEEDINGS.

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ABSTRACT

The problem of concentration evidence in civil proceedings has recently been studied by a number of proceduralists and other prominent specialists, but this in itself does not adequately explain the importance and relevance of this research topic at the stage of its formation and further development. Considering international experience, as well as the fact that the concentration of evidence in one trial can be successfully integrated with all stages of legal proceedings, much remains to be done in this area of scientific and practical research. The problem of concentration of evidence in civil cases has not yet received its final resolution either at the doctrinal level or in the applied sphere. By means of logical synthesis and systematic solution of general theoretical problems of evidence concentration, a new series of scientific provisions on the concept, internal content, composition and methods of implementation of the studied procedural phenomenon are formulated. At the same time, the scope of application of evidence concentration in the daily activities of various judicial instances is specified and the identifiability of the existing scientific position on the issue of subjects in the case is revealed.

Keywords: concentration of evidence, parties, civil trial, trial

INTRODUCTION

Recently, in the field of jurisprudence and practice, much attention has been paid to improving the system of principles of modern civil proceedings, in particular, adversarial and optional. Of particular importance are the principles of adversarial and optional, which not only have constitutional significance, but also determine the general mechanism of proof in civil cases, that is, the concentration of important evidentiary information in the court of first instance. Therefore, any scientific research in this area will retain its relevance in the long term and can be used for further study of issues of evidentiary procedural law.

In a general sense, timeliness means that actions must be completed within a clearly defined period of time. Correctness means that actions must be performed in accordance with the norms established for these actions. However, the norms may stipulate that certain actions must be performed at certain intervals (the time of performance of an action is a rule).

On the other hand, a certain period of time may be determined by the rule used (the time of the action is determined by the rule) - only a correct action is timely. For example, the timeliness of determining the subject of proof may (but not always) depend on the correctness of this determination, and at the same time, only correctly determined subjects of proof can be considered timely. Such a relationship between qualitative and temporal indicators certainly exists, but it is not absolute. To a certain extent, in order to clarify the nature of this relationship in civil proceedings, it may be necessary to combine evidence.

Therefore, there is an urgent need to apply and accelerate the modernization of individual types of civil proceedings using various procedural systems and instruments, including concentration of evidence. At the same time, an in-depth study and comprehensive analysis of the processes and results of general and specific modernization was conducted, partly in the context of civil procedural practice.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

METHOD

The methodological basis of the study is the dialectical epistemological method. At the same time, a wide range of specific scientific methods was used, including logical, comparative legal, with observance of the universal principles of scientific knowledge (objectivity, comprehensiveness, historicity, unity of theory and practice, development of the object of study, logical certainty, systematicity and complexity of the study).

RESEARCH AND FINDINGS

Among the inexhaustible types of civil proceedings, the concentration of evidence in civil proceedings has its own subtle specifics, determined by the features of a significant legal relationship and the composition of the subject, as well as the influence of adversarial nature. In particular, the concentration of evidence in a special judicial process has the following features. The formation of the evidence base is, in principle, assigned to the applicant, since there is no dispute about rights.

Thus, the applicant, interested parties and the court are involved in the process of evidence concentration within the framework of special proceedings. Their efforts should be aimed at forming evidentiary material at the preparatory stage of the trial. Some difficulties in solving this problem, in turn, are dictated by the special nature of the key legal relations. Firstly, the volume of evidence in special proceedings is not limited to documents, as in written proceedings. For example, in accordance with the law, an expert opinion is required to determine the mental state of a person in cases of recognizing a citizen as incompetent, and when establishing facts of legal significance, photographs, video recordings, etc. are actively used. Secondly, procedural requirements are imposed on certain categories of cases in special proceedings that significantly change the time limits for evidence concentration. For example, the adoption of a child by a foreign citizen requires the submission of a number of documents issued by the competent authorities of the state of citizenship of the adopted person, many of which have their own validity periods. Consequently, the system of evidence concentration in special proceedings cannot be uniformly applied to all categories of cases.

It is in the context of accelerated procedures that the features of concentration are most clearly manifested and therefore deserve closer study. This is all the more important since the accelerated procedure itself is most actively being introduced as an integral and necessary element of procedural and legal issues.

In this regard, several opinions have recently emerged on how to understand expedited proceedings in civil proceedings. Supporters of a broad interpretation argue that expedited proceedings should generally be viewed as a general phenomenon, and not as a phenomenon focused on the concentration of documentary evidence without the need for the personal appearance of the subject of an individual interest. Thus, Z.A. Papulova writes that “modern Russian civil proceedings have given rise to three forms of expedited proceedings: proceedings in absentia and in writing in civil proceedings, and expedited proceedings in arbitration proceedings.” In the scientific field, the concepts of expedited and simplified proceedings are often confused for obvious reasons. Despite the fact that these concepts are similar to a certain extent, there are also differences. [7, p.3]

Other authors, on the contrary, propose to analyze accelerated and simplified proceedings as analogs. [9, pp. 50-54] Other authors conclude that simplified proceedings represent an acceptable deviation from the general procedural form, which corresponds to international standards and the requirements of national judicial practice. [10, pp. 19-23; 12, p. 53-57]

A similar controversy has arisen in the area of criminal proceedings, with the only difference being that the simplification of criminal proceedings affects not only the judicial activity itself, but also the form of preliminary investigation. At the same time, we note that formal simplification in criminal proceedings will continue, including with the use of foreign experience. For example, in Germany, two types of simplification of criminal proceedings are enshrined in law: simplification of the proceedings themselves (das beschleunigte Verfahren) and court decisions (das Strafbefehlsverfahren). [4, p.162-170]

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

Therefore, let us move on to a direct study of how the concentration of evidence manifests itself in civil cases in summary and simplified (written) proceedings.

Thus, as a general rule, the order procedure does not involve procedural activity by the debtor to present evidence to the court, nor does it involve the exchange of pleadings. The debtor only receives a copy of the court order as a result of satisfying the claimant's demands. [1, pp.205-219]

On the other hand, the concentration of evidence in the process seems to be closer to the ideal model, since the applicant, when filing an application for the issuance of a court order, presents to the court all documents confirming the validity of the claimed right. [6, p p.12-15] Failure to fulfill this obligation leads to an unfavorable outcome in the form of a civil claim for the return of the application to the applicant with the imposition of liability on him. On the other hand, the concentration of evidence in the trial has a distinctive character, due to the absence of a civil process, the preparatory stage of the trial and the process itself.

However, when comparing the national procedural model with simplified procedures in other countries, it would be wrong to assume that it is imperfect and unworthy of being an independent civil procedure. On the contrary, there is a special procedural form here that is widely used and allows for the rapid concentration of evidence and the issuance of a final judicial decision. [2, pp.288-293]

An analysis of the procedural schemes of writ proceedings in force in the EU member states, conducted by D.I. Krymsky, shows that there are two main types of procedures for issuing arrest warrants: written, when the court order is issued on the basis of evidence presented to the court, and unwritten, when evidence is not presented to the court. In the latter case, it is sufficient for the petition to be admissible and meet formal requirements. In some countries, a mixed written procedure for judicial proceedings is practiced. [5, pp. 21-22] Of course, there is no need to discuss the application of the principle of centralization of evidence in cases where court decisions are made without applying the principle of centralization of evidence. The design of the written procedure provided for by the Civil Procedure Code allows us to emphasize the specificity of the principle of concentration of evidence. That is, the principle applies only to the plaintiff and is aimed at forming information about the circumstances of the case only with the help of written evidence.

This is why the Resolution of the Plenum of the Supreme Court of Justice of the Republic of Moldova "on certain issues related to the issuance of a court order" No. 18 of 31.05.2004 [8] notes that "the existence of contractual relations between the claimant and the debtor can be confirmed not only by an agreement formulated in one document signed by the parties, but also by other documents confirming the existence of an obligation, provided that the court has no doubt that the right is not being disputed."

In addition, developing what was said in the Resolution on one of these specific cases, it was noted that non-contractual legal relations can also be confirmed, within the meaning of current legislation, by evidence attached to the application for the issuance of a court order, that is, by the corresponding concentration of evidence that can be traced at the stage of receiving the application for a court claim.

A similar situation arose in other proceedings, but here on a much larger scale, since the case on the recipient's claim for forced payment or recovery of a sanction was considered within the framework of the order procedure, taking into account the degree of admissibility of evidence in the evidentiary base. In other words, such cases cannot be supported by other public legal relations, except for a number of documentary evidence that could serve as grounds for the withdrawal of the application for the issuance of a court order.

In this case, the legislator can implement the idea of evidence concentration in a simplified manner by setting a deadline (at least 15 days from the date of the decision on the case considered in a simplified manner) 3 for the parties to send each other evidence and to submit written objections to the claims made to the court. In addition, the court can set a deadline of at least 30 days from the date of the relevant decision for the parties to send each other additional documents outlining their position, including explanations and refutations. The court makes a decision based on an examination of the submitted documents. This explains why it is possible to set a clear deadline for the centralization of evidence, even taking into account the fact that information on the state of the case can only be obtained from

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

documentary evidence and that one of the parties may not appear in court. At the same time, paradoxically, the corresponding programs linking the consolidation of evidence, notification of the relevant parties and appearance in court “work” faster in practice.

The above allows us to conclude that the principle of concentration of evidence is universal and applies not only to all stages of civil proceedings, but also extends its effect to all types of civil proceedings.

However, without repeating the provisions of this decision, it is important to note that the mechanism of the Civil Procedure Rules in terms of concentration of evidence should have a differentiated approach, taking into account the specifics of various types of civil proceedings. These include, in particular: extension of the period for submitting an expert opinion to the court for objective reasons; conducting additional and repeated expert studies; issuing judicial rulings; impossibility of providing evidence requested by an official or citizen within the time limit set by the court.

At the same time, it is obvious that all this concerns the same behavior of judges, since the issue of proper motivation and exclusion certainly arises in simplified proceedings. Currently, the legislator is focused on reducing the overall number of reasoned court decisions, including in simplified proceedings, taking into account the introduction of additional sanctions. The above-mentioned Resolution once again emphasizes that an application for a reasoned decision filed before the operative part is drawn up does not automatically entail the court's obligation to issue a reasoned decision. However, not everyone agrees with this point of view. In particular, V.M. Zhuykov criticized the lack of motivation for imposing the obligation to issue a decision and further indicated: "When a case is considered in simplified proceedings, the court is obliged to motivate the decision. When considering a case in simplified proceedings, the judge sets a period for presenting evidence, for example, one month. All evidence presented within this period will be presented and will not be considered after this period. Then a decision is made without calling the parties. What does this mean? This means that the judge sits in his office and studies the materials without holding a hearing. [11, p .11]

Inclusion of the concentration principle in the principles of civil proceedings will ensure timely and high-quality protection of the rights of citizens and organizations by the courts. On the contrary, as emphasized by E.A. Borisova, agreeing with V.M. Sherstyuk, narrowing the scope of the principle may "lead to a decrease in guarantees of judicial protection of the rights of organizations and citizens." Although the term "concentration" may raise objections as unusual, imprecise and unlawful, it reflects the target orientation of the procedural behavior of the court, the parties and other participants in the process when considering a case in the court of first and second instance (review)" [3, p p.164-165] Norms are established on the "concentration" and "accumulation" of materials necessary for considering a case at certain stages and at a certain time of the process, under certain conditions.

CONCLUSION

1. An analysis of the current provisions on participation of the parties and preparation for trial has shown that the most important interaction between the plaintiff and the court (information related to the case) is the participation of the parties. The reason for this lies in the different nature of writing and speech. The principle of written presentation allows the parties and the court to examine the claims and arguments of the opposing parties and litigants more impartially and deeply.
2. Among the inexhaustible types of civil proceedings, the concentration of evidence in civil proceedings has its own subtle specifics, determined by the features of a significant legal relationship and the composition of the subject, as well as the influence of adversarial nature. In particular, the concentration of evidence in a special judicial process has the following features. The formation of the evidence base is, in principle, assigned to the applicant, since there is no dispute about rights.
3. Thus, the applicant, interested parties and the court are involved in the process of evidence concentration within the framework of special proceedings. Their efforts should be aimed at forming evidentiary material at the preparatory stage of the trial. Some difficulties in solving this problem, in turn, are dictated by the special nature of the key legal relations. Firstly, the volume of evidence in special proceedings is not limited to documents, as in written proceedings. For example, in accordance with the law, an expert opinion is required to determine the mental state of a person in cases of

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

recognizing a citizen as incompetent, and when establishing facts of legal significance, photographs, video recordings, etc. are actively used. Secondly, procedural requirements are imposed on certain categories of cases in special proceedings that significantly change the time limits for evidence concentration. For example, the adoption of a child by a foreign citizen requires the submission of a number of documents issued by the competent authorities of the state of citizenship of the adopted person, many of which have their own validity periods. Consequently, the system of evidence concentration in special proceedings cannot be uniformly applied to all categories of cases.

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INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

A REVIEW ON: THE CONCEPT OF HUMAN BEHAVIOURS ACCORDING TO PSYCHOLOGY

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ABSTRACT

This review offers a comprehensive summary of the available data on the behavioural determinants of psychological health and its significance for guiding future research on determinants and interventions. Labelling and classifying the numerous factors found in the existing research to identify the main categories of determinants is the first step in the review.

Following the identification of these determinant group's conceptual underpinnings, a critical evaluation is conducted of the evidence supporting their alleged effects on health behaviour. These include dispositional determinants (e.g., personality, regulatory control), belief-based determinants (e.g., outcome expectancies, capacity beliefs), determinants representing self-regulatory capacity (e.g., planning, action control), and nonconscious processes (e.g., habit, implicit cognition).

The review also focuses on moderating factors that increase or decrease determinant effects, as well as the theory-based mechanisms that support them. In conclusion, the study promotes a departure from studies that focus on determinants as correlates, describes how determinants can guide the development of interventions and mechanisms of action testing, offers substitutes for the prevailing individualist approaches, and suggests future avenues of inquiry.

Keywords: Behavioural determinants, Psychological health , Personality

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

AN EPIDEMIOLOGICAL STUDY OF ACID BURN INCIDENTS IN PAKISTAN: CAUSES, CONSEQUENCES AND PREVENTION STRATEGIES

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ABSTRACT

According to Acid Survivors Foundation (ASF), there are about 200 acid attacks every year in Pakistan, and there have been more incidents reported this year than last (Ahmad, S. 2022). Murder is regarded better than throwing acid (Mihaela B. I. 2015). Unfortunately, Pakistan is becoming more and more popular for hurling acid. A woman in Lahore was recently beaten with acid after rejecting a marriage proposal (Ashraf, S. 2017). South Punjab, a region known for its agriculture and as the "cotton belt," is where more than half of all acid-related crimes occur. This region has historically been plagued by low socioeconomic indicators, and it is also where acid is easily accessible in local markets and frequently used to clean cotton. According to an unbiased study, 9,340 people in Pakistan were victims of acid attacks between 1994 and 2018 (Wong, Y. 2021). Unless the government takes strong action to put an end to the evildoer, such attacks will continue to occur in the nation. According to the Acid Survivors Trust International, 80% of acid attack victims are women, putting acid attacks in the category of gender-based violence (J. G. 2019). Although attackers also target men, the problem primarily impacts women and is more likely to happen in societies where there is a strong gender division (Duggan, M. 2020). This way of life supports gender inequality and highlights the vulnerable status of women in Pakistani society, who frequently face attacks not just from outsiders but even from their own spouses and relatives.

Keywords: Epidemiological study, acid burn, incidents, Pakistan, causes, consequences, prevention strategies

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

DESIGN AND IMPLEMENTATION OF A COMPUTERIZED RESTAURANT MANAGEMENT INFORMATION SYSTEM: A STUDY OF JEVENIKS RESTAURANT LTD., ABUJA FCT

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ABSTRACT

The need for a computerized Restaurant Management Information System in the context of recent developments in the digital economy is as critical as the need for economic sustainability itself. The restaurant industry in Nigeria and many developing countries put in a lot of efforts in managing information and giving the right output to the ever-waiting Restaurant and Hotels clientele. The major aim of this research project is to examine the design and implementation of a Computerized Restaurant Management Information System, adopting a case study from the Jeveniks Restaurants Abuja FCT, Nigeria. Hence, the project work was primarily designed to give an insight to computer-based restaurant management information system. It is as a result of problems associated with the existing system which involves the use of manual methods in keeping information and other financial records in the industry. This study was anchored by three theories, viz – the Resource-Based View Theory (RBV), the Dynamic Capabilities Theory (DCT), and the Strategic Choice Theory (SCT). The study employed descriptive survey research design that allows for the use of questionnaire to elicit data from the respondents. The population of this study was 1,200 employees of Jeveniks Restaurants, Abuja, FCT, Nigeria), out of which 120 employees (that is, 10% of the total population) were selected for the study using the simple random sampling technique. Questionnaire was the primary instrument used to elicit information from the respondents. The research data was analyzed using both descriptive and inferential statistics: simple percentage derived from Frequency Distribution Tables, Mean scores and Standard Deviation (SD). Additionally, the research data was analyzed using the Statistical Package for Social Sciences (SPSS) Version 26. The hypotheses for this study were tested using inferential statistics (the independent t-test). The general finding shows that computerized restaurant information system improves the services offered by the restaurant industry; it is customer-friendly rendering effective, efficient and quick services to them, enhances accountability and effective and efficient record keeping, and enhances productivity of employees and overall profitability of the restaurant industry. Therefore, it was recommended that policies such as the digitalization of the economy should be implemented as it will go a long way to create more sensitization on the use of electronic devices that could create and develop the country as a whole through an effective and efficient computerized restaurant management information system.

Key Words: Design, Implementation, Computerized, Management Information Systems (MIS), Restaurant/Other Hospitality Industry, Abuja-FCT

1.0 Introduction

Computerized restaurant management information system is database program that keeps record of all transactions carried out in the restaurant on daily basis. The system helps the restaurant management to keep adequate record of all transactions carried out and does those that will be carried out by the restaurant and maintain the database of the restaurant.

Business administration the world over has turned a new leaf, matching forward at the speed of light towards the digital economy due to the numerous advantages it brings. Jones (2003) maintained that what gives the administrator the power and control to manage the resources is the availability of information. According to Ogbonnaya (1994), it is the administrative responsibility of both managers and employees to enhance ideal administrative practices that ensures effective and efficient financial records in the restaurant and hotel industry. Computerized restaurant management information system database

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

program that keeps record of all transactions carried out in the restaurant on a daily basis is a sine-qua-non for efficiency in the activities of the business. The system helps the restaurant management to keep adequate record of all transaction carried out and those that will still be carried out by the restaurant and maintain the database of the restaurant.

Various types of restaurants fall into several industry classifications based upon menu style, preparation methods and pricing. Additionally, how the food is served to the customer helps to determine the classification. Historically, restaurant referred only to places that provided tables where one sat down to eat the meal, typically served by a Waiter. Following the rise of Fast food and restaurants, a Retronym for the older ‘standard’ restaurant was created, sit-down restaurant then emerged. Most commonly, ‘‘sit-down restaurant’’ refers to a casual dining restaurant with Rable service, rather than on a ‘‘diner’’, where one orders food at a Countertop. Sit-down restaurants are often further categorized, in North America, as ‘‘family-style’’.

The term restaurant almost always means an eating establishment with table service, so the ‘‘sit-down’’ qualification is not usually necessary. Fast food and takeaway (take-out) outlets with counter service are not normally referred to as restaurants. Outside of North America, the terms fast casual dining restaurants, family style, and casual dining are not used and distinctions among different kinds of restaurants is often not the same.

In France, for example, some restaurants are called ‘‘bistros’’ to indicate a level of casualness or trendiness, though some ‘‘bistros’’ are quite formal in the kind of food they serve and clientele they attract. Others are called ‘‘brasseries’’, a term which indicates hours of service. ‘‘Brasseries’’ may serve food round the clock, whereas ‘‘restaurants’’ usually only serve at set intervals during the day. In Sweden, restaurants of many kinds are called ‘‘restauranger’’, but restaurants attached to bars or cafes are sometimes called ‘‘kok’’, literally ‘‘kitchens’’, and sometimes a bar-restaurant combination is called a ‘‘krog’’. In English a ‘‘tavern’’.

In Dishing It Out: In Search of the Restaurant Experience, Robert (2002) argues that all restaurants can be categorized according to a set of social parameters defined as polar opposites, high or low, cheap or dear, familiar or exotic, formal or informal, and so forth. Any restaurant will be relatively high or low in style and price, familiar or exotic in the cuisine it offers to different kinds of customers, and so on. Context is as important as the style and form; a taqueria is a more than familiar site in Guadalajara, Mexico, but it would be exotic in Albania. A Chris restaurant in North America may seem somewhat strange to a first-time visitor from India; but many Americans are familiar with it as a large restaurant chain, albeit one that features high prices and a formal atmosphere.

Computerized Management Information Systems (CMISs) can serve as a catalyst to restaurant management in Nigeria. This would go a long way to demystify the complexities of restaurant administrative systems in the country, facilitate data collection, quicken administrative decision-taking, harmonize the nature of issuing documents in restaurant businesses, ensure accountability, provide statistics for government policy and ensure effective communication within the organizational milieu. The development, design and implementation of a Restaurant Management Information System like the one proposed in this research project is therefore critical to Nigeria.

Ololube (2012) maintained that rising cost of running restaurant businesses leave some restaurants with low quality and inadequate human and material resources. Thus, the need for alternative ways of utilizing slim resources to attain set objectives makes restaurant record keeping imperative. Keeping records about restaurant manpower and material resources is critical for effective restaurant administration by managers. The administration of restaurants in Nigeria though a very complex venture that goes beyond the ordinary business of profit motive cannot be left behind. There’s the will to go digital like other countries have done with their tourism and hospitality sector of the economy. Like other developing countries, Nigeria lacks the resources necessary to digitalize the tourism and hospitality industry, one of which is Restaurant Management Information System.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

1.1 Statement of Research Problem

Sales and services are the fundamental tools in any business organization; the profit and loss of any business depends on detailed information on sales and services made to aid decision making and implementation, if accountability is not checked, then the business is sure to collapse, as a result in any restaurant and hospitality business there is a need for a system that gives feedback to the management to aid decision making, this is where computerized management information system comes handy.

Besides, staffing in restaurant can be tricky because demand for food will likely fluctuate dramatically, often due to variables that you cannot track. It is important you identify any variables that can influence traffic in your restaurant such as weather and day of the week. Build a weekly schedule to staff your restaurant in accordance with these variables, such as scheduling additional staff on Saturday night if that is your busiest shift.

Compile data about sales and employee hours to determine a profitable ratio of employee hours to sales totals. Restaurant personnel training systems are also vital to success, ensuring that employees know company protocol and systems, and are capable of delivering a high quality product. Write a comprehensive employee manual detailing information that each member of your staff should know.

Besides, customers are not able to ask about quality of food or ask for any specialized diet foods. It is more difficult to ask for gluten-free or allergy-free foods with computerized ordering. Also, it is more possible for a customer to place an order, but never pick up the order which can lead to waste of food and possibly a loss of profits. Hence, it is in consideration of the advantages of a computerized as detailed above and more that the researcher embarked on this research to examine the design and implementation of a computerized restaurant management information system, adopting the Jeveniks Restaurants in Abuja, FCT, Nigeria.

1.2 Objectives of the Study

The main objectives of the study are the Design, Documentation and Implementation of a Computerized Restaurant Management Information System. The specific objectives of the study were to:

- i. determine how computerized management information system has facilitated increased productivity, decrease paperwork, and ability to analyze trouble spots;
- ii. evaluate how the system will increase the level of services quality and customer satisfaction;
- iii. highlight how the system will help the restaurants to have the ability to build competitive and strategic advantages;
- iv. identify how computerized management information system will improve the operating efficiencies and timely access to financial and operating data.

1.3 Research Questions

In line with the purpose of this study, the following research questions were formulated.

- i. What are the impacts of computerized management information system on increased productivity, decrease paperwork and ability to analyze trouble spots?
- ii. What are the impacts of the increase in the level of service quality on customer satisfaction?
- iii. How will the system help restaurants to have the ability to build competitive and strategic advantages?
- iv. How will computerized management information system improve the operational efficiencies and timely access to financial and operating data?

1.4 Research Hypotheses

In line with the purpose of this study, the following null hypotheses were formulated and will be tested at 0.05 alpha level of significance.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

Ho1: There is no significant difference between the mean ratings and opinions of male and female respondents in Jeveniks Restaurants Abuja, FCT, Nigeria.

Ho2: There is no significant difference between the mean ratings and opinions of top-Management and other staff of Jeveniks Restaurants, Abuja, FCT, Nigeria.

1.5 Significance of the Study

This study is significant and useful to different stakeholders in the Nigerian economy. Firstly, this study would offer useful tips to Managers and operators of Restaurants in Nigeria. It would serve as an eye opener to the principles, practice and applications of Computerized Management Information Systems in improving their organizational productivity, profitability and overall business performance; it would also reduce costs invested in traditional paperwork activities, particularly in keeping paper documents in file cabinets and the susceptibility of losing vital documents on the long run, thereby enhancing efficiency and effectiveness in their business dealings.

Secondly, this study will serve as a policy document for the government in enacting effective policies that would guide the practice and activities of today's Computerized Management Information Systems which has taken center-stage in business operations across the globe. It would educate the government and their functionaries on the rudiments and applications of Computerized Management Information Systems in terms of the ethics of practice.

Again, this study would be very useful to academics and students of Management Sciences, as it would add to their body of knowledge, enrich and fill the research gaps in this area of study, serve as lecture notes for academics and spur them up to undertake further researches in this study area of knowledge. To the students, this study will enhance their understanding of Computerized Management Information Systems as it applies to Restaurants and other sectors of the Tourism and Hospitality industry, giving them the necessary skills needed to utilize the modern digital and computerized management information systems in Business Management practices generally.

In summary, this study is primarily aimed at increasing efficiency in operation, reducing time and running costs, monitoring and the recording of the activities and total administration in Jeveniks Restaurants Ltd Abuja, FCT, Nigeria by introducing a computerized Restaurant Management information system. Besides, this study is significant because its conclusions would be useful to:

1. Human Resources Managers in the hotel and restaurants business
2. The Federal, State and Local Government.
3. Scholars in the field of hotel and restaurant management
4. Management of Jeveniks Restaurants Ltd Abuja, FCT, Nigeria.

2.0 Literature Review

This section reviews related literature in the subject area of study. It is sub-divided into four major sections. The first section incorporates the conceptual framework which reviewed the basic concepts as used in the study. The second section dealt with the theoretical framework, which discusses the theories that underpins or anchored the study. The third section is based on the review of related empirical studies with the present study while the fourth section summarized the literature reviewed identifying the gaps in literature.

2.1 Conceptual Framework

This section discusses the basic concepts as used in this research projects. It examines the independent and dependent variables and constructs as used in the study.

2.1.1 An Overview of Different Types of Restaurants

There are many different types of restaurant concepts to choose from, when planning a new restaurant. It can be hard to decide which concept will be right for you. Before you settle on one particular concept, first consider the following: who's your audience? What is your price range? Are you thinking formal

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

or casual? Do you have a particular type of food in mind you can build a brand around? Below are eight distinct types of restaurant concepts, from fast food chains to fine dining. Keep in mind that your restaurant design theme can blur the line between concepts to make it unique (Harrison, 2007).

One of the hottest trends at the moment is fast-casual, which is a slightly more upscale (and therefore more expensive) than fast food. Fast casual restaurants offer disposable dishes and flatware, but their food tends to be presented as more upscale, such as gourmet breads and organic ingredients. Open kitchens are popular with fast casual chains, where customers can see food being prepared. Panera Bread is a good example of fast casual.

There are many different restaurant-types out there. New restaurants open all the time, and concepts vary from pizza chains to fine sashimi restaurants to breakfast cafes and even restaurants that specialize in peanut butter and jelly sandwiches. Despite the broad range of restaurant concepts, most are classified by one of three major restaurant types, including full-service, fast-casual and quick service. This project details the challenges and opportunities operators face within each restaurant type.

a. Full-Service Restaurants

Full-service restaurants encapsulate the old-fashioned idea of going out to eat. These restaurants invite guests to be seated at tables, while servers take their full order and serve food and drinks. Full-service restaurants are typically either fine dining establishments or casual eateries, and in addition to kitchen staff, they almost always employ hosts or hostesses, servers, and bartenders. Two standard types of full-service operations include fine dining and casual dining restaurants. Fine dining restaurants usually gain perceived value with unique and beautiful décor, renowned chefs and special dishes.

b. Fast-Casual Restaurants

They are relatively modern technology for a restaurant that falls between full-service and quick-service. Also called quick-casual and limited service, these types of restaurants are typically distinguished by service type and food quality. Fast-casual restaurants are often perceived to offer better quality food and a more upscale dining area than quick-service restaurants, but with less expensive menu items than full-service restaurants.

c. Quick-Service Restaurants

Quick-service is the term for restaurants that capitalize on speed of service and convenience. Fast-food restaurants often fall under the umbrella of quick-service restaurants, but not all quick-service places serve fast-food.

2.1.2 The Broad Environment for Restaurants

Opportunities are discovered when organizations begin to analyze the broad environment. Hoteliers and restaurants need to be cognizant of these factors and how they can drive change in the industry. Societal trends and technological trends should be critical points of interest for industry executives. From a societal perspective, organizations need to look at influences such as current topics, emerging attitudes, demographic shifts and new fads (Oparanma, et al., 2009; Harrison, 2003).

An example of societal trends that are impacting the hospitality industry would include the explosion of social networking. The trend has spanned across several demographic barriers ranging from Baby Boomers to the Millennials. There has additionally been an enormous effect on the hotel and restaurant industry. Bloggers have launched sites commenting about experiences that they have had and have made recommendations regarding the hotel or restaurant. Savvy industry executives understand the impact of these societal trends and focus efforts on establishing methodologies that can incorporate appropriate strategies to take advantage of these trends (Luebke, 2010).

Technological advances focus on the innovation of products, procedures, or services and how these developments can affect the hospitality industry (Yang & Fu, 2007; Harrison, 2003). For example, online reservations have grown exponentially over the years (Jin-Zhao & Jing, 2009). The ability for industry executives to recognize the implications of this technological advance and develop strategies to take advantage of it is a critical component of strategy development. One of the premier online

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

reservation⁷⁴ Journal of Applied Business and Economics vol. 12(1) 2011portals, OpenTable.com, boosted that in 2006 dining seats filled in restaurants through the use of their online reservation system exceeded one million (Ross, 2006). This was a 65% increase from the previous year. Industry leaders, not acknowledging this technological advance and implementing it in some capacity would find their companies lagging in providing the appropriate customer service that their clientele would demand. Delay in the implementation of technological advances of this magnitude detracts from developing sustainability and competitive advantage (Jin-Zhao & Jing, 2009; Piccoli, 2008; Yang & Fu, 2007).

2.1.3 Technology's Impact in the Restaurant and Hotel Industry

Technology have impacted greatly on restaurant and hotel industry. A study conducted by Griffin (2018) investigated how information (through the data warehouses) was being utilized by restaurants/hotels, through the investigation of 12 of the largest hotel firms in the industry. In this study, only 7 of the 12 hotels were involved with data manipulation and 2 of the 7 had successfully developed and implanted their own data warehouses. Even though some of the hotels did not have data houses in place they were planning on the future development of this technology.

Most of the hotels in the study were using information for support of strategic market analysis including targeting new customers, fine-tuning loyalty programs, sales analysis and conducting trend analysis. The study concluded that the hotels' ability to collect, process, and access large amounts of data can help companies build a competitive advantage (Griffin, 2018).

At the Balsams Grand Resort Hotel in New Hampshire, technology was used to help develop a guest history log. The Balsam Grand used the guest history logs to capture customized information on the guests that had already made reservations at the hotel. The program was one of the first attempts to use an expert system model to gauge the needs and wants of the guests. Information was generated in regards to hotel inquiries, rooms, room types and numbers, special requests, times of year visited, any special requests, service personnel requested, etc. (Siguaw & Enz, 2019).

At the Ritz Carlton in Chicago, customer demand of technical help with computers in the rooms was on the rise. With most guests making inquiries to the concierge office, both guests and employees were getting frustrated due to lack of technical knowledge. In response Ritz management created a new position, pulling from the hotel management information system department, called the concierge. With services being offered Monday through Friday, guests were able to obtain any technical support they need in conducting business requiring computers or computer technology. Customer service has improved overall, as well as the morale of the staff at the Ritz Carlton (Siguaw & Enz, 2019).

In addition to improving customer service and satisfaction several hotels were given "Best Practices Awards" for information technology by implementing systems that helped in the increased efficiency of hotel operations. The Barbizon Hotel and Empire Hotel New York co-developed a computer database and hotel logbooks, phone cells for maintenance and record keeping of operations. Hotel personnel from any house phone or PC throughout the hotel can access the expert system. The expert system automatically assigns tasks to the responsible employee or manager, and can even page them to make them aware of the task. In 15 minutes, the system will re-page to remind, and if the task has not shown to be completed the system will automatically notify the appropriate manager. The system also facilitates management in \$750,000 in 3 years through increased productivity, decreased paperwork, and ability to analyze trouble spots.

Directly linked to the hotels improvement in operations they have shared a 30% increase in repeat business (Siguaw & Enz, 2019). It is evident through the preceding literature that leveraging this type of information can lead organizations toward better decision making and building and sustaining competitive 76 Journal of Applied Business and Economics vol. 12(1) 2011advantage (Yang & Fu, 2007; Lee, Barker & Kandampully, 2003).

2.1.4 Managerial Implications in the Restaurant Industry

The technology being developed and implemented by hotels and restaurants is ultimately going to increase the level of service quality and customer satisfaction industry wide. As was seen by the studies

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

conducted in the hotel industry, a primary focus was the improvement of the level of service to the guests (Siguaw & Enz, 2019). The same scenario holds true for the restaurant industry. Service quality is a construct, which has received a great deal of attention and has been studied empirically in many industries including the restaurant industry (Garver, 2012; Bojanic & Rosen, 2014; Stevens, Knutson, & Patton, 2019).

Vandermerwe (2013) felt that those companies which would become successful would have had to look at the customer's entire experience from the pre to post purchase stage. Strategic use of technological factors gives industry executives the ability to gauge that experience and to predict purchasing habits of current customers, future customers, clusters of customers, and can break groups down demographically for better analysis (Garver, 2002).

As in the hotel industry, restaurateurs would have the ability to build competitive and strategic advantage by better understanding the needs and wants of the guests, hence building repeat business. Piccoli et al. (2001) believed that competitive advantage which is provided by technology can and will be invaluable in hospitality and other industries in the future. It is also felt that gaining competitive advantage by using technology, as a distinctive competency will require a total commitment from the entire organization.

Piccoli et al. (2001) continues by adding that proper evaluation of customers, competitors, internal and external factors combined with technology will uncover many opportunities which could be used to increase the service quality and customer satisfaction of hospitality and other industries' customers.

2.1.5 Strategic Management Process for Restaurants

The strategy formulation component is the driving force of the analysis. An in depth look at firms direction begins at this point. The focus at this stage is to assess the current vision, mission and objectives of the organization in addition to examining both the external and internal environments. From an external perspective, organizations need to look at two distinct environments: the broad environment and the task or firm environment (Harrison & John, 2018; Harrison, 2013).

The broad environment looks at factors, including societal trends, technological advances, political and legal trends, economic factors and other major industry innovations. The task or firm environment looks at factors such as customers, competition, government agencies, suppliers, and financial intermediaries. Finally, the internal environment focuses on factors within the organization such as management, financial and human (Berry, 2019).

2.1.6 Management Information Systems (MIS) in Restaurants

Management information systems (MIS) provide critical information used to effectively operate a business. Many companies have entire departments devoted to managing, maintaining and configuring their management information systems. Management Information System (MIS) began in the late 1960s but really gained ground in the 1990s. Because a MIS represent a significant investment for most organizations, small businesses must perform thorough due diligence before deciding to implement a new system or overhaul existing systems (Miller, 2001).

Management information systems refer to the practice of integrating computer systems, hardware and software used to meet an organization's strategic goals. A MIS basically provides companies with four different types of information: descriptive, diagnostic, predictive and prescriptive (Miller, 2001).

A MIS has become very important in the areas of strategic support, data processing and managing by objectives. Because a MIS provides enormous amounts of information many companies think they make great investments. This holds true only if the information gained from the MIS generates a change in a company's harmful behavior.

a. Descriptive Information

Descriptive information provided by a MIS gives a company the "what is" state of the business. Descriptive or "what is" information provides the business with pertinent information that captures a specific moment during the company's operation. Examples of "what is" information include sales

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

reports, financial reports, production reports, shipping, and receiving reports, and customer service reports (Miller, 2001).

b. Diagnostic Information

A MIS also provides companies with diagnostic information. Think of this type of information in terms of an automobile checkup. When a vehicle has a mechanical issue, often it gets a diagnostic checkup to determine the problem. A MIS provides the same type of diagnostic or “what is wrong” information. The diagnostic information generated compares the “what is wrong” information to standardized correct information. Companies use diagnostic information coupled with other information types to make decisions regarding corrective actions. For example, a diagnostic report indicated how many units of product “X” shipped (descriptive information) but the key performance indicator report indicates that shipments have fallen below target levels (diagnostic information).

c. Predictive Information

As indicated by its name, predictive information provides companies with “what if” scenario analysis. Predictive information generated by a MIS doesn’t always answer “what if” but it does provide companies with information to help determine future scenario based on current information. Examples of predictive information include: What will sales look like next quarter? Should we increase the forecast for this line? Will prices stabilize next year? (Miller, 2001).

d. Prescriptive Information

Prescriptive information answers the question “what should be done”. After the predictive information provides a company with the “what if” scenario and the diagnostic information provides the “what is wrong”, the predictive information leads the company in the direction to make an informed decision. Although predictive information does not provide the answer on “what if” or “what is wrong” information, it does give the company the information required to make a decision based on the company’s goals and strategic objectives (Garver, 2019).

2.1.7 Management Information Systems and Restaurant Formation

All of our company restaurants utilize computerized management information systems, which are designed to improve operating efficiencies, provide restaurant and Support Center management with timely access to financial and operating data and reduce administrative time and expense (Ansel, 2021).

With our current information systems, we have the ability to query, report and analyze this intelligent data on a daily, weekly, period, quarter and year-to-data basis and beyond, on a company-wide, regional or individual restaurant basis. Together, this enables us to closely monitor sales, food and beverage costs and labor and operating expenses at each of our restaurants. We have a number of systems and reports that provide comparative information that enables both restaurant and Support Center management to supervise the financial and operational performance of our restaurants and to recognize and understand trends in the business (Ansel, 2019).

Our accounting department uses a standard integrated system to prepare a monthly profit and loss statements, which provide a detailed analysis of sales and costs, and which are compared both to the restaurant prepared reports and to prior periods. We have satellite technology at the restaurant level, which serves as a high-speed, secure communication link between the restaurants and the Support Center as well as our credit and gifts card processor (Ansel, 2019).

2.1.8 Management Information System (MIS) and the Computer

Translating the real concept of the MIS into reality is technically, an infeasible proposition unless computers are used. The MIS relies heavily on the hardware and software capacity of the computer and its ability, retrieve, communicate with no serious limitations. The variety of the hardware having distinct capabilities makes it possible to design the MIS for a specific situation. For example, if the organization needs a large database and very little processing, a computer system is available for such a requirement. Suppose the organization has multiple business location at long distances and if the need is to bring the data at one place, process and then send the information to various location, it is possible to have a

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

computer system with a distributed data processing capability. If the distance is too long, then the computer system can be booked through a satellite communication system (Brandau, 2007).

The ability of the hardware to store data and process it at a very fast rate helps to deal with the data volumes, its storage and access effectively. The ability of the computer to sort and merge helps to organize the data in a particular manner and process it for complex lengthy computations. Since the computer is capable of digital, graphic, word image, voice and text processing, it is exploited to generate information and present it in the form which is easy to understand for the information user. The ability of a computer system to provide security of data brings a confidence in the management and storage of data on to a magnetic media in an impersonal mode (Brandau, 2007).

The computer system provides the facilities such as READ ONLY where you cannot delete to UPDATE. It provides an access to the selected information through a password and layered access facilities. The confidence nature of the data and information can be maintained in a computer system. With this ability, the MIS become a safe application in the organization. The software, an integral part of a computer system, further enhances the hardware capability. The software is available to handle the procedural and nonprocedural data processing. For example, if you want to use a formula to calculate a certain result, an efficient language is available to handle the situation. If you are not used to formulas but have to resort to every time to a new procedure, the nonprocedural languages are available. The software is available to transfer the data from one computer system to another. Hence, you can compute the results at one place and transfer them to a computer located at another place for some other use. The computer system being able to configure to the specific needs helps to design a flexible MIS (Brandau, 2017). The advancement in computers and the communication technology has the distance, speed, volume and complex computing an easy task. Hence, designing a flexible and open system becomes possible, thereby saving a lot of drudgery of development and maintenance (Burkingham, 2017).

2.2 Theoretical Framework

Several theories abound to serve as platform for the explanation of the nature, processes, manifestations and variables of the Design and Implementation of A Computerized Restaurant Management Information System. However, the theories that anchor or underpin this study were the Resource-Based View (RBV) Theory, the Dynamic Capabilities Theory (DCT), and the Strategic Choice Theory (SCT). A brief discussion of these theories and their relevance to the study is instructive here.

2.2.1 The Resource-Based View (RBV) Theory

Barney's 1991 article is widely cited as a pivotal work in the emergence of Resource-based View (RBV), though other scholars (e.g. Birger Wernerfelt) had explained (less systematically) this theory before then. The fundamental principle of the RBV is that the basis for a competitive advantage of a firm lies primarily in the application of the bundle of valuable resources at the firm's disposal. RBV is a managerial framework used to determine the strategic resources a firm can exploit to achieve sustainable competitive advantage.

Resource-based View (RBV) conceptualizes the firm as a unique bundle of idiosyncratic resources and capabilities. To transform a short-run competitive advantage into a sustained competitive advantage requires that these resources are heterogenous in nature and not perfectly mobile. Two key assumptions of Resource-based View (RBV) that distinguishes it from others like the Industrial Organization View are that:

- Firms within an industry may be heterogenous with respect to strategic resources they control
- Resources may not be perfectly mobile across firms, and thus heterogeneity can be long-lasting

Effectively, this translates into valuable resources that are neither perfectly imitable nor substitutable without great effort. If these conditions hold, the firm's bundle of resources can assist the firm sustaining above average returns. Resources are all assets, capabilities, organizational processes, firm attributes, information, knowledge, etc. controlled by a firm that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness. Three categories of resources exist, which are physical capital resources, human capital resources, and organizational capital resources. A resource

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

must meet the following four criteria to be suitable and long-lasting under the RBV theory assumptions popularized by the acronym VRIN, viz:

- Valuable (V): A resource must meet the requirement of being valuable in terms of being in high demand, being relatively scarce in order to command high value.
- Rare (R): Such resource must be unique and incapable of being found everywhere.
- Inimitable (I): Such resource is not capable of being imitated, copied, or counterfeited, beyond imitation, matchless, unrivaled, exceptional, unique, etc.
- Non-substitutable: This suggests that the resource have no close substitute and cannot be replaced by another.

2.2.2 The Dynamic Capabilities Theory (DCT)

The idea about dynamic capabilities (DCs) was first developed by Teece (1994) in his seminal Paper on Dynamic Capabilities as an improvement, and to correct the shortcomings of the Resource-Based View theory. Teece, Pisano and Shuen (1997), opine that, dynamic capabilities refer to:

- Ability to achieve new forms of competitive advantage
- Ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments
- Ability to renew competences so as to achieve congruence with the changing business environments

Dynamic capability requires a strong base of established capabilities as well as the ability to efficiently deploy these resources and to continuously create bundles of new resources and knowledge. Dynamic capabilities theory (DCT) extends Resource-based View (RBV) and Knowledge-based View (KBV) by incorporating the process, deployment, and upgrading a firm's distinctive capabilities and competitive advantages in a constantly changing marketplace. It is often referred to as the 'capability of capabilities'.

Dynamic capability requires a strong base of established capabilities as well as the ability to efficiently deploy these resources and to continuously create bundles of new resources and knowledge. Learning ability centers at the core of dynamic capability. It is the capacity to generate and generalize (often through routines) ideas and to acquire new knowledge. Explorative learning seeks out variation, taking risks, experimentation, flexibility, discovery, and innovation. Exploitative learning focuses more on making and refining choices, increasing production efficiency, and execution of strategies.

Dynamic capability involves capability possession, capability deployment and capability upgrading. Combinative capability is key to dynamic capability. It is a firm's ability to integrate and synthesize internal resources and external learning and apply both to the competitive environment.

2.2.3 The Strategic Choice Theory

Mintzberg (1991) is associated with the Strategic Choice theory. Strategic choice theory is a theory in which forces and variables in the external environment are dynamic, and that business strategies are affected by the interactions between these factors. "Strategic choice" is defined as the process whereby power-holders within organizations decide upon courses of strategic action. This theory conceives of action being informed by the prior cognitive framing of actors of organizations in form of embedded routines and cultures. Actor's prior value, experience and training will color his evaluation in some degree.

The ability of decision-makers (agents) to make a 'choice' between policies depends ultimately upon how far they could preserve autonomy within the environment, through achieving the levels of performance expected of them. The three key issues arising from the theory concern (1) the nature of agency and choice (2) the nature of environment and (3) the nature of the relationship between agents and the environment and between strategy and environment.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

Changing external environment induce decision-makers to make adjustment in their competitive business strategies. In making these adjustments, the range of options considered are filtered and constrained so as to be consistent with the values, beliefs, and philosophies engrained in the mind of key decision-makers.

2.3 Related Empirical Studies

Several scholars had conducted empirical studies on the subject matter of the design and implementation of computerized restaurant management information systems. It is our interest in this section to critically highlight these previous studies, identifying their findings and conclusions and gaps in knowledge and how this present study attempted to fill the gaps identified.

A study conducted by Griffin (2018) in Nicaragua investigated how information (through data warehouses) was being utilized by restaurants/hotels, through the investigation of 12 of the largest hotel firms in the industry. In this study, only 7 of the 12 hotels were involved with data manipulation and 2 of the 7 had successfully developed and implemented their own data warehouses. Even though some of the hotels did not have data houses in place they were planning on the future development of this technology. The study employed survey research technique. A total population of 3200 employees out of which a sample size of 320 employees were selected using simple random sampling techniques. The study employed both descriptive and inferential statistics (i.e. simple percentages derived from frequency distribution tables, mean scores and standard deviation (SD) for the analysis of study data while the Chi-square statistics was utilized in interpretation of field data and testing of the hypotheses for the study.

A study conducted by Robinson (2016) examined 62 companies who had successfully developed and implemented data warehouses. The financial impact shown was reasonable return results, return on investment (ROI) equaling 40% and payback periods of approximately 2.31 years. One of the limitations discovered in Robinson study was the expense involved with the development of this type of technology. O'Sullivan (2016) has stated that the development of this type of data warehouse could cost an excess of 3 million dollars. The sheer cost of development of this type of technology will simply eliminate many smaller companies from participating in using this technology. A possible solution to the smaller firms could be purchasing information from a third- party vendor on a decision-by-decision basis (O'Sullivan, 2016; Robinson, 2016).

Magnini, et al, (2013) have identified six essential factors that can help build successful marketing strategies through the use of data mining, a statistical technique that builds models from vast data bases. They include (a) creating direct mail campaigns, (b) planning seasonal promotions, (c) planning the timing and placement of ad campaigns, (d) create personal advertisements, (e) define growing and emerging markets, (f) help in room reservations (wholesale and business customers) (Magnini et al., 2013).

Anjoh et al. (2021) conducted a study on: Design and Implementation of a Computerized Management Information System to Improve Secondary School Administration in Cameroon. The paper was aimed at designing and implementing a school management information system tailored to suit the needs of Cameroon's milieu. The methodology used in the programming is MERISE Method of database design and the program achieved is named DBeztSCUL M.I.S. The program is a network-based Window program that is both desktop and web-based. The network design is suggested to enhance the system sharing and division of labor. The result of this paper is to produce an electronic school management information system that is functional at micro and macro level.

Nwokocha (2017) conducted a study on the design and implementation of a computerized restaurant management information system: a case study of Jeveniks Restaurant Enugu Stat, an unpublished BSc Project submitted to Caritas University, Enugu State, Nigeria. The researcher employed the Computerized management information system database to elicit information restaurant personnel to collect data, process it and also store it for future use. Researcher used visual basic in designing the system and Microsoft office as the database system.

2.3.1 Gaps in Knowledge

The researcher having reviewed extensively the literature available in this subject matter identified some relevant gaps in literature. The researcher was not privileged to discover any empirical study that extensively dealt on the Design and Implementation of Computerized Restaurant Management Information System using Jeveniks Restaurant Abuja, FCT, Nigeria. In fact, this study ranked as the first in this geographical locale (Abuja, Nigeria). Hence, this study filled the gap of geographical scope that was absent in previous studies. Secondly, while many previous studies adopted qualitative method of study, this present study was fully a quantitative and empirical study in its entirety; Thirdly, this study engaged a plethora and comprehensive literature reviews of virtually all previous works conducted in the subject matter; highlighting a strong and positive relationship between Computerized Restaurants and Management Information System (MIS) in Nigeria.

2.4 Summary of Reviewed Literature

The researcher reviewed the conceptual framework; highlighting and explaining the independent and dependent variables of the study. He identified and discussed the three theories underpinning the study. He discussed exhaustively the related previous empirical studies conducted by authors in this subject matter, identifying the gaps in literature which he attempted to fill in the present study

3.0 Methodology

The researcher in this section examined the issues concerning research design, population, sample and sampling technique that will be used for this work. The researcher also examined the instrument in collecting data, the validity of the instrument, reliability of the instrument, procedure for data collection, method of data analysis, and limitations of the study. The design for this study is a descriptive survey method. It is used to describe what is existing and to answer the research questions stated by the researcher for the study. The population of this study comprised of all the employees of Jeveniks Restaurant Ltd in Abuja, FCT., totaling 1,200. The population is made up of 800 males and 400 female traders.

Simple random technique was adopted for this study. In order to achieve a sample size that is representative of the total population, the researcher adopted a 10% of the total population totaling one hundred and twenty (120) employees of Jeveniks Restaurants Ltd in Abuja, FCT for the study. One research instrument was used for this study was questionnaire which was entitled: Design and Implementation of Computerized Restaurant Management Information System: A Study of Jeveniks Restaurants Ltd in Abuja, FCT, Nigeria was used to collect data for this study by the researcher. The reason for using questionnaire was based on the following advantages. Firstly, it can give objective and reliable information of it is carefully and well-constructed. Secondly, it is relatively effective and easier to score and administer. Questionnaire is a good representation of group test and owing to the nature and diversity of the population, questionnaire methods become necessary.

The questionnaire is divided into two sections to enable the researcher obtain information from the respondents; the questionnaire will be designed in such a way that it provides the following sections (Section A; consisting of respondent personal information (data); while Section B consists of the structured questions to technically elicit information from the respondents on the subject matter. It was subdivided into strongly agreed (5), agreed (4), undecided (3), disagree (2) and strongly disagree (1) questionnaire. The Likert scale consists of a list of statement that has relationship with the issue in the question, it does not only allow the respondent to check those statements in which they agree or disagree but allows the respondent to state the degree of agreement or disagreement with every statement (Osuala, 2007).

Face and content validity is employed in this study, the researcher employed the help of some Senior members of the Faculty of Management Sciences (NOUN). After going through the work, they advised the researcher to see a statistician who will scrutinize the objectives of the study, research questions, research hypotheses as well as the methodology of the study. The draft questionnaire was also presented to the project supervisor for necessary corrections and adjustments before the final copy was printed out for use in the research work.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

In order to establish the reliability of the instrument, pilot study was carried out. The essence of pilot study was to test the adequacy and suitability of the instrument in measuring what it is supposed to measure and to ascertain any difficulty that the researcher may encounter. For the purpose of this, a total of (12) copies of the questionnaire representing 10% of the total population of study were administered to the selected employees of Jeveniks Restaurant Ltd in Abuja, FCT, Nigeria. They were filled under the supervision of the researcher. The filled questionnaires were collected and subjected to statistical analysis in order to determine the reliability co-efficient of the instrument as well as the internal consistency of the items within the instrument.

The data collected from the pilot study was analyzed using Cronbach Alpha techniques and reliability index of 0.85 was obtained. Bennett (2006) testified that for a scale to be considered reliable, it should have an alpha value of 0.50 to 1. With the level of reliability index of 0.85, the instrument was considered reliable for use in the main study.

To administer the validated instrument of the study, an introductory letter was collected from the head of department and presented to some members of the Management team of the selected SMEs and other employees that were randomly selected. The research assistants were educated on how to distribute the questionnaires and who is qualified to be given the questionnaire.

The analysis of data for this study was done based on the hypotheses formulated. The researcher used descriptive statistical method for bio-data presentation. Measures of relationship between the variables were being carried out using independent t-test. The simple percentage, mean score and standard deviation was used to answer the research questions. All hypotheses were tested using the independent t-test at 0.05 alpha level of significance like what is obtainable in other social science. The reason for adopting these statistical tools is to test whether there will exist some significant differences or not and either to retain or reject the null hypotheses.

4.0 Data Analysis, Interpretation and Discussion

This chapter presents the data collected, the analysis carried out and the discussion of the results obtained. The analysis is presented in sections. The first section presents the frequency and percentage distribution of bio data respondents and nominal questions as responded by respondents. The second section presents the answers to the research questions using descriptive parameters of mean scores and standard deviation. The third section presents the testing and interpretation of the two null hypotheses using parametric statistical techniques of independent t-test. All hypotheses were tested at 0.05 alpha level of significance. The major findings are then revealed before the discussions of the major findings.

4.1 Data Analysis and Interpretation

4.1.1 Analysis of Demographic Information

Descriptive statistics was used to analyze the demographic information of the respondents, these included the use of frequency and percentage.

Table 4.1.1: Bio-Data of Respondents

S/No.	Bio-data	Category	Frequency	Percentage (%)
1.	Status	Top-Management	10	9.3
		Managers	30	25.0
		Other employees	80	65.7
2.	Gender	Male	70	58.3
		Female	50	41.7
5.	Qualifications	M.Sc./M.Ed/MA/MBA	25	30
4.	Years of experience	B.Sc/B.Ed	20	24
		NCE/OND	50	60
		0- 5 years	60	72
		6 - 10years	20	24
		11 - 15 years	20	24

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

On the status of the respondents, 10 representing (9.3%) were top-Management executive, 30 representing (25.0%) were Managers, while 80 representing (65.7%) were other employees of the organization. Table 4.1.1 above showed that 70 representing (58.3%) were males and 50 representing (41.7%) were females. According to Table 4.1.1, 25 representing (30%) had M.Sc/M.Ed/MA/MBA degree, 20 representing (24%) possess B.Sc/B.Ed degree while 50 representing 60% had NCE/OND. On the respondents' working experience, from the table above showed that 60 persons representing (72%) had worked between 0 – 5 years, 20 persons representing (24%) had worked between 6-10 years, while 20 persons representing (24%) had worked between 11 – 15 years respectively.

4.1.2 Answering of Research Questions

This section presents the result of this study based on the data analysis. They were presented on the basis of the five research questions and two null hypotheses that guided the study. The researcher used 3.00 as the mean otherwise known as decision mean since the instrument was structured along a modified five Likert scale structure to take decision on whether to accept or reject the research questions after comparing it with the qualitative mean. Therefore, a mean score of 3.00 and above indicate positive response to the research question and accepted while a mean score below 3.00 indicate negative answer to the research question and rejected.

This is shown below:

- SA - 5 points
- A - 4 points
- UD - 3 points
- SD - 2 points
- D - 1 point

$$\frac{.....5 + 4 + 3 + 2 + 1.....}{5} = \frac{.....15.....}{5} = 3.00 \text{ (Decision Mean)}$$

Research Question One:

What are the impacts of computerized management information system on increased productivity, decrease paper work and ability to analyze trouble spots?

The data for providing answers to the above research question is presented on Table 4.1.2 below:

Table 4.1.2: Mean and Standard Deviation Ratings of the impacts of computerized management information system on increased productivity, decrease paper work and ability to analyze trouble spots

S/No.	Questionnaire Items	Mean	SD	Decision
5.	Computerized management information system enhances efficiency in the employee work processes	4.22	1.05	Agreed
6.	Employees' stress pattern are reduced, organizational productivity high, paper work reduced, and ability to analyze trouble spots enhanced	3.99	0.97	Agreed
Cluster		3.85	1.03	Agreed

The respondents in Table 4.1.2 agreed that there is a strong positive relationship between computerized management information system and increased productivity, reduction in paper work and ability to analyze trouble spots in Jeveniks Restaurant Ltd., Abuja, FCT, Nigeria. The variation of opinions of

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

respondents symbolized by the mean ratings ranges between 3.99 and 4.22 while the standard deviation (SD) ranges between 0.97 and 1.05 respectively.

Research Question Two:

What are the impacts of the increase in the level of service quality on customer satisfaction?

The data for providing answers to the above research question is provided in Table 4.1.3 below:

Table 4.1.3: Mean and Standard Deviation Ratings of the impacts of the increase in the level of service quality on customer satisfaction

S/No.	Questionnaire Items	Mean	SD	Decision
7.	Improvement in total quality management (TQM) in Jeveniks Restaurant Ltd has improved customer trust in our products	4.31	1.08	Agreed
8.	Sales revenue has seriously increased as a result of high customer patronage of our products	4.20	1.10	Agreed
Cluster		4.20	1.09	Agreed

The respondents in Table 4.1.3 agreed that that the increase in the level of service quality has positively impacted on customer satisfaction by improve customer trust in our products and enhancing sales revenue of our company. This acceptance was symbolized by the above mean score ratings ranging between 4.20 and 4.31 and the standard deviation ranging between 1.08 and 1.10 respectively.

Research Question Three:

How will the system help restaurants in their ability to build competitive and strategic advantage?

Table 4.1.4: Mean Ratings and Standard Deviation on how computerized management information system help restaurants in their ability to build competitive and strategic advantage

S/No.	Questionnaire Items	Mean	SD	Decision
9.	Computerized management information system reduces unnecessary paper work in the daily activities of restaurants and enables them build competitive and strategic advantages	4.01	0.92	Agreed
10.	Employees work lesser hours and earn higher pay as productivity is enhanced	3.99	0.95	Agreed
Cluster		3.99	0.91	Agreed

The respondents in Table 4.1.4 accepted that computerized management information system helps restaurants to build competitive and strategic advantage. This was symbolized by the mean ratings ranging between 3.99 and 4.01 while the standard deviation (SD) ranges between 0.92 and 0.95 respectively.

Research Question Four:

How will computerized management information system improve the operational efficiencies and timely access to financial and operating data?

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

Table 4.1.5: Mean and Standard Deviation Ratings of how computerized management information system improve operational efficiencies and timely access to financial and operating data

S/No.	Questionnaire Items	Mean	SD	Decision
11.	Computerized management information system enhances operational efficiencies through efficient production processes, efficient production line management, wastage reduction, greater workforce engagement, etc.	4.24	1.05	Agreed
12	Computerized management information system guarantees timely access to financial and operating data, as information flow is at its peak in all facets of the organizational activities	3.92	1.07	Agreed
Cluster		3.92	1.04	Agreed

Respondents in Table 4.1.5 accepted that computerized management information system improve operational efficiencies and timely access to financial and operating data. This was symbolized by the mean ratings ranging between 3.92 and 4.24 while the standard deviation (SD) ranges between 1.05 and 1.07 respectively.

4.2 Test of Hypotheses

The following hypotheses will be tested at 0.05 alpha level of significance.

Table 4.2: t-test of Hypotheses on Ho1 and Ho3

S/No	Hypotheses	Categ ory of Resp	N	- N	SD	T- CD	DF	T. TA B	Decision
1.	There is no significant difference between the mean ratings and opinion of male and female respondents in Jeveniks Restaurants Ltd., Abuja, FCT, Nigeria	Males Femal es	120	4.01	1.15	- 1.62	541	1.9 6	Accepte- d
2.	There is no significant difference between the mean ratings and opinions of the top-Management executive and other employees of Jeveniks Restaurants Ltd., Abuja, FCT, Nigeria	Top- Mgt. Execu tives Other emplo yees	120	3.89	1.01	- 1.62	541	1.9 6	Accepte- d

Significant level = 0.05

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

4.2.1 Hypothesis One (Ho1):

Hypothesis (Ho1) states that there is no significant difference between the mean ratings and opinion of male and female respondents in Jeveniks Restaurant Ltd., in Abuja, FCT, with regards to the design and implementation of computerized management information system in Jeveniks Restaurant in Abuja, FCT, Nigeria. The hypothesis was tested at 0.05 alpha level of significance. From the table 4.2 above, the calculated t-values, (-1.62) is less than the t-calculated (1.96). Hypothesis (Ho1) is therefore accepted.

4.2.2 Hypothesis Two (Ho2):

Hypothesis (Ho2) states that there is no significant difference between the mean ratings and opinions of the top-Management executive and other employees in Jeveniks Restaurants Ltd., in Abuja FCT Nigeria with regard to the design and implementation of computerized management information system in Jeveniks Restaurant Ltd., Abuja, FCT, Nigeria. This was tested at 0.05 alpha level of significance. From table 4.2 above, the calculated t-value (-1.62) is less than the t-tabulated (1.96). Hypothesis (Ho2) is therefore accepted. Respondents therefore accepted in all clusters, there is no significant difference between the opinions of male and female respondents and the top-Management executive and other employees of Jeveniks Restaurant Ltd., in Abuja, FCT, Nigeria.

4.3 Summary of Major Findings

The findings from this present research are consistent with the hypotheses. The outcome of the independent t-test analysis revealed that there is a strong positive relationship between computerized management information system and restaurant efficiency and effectiveness in terms of design and implementation. Hence, the major findings are hereby summarized below:

- i. That a computerized management information system offers a wide selection of features to improve control of restaurant business and save time spent on inventory, purchasing and accounting;
- ii. That a computerized management information system can drastically cut down on shrinkage, the inventory that disappears from the store or restaurant due to theft, wastage and employee misuse;
- iii. That, since employees knows that inventory is being carefully tracked, internal shrinkage will dwindle;
- iv. That the right of the automated management information system would offer to restaurants a new level of control over their operations, increase efficiency, boosting profits, and helping them fine-tune their business model.

4.4 Discussion of Results

The body of literature presented by O'Sullivan, 2016; Robinson, 2016; Jin-Zhao & Jing, 2019; Griffin, 2018; Magnini, et al., 2013; Siguaw and Enz, 2019 from which the research hypotheses were formulated agreed with this present study and provided great support that the design and implementation of a computerized management information system has strong and positive relationship with the efficiency and effectiveness of restaurants' businesses in terms of improving sales revenue and profits, reduce production time, cut down on production resource wastages, reduces employees' stress level, and increases customer satisfaction through product total quality assurance. Hotel and restaurant executives understand the importance and power of information, especially in turbulent financial times such as in the present global economy. The development and use of management information systems can additionally aid in hotels' ability to develop concepts for new development, target better locations, identify potential franchises, locate new labor markets, track employee performance, and most importantly, track customer satisfaction (Jin-Zhao & Jing, 2019; Griffin, 2019).

It is evident from the study findings that leveraging this type of computerized management information system can lead organizations toward better decision-making and building and sustaining competitive and strategic advantage (Journal of Applied Business and Economics, vol. 12(1), 2011; Yang & Fu, 2017; Lee, Barker & Kandampully, 2013)

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

5.0 Study Implications, Conclusion and Recommendations

This research study is on the design and implementation of computerized restaurant management information system: a study of Jeveniks Restaurants Ltd., Abuja, FCT, Nigeria. The main objective of this study is to investigate the impact of the design and implementation of computerized management information system on restaurant's business activities in Jeveniks Restaurants Ltd. in Abuja, FCT, Nigeria. The study also seeks to examine the benefits of utilizing a computerized management information systems in restaurant business transactions in Nigeria.

5.1 Implications of the Research Findings

Based on the results of analysis for the study, it was revealed that this study were detailed as the study has relevant implications for operation of restaurant business in Nigeria. Hence, the implication of this study are as follows:

- i. It is very clear that a new automated management information system is inevitable for effective and proper management information system of the restaurant;
- ii. The computerized management information system will help to solve all the problems inherent in the traditional manual business operations with its attendant unnecessary paper work;
- iii. That Managers of restaurants will find the computerized management information system more efficient and effective in handling employee matters, customer and clientele management and overall organizational performance;
- iv. That the design and implementation of an efficient computerized management information systems is employee-friendly as it will reduce man-hours spent in production and invariably improved productivity and higher pay for the workers.

5.2 Conclusion

At any point of the day, a computerized management information system can instantly tell you how many of a particular product has been sold today (or last week, or last month) how much money you have in your cash drawer, and how much of that money is profit, Detailed sales reports make it much easier for you to keep the right stock on hand. The restaurants can track their remaining inventory, spot sales trends, and use historical data to better forecast their needs. Often, this software can alert the Manager to re-order when stocks run low. Many store owners think they know exactly what trends affect them find a couple of surprises once they have this data.

Few purchases can have as dramatic an effect on the restaurant retail or hospitality business as an automated management information system. The right of the automated management information system will give the restaurants a new level of control over their operations, increasing efficiency, boosting profits, and helping them fine-tune their business model.

5.3 Recommendations Based on Research Findings

Based on the research findings of this study, the following recommendations were proffered:

- i. Staff should have basic knowledge of computer operations in terms of computer hardware and software applications;
- ii. That the original Basic CD, organizational databases should be stalled for effective and efficient Management Information Systems operations in restaurants;
- iii. That Managers of restaurants in Nigeria should design and implement 21st Century computerized computer gadgets in order to effectively and efficiently enhance their corporate performance;
- iv. That employees of restaurant businesses in Nigeria should be trained on-the-job to enable them effectively handle the computerized equipment in order to achieve organizational goals.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

This study focused on the evaluating the design and implementation of a computerized restaurant management information system adopting a case study of Jeveniks Restaurants Limited in Abuja, FCT, Nigeria. It is necessary that further research be conducted in this area of study; possibly on the impact of a computerized management information system in the public sectors of the Nigerian economy.

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INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

THE IMPACTS OF MULTINATIONAL CORPORATIONS ON THE SOCIO-ECONOMIC DEVELOPMENT OF NIGERIA (A CASE STUDY OF NIGERIA BREWERIES PLC)

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ABSTRACT

Multinational corporations (MNCs) are enterprises which have operations in more than one country. They manage production establishments or deliver services in at least two countries. This study examines the impacts of Multinational Corporations (MNCs) on socio-economic development of Nigeria adopting a case study from the Nigeria Breweries PLC. The specific objectives of this study were to: determine the impact of Multinational Corporations (MNCs) on the integration of international and indigenous business in Nigeria; assess the socio-economic benefits behind the integration of indigenous and international business in the context of Nigeria, adopting the Nigerian Breweries PLC as a case study; evaluate the impact of World Trade Organization (WTO) on the integration of international and indigenous businesses in Nigeria with particular reference to the Nigerian Breweries PLC; highlight the impact of government attitude on the integration of international and indigenous businesses, adopting the Nigerian Breweries PLC. This study adopted the descriptive survey research design. The total population for this study was 1,200 staff of Nigeria Breweries (NBL) PLC selected from the middle-level managers and top-executives of (NBL) PLC. Out of this total, 120 employees were selected for this study using the simple random sampling technique that is 10% of total. The study adopted both primary and secondary modes of data collection. Primary data was collated using structured questionnaires while the secondary data was from relevant books on the subject matter, journals, articles, company periodicals, unpublished projects, dissertations and thesis. Both the descriptive and inferential statistic were employed in the analysis of data collated from field work. Descriptive statistic employed frequency distribution tables, mean and standard deviation (SD) while the independent t-test was adopted in testing the hypotheses for the study. Statistical Packages for Social Sciences (SPSS) Version 26 was further employed in the data analysis. The study revealed that multinational corporations performed vital roles such as employment generation, improvement of infrastructural development, poverty alleviation, building competence and local skills of local workers. The study further revealed that highly paid skilled wages were not received by local workers, workers are exploited, profit repatriated, and out-model technologies are transferred and environments are polluted in most developing countries by multinational corporations. The study recommends that Nigerian government should initiate regulatory laws that can discourage multinational corporations from exploiting and engaging in policies that are not beneficial to its citizens. Moreso, they should initiate economic policies that will attract multinational corporations to invest in the country considering the significant benefit its citizens gained with regards to employment, poverty alleviation, economic growth and development.

Key Words: Multinational Corporations (MNCs), Socio-economic development, Nigeria Breweries Plc

1.0 Introduction

Multinational corporations (MNCs) can be defined as enterprise that engages in foreign direct investment (FDI) of which owns or, to some extent, controls value-added activities in several countries (Mayrhofer & Prange, 2015). It is widely acknowledged that multinational corporations (MNCs) had become the key institution and engines of socio-economic development in developing or less developed countries (LDCs) (Ayesha, 2020; Chen, 2020; Prema, 2020; Pettiinger, 2019; Okon & Okon, 2018;

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

Amusan, 2018; Ambibola & Dele, 2015; Worsinchai & Bechina, 2010). Multinational corporations have acquired great relevance in the academic world and in firm management in recent years (Aguilera-Caracuel, Guerrato-Villegas & Garcia-Sanchez, 2017). Majority of these corporations started their operations many decades back. Although, there are significant changes in their operations in recent times, Nizzamuddin (2007) reveals that: today, multinational corporations (MNCs) comprise a central place in the world economy. Before World War II, terms such as ‘‘multinational’’ or ‘‘transnational’’ were seldom used to describe international economic relations. Although, transnational entities like the British East India Company and Joint-Stock Enterprises existed in the past, the expansion and proliferation of multinational agents is a recent phenomenon (p.1).

In an era where external assistance (development aid) to developing countries (DCs) has been declining due to the fact that the donors in developed countries have not been willing to part with a larger proportion of their GDP as assistance to developing countries (Ayesha, 2020). Multinational corporations (MNCs) therefore have to step in. According to Ayesha (2020), multinational corporations (MNCs) are important source of foreign direct investment (FDI). A number of factors or combination of factors has contributed to the enormous expansion and spread of the multinational activity in the past three decades. Loku & Loku (2016) posits that: changes in technology and organizational sophistication created the possibility of expansion. The development of new communications technologies, cheaper and more reliable transportation networks, and innovative techniques of management and organization have made possible the kind of concentration, integration, and flexibility that are the hallmark of the successful MNCs (p.77).

Multinational corporations tend to have budgets that exceed those of many small countries (Chen, 2020). The dominant player in the modern world investment set up multinational corporations (Clicker, 1990). The challenges faced by multinational corporations in most developing countries during entry into market include government regulations and policies, geographical location, language barriers, shortage of skilled labor, and low level of intellectual property development (Abimbola & Dele, 2015).

Weak rates of intellectual property protection in developing countries also prevents both down-stream and up-stream technology transfer activities characterized by the fear of unauthorized use of proprietary knowledge prevents foreign companies or corporations from entering into transfer activities with local entities (Abimbola & Dele, 2015). In addition, corruption and insecurity discourage multinationals as corruption is adjudged to increase the cost of doing business and as a result most foreign investors would rather want to invest in countries with lower levels of corruption which derive maximum profits from investment (Abimbola & Dele, 2015). Moreso, insecurity which manifest in kidnapping, hostage taking, armed robbery, burglary, religious, ethnic and political crisis, terrorism and killings in most developing countries like Nigeria discourage foreign investment from multinational corporations rather firms prefer environments that are peaceful and investment-friendly (Abanyan, Abubakar & Ikwuba, 2017; Abimbola & Dele, 2015). Moreover, Kamg (2013), asserts that multinational corporations are under more pressure because they face very relevant, diverse, strong interest groups in the local and global environment, groups that will grant them legitimacy and the power to act.

Worasinchai & Bechina (2010), suggests that the investments by foreign companies make the developing countries more receptive to social and economic changes as they enter in the global market and they have to adopt modern values and business practices. The host country should facilitate the operations of MNCs because their direct investments are much easier to obtain than funding from traditional channels such as the World Bank, national development organizations, or non-profit organizations (Worasinchai & Bechina, 2010).

Nevertheless, Tirimba & Macharia (2015), argue that multinational corporations do not come into being from thin air. There has to be some motives, substance, some meaning, reasons and some objectives for them to come into being. Ayesha (2020), insists that multinational corporations exist because they are highly efficient. He further asserts that their efficiencies in production and distribution of goods and services arise from internationalizing certain activities rather than contracting them to other firms.

Similarly, Aguilera-Caracuel, Guerrero-Villegas & Garcia-Sanchez (2017), suggest that one of the main reasons these firms invest in developing countries is to improve their reputation. Not surprisingly,

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

Ferdausy & Rahman (2008) doubts the accuracy of this account. Instead, they stressed that many multinational corporations enter developing country basically to exploit cheap labor and abundant natural resources. He further assert that multinational corporations make just a little contribution to employment, and they discourage local entrepreneurs by competing and acquiring existing firms, by using expatriate managers instead of training local people, and by hiring away local skilled workers. Oden (2019), argues that: developing nations attract multinational subsidiary operations due to a number of factors such as cheap labor, low taxation and less vigilance concerning workers' rights and environmental protection. They are made to contribute to the social security net (i.e. welfare, unemployment insurance, etc.), other factors including low pay for women workers, child labor, and the absence of labor unions, also combine to make the Third World Ripe for Exploitation.

The introduction of Multinational Corporations (MNCs) into a host country's economy may also lead to the downfall of smaller, local businesses (Chen, 2020). Robbok & Simmonds (1989), laments that the rise of multinationals into a host country's economy have confronted the nation state with the challenges of the operations of the local jurisdiction. The nation state has to grapple with national interests and how to protect them from being compromised by the multinational corporations whose focus is to control and transfer goods and money as they cross national borders. Tirimba & Macharia (2015), confirm that MNCs have devastating effects on their host countries; they are crafty in their dealings and do more economic and political harm and perpetuate poverty in the less developed countries (LDCs).

Nevertheless, Multinational Corporations (MNCs) on the other hand, benefit much from lower costs and grants given by the government of developing economies to attract more MNCs. More often, lower tax rates or tax exemptions are given to MNCs for a period in the developing countries (Ferdausy & Rahman, 2009). On the other hand, most of these developing countries also benefit (gain) from the investment made by the multinationals. Multinational companies help in reducing poverty, driving economic growth, creating jobs that u2009). In addition, they can boost economic development by transferring technology and knowledge, utilize local people, raise employment standards by paying better wages at least more than local firms pay or subsistence agriculture (Pettinger, 2019; Ferdausy & Rahman). In addition, they can boost economic development by transferring technology and knowledge, improve or build up infrastructure raise people's standard of living (Ajibo et al, 2019; Okon & Okon, 2018; Evstigneeva, 2016; Hairy, 2013; Dunning, 2013). However, there appears to be uncertainties about the activities of these corporations, in both positive and negative ways (Pettinger, 2019; Ferdausy & Rahman, 2009). MNCs take undue advantage of developing countries. Many are guilty of causing environmental pollution, repatriation of profit, monopolizing the economy, paying low wages, forcing local firms out of business and doing human rights abuse (Pettinger, 2019). It is in line with this mix perspective (both positive and negative)that this study sought to examine the impacts of Multinational Corporations (MNCs) on the socio-economic development of Nigeria adopting the Nigeria Breweries PLC as a case study.

1.2 Statement of the Research Problem

The primary research focus of this study is to examine the Impacts of MNCs on the socio-economic development in the host country's integration of indigenous and international businesses. The focused research context of Nigeria is suitable for such a study for few reasons. For instance, Nigeria is an emerging market with the 27th largest economy in the world. The GDP of the country is over \$450 billion, with an estimated population of 242 million people living in this country. The country is bestowed with a large number of natural resources, and Nigeria is the largest exporter of crude oil in Africa. Volatility in oil prices greatly influences the GDP growth of the country, The average GDP growth of the country from the year 2000 to 2014 was about 7% on the average, which then fell to about 2.7% in 2015 when there was a fall in oil price. The average GDP growth of the country has been 2% on average since 2015 (www.worldbank.com, 2019).

The dependence on natural resources threatens the stability of the economy. Now the country is focusing on manufacturing and consumption for GDP growth for which it is opening its economy for foreign investors. Multinational corporations (MNCs) are investing greatly in this growing economy where there

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

is huge scope for expansion. All of these background facts of Nigeria's economy suggest that Nigeria is a suitable research context for the primary research focus of analyzing the impacts of MNCs on its socio-economic development.

The Nigerian Breweries PLC is listed on the Nigerian Stock Exchange (NSE) as the largest Brewer of Beer and other food drinks and confectionaries in Nigeria. It is affiliated to the World's largest Beer brewery industry (Heineken Brewery Worldwide) that has businesses in over 150 countries, and there are around 89 production sites of the company. Hence, Nigerian Breweries PLC qualifies as a multinational corporation (MNC) and worthy to be adopted as a case study for this research. In Nigeria, the head office and manufacturing plant is located in Eric Moore Industrial Layout, Surulere, Lagos (ng.nbl.com).

Nigerian Breweries PLC has been a strong presence in the Nigerian market through its regional sales team and also gained vast experience in the international expansion through organic growth, merger, and acquisition. The integration of the company can be assessed looking at the mission of the company and the channels of distribution of its products and how they source raw materials (ng.nbl.com). Thus, analyzing the impacts of Nigerian Breweries PLC as a multinational company can provide strong evidence to this study which might validate the research outcome at an upper level to draw conclusions on whether the activities of the multinational corporations (MNCs) have impacted positively or negatively on the socio-economic development of Nigeria.

1.3 Objectives of the Study

The main purpose of this study is to examine the impacts of Multinational Corporations (MNCs) on the socio-economic development of Nigeria adopting the Nigerian Breweries PLC as a case study. The specific objectives include to:

- i. determine the impact of Multinational Corporations (MNCs) on the integration of international and indigenous business in Nigeria using the Nigerian Breweries as a case study;
- ii. assess the socio-economic benefits behind the integration of indigenous and international business in Nigeria adopting the Nigerian Breweries PLC as a case study;
- iii. evaluate the impact of WTO on the integration of international and indigenous businesses in Nigeria with particular reference to the Nigerian Breweries PLC;
- iv. highlight the impact of government attitude on the integration of international and indigenous businesses in Nigeria adopting the Nigerian Breweries PLC as a case study,

1.4 Research Questions

In line with the research objectives, the following research questions were formulated:

- i. What is the impact of Multinational Corporations (MNCs) on the integration of international and indigenous businesses in Nigeria adopting the case of Nigerian Breweries PLC?
- ii. What are the socio-economic benefits behind the integration of international and indigenous businesses in Nigeria using the Nigerian Breweries as a case study?
- iii. What is the impact of WTO on the integration of international and indigenous businesses in Nigeria with particular reference TO THE Nigerian Breweries PLC?
- iv. What is the impact of government attitude on the integration of international and indigenous businesses in Nigeria adopting the Nigerian Breweries PLC as a case study?

1.5 Research Hypotheses

In line with the research objectives, two null hypotheses were formulated and will be tested at 0.05 level of significance:

Ho1: There is no significant difference in the mean ratings between the opinions of male and female respondents of the Nigerian Breweries PLC.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

Ho2: There is no significant difference in the mean ratings between the opinions of the Management Team and other employees of the Nigerian Breweries PLC.

1.6 Significance of the Study

This study will provide a working template for Managers of the Multinational Corporations (MNCs) on the right business relationships to adopt in their dealings with the government and the entire Nigerian citizenry as they engage in their business operations. The study will assist policy makers (particularly the government) and development planners to comprehend the level of contribution of Multinational Corporations to the people's socio-economic wellbeing. The viability and successful operations and its adherence to Corporate Social Responsibility (CSR) to the locations where they operate and the entire populace of Nigerians by the Nigerian Breweries PLC in Nigeria was the subject of discussion which practices the researcher admonishes other upcoming multinationals to imbibe.

This research will also provide very useful materials for academics and would no doubt spark off further research in this area of study. This work would equally be utilized in teaching and learning for students in the Faculty of Management Sciences (Business Administration, Entrepreneurship, Marketing, Public Administration, Financial Studies including Banking & Finance, Accounting & Operations Research (OR) across the globe.

1.7 Scope of the Study

This study limits itself in finding out the impacts of Multinational Corporations (MNCs) on the socio-economic development of Nigeria, adopting a case study from the Nigerian Breweries PLC. It tries to educate the Managers, Practitioners, Academia and Students on how to identify and cushion the negative impacts of the operations and activities of Multinational Corporations (MNCs) in Nigeria by educating both the Government and the entire Nigerian citizenry on what should be a beneficial relationship between them and the MNCs and to insist that the MNCs operates within laid down rules and regulations thereby enhancing our indigenous economy.

In defining the limitations of this study, cognizance was taken of the fact that the activities of MNCs over wide areas whose study may not yield desirable results due to resource constraints are down-played. For this reason, it was found necessary to limit the study to one Multinational Corporation (MNC), the Nigerian Breweries PLC. It was also convenient to confine this study to Brewery and Corporate Social Responsibility (CSR).

2.0 Review of Related Literature

This section would review related literature. The section will be divided into four major sections: the conceptual framework which will discuss the basic concepts associated with the topic of this research; the theoretical framework which will discuss the theories that underpin this study; the related empirical study associated with this research; and the summary of reviewed literature.

2.1 Conceptual Framework

2.1.1 Historical Evolution of MNCs operations in Developing Countries

Most Multinational Corporations (MNCs) in developing countries first appeared as subsidiary branches of their main companies based in industrialized richer countries. According to Maxon (1992), the MNCs being the main channels for foreign capital represented a network of business enterprise which strived to extend their operations into less developed parts of the world. Some of these activities were independent from colonial domination. During colonial period the MNCs were actively engaged in investments related to extraction of raw materials such as mining and petroleum. After the colonies attained their independence, the MNCs started engagement in manufacture of consumer goods which were oriented to the internal markets of the new nations. MNC operations in Nigeria generally fall into this category. Langdon (1981) conducted a study of Nigerian society focusing first on the historical pattern of Nigerian incorporation into the international economy; second on the shaping of Nigerian social relations as the country's links with the international economy changed in the context of decolonization and third, on the post-independence structure of the Nigerian economy as shaped by

external-internal interplay. The study also outlined the position of the MNC sector within the framework. His findings were that there were economic structural changes both in the rural and urban areas after independence. For example, there was increased peasant production in the rural areas due to government policies that encouraged the rural people to engage in cash crop production and other forms of plantation farming. In urban areas there was accelerated pattern of import substituting industrialization coupled with government policy of Africanizing external relationship in Nigeria (Indigenization Policies of the 1960s). These trends which was however not sustained in the 1970s brought about an increasing number of MNCs in Nigeria, as the commercial firms often used their external trade links to attract manufacturing multinationals into joint ventures. The changes also gave an opening to multinationals from other countries to penetrate the Nigerian market which had previously been dominated by British companies and capture a large share of it by taking measures such as locating industrial subsidiaries in Nigeria. The British companies lost economic privileges and monopolies that they had enjoyed during colonial time. These companies found that the only way to protect their market in Nigeria was to locate to Nigeria through their subsidiary companies.

The post-independence period in Nigeria witnessed significant developments which were occasioned by globalization. This refers to the integration of markets within the world economy. As a result, sovereign states have been thrust into world system where markets within their economies have been interconnected. Multinational Corporations (MNCs) have utilized this connectedness to suit their operations within multiple countries. This background sets the ground for literature review on the main variables in this study i.e. Manufacturing (Breweries and other processed food production), Corporate Social Responsibility (CSR) and Socio-Economic Development.

2.1.2 Multinational Corporations and Socio-Economic Development

Multinational Corporations (MNCs) are those having operations in more than one country. They are subject to changes in international exchange rates, tariffs, duties, and restrictions on trade. The most successful ones have established production points where labor is cheap and secures affordable transportation to deliver to their markets (Otokiti, 2012). Many multinationals use outsourcing and subcontracting to reduce their tax liabilities and avoid government regulations, Otokiti, 2012). Multinational corporations contribute to 65% of the non-governmental employment opportunities available at any given country of host (Reid, 2001 cited in Tirimba and Macharia, 2014). In 1998, multinational corporations had 19 million employees in developing countries and were also responsible for more than 100 million jobs created indirectly through multiplier effects (Quinlivan, 2005).

The economic role of multinational corporations is simply to channel physical and financial capital to countries with capital shortages. As a consequence, wealth is created which yields new jobs directly and through “crowding in” effects. In addition, new tax revenues arise from multinational corporations’ generated income allowing developing countries to improve their infrastructures and to strengthen their human capital. By improving the efficiency of capital flows, multinational corporations reduce world poverty levels and provide a positive externality that is consistent with the United Nations (UN) mission – countries are encouraged to cooperate and to seek peaceful solutions to external and internal conflicts (Quinlivan, 2015). In all, Multinational corporations (MNCs) can spur economic activities in developing countries and provide an opportunity to improve the qualities of life, economic growth, and regional and global commons (Litvin, 2002).

2.1.3 Negative Effects of Multinational Corporations in Nigeria

According to Ugbejeh ((2018), Nigeria is very much affected by the negative activities of these multinational corporations operating within its jurisdiction. Their obnoxious acts have affected our economy tremendously. Firstly, environmental degradation is more conspicuous among the oil producing companies/firms in Nigeria. These companies have blatantly degraded our environment, farmlands, wildlife, rivers through gas flaring, oil spillages (Ibeanu, 2009). At the same time, millions of naira have been lost on these issues because they seriously impede economic growth and development of the country. For instance, Nigerians lost 2.456 trillion in 2006, 2.69 in 2007 and 2.97 in 2008 as a result of the activities of these multinationals.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

Multinational corporations have contributed to the technological backwardness of the country. It is in this area that the MNCs are regarded as the worst culprits as they play their greatest trick imaginable. The MNCs by way of purporting to help industrialize Nigeria create a branch-plant economy of small inefficient-firms incapable of propelling overall development. The local subsidiaries exist only as enclaves in the host economy rather than as engines of self-reliant growth. According to Odiete (2021), these corporations intentionally and deceitfully introduce inappropriate types of technologies that hinder indigenous technological developments. He further reiterated that these MNCs employ capital intensive productive techniques that cause unemployment. All these prevent the assorted types of technologies all over the country, though they were of low scale type. The MNCs rather than help them grow knock them off systematically through the introduction of more advanced technologies. The MNCs both retain the control of the most advanced technology and do not transfer it to Nigeria or the rest of the developing economies at reasonable prices.

The negative impact of MNCs on Nigerian economy is most conspicuous in this area of technology transfer. Ozoigbo and Chukuezi (2011) noted that there are four main reasons for this assertion: the MNCs jealously guard the technological know-how of their technologies by way of refusing to make use of competent staff; most of the imported technologies came under the industrial property system of restrictive patterns and license; introducing very sophisticated technologies which an average indigenous trained Nigerian could cope with; structural distortions whereby the economic base of MNCs are purely in large urban cities to the detriment of the rural areas where greater population of Nigerian elites resides; and the MNCs mal-distribution of income, This step creates a class-conscious society, which does not help development as such.

Adegoke et al, (2022) opine that, because these corporations require a stable host government, which of course is sympathetic to capitalism, they try as much as possible to directly protect the existing government whenever a reactionary leader or group seems to take over the government. The MNCs try to maintain the status quo that is, dependent development which encourages the emergence of authoritarian regimes in the host country and thereby manipulating the state apparatus to suit their economic interests. It is on record that the MNCs kept President Mobutu of Zaire in power for so long because he was tutelage to them and with MNCs they sucked dry the economy of Zaire. The MNCs equally were responsible for the early exit and assassination of Patrice Lumumba because he would not allow their exploitative activities. The same story is true of Captain Thomas Sankara of Burkina Fasso and so many others.

Nkemneme et al, (2019) opine that MNCs have the nature of profit-repatriation to their home base. These corporations have siphoned our economy by sending bulk of their profits to their home countries which they could have invested to develop our country, thereby subjecting the nation to the whims and caprices of underdevelopment. Ojukwu (2020) adumbrated that the royalties or patent paid to the government by these MNCs are so inconsequential that they cannot be invested into heavy industrial projects. To cap it up, Ndukwe et al, (2015) noted: that MNCs are one of the agents of corruption in Nigeria. They have influenced our leaders negatively through bribes to earn their ends meet. This is a wrong signal to the international community and a big minus for Nigerian's image and reputation.

2.1.4 Management of Multinational Corporations (MNCs) in Nigeria

Managing multinational corporations require a different set of conceptual tools than in the case of purely domestic firms. In particular, it is important to understand the Fundamental economic, strategic, structural, organizational and socio-political issues that have impact on the process of international expansion of the firms, on the linkages between foreign subsidiaries and corporate headquarters in the home country, and on the relationship between the multinational firms and interest groups in the foreign countries, including the government, labor unions, customers and suppliers. Their employment modes such as polycentric, ethnocentric and geocentric approaches should be seriously taken into consideration in order to achieve effectiveness and efficiency in their managerial process. Bernadine (2013:26) explained the above three possible models of managing multinational corporations in Nigeria; These models include:

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

Ethnocentric model: This model works within the assumption that management and human resource practices are critical core competence to a firm's competitive advantage and as such should not be trifled with nor compromised (Bird et al. 1998). Under this model, the foreign subsidiaries tend to have little autonomy and operations and decisions are typically centralized at the headquarters. The bulk of the management staff is usually sent from the headquarters and comprise namely the Parent Company Nationals. Most Japanese and American organizations are known to use this approach in recruiting and deploying their staff (Bernadine, 2013:26).

Polycentric Model: This model handles subsidiary as a distinct entity with some level of decision-making authority. Under this model, both the management and the supporting staff are usually selected competitively from the local labor market. The only challenge is that in most cases, these local personnel are hardly ever promoted to work outside their local environment either in other countries where the company has subsidiaries or in the headquarters. This model is cheaper in addition to being more adaptable to local conditions.

Geocentric Model: This model tries to remove the boundaries and separating lines between the parent company and the subsidiaries scattered all over the globe. It strives to integrate its businesses and the relationships based on collaboration and mutual reciprocity (Onodugo, 2013). Under this model, the organization begin to see itself as having a global workforce that can be deployed and utilized in a variety of ways throughout the world. Key positions tend to be filled by the most qualified individuals regardless of nationality, race or color. Staff remunerations in companies that are geocentric are generally based on global market rates and standards. Pay and work concentration are solely based on individual contributions to the organization rather than country of origin.

It is important to note that within the contextual needs of developing countries any models chosen must strike a balance between maximizing its huge labor potential and providing opportunities for technology transfer. A critical look at the models enumerated above, one can suggest that, for multinational corporations to thrive in Nigeria, polycentric and geocentric approaches to staff selection be adopted. They increase the chances of technology transfer. The best strategy again is for developing countries like Nigeria to initiate standard policies that will be binding on the operations of multinational corporations in Nigeria.

2.1.5 The WTO and Organizational Performance

The World Trade Organization (WTO) is a 164-member international organization that was created to oversee and administer global trade rules, serve as a forum for trade liberalization negotiations, and resolve disputes. The United States was a major force behind the establishment of WTO in 1995, and the rules and agreements resulting from multilateral trade negotiations since 1947. The WTO encompassed and succeeded the General Agreement on Tariff and Trade (GATT), established in 1947 among the United States and 22 countries. Through the GATT and WTO, the United States with other countries sought to establish a more open rules-based trading system in the Post-War era to foster international economic cooperation and prosperity. Today, 98% of global trade us among WTO members.

The WTO is unique among international organizations in not having either an independent evaluation office or an internal review mechanism that assesses the operation of the institution. Periodic assessment of the WTO's institutional performance can help identify both good practices and reasons why performance in some areas may be below what is anticipated. The WTO's effectiveness as a negotiating body for broad-based trade liberalization has come under intensified scrutiny, as has its role in resolving trade disputes. WTP members have struggled to reach consensus over issues that can place developed country members against developing country-members (such as agricultural subsidies, industrial goods tariffs, and intellectual property rights protection). The institution has also struggled to address newer trade barriers, such as digital trade restrictions and the role of state-owned enterprises in international commerce including the monitoring of the activities on Multinational Corporations (MNCs) in developing country-member states, which have become more prominent issues in recent years. Global supply chains and advances in technology have transformed global commerce, but trade rules have failed to keep up with the pace of change; since 1995, WTO members have been unable to reach consensus

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

for a new comprehensive multilateral agreement. As a result, many have turned to negotiating FTAs and regional agreements, including those pursued by the United States and EU, newer rules may vary significantly. Plurilateral negotiations, involving subsets of WTO members rather than all members, are also becoming a popular forum for tackling newer issues on the trade agenda.

2.1.6 Ways of Minimizing Negative Effects of Multinational Corporations in Nigeria

These negative effects earlier discussed in this study affecting multinational corporations (MNCs) operations in Nigeria can be reduced through the instrumentality of:

- i. **Government active intervention and honest participation:** Although government herself is guilty of unethical practices like bribery and corruption but she can still influence operations of multinational corporations positively in order to reduce the magnitude of their nefarious activities on Nigerian economy. Assistance from government can be planned and programmed as a component in a rational environment program. This can be achieved in three broad ways: Inform, sensitize and engage businesses in dialogue and negotiations concerning voluntary initiatives. Secondly, offering incentives and assistance to firms seeking to adopt more environmentally-responsible business models. Thirdly, reinforcing monitoring environmental conditions and enforces sanctions (Mazurkiewicz, 2003).
- ii. **Strict penalties and sanctions:** These have the capacity to curb corrupt practices. Government should impose more severe penalties on the directors of companies and threats of corporate closure.
- iii. **Corporate Environmental Policy:** Companies committed to reducing their environmental impact usually create a set of environmental principles and standards, often including formal goals. At minimum, most of such sentiments express a company's intentions to respect the environment in the design, production and distribution of its products and services to commit the company to be in full compliance with all laws and go beyond compliance whenever possible, and establish an open-book policy whereby employees, community members and others can be informed of any potentially-adverse effects the company might have on the environment.
- iv. **Environmental Scanning:** Before a company attempts to reduce its impact on the environment, it is essential that it first gains a full understanding of the impact of its products on the environment. For most companies, this usually involves some kind of environmental audit. The goal of audits is to understand the type and amounts of resources used by a company, product line or facility, and the types of waste and emissions generated. Some companies also try to quantify this data in monetary terms to understand the bottom-line impact. This also helps to set priorities as to how a company can get the greatest return on its efforts (Onwuchekwa, 2000).
- v. **Employee Training Involvement:** Leadership of companies recognizes that to be effective, an environmental policy needs to be embraced by employees throughout the organization not just those whose work is related to the environment. To do that, companies should engage in a variety of activities, especially education, to help employees understand the environmental impact of their jobs and to support their efforts to make positive changes. Some companies go further, helping employees become more environmentally-responsive throughout their daily lives, helping them build a true environmental ethics. Besides education, many companies create incentives, rewards and recognition programs for employees who demonstrate their environmental commitment.
- vi. **Green Procurement:** To help ensure that their products and processes are environmentally-responsive, many companies seek to buy greener products and materials from their suppliers. Some companies participate in buyers' groups in which they leverage their collective buying clout and power to push suppliers to consider alternative products and processes.
- vii. **Green Products:** Products themselves may be made more environmentally-friendly, with regard to, for example, the control of emissions, noise, reduced health and safety risks, and reduced energy requirements.
- viii. **Effective Regulatory Mechanism:** Investors must be thoroughly screened so that genuine ones can be allowed to do business. This will ensure that the kind of investment that is welcomed is one that

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

can complement the developmental objective of the host country and equally ensure that only multinationals that meet the developmental objectives are welcomed.

2.2 Theoretical Framework

Three theories were reviewed to explain the relationship between multinational corporations and the socio-economic development of Nigeria. These theories include: the New Trade theory, Unequal Exchange and Dependency theories.

2.2.1 New Trade Theory

New Trade Theory was propounded by Tejvanne and Pettinger (2013). It proposes a critical factor in determining international patterns of trade are the very substantial economies of scale and network effects that can occur in key industries. These economies of scale and network of effects can be so significant that they outweigh the more traditional theory of comparative advantage. New Trade Theory is a factor that explains the growth of globalization which multinational corporations serve as main agents. It means that poorer, developing economies may struggle to ever develop certain industries because they lag too far behind the economies of scale enjoyed in the developed world. The theory suggests that government might have a role to play in promoting new industries and supporting the growth of key industries. A developing economy may need tariff protection and domestic subsidy to encourage the creation of capital-intensive industries. If the industries get support for few years, it will be able to exploit economies of scale and then be competitive without government support. New Trade Theory is not primarily about advocating government intervention in industry, it is more a recognition that economies of scale are a key factor in influencing the development of trade. It also suggests that free trade and laissez-faire government intervention may be much less desirable for developing economies who find themselves unable to compete with established multinationals.

2.2.2 The Unequal Exchange Theory

The Unequal Exchange Theory equally explains situations in Nigeria. According to Arghiri (1972), underdeveloped countries are exploited through the process of unequal exchange. In the realm of international trade, when the former sell their commodities below value and at the same time buy commodities from the developed countries above the value, this provides a veritable means of underdevelopment. In Nigeria, our crude oil is sold at a much-reduced price to the Multinational Corporations who refine it and sell it to us at very exorbitant prices.

2.2.3 Dependency Theory

The third theory under review is the Dependency Theory. This study is in fact anchored on Dependency Theory developed by Boxborough (1974). According to the theory dependency implies a kind of parasitic relationship that exists between the highly-industrialized and the less-developed ones in a manner that ensures the continuous advancement of the former to the detriment of the later. The theory defines the relationship between Nigeria and the multinational corporations (MNCs), especially their owners. This theory represents the complex politico-economic relationship that binds the advanced capitalist countries of the Center and other countries in the periphery such that the movement and structure of the former decisively determine those of the later in a fashion somehow detrimental to the economic progress of the other societies. Countries such as Ghana, that once experimented with the dependency theory have achieved neither prosperity nor greater economic independence. Rather they have experienced much poverty, misery and greater dependence on international aid and charity (Ahiakpori, 1985).

2.3 Related Empirical Studies

Eckerberg et al, (2015) conducted their study on the impact of multinational corporations (MNCs) on the socio-economic development of Kenya adopting 32 textile manufacturing firms quoted on the Kenya Stock Exchange. They employed the descriptive survey research design. Primary data for the study was based on structured questionnaire distributed to employees of these firms. The population for this study was 246 employees arrived at through stratified random sampling. The study data was analyzed using the Chi-Square statistic. The finding of the study was to the effect that the activities of the MNCs in

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

Kenya have not yielded the expected positive impact on their economy. It was recommended that the government of Kenya should formulate better and stringent policies that would regulate the activities of these MNCs in the country directed towards improving their economy.

The World Commission Report (2014) in their survey on the operations and activities of multinational corporations (MNCs) in developing countries noted that the business relationships between these foreign corporations and the African continent have been everything but retrogressive. The survey incorporated a study of 49 multinational corporations un 15 less developed countries. The study adopted participant observation and interview methodology to generate data for the study. Regression analysis statistic was employed in the analysis of research data. It was recommended that home countries of these multinationals should closely monitor the activities of these subsidiaries across the nations to ensure that they operate according to regulations establishing the parent companies as well as ensuring that they abide by agreements entered into by them with governments where these subsidiaries are domiciled.

A related study to the World Commission Report was conducted by Johnson & Dahlstrom (2014) using 25 developing countries in Latin America and sub-Saharan Africa as case study. The study investigated the effects of the activities of multinational corporations on the socio-economic-cultural life of these less developed economies. Descriptive research design methodology was employed while the population sample size of 5,200 was adopted using snow-ball sampling technique. The PL-SEM model was employed in the analysis of data. It was revealed that the business relationships between the MNCs and these developing countries have been parasitic in nature creating a situation of dependency rather than cooperative or beneficial. The study recommended a better business relationship and suggested a stakeholder approach to doing business with these countries.

Chinwe & Ojebe (2020) in their study of 50 multinational corporations (MNCs) in Europe opine that for developing countries to capitalize effectively, regulatory laws become essential. The absence of law and order can often lead to corruption in government and MNCs, which can later hinder any possible economic development. Further findings revealed that industrial corporations may deplete resources and harm host countries that lack effective regulations. Nonetheless, Mayer and Jebe (2010) in their study asserted that there are very few international environmental treaties for MNCs. The reality is that most environmental standards and regulations vary from one nation to the next.

The general belief that multinational corporations (MNCs) invest in countries characterized by good governance was the subject matter of the study conducted by Globeman and Shapirom 2003; Cadbury, 2002; King Report II, 2000; World Bank, 2002 & Gani, 2007). According to these studies, government entails capturing many modalities of coordinating, managing, and steering activity in public affairs. Globerman & Shapiro in their study agreed that preserving one's investments is impossible under dysfunctional governance. According to the study by Cadbury (2002), corporate governance is key to upholding a steadiness between firms, communal aims, and economic and social goals, to establish aligned interests among individuals, corporations and society. According to the study carried out and translated into the King Report II, (2002), companies including MNCs should not in any way separate themselves from the societies and environments in which they operate; this generally implies that, while the board is accountable to the company structures, it must also act responsively to all stakeholders. A decent relationship between MNCs and governments of host countries can only be realized when a company is aware pf and responds to social issues and prioritizes ethical issues, as evident in the stakeholder theory (King Report I, 1994).

2.4 Summary of Reviewed Literature

This section reviewed extensively the related previous works carried out in this area of study. The literature review was sub-divided into four sections; that is, the conceptual review, which chronicled the review of the relevant concepts as used in the study, basically the concepts of the historical evolution of multinational corporations in developing countries, multinational corporations and socio-economic development in Nigeria; negative impacts of multinational corporations in Nigeria and the ways of mitigating and improving the negative impacts of multinational corporations on the socio-economic development of Nigeria.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

The theoretical framework, discussing the New Trade theory, Unequal Exchange Theory and the (Dependency Theory), which theory under-pinned or anchored this study; and finally, discussions on the related empirical studies chronicled from previous researchers in areas related to the present study, highlighting their research techniques, tools of analysis, findings and conclusions drawn therein.

3.0 Methodology

The researcher in this section examined the issues concerning research design, population, sample and sampling technique that will be used in this work. The researcher also examined the instrument for collecting data, the validity of the instrument, reliability of the instrument, procedure for data collection, method of data analysis and limitation of this study.

The design of this study is a descriptive survey method. It is used to describe what is existing and to answer the research questions raised by the researcher for the study. The population of this comprised of 1,200 staff of Nigerian Breweries PLC including Management, staff and other staff of the organization. In order to achieve a sample size that is representative of the total population, a 10% of the total population was adopted totaling one hundred and twenty thousand (120) respondents which is made up of 70 males and 50 females.

Simple random sampling technique was adopted for the study. In order to achieve a sample size that is representative of the total population, the researcher adopted a 10% of the total population totaling (one hundred and twenty) staff and including the Management of the Nigerian Breweries PLC for the study. A research instrument is a data collection tool that is used to elicit information in order to achieve the desired research objectives (Ihemeje, Umeh and Ogbanje, 2011). One research instrument was used for this study which was Questionnaire and it is titled: The Impact of Multinational Corporation on the Socio-Economic Development of Nigeria (A Case Study of Nigerian Breweries PLC).

The reason for using questionnaire was based on the following advantages. Firstly, it can give objective and reliable information if it is carefully and well-constructed. Secondly, it is relatively effective and easier to score and administer. Questionnaire is a good representation of group test and owing to the nature and diversity of the population questionnaire method becomes necessary. The questionnaire is divided into three sections to enable the researcher obtain information from the respondents, the questionnaires will be designed in such a way that it provided the following: section (A) the respondents' personal data, section (B) the respondents' understanding the subject matter of the study; section (C) the impacts of Multinational Corporation on the socio-economic development in Nigeria.

The five Likert scale (strongly agreed, agreed, undecided, strongly disagreed and disagreed) questionnaires will be adopted by the researcher. The Likert scale contain a list of statement that has relationship with the issue in the question, it does not only allow the respondent to check those statements in which they agree or disagree but allows the respondents to state the degree of agreement or disagreement with every statement (Osuala, 2007).

Face and content validity is employed in this study; the researcher employed the help of some senior lecturers from the Faculty of Management Sciences (FMS), National Open University of Nigeria (NOUN). After going through the work, they advised the researcher to see a statistician who will scrutinize the objectives of the study, research questions, research hypotheses as well as the methodology of the study. The draft questionnaire was also presented to the project supervisor for necessary corrections and adjustments before the final copy was printed out for use in the research work.

In order to establish the reliability of the instrument, pilot study was carried out. The essence of pilot study was to test the adequacy and suitability of the instrument in measuring what it is supposed to measure and to ascertain any difficulty that the researcher may encounter. For the purpose of this, a total of (12) copies of the questionnaire representing 10% of the total population of study was administered to selected Management Staff and other employees of the organization. They were filled under the supervision of the researcher. The filled questionnaires were collected and subjected to statistical analysis in order to determine the reliability co-efficient of the instrument as well as the internal consistency of the items within the instrument.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

The data collected from the pilot study was analyzed using Cronbach Alpha technique and reliability index of 0.85 was obtained. Bennett (2006) testified that for a scale to be considered reliable, it should have a reliability index of 0.5 to 1. With the level of reliability index of 0.85, the instrument was considered reliable for use in the main study.

To administer the validated instrument of the study, an introductory letter was collected from the head of department and presented to the Management staff and other employees of the organization. These respondents were drawn from the Management, staff and other employees in the organization. The research assistants were educated on how to distribute and collect the questionnaires and who is qualified to be given the questionnaire.

The analysis of data for this study was done based on the hypotheses formulated. The researcher used descriptive statistical method for bio-data presentation. Measures of relationship between the variables were being carried out using independent t-test. The simple percentage, mean score and standard deviation was used to answer the research questions. All hypotheses were tested using the independent t-test at 0.05 alpha level of significance like what is obtainable in other social sciences. The reason for adopting these statistical tools is to test whether there will exist some significant differences or not and either to retain or reject the null hypotheses.

Conducting effective research in Nigeria is not easy due to the fact that most people are reluctant to release information needed for research study. The researcher devoted enough time and effort in making sure that enough data are gathered to accomplish the research work. There is also the constraint of time as the researcher has to carry out the research work alongside his official duties.

4.0 Data Analysis, Interpretation and Discussion of Findings

This chapter presents the data collected, the analysis carried out and the discussion of the results obtained. The analysis is presented in sections. The first section presents the frequency and percentage distribution of the data respondents and nominal questions as responded by respondents. The second section presents the answers to the research questions using descriptive parameters of mean scores and standard deviation. The third section presents the testing and interpretation of the two null hypotheses using parametric statistical techniques of independent t-test. All hypotheses were tested at 0.05 alpha level of significance. The major findings are then revealed before the discussion of the major findings.

4.1 Analysis of Demographic Information

This section chronicled the demographic information, impact of Multinational Corporations on the Socio-economic Development of Nigeria adopting the Nigerian Breweries PLC as a case study, percentage of environmental factors, survival and growth dimensions and computation of Z-value at 0.05 level of significance (2-tailed test). Demographic statistics was used to analyze the demographic information of the respondents; these included the use of frequency and percentage.

Table 4.1: Demographic Information about the Respondents

Variables	Frequency Distribution	Percentage (%)
Male	70	58.3
Female	50	41.7
Total	120	100
Marital Status		
Single	40	33.3
Married	50	41.8
Divorced	20	16.7
Widow	10	9.2
Total	120	100
Educational Qualification		
M.Sc./MBA	20	16.7
B.Sc./BA/B/Ed./HND	50	41.7
ICAN/NIM/CIPM/CIBN	10	9.2

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

OND/NCE	40	33.3
Tota	120	100

Work Experience		
Less than 2 yrs	30	25.0
1 yrs - 4 yrs	40	33.3
5 yrs – 7 yrs	35	29.9
8 yrs & above	15	13.5
Total	120	100
Age Limit		
Less than 25 yrs	15	13.5
25 yrs – 35 yrs	40	33.3
36 yrs– 45 yrs	30	25.0
46 yrs – above	35	29.9
Total	120	100

Source: Field Survey, 2024

The above table has information about the demographic status of the respondents. In the gender cadre, 70 respondents were male representing 58.3 % of the respondents while 50 representing 41.8% were female which showed that male respondents are the majority. It is also evident that in the marital status, it is dominated by married respondents with 50 respondents representing 41.7 % followed by single respondents with 40 respondents representing 33.3%, 20 respondents representing 26.7% were divorced, 10 representing 9.2% were widow and there is no record of widower. The implication of this information is that the respondent’s emotional crisis or trauma is minimal and relatively stable which means they are in best frame of mind to answer questions without prejudice. The educational qualification responses has that majority of the respondents are with first degree with 50 respondents representing 41.7% followed by OND/NCE respondents with 40 respondents representing 33.3%, it is crystal clear that the respondents have what it takes to understand the questions. Without undue influence and also know the confidentiality and the essence of research hence would not hoard any information. From the work experience responses, majority of the respondents were found in the range of 2yrs - 4yrs with 40 respondents representing 33.3% followed by 35 respondents in the range of between 5 yrs - 7 yrs representing 29.9%. It can then be deduced that the years of experience in adequate to know, identify and express the likelihood effect of environmental factors in SMEs business survival and growth. From the age limit responses, the respondents in the age bracket of 25 - 35 yrs were found to be the majority with 40 respondents representing 33.3%, the implication is that the respondents are matured and can give candid information without fear or favor.

4.1.2 Answering of Research Questions

This section presents the result of this study based on the data analysis. They were presented on the basis of the five research questions and two null hypotheses that guided the study. The researcher used 3.00 as the mean otherwise known as decision mean since the instrument was structured along a modified five-point Likert scale structure to take decision on whether to accept or reject the research questions after comparing it with the qualitative mean. Therefore, a mean score of 3.00 indicate positive response to the research question and accepted while a mean score below 3.00 indicate negative answer to the research question and rejected.

This is shown below:

- SA 5 points
- A 4 points
- UD 3 points

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

SD 2 points
 D 1 point

$$\frac{\dots\dots 5 + 4 + 3 + 2 + 1 + \dots\dots}{5} = 3.00 \text{ Decision mean}$$

Research Question One:

What is the impact of Multinational Corporations (MNCs) on the integration of international and indigenous businesses in Nigeria using the Nigerian Breweries PLC as a case study?

Table 4.1.2: Mean and Standard Deviation Ratings of the Impact of Multinational Corporations (MNCs) on the integration of international and indigenous businesses in Nigeria using the Nigerian Breweries PLC s a case study

S/No.	Questionnaire Items	Mean	SD	Decision
1.	There are many firms offering products and services similar to ours in the market	4.22	1.05	Agreed
2.	Firms in our industry are very aggressive in marketing their products/services	3.99	0.97	Agreed
3.	Our competition control is a very small market share in our industry	4.01	0.99	Agreed
4.	Our industry attracts many new organizations every year	4.05	1.05	Agreed
5.	It is not easy for our customers to find an alternative supplier offering same products	4.10	1.07	Agreed

Table 4.1.2 indicates that the impact of multinational corporations (MNCs) in the integration of international and indigenous businesses in Nigeria with particular reference to the Nigerian Breweries PLC. This is represented by the mean ratings of between 3.99 and 4.22 while the standard deviation (SD) ranges between 0.97 and 1.05 respectively. The items are therefore rated Agreed (A) by the employees of Nigerian Breweries PLC.

Research Question Two:

What are the impact of the socio-economic benefits behind the integration of multinational corporations (MNCs) on the international and indigenous businesses in Nigeria using the Nigerian Breweries as a case study?

Table 4.1.3: Mean and Standard Deviation Ratings of the Impact of socio-economic benefits behind the integration of MNCs on the international and indigenous businesses in Nigeria using the Nigerian Breweries PLC as case study

S/No.	Questionnaire Item	Mean	SD	Decision
6.	The socio-economic benefits on the integration of MNCs on the integration of international and indigenous business is numerous	4.31	1.08	Agreed
7.	The less developed countries (LDCs) enjoy little or no socio-economic benefits from the MNCs	4.20	1.10	Agreed
8.	The MNCs enjoys the economic benefits alone to the detriments of LDCs	3.46	1.06	Agreed
9.	The WTO as a monitoring body should help curtail the excesses of MNCs negative impacts on LDCs economies	3.56	1.09	Agreed

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

The respondents agreed that there is a strong impact of the socio-economic benefits on the integration of MNCs on the international and indigenous businesses in Nigeria with particular reference to the Nigerian Breweries PLC. This is evidenced in Table 4.1.2 by the mean ratings of between 3.46 and 4.31 and the standard deviation (SD) of between 1.05 and 1.10 respectively. The items are therefore rated Agreed (A) by the Nigeria, Nreweries PLC.

Research Question Three:

What is the impact of WTO in the integration of international and indigenous businesses in Nigeria with particular reference to the Nigerian Breweries PLC?

Table 4.1.4: Mean and Standard Deviation Ratings of Impacts of WTO in the integration of international and indigenous businesses in Nigeria with particular reference to the Nigerian Breweries PLC

S/No.	Questionnaire Items	Mean	SD	Decision
10.	The WTO has been helpful in monitoring the activities of MNCs in less developing countries (LDCs), particularly in Nigeria	3.99	0.95	Agreed
11.	The WTO finds it difficult to reach consensus on trade tariffs and other trading agreements with member-countries	4.01	1.01	Agreed
12.	The WTO is today dictating the pace of international businesses at the world market	3.92	1.08	Agreed
13.	The presence of WTO had curtailed the excesses of MNCs operations in LDCs particularly in Nigeria	3.90	1.09	Agreed

Respondents in Table 4.1.4 above accepted that the WTO has not lived up to expectations in their monitoring responsibilities on the Multinational Corporations (MNCs). This is evidenced with the high mean ratings ranging between 3.90 and 4.01 and the standard deviation (SD) of between 0.95 and 1.09 respectively. Hence, all the items were favorably rated Agreed (A) by the respondents.

Research Question Four:

What is the impact of government attitude on the integration of international and indigenous businesses in Nigeria with particular reference to the Nigerian Breweries PLC?

Table 4.1.5: Mean and Standard Deviation Ratings of the Impact of government attitude on the integration of international and indigenous businesses in Nigeria with particular reference to the Nigerian Breweries PLC

S/No,	Questionnaire Items	Mean	SD	Decisions
14.	The government and the MNCs' relationships has been cordial	4.24	1.05	Agreed
15.	Government policies on the monitoring and control of MNCs activities in Nigeria is ineffective	3.92	1.07	Agreed
16.	Bribery and corruption has been identified as responsible for weak government regulatory policies on the activities of MNCs in Nigeria	3.99	1.10	Agreed
17.	The government is expected to wake up to make stringent policies on the activities of MNCs that will improve the economy and promote growth of indigenous firms			

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

17.	Government's poor attitudes to wanton environmental destruction and economic losses to our nation should be addressed	3.91	1.06	Agreed
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Table 4.1.5 indicates that the respondents are of the opinion that the government's attitude and policies on the MNCs operations in Nigeria has been very poorly managed. Again, the impact of environmental factors was negative, environmental scanning is important for both prospective and existing MNCs and that business environment in Nigeria has been volatile, unpredictable and unfriendly. The mean score ratings range between 3.91 and 4.24 while the standard deviation (SD) range between 1.05 and 1.10 respectively

4.2 Test of Hypotheses

The following hypotheses will be tested at 0.05 level of significance.

Table 4.2: Tests of Hypotheses on Ho1 and Ho2

S/No.	Hypotheses	Category of Respondents	N	- X	SD	T-CD	DF	T.TAB	Decision
1.	There is no significance difference between the opinions of male and female employees of the Nigerian Breweries PLC	Academic	70	4.01	1.05	-4.62	541	1.96	Accepted
		Non-academic	50						
2.	There is no significant difference between the opinions of Top-Management and other employees of the Nigerian Breweries PLC	Other Employees		3.89	1.01	-1.62	541	1.96	Accepted
		Top-Management staff							

4.2.1 Hypothesis One (Ho1):

Hypothesis (Ho1) states that there is no significant difference between the opinions of both male and female staff with regards to the impacts of Multinational Corporations (MNCs) on the socio-economic development of Nigeria with particular reference to the Nigerian Breweries PLC. The above hypothesis was tested at 0.05 alpha level of significance. From the Table 4.2 above, the calculated t-values (-1.62) is less than the t-tabulated (1.96). Hypothesis (Ho1) is therefore accepted.

4.2.2 Hypothesis Two (Ho2):

Hypothesis (Ho2) states that there is no significant difference between the opinions of academic and non-academic staff with regards to the impacts of Multinational Corporations (MNCs) on the socio-economic development of Nigeria with particular reference to the Nigerian Breweries PLC. This was

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

tested at 0.05 alpha level of significance. From Table 4.2 above, the calculated t-value (-1.62) is less than the t-tabulated (1.96). Hypothesis (Ho2) is therefore accepted. Respondents therefore accepted that in all clusters, there is no significant difference between the opinions of male and female staff and Top-Management and other employees of the Nigerian Breweries PLC.

4.3 Summary of Major Findings

The main purpose of this study was to examine the impacts of Multinational Corporations (MNCs) on the socio-economic development of Nigeria with particular reference to the Nigerian Breweries PLC. From this study, it has been found that all the four independent variables are statistically significant in influencing the choice of strategic response of MNCs which led to the rejection of the null hypotheses for this study. This therefore means that the four variables are constituents of competition and have converged to the study's hypothesized model. This finding is important considering that this study was done in Nigeria and the convergence of the four variables into a single factor is concurrent with findings of studies done in other parts of the world such as USA and Germany (Bernard and Koerte, 2007).

The study has revealed that the best predictor of strategic response to be chosen by a MNC in Nigeria is the firm's marketing experience. This means that a prior exposure of an organization into a given industry is very important in informing competitive strategies to be employed. The longevity of involvement in a certain industry is also critical to a firm, mainly because such a firm knows the competition dynamics, the market trends and consumer behavior that are critical in determining the choice of a competitive strategy. This finding has a link with the strategic choice model advanced by Kochan (1984) and the dynamic fit model (Nissen, 2009). It was also found that there is stiff competition among the MNCs in Nigeria as indicated by the presence of three forces of industry competition in the Nigerian market. These findings are linked to Michael Porter's theory of industry forces that include threat of new entrants, threat of substitute goods and threat of internal rivalry (Porter, 1980). Going by this theory, it was however found that the intensity of competition in Nigeria is not due to the threat of powerful consumer or powerful supplier as the theory contends.

Another finding of this study that is linked to the model of generic strategies developed by Michael Porter (Porter, 2004) was that the majority of the Multinational Corporations (MNCs) in Nigeria employs cost leadership strategy to counter competition. This shows that cost products play an important role in the competitiveness of firms in Nigerian market. Moreover, going by this model, MNCs in Nigeria also employs product and market differentiation, which is an indicator that customers can be grouped into various product and market segments. Such segments will consider other factors other than offering price of the products.

It was found that a very significant number of MNCs in Nigeria employs relocation strategy, meaning that such industry players would either quit from the Nigerian market or shift from their main stay industries. This finding is important because the relocation of MNCs of that magnitude from Nigerian market has a big economic implication and will negate the efforts by the Nigerian Breweries PLC to realize Vision 2030 by attracting multinational corporations through the BPO and FDI initiatives (GOK, 2007). The choice of relocation strategy by MNCs explains why in the last 10 years, some 10 MNCs have relocated from Nigeria to other investment destinations as found by Owour (2011) and Okoth (2010). The Nigerian market is not unique in this characteristic of industry players relocating because Bernard and Koerte (2007) report similar findings for the USA AND German Multinationals.

The study findings have also revealed that MNCs in Nigeria do not employ avoidance strategy to counter competition. This indicates that those tactics that would place an organization ahead of the other industry players like employment of high skill labor and capital-intensive undertakings do not make much difference to the consumer. It also means that production costs are restrictive in the Nigerian market, especially electricity, specialized labor and poor utility infrastructure as contended by Owour (2011). This finding could also be attributed to attractive government incentives that encourage foreign-owned companies to invest in their jurisdiction as was found by Blomstorm (2002) in his study.

4.4 Discussion of Results

Comparing the influence that marketing capabilities has in developed countries vs developing countries, the results suggest that marketing capability has a greater influence on MNCs performance in countries with higher levels of economic development. This greater influence of marketing which comes when economic development is more advanced may be due to the assistance of economic development in permitting market-based capabilities to operate efficiently (Wu, 2013). With the development of the economy, the purchasing power of consumer rises, and consumer predictions vary (Wu, 2013). This finding gives wide support for the conceptual model and for the importance of including capability and performance.

Earlier researches on Marketing capability (Kotabe et al., 2002), were performed in Western countries, especially in the United States, and not enough consideration has been paid to developing countries (Steenkamp, 2005). Developing countries show substantial departures from the assumptions of theories developed for Western economies, and offer natural laboratories to test those theories' assumptions and predictions.

5.0 Study Implications, Conclusion and Recommendations

The study sought to establish the impacts of Multinational Corporations (MNCs) on the socio-economic development of Nigeria using the Nigerian Breweries PLC as a case study. This study summarizes the study findings based on the four objectives of the study; the implications of the research findings; the conclusion drawn from the findings; the recommendations based on the study findings, and the provision for further studies in this area of research.

5.1 Implications of the Research Findings

The findings of the study have some important strategic business management implications. The implication of the finding as they relate to the impacts of Multinational Corporations (MNCs) in Nigeria with particular reference to Nigerian Breweries PLC is hereby highlighted. The major implication of the findings of this study is that it provides a more comprehensive understanding of the negative impacts of the operations and activities of Multinational Corporations (MNCs) in Less Developed Countries (LDCs). The findings also reflect that a large proportion of MNCs in the LDCs are still seriously unable to treat the economies of where they are domiciled in the less developed countries (LDCs) as partners in progress. They only use them as avenues to make huge profits and ship their resources and huge funds generated back to their countries of origin. This is further supported by Okoronkwo et al., (2023) where they concluded that the activities and operations of MNCs have left the LDCs more-poorer than they met. Hence, they called for an urgent re-evaluation and overhauling of the policies and agreements entered between the governments of LDCs and the MNCs for a better and beneficial business relationship.

These findings signal a need for more robust financial and economic policies and collaborative supports from the originating countries where the MNCs functions. Also, poor managerial skills affect MNCs performance because many of the MNCs operating in the country do not have the necessary manpower to effectively carry on their operations in the LDCs; neither do they have confidence in fully engaging the local staff to man their major operations. Rather, the local staff are casualized and where they are placed in positions of authority are debarred from the mainstream activities of the MNCs and rather act as ceremonial figures. The result is that efficiency and effectiveness in service delivery are jeopardized on the altar of profiteering/

This finding is further confirmed by Ojutalayo et al., (2022) where they opined that apart from their inefficiency in operational management, they equally engage in wastage of the LDCs natural resources and are the worst culprits of environmental pollution. This issue raised is more prevalent in the upstream and downstream Oil and Gas sector where millions of barrels of Gas is flared on a daily basis. Moreover, there are incidences of oil spillages that destroys the natural ecosystems, waterways, living spaces and the entire environment making it inhabitable, A typical example of this wanton destruction of the environment and its ecosystem and mankind, according to Ojutalayo et al., (2022) is the negligent operations of Multinational Oil companies in the Niger-Delta Regin of Nigeria. These flagrant abuse

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

and neglect of the well-being of the people and their environment for several decades now have contributed to the backwardness of the Region vis-à-vis other parts of the country.

Dilapidated amenities where they exist at all affect the well-being of members of the communities where these Multinational Corporations (MNCs) operates. The MNCs are the worst culprits in the Corporate Social Responsibility (CSR) Ideology of adding value to the communities where they operate. The CSR ideology opines that it is the primary responsibility of business firms to give back to the communities where they operates by providing them with basic infrastructural amenities such as good road network, pipe-borne water, educational institutions, well-equipped hospitals, recreational facilities etc. According to Nkemjika et al., (2020), the MNCs have failed woefully in their primary assignment of humanistic approach to business relations. They called on the governments of Less Developed Countries (LDCs) to rise up to the challenge of effective monitoring and insistence on the duties of MNCs to their communities where they reside and operate and in extension to the improvement of their national economies. This they can do by enacting stringent policies detailing the modus operandi (mode of operations) for the MNCs which they must strictly abide by or risk their license being revoked and sent packing from these countries. They should made aware that enough is enough for their mismanagement of the LDCs natural resources and national economies.

5.2 Summary of Findings

Based on the literature reviewed, the following findings were articulated:

- a) Multinational Corporations (MNCs) have done more harm than good on Nigerian economy in terms of profit repatriation, environmental degradation, human rights violation, non-technology transfer, endemic bribery and corruption etc.
- b) That, most of the Multinational Corporations (MNCs) operations are imperialist and capitalist in nature;
- c) That it is only through active government participation and honest intervention in operations of these Multinationals that will minimize their nefarious activities on Nigerian economy;
- d) That adoption of ethnocentric approach of staff selection will not only favor a developing economy like Nigeria but also the polycentric approach that encourages filling the key positions from home country nationals should be entrenched and encouraged;

5.3 Conclusion

Multinational corporations (MNCs) are the major vehicles by which globalization is affecting businesses in different parts of the world. Globalization further makes the influence of multinational enterprises more pervasive and impacting. These corporations in spite of their huge benefits from their countries of operations have impacted negatively on their economy. Nigeria as a developing country can only benefit tremendously from operations of these multinationals if serious considerations are given to the environment in which they operate.

Since these operations are component of the society, they must subject themselves to the fair requirements of the society, for their relationship is paramount and reciprocal (the corporation needs the society just as the society needs the corporation). Business is not divorced from the rest of the society. How these corporations behave affect many people, not just shareholders (Angom 2012). A strong tie must exist between government and the various multinationals operating in Nigeria to ensure maximum cooperation and peaceful co-existence.

5.4 Recommendations Based on Research Findings

This study empirically examines the impact of Multinational Corporations (MNCs) on the socio-economic development of Nigeria adopting a case study of the Nigerian Breweries PLC. In view of the conclusion of this study, the following recommendations were stated:

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

- a) Representative of all stakeholders – employees, customers, society, government should be appointed as members of the Board of Directors of various multinational corporations, for direct representation and participation in the decision-making process;
- b) The polycentric model of staff selection should be imposed by government on these corporations which will be enshrined under the terms of agreement with the multinational corporations operating in Nigeria. This will enhance skill acquisition and ensure adequate transfer of technology;
- c) There should be interactive sessions on regular basis between the Multinational corporations and leaders of our country to proliferate understanding and enhance harmonious business relationship especially on moral and Ethical ground. Such interactions would impact positively on the ethical performance of both the companies in particular and the various corporations at large;
- d) Discrimination in employment policies and salaries of workers should be ruled out and adoption of polycentric and geocentric approach to staff selection should be encouraged to benefit our citizenry. A technology policy transfer should be formulated which will be binding on any company wishing to do business in Nigeria. This policy will boost our image and prestige thereby ensuring sustained economic growth and development which is our right from these Multinational Corporations (MNCs).

5.5 Suggestions for Further Studies

Future researchers are hereby called upon to conduct researches to measure the impact of Multinational Corporations (MNCs) on the political development in Nigeria to affirm the veracity of our findings and the performance of Multinational Corporations (MNCs) in Less Developed Countries (LDCs), particularly in Nigeria.

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INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

YORUBA ARCHITECTURAL DESIGN GENERATIVE SYSTEM: A MACHINE LEARNING APPROACH USING SHAPE GRAMMAR AND TEACHABLE MACHINE MODELS

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ABSTRACT

This study presents an architectural language for Yoruba-Agboile (courtyard type) traditional architecture, addressing the need for a comprehensive understanding of its plan layouts within physical and socio-cultural contexts. The aim is to define and categorize architectural elements using an analytical shape grammar approach, drawing from the recent compilations. Utilizing a mixed-methods strategy, the research involved field surveys, archival research, shape grammar and machine learning techniques, specifically a shapegraphic AI model, to analyze existing designs.

Key findings indicate that Yoruba-Agboile architecture features a distinct courtyard organization, enhancing social interaction and cultural practices. The model successfully classified various plan types, highlighting a coherent vocabulary of architectural elements such as the hypo-courtyard (Agbala) and corridor (C). The study concludes that traditional Yoruba-Agboile architecture can inform contemporary designs while maintaining cultural significance.

Recommendations include further research into the spatial structures of Yoruba architecture and the application of generative shape grammar systems to foster deeper academic and practical insights into this architectural heritage. This approach could bridge traditional design principles with modern architectural practices, enhancing the appreciation and preservation of Yoruba cultural identity in contemporary contexts.

Keywords: Yoruba Architectural Design, Generative System, Machine Learning, Shape Grammar and Teachable Machine Models

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

ALTERNATİF KABA YEM OLARAK MEYVE AĞACI YAPRAKLARI

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ÖZET

Hızla artan dünya nüfusunun hayvansal protein ihtiyacının karşılanmasında ruminant hayvanlar temeldir. Ruminant hayvanların en azından yaşam payı besin maddeleri ihtiyaçlarının ham selüloz bakımından zengin kaba yemlerle karşılanması önerilmektedir. Bu miktar kaba yem tüketimi rumen fonksiyonlarının düzenlenmesine, maliyetin düşmesine, üretilen ürünün miktar ve kalitesinin artmasına sebep olmaktadır. Ancak ülkemizde çayır mera ve yem bitkileri gibi başlıca kaynaklardan üretilen kaba yem miktarı, mevcut hayvan varlığının ihtiyacını karşılayamamaktadır. Hayvancılık sektöründeki söz konusu kaba yem açığı alternatif kaba yem arayışlarının yoğunlaşmasına sebep olmaktadır. İncelenen araştırma sonuçları birçok meyve ağacı yapraklarının, ruminant hayvanlar için düşük kaliteli çayır ve otlara göre iyi kalitede kaba yem kaynağı olma potansiyeline sahip olduğunu göstermektedir. Sonuç olarak ülkemiz bahçecilik faaliyetlerinden elde edilecek önemli miktardaki meyve ağacı yaprak biyokütlesinin, diğer kaba yemlerle birlikte ve belli oranlarda verilmesi koşulu ile ruminant hayvan beslemede alternatif kaba yem olarak kullanılabilen düşülmektedir.

Anahtar Kelimeler: Meyve ağacı yaprağı, Ruminant hayvan, Kaba yem, Biyokütle.

ABSTRACT

Ruminant animals are essential in meeting the animal protein needs of the rapidly increasing world population. It is recommended that at least the life share nutrient needs of ruminant animals should be met with roughages rich in crude cellulose. This amount of roughage consumption causes rumen functions to be regulated, costs to decrease, and the quantity and quality of the product produced to increase. However, the amount of roughage produced from the main sources such as meadow-pasture and fodder crops in our country cannot meet the needs of our existing livestock. This roughage deficit in the livestock sector causes the search for alternative roughage to intensify. The results of the investigated researches show that many fruit tree leaves have the potential to be a good quality roughage source for ruminant animals compared to low quality meadows and grasses. As a result, it is thought that a significant amount of fruit tree leaf biomass to be obtained from horticultural activities in our country can be used as an alternative roughage in ruminant animal feeding, provided that it is given together with other roughages and at certain ratios.

Keywords: Fruit tree leaf, Ruminant animal, Roughage, Biomass.

GİRİŞ

Sağlıklı ve dengeli beslenmek için günlük olarak belli düzeylerde hayvansal protein tüketilmesi gerekmektedir. Et, süt gibi ürünler insanların sağlıklı ve dengeli beslenmesi için hayati öneme sahip hayvansal protein kaynaklarının başlıcalarıdır ve ruminant hayvanlardan elde edilmektedir. Dünya gıda arzının temelini oluşturan çiftlik hayvanlarının sağlığı ve üretkenliği, büyük ölçüde hayvanların doğru beslenmesine bağlıdır (Liu vd., 2021). Yeterli beslenme, hayvanların kritik fizyolojik işlevler, büyüme, üreme ve emzirme için gereken temel besin maddelerini almasını sağlar (Rangasami vd., 2024).

Ruminant hayvanların yem kaynaklarını kaba ve kesif yemler ile yem katkı maddeleri olarak üç gruba ayırmak mümkündür. Ruminant hayvan rasyonlarının temelini kaba yemler oluşturmaktadır. Kaba

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

yemler ham selüloz içeriği yüksek, protein ve enerji içeriği genellikle düşük yemlerdir. Kaba yemlerde fazlaca bulunan başta ham selüloz olmak üzere hücre duvarı unsuru olan kompleks karbonhidratlar, rumende uğradıkları fermentasyon ile asetik asit, propiyonik asit, butirik asit gibi kısa zincirli uçucu yağ asitlerine dönüşmektedir. Rumen mikroorganizmaları faaliyetleri sonucu üretilen uçucu yağ asitleri ile hayvanın enerji ihtiyacının yaklaşık %70'i karşılanabilmektedir (Tekce ve Gül, 2014). Rumen mikroorganizma popülasyonunun var olabilmesi ve çoğalabilmesi için rasyonda belli oranlarda ham selüloz bulunmalıdır (Kaya, 2024). Öte yandan ruminant hayvanların geviş getirme, tükürük sekresyonunun devamı ve tükürükle rumene bikarbonat akışının sağlanması, rumen mikroorganizma popülasyonu ve rumen pH'nın dengesi gibi fizyolojik olayların temini için günde en az 1,5 kg kaba yem kuru madde (KM)'si tüketmeleri gerekmektedir (Türkmen ve ark., 2011). 31/07/1998 tarihli, 23419 numaralı Resmi Gazete'de yayınlanmış olan Mera Yönetmeliği 6b'de ruminant hayvanların günlük olarak canlı ağırlığının %2,5'i kuru ot ya da %10'u kadar yeşil ot tüketebileceği bildirilmiştir (Anonim, 1998). Bu bakımdan hayvansal protein ihtiyacının karşılanması özelinde küresel gıda arzının temel taşı olan ruminant hayvanların, sağlıklı ve verimli olabilme durumunu sürdürülebilmesi büyük ölçüde kaba yem üretim ve talebinin karşılanmasına bağlıdır.

Kaba yemlerin esasını çayır ve mera yemleri ile tarım alanlarında yetiştirilen yem bitkilerinden üretilen otlar oluşturmaktadır. Bunların haricinde tarım ürünleri artıkları da yoğun olarak kullanılmaktadır (Gökkuş, 1994). Türkiye'de yaklaşık 1,4 milyon ha çayır ve 13,2 milyon ha mera olmak üzere toplam 14,6 milyon hektar çayır mera alanı bulunmaktadır (TÜİK, 2024a). Bir dekar çayırdan 300 kg kuru ot, bir dekar meradan ise 60 kg kuru ot elde edilebildiği tahmin edilmiştir (Gökkuş, 1994). Bu tahmine göre, mevcut çayır varlığımızdan yıllık olarak gerçekleştirilen üretimin 4,2 milyon ton, meralarımızdan da 7,92 milyon ton

Tablo 1. Yem bitkileri üretim miktarı (Kaya, 2024; TÜİK, 2024b)

Ürünler	Kuru ot (ton) 2021-2023*		
	2021	2022	2023
Yonca	3.862.192	3812.843	3.659.257
Korunga	309.328	357.241	315.995
Fiğ	797.987	804.086	743.573
Üçgül	24	24	18
Çayırotu	160.936	706.681	1.069.172
Bezelye	97.246	95.000	91.456
Mürdümük	12.605	11.042	8.474
Hayvan pancarı	13.412	11.272	9.965
Yem şalgamı	43.514	53.778	63.552
Mısır (hasıl)	128.704	114.672	90.169
Mısır (silaj)**	9.103.321	9.519.661	9.551.177
Sorgum	22.636	23.415	31.966
Buğday	57.254	61.193	67.438
Arpa	88.711	96.533	107.589
Çavdar	22.833	30.177	36.698
Yulaf	750.570	929.810	903.410
Burçak	2.680	2.484	3.417
Sudan otu	2.121	1.834	2.842
Tritikale	134.623	214.527	251.312
İtalyan çimi	276.039	424.421	430.904
Diğer	3.918	5.685	5.875
Toplam	15.890.654	17.276.379	17.444.259

* Kuru ot miktarları, TÜİK (2024b) verilerinin %20'si alınarak hesaplanmıştır (Oktay vd., 1990).

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

**Mısır (silaj) kuru ot miktarı TÜİK (2024b) verilerinin %33,3'ü alınarak hesaplanmıştır (Türkmen vd., 2011)

olmak üzere, bu doğal yem alanlarından yılda toplam 12.2 milyon tonluk kuru ot üretiminin söz konusu olduğu belirlenmiştir. Öte yandan Yavuz vd. (2020)'ye göre Türkiye'de çayır ve meralardan yıllık ortalama 13.6 milyon ton kaliteli kuru kaba yem elde edildiği bildirilirken, TÜİK (2024b) verilerine göre 2024 yılında yem bitkileri üretiminden elde edilen kuru ot miktarı 17.4 milyon ton civarındadır (Tablo 1). Bu bilgiler ışığında Türkiye'nin çayır mera ve yem bitkileri özelinde toplam kuru ot üretiminin güncel miktarının 30-31 milyon ton civarında olduğu söylenebilir. TAGEM (2022)'nin raporunda bildirilen yeni normlara göre Türkiye büyükbaş hayvan birimi (BBHB)'nin 2024 yılı için yaklaşık 18 milyon civarında olduğu ve yıllık kuru ot ihtiyacının 39.milyon ton olduğu hesaplanmıştır (Kaya, 2024). Bu verilerden de anlaşılacağı üzere Türkiye'de çayır-mera ve yem bitkilerinden elde edilen kaba yem miktarının mevcut hayvan varlığının ihtiyaçlarını karşılayabilmesi çok mümkün görünmemektedir. Ayrıca üretilen kaba yemin sindirilebilir protein (SP) ve toplam sindirilebilir besin maddeleri (TSBM) düzeylerinin dikkate alınması ile açığın daha da arttığı anlaşılmaktadır. Bu nedenle ülkemizde son yıllarda hayvan beslemede mevcut kaba yem kaynaklarına alternatif olarak özel bakıma ihtiyaç duymayan ağaç yapraklarının kullanım olanakları sıklıkla araştırılmaktadır (Özyazıcı ve Açıkbaş, 2020; Boğa vd., 2022; Acar vd., 2022; Göncü ve Kaya, 2022; Selçuk vd., 2024; Yıldız, 2024). Ağaç yaprakları, yüksek selüloz içerikleri ile rumen fonksiyonu, mikrobiyal verimlilik ve vücut metabolizması üzerindeki olumlu etkilerinin yanı sıra ham protein (HP), enerji ve vitamin içerikleri bakımından da ruminant hayvanlar için yüksek kaliteli potansiyel bir yem kaynağı olarak giderek daha fazla kabul görmektedir (Kocadayıoğulları vd., 2024). Ayrıca dökülen yaprakların toplanması hem meyve bahçelerinde oluşabilecek hastalıkların kontrolü açısından hem de hayvancılığa katkı sunduktan sonra organik gübre olarak kullanılmasının doğa için iyi bir döngü olacağını belirten Karan ve Başbağ (2022), meyve ağaç yapraklarının mevcut kaba yem açığının karşılanmasında önemli bir potansiyel olduğunu savunmuşlardır.

Literatürde ağaçlar genellikle çalı, çalı formunu almış ağaç ve ağaçlık türleri, orman ve süs ağaç türleri ile meyve ağaç türleri şeklinde 3 farklı şekilde gruplandırılmış ve bu gruplardaki ağaç yapraklarının besin kompozisyonu, gaz üretimi, metan üretimi, sindirim derecesi ve ME değerleri incelenmiştir. Bu derlemede ruminant beslenmesinde yem hammaddesi potansiyeli bulunan bazı meyve ağaç yapraklarının yem değerlerine yönelik yapılmış olan çalışmalar hakkında bilgi verilecektir.

Meyve ağaç yaprakları

Hayvan beslemede meyve ağacı yapraklarının kaba yem kaynağı olarak kullanımı son yıllarda dikkat çeken konular arasında yer almaktadır. Ülkemiz coğrafyasının neredeyse tamamında oldukça farklı türdeki meyve ağaçları kolaylıkla yetişebilmektedir. Lezzetli ve üretim maliyeti çok düşük olan meyve ağaç yaprakları, hem uzun bir dönem taze yaprak üretebilme hem de kurutulup saklanabilme ve lezzet oranlarının da yüksek olması gibi avantajlara sahip olmaları nedeniyle önemli bir kaba yem kaynağı olabileceğine sahiptirler. (Pala, 2023). Ruminant beslemede meyve ağaç yapraklarının düşük kaliteli otlara kıyasla daha önerilebilir olduğunu belirten Kocadayıoğulları vd. (2024), ağaç yapraklarının tek kaba yem kaynağı olarak kullanımı yerine diğer kaba yemlerle birlikte verilmesi ve belirli bir oranı aşmamasını tavsiye etmektedirler. Ağaç yapraklarındaki HP değerleri genellikle belirli ruminant hayvanlar için yaşam payı ihtiyaçlarını karşılayabilmektedir ancak yüksek verimli oldukları dönemlerde rasyonlar ek bir protein kaynağı ile desteklenmelidir (Yavuz ve Öztürk, 2023).

TÜİK'in meyve ağaçlarını turunçgiller, yumuşak çekirdekli, taş çekirdekli, sert kabuklu ve diğer meyveler şeklinde gruplandığı 2023 yılı verilerine göre Türkiye'de bulunan toplam meyve ağacı sayısı yaklaşık 888 milyon (tam olarak 887.636.000) adettir (TÜİK 2024c). Bu gruplandırmanın dışında 3 milyon 778 bin dekar alanda da yaprakları insan gıdası olarak kullanılabilirdiği gibi hayvan beslemede de kullanım potansiyeline sahip olan üzüm yetiştiriciliği yapılmaktadır (TÜİK, 2024c). Öte yandan doğu kayını yapraklarının 7,46 kg biyokütle değerine sahip olduğu tespit edilen çalışmada (Kahyaoğlu vd., 2019) ormancılık faaliyetlerinde gövde odunu hariç alanda bırakılan ağaç bileşenleri miktarının %1,8'ini yaprak kuru maddesinin oluşturduğuna ve gelecek yıllarda ormanda bırakılan ağaç bileşenlerinin değerlendirilmesinin büyük bir önem kazanacağına vurgu yapılmıştır. Tuğluer ve Gül

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

(2018), içerisinde oldukça farklı türlerin olduğu 1498 adet ağacın coğrafi bilgi sistemine göre oluşturulan model ile hesaplanması sonucu toplam yaprak biyokütle değerinin 14.802 kg olduğunu, UFORE modeli (Kent Ormanı Etkileri Modeli) i-Tree Eco uluslararası sürümü vasıtasıyla hesaplanan yaprak biyokütle değerinin ise 23.461 kg olduğunu tespit etmişlerdir. Yukarıdaki bilgilerin ışığında tür, yaş ve büyüklük gibi faktörler tarafından etkilenmekle birlikte bir ağacın 7,5-15 kg arasında değişen ortalama 10 kg kuru yaprak biyokütle değerinin olduğu söylenebilir. Bu bağlamda ülkemizdeki üzüm bağlarından elde edilecekler hariç mevcut meyve ağacı varlığımızdan elde edilecek muhtemel yaprak biyokütlesinin yaklaşık 9 milyon ton (8.877.360 ton) olduğu anlaşılmaktadır. Bu miktar meyve ağacı biyokütlesinin en azından yarısının alternatif kaba yem kaynağı olarak ruminant hayvan beslemede kullanımı ile gerek hayvancılık gerekse bahçecilik faaliyetlerinde önemli bir potansiyele sahip olan ülkemizin kaba yem açığının önemli bir kısmının karşılanabileceği tahmin edilmektedir.

Aşağıda görülmekte olduğu gibi literatürde farklı meyve ağaç yapraklarının besin madde kompozisyonu, sindirim derecesi ve ME değerleri bitki türüne ve vejetatif dönemlerine bağlı olarak değişmektedir. Karan ve Basbag, (2022), Elazığ Merkezine bağlı Hal Köyü'nde yetişen alıç, kiraz, asma, zerdali, ceviz, armut, şeftali ve elma ağaçlarının sonbahar aylarında dökülen yapraklarının (gazel) yem kalitesini belirlemek amacıyla yürüttükleri çalışmada HP %7.38-15.69, asit deterjan lif (ADF) %15.39-34.98, nötral deterjan lif (NDF) %19.22-43.49, sindirilebilir kuru madde (SKM) %61.65-76.92, kuru madde tüketimi (KMT) %2.77-6.25, nispi yem değeri (NYD) 149.79-372.39, TSBM % 56.13-78.66, nispi yem kalitesi (NYK) 143.99- 399.37, potasyum (K) %0.35-1.68, magnezyum (Mg) %0.57-0.80, kalsiyum (Ca) %2.08- 2.69, fosfor (P) %0.21-0.52, kalsiyum/fosfor (Ca/P) 4.59-12.44, potasyum/kalsiyum+magnezyum (K/Ca+Mg) 0.11-0.52 arasında değiştiğini belirlemişlerdir (Tablo 2). Araştırmada incelenen meyve ağacı yapraklarının yem kalite standartları Lacefield (1988) tarafından bildirilen sınıflandırmaya göre değerlendirildiğinde, HP bakımından kiraz ve şeftali yaprakları 2. grupta yer alırken, asma ve elma 3. grupta, adi alıç ve armut 4. grupta, zerdali ve ceviz 5. grupta yer aldığı, ADF, NDF, SKM, KMT, NYD ve TSBM bakımından ise tüm bitki yapraklarının genel olarak prime grupta yer aldığı bildirilmiştir. Ayrıca dökülen bu yaprakların toplanıp alternatif yem kaynağı olarak kullanılmasının meyve bahçelerinde hem hastalıkların kontrolü hem de hayvancılığa katkı sunduktan sonra organik gübre olarak tekrardan doğada kullanılması açısından iyi bir döngü olacağı ileri sürülmüştür.

Erzurum ilinde kendiliğinden yetişen kuşburnu, siyah meyveli kuşburnu, dağ muşmulası, yaban elması, yalancı iğde, alıç ve kuş eriği Ağustos ayının ikinci haftasında toplanan yapraklarında en yüksek HP değerine yalancı iğdede, en düşük NDF, ADF ve ADL içeriğine kuşburnu ve siyah meyveli kuşburnuda, en yüksek ME ve OMSD değerlerine ise yaban elması yapraklarında rastlanmıştır. NYD 166,81-89,71 arasında değiştiği ve söz konusu yapraklar arasında kuşburnu, yaban elması ve siyah meyveli kuşburnunun en yüksek yem kalitesine sahip olduğu kanaatine varılmıştır (Yılmaz, 2021).

Şeftali, erik, kiraz, kayısı, elma, kara erik, armut ağaçlarının sonbahar aylarında dökülen yapraklarının KM içeriği en yüksek şeftali yaprağında en yüksek SD içeriği kayısı yaprağında, en düşük ise armut yaprağında, HP içeriği en düşük armut yaprağında bulunurken en yüksek erik yaprağında, en düşük NDF içeriği kiraz yaprağında bulunurken en yüksek şeftali yaprağında, en yüksek ADF değeri armut yaprağında görülürken en düşük kayısı yaprağında, ham kül (HK) içeriği en düşük armut yaprağında, en yüksek kayısı yaprağında, tespit edilmiştir (Malgaz ve Atalay, 2022). Organik madde sindirim dereceleri (OMSD) %70.31-81.42 arasında, metabolik enerji (ME) değerleri ise 7.67-9.13 MJ/kg KM arasında tespit edilmiştir.

Şanlıurfa'da yetiştiriciliği yapılan dut, akasya ve çınar ağaçlarından 45 gün aralıklarla 4 kez alınan (15 Temmuz- 1 Aralık Dönemi arasında) yapraklarının ADF değerleri hariç diğer besin madde kompozisyonları, SKM, KMT ve NYD üzerine ağaç türü x hasat zamanı interaksyonlarının etkisi önemli bulunarak SKM değerleri üzerine ağaç türü ve hasat zamanının etkili olduğu gözlenmiştir. *In vitro* SKM ve HP değerleri açısından dut ve akasya ağacı yapraklarının iyi kalitede kaba yem kaynağı olabileceği fakat çınar ağacı yapraklarının bu özellikler açısından yeterli olmadığı sonucuna varılmıştır (Pala, 2023).

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

Elma, kayısı, kiraz, asma, urum dutu yapraklarının ruminant beslemede kullanılabilirliğini araştırmak amacıyla yürütülen çalışmada sonucunda ağaç yapraklarının besin madde içerikleri ME, OMSD, SKM, KMT, NYD istatistiki olarak birbirinden farklı bulunmuş ve söz konusu parametrelere ait en yüksek değerlerin dut yaprağında olduğu görülmüştür. Asma, dut, elma, kayısı ve kirazda ME sırasıyla, 9.24, 10.69, 10.07, 10.24, 9.33 MJ/kg KM olarak, OMSD (%) ise 56.49, 58.98, 54.46, 57.34, 58.31 olarak tespit edilmiştir (Tablo 2). Araştırmacılar çeşitli meyve ağaçlarının yapraklarında göz ardı edilemeyecek derecede besin içeriği bulunduğunu ve söz konusu meyve ağaçlarının yapraklarının kaba yem kaynağı olarak kullanılabilirliği konusunda önemli bir potansiyel sunduğunu iddia etmişlerdir (Kocadayıoğulları vd., 2024).

Irak'ın Erbil şehrinden toplanan badem, nar, kayısı, zeytin, asma ve ceviz gibi meyve ağaç yapraklarının HP içeriği %9.23 ile 14.84 arasında değişmiş olup en yüksek protein içeriği badem yapraklarından elde edilmiştir. Ağaç yapraklarının NDF ve ADF içerikleri sırasıyla %17,93 ile 40,67 ve %10.43 ile 29.69 arasında değişmiş olup nar yaprakları diğerlerinden farklı bulunmuştur. Kondense tanen (KT) içeriği %1.17 ile 8.76 arasında değişmiş olup en düşük tanen içeriği kayısı ağacından elde edilmiştir. ME ve OMSD sırasıyla 7,61 ile 10.76 MJ/kg ve %50.26 ile 71.14 arasında değişmiştir ve kayısı ağaç yaprakları diğerlerinden farklıdır. Bu çalışmaya konu olan ağaç yapraklarının çoğunun ruminant hayvanların yaşama ve verim payını karşılayacak düzeyde yüksek protein içeriği, ME içeriği ve OMSD olduğunu bildiren araştırmacılar KT içeriği %2'den düşük olan nar ve kayısı ağaç yapraklarının ruminant hayvanlarda gaz oluşumu önleyip ve metan emisyonunu azaltarak beslemede güvenle kullanılabilirliğini belirtmektedirler (Hassan, 2015).

Taze dut yapraklarının biyokütle veriminin genellikle 25-30 ton/ha/yıl, kesme aralığının yaklaşık 9 ila 10 hafta, HP içeriğinin %18-25 ve *in vitro* sindiriminin %75 ile 80 arasında değiştiği saptanmıştır (Ba vd., 2005). Dut yaprağı ile ilgili yapılan bir diğer çalışmada (Singh ve Makkar, 2002), yaprakların kimyasal bileşiminin yaprağın türüne, vejetatif dönemine, yaprağın daldaki pozisyonuna ve gübreleme düzeyine göre farklılık gösterdiği ve dut yaprağının KMT, KM, organik madde (OM), HP ve ham selüloz (HS) sindirilebilirliğinin sırasıyla %3.36, %66.4, %71.8, %58.2 ve %21.4 olduğu bildirilmiştir. Ayrıca sığır yemi bileşeni olarak yüksek maliyetli pamuk tohumunun yerine dut yapraklarının rasyonda protein takviyesi olarak kullanılabilirliği belirtilmiştir. Dut yaprağının kimyasal bileşimini, *in vitro* OMSD ve KM değerini belirlemek için yürütülen çalışmada (Teskay vd., 2018), dut yaprağı besin maddelerinin konsantrasyonuna göre birçok bakımdan daha iyi olduğu ve özellikle Ca içeriğinin konsantrasyonundan üç kat fazla olduğu gözlemlenmiştir.

SONUÇ

Günümüzde dünyanın birçok ülkesinde ağaç yapraklarının potansiyel yem değerlerini belirlemek ve ruminant rasyonlarına dahil etmek için artan bir eğilim bulunmaktadır. Yapılan çalışmalar ağaç yapraklarının sindirilebilir besin maddeleri bakımından diğer birçok yem bitkisiyle karşılaştırılabileceği, hatta bunların birçok yem bitkisinden daha iyi olabileceğini ifade etmektedir. Meyve ağaç yapraklarının besin madde içerikleri ve çoğunlukla *in vitro* parametrelerle belirlenen yem değerleri dikkate alındığında, kaba yemin yeterince temin edilemediği, azaldığı veya kısıtlı miktarlarda üretildiği dönemlerde başta dut, şeftali, kayısı, üzüm ve badem olmak üzere elma, armut, kiraz, vişne, zeytin, ceviz erik gibi meyve ağacı yapraklarının ruminant beslemede düşük kaliteli mera ve otlara kıyasla kaba yemlere alternatif olarak kullanılabilirlikleri kanaatine varılmıştır. Ayrıca yaprakların alternatif yem kaynağı olarak kullanılması, meyve bahçelerinde hastalıkların kontrolüne katkı sunmanın yanı sıra iyi bir doğal döngü olabileceği sonucuna varılmıştır. Bu bağlamda ülkemiz bahçecilik faaliyetlerinden elde edilecek 9 milyon ton kapasiteye ulaşabilecek meyve ağacı yaprak biyokütlesinin, diğer kaba yemlerle birlikte verilmesi ve belirli bir oranı aşmaması koşulu ile ruminant hayvan beslemede alternatif kaba yem kaynağı olarak kullanımı ile kaba yem açığının belli bir kısmının karşılanabileceği düşünülmektedir.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

Tablo 2. Meyve ağaç türleri

Ağaçlar	SKM	HK	HP	HY	ADF	NDF	KMT	TSBM	NYD	KT	ME	Literatür
Kiraz (<i>Prunus avium</i>)	71,84		9,49		21,91	24,94	4,85	71,16	270,50			Karan ve Basbag, 2022
Asma (<i>Vitis vinifera</i>)	67,83		12,48		27,05	30,36	3,95	65,24	207,91			Karan ve Basbag, 2022
Zerdali (<i>Prunus armeniaca</i>)	71,70		7,38		22,08	25,09	4,79	70,95	266,29			Karan ve Basbag, 2022
Ceviz (<i>Junglas regia</i>)	61,65		7,64		34,98	38,21	3,15	56,13	150,76			Karan ve Basbag, 2022
Armut (<i>Pyrus communis</i>)	69,30		10,21		25,16	31,34	2,77	67,42	206,20			Karan ve Basbag, 2022
Şeftali (<i>Prunus persica</i>)	73,57		14,03		19,68	22,11	5,43	73,72	309,70			Karan ve Basbag, 2022
Elma (<i>Malus communis</i>)	71,24		12,70		22,67	24,44	5,43	70,29	274,29			Karan ve Basbag, 2022
Şeftali (<i>Prunus persica</i>)	43,43	16,43	8,34	13,36	22,26	44,48					9,06	Malgaz ve Atalay, 2022
Erik (<i>Prunus domestica</i>)	29,67	15,23	9,27	10,80	22,33	37,13					9,13	Malgaz ve Atalay, 2022
Kiraz (<i>Prunus avium</i>)	38,07	9,28	7,74	14,09	23,26	28,67					7,67	Malgaz ve Atalay, 2022
Kayısı (<i>Prunus armeniaca</i>)	26,79	20,55	7,04	10,39	21,52	38,89					8,64	Malgaz ve Atalay, 2022
Elma (<i>Malus domestica</i>)	28,38	11,34	6,83	12,92	25,19	31,31					8,02	Malgaz ve Atalay, 2022
Kara erik (<i>Prunus nigra</i>)	35,93	17,34	7,99	11,51	22,31	37,19					7,99	Malgaz ve Atalay, 2022
Armut (<i>Pyrus communis</i>)	29,33	9,09	5,43	12,27	26,07	33,79					7,89	Malgaz ve Atalay, 2022
Elma (<i>Malus domestica</i>)	91,13	5,70	11,25	5,03	36,52	47,85	2,51		117,56	10,99	10,07	Kocadayoğulları vd., 2024
Kayısı (<i>Prunus armeniaca</i>)	87,81	6,78	10,99	4,41	34,07	44,47	2,70		130,47	8,25	10,24	Kocadayoğulları vd., 2024
Kiraz (<i>Prunus avium</i>)	90,32	6,91	10,33	3,39	35,48	47,21	2,54		120,72	10,11	9,33	Kocadayoğulları vd., 2024
Asma (<i>Vitis vinifera</i>)	89,72	9,47	12,83	3,79	32,04	47,84	2,51		124,33	9,89	9,24	Kocadayoğulları vd., 2024
Urum dutu (<i>Morus rubra</i>)	80,43	8,67	13,09	4,74	29,81	42,93	2,80		142,36	7,89	10,69	Kocadayoğulları vd., 2024
Dut (<i>Morus spp.</i>)	35,37	20,44	16,45		30,70	37,93						Pala, 2023
Badem (<i>Prunus dulcis</i>)	90,47	15,61	14,84	5,60	19,00	33,46				8,76	7,61	Hassan, 2015
Nar (<i>Punica granatum</i>)	96,06	16,69	11,73	6,82	10,43	17,93				1,43	8,92	Hassan, 2015
Kayısı (<i>Prunus armeniaca</i>)	97,95	7,01	9,23	16,30	29,69	40,67				1,17	9,94	Hassan, 2015
Zeytin (<i>Olea europaea</i>)	97,83	18,83	13,37	11,86	15,03	21,88				4,55	10,76	Hassan, 2015
Asma (<i>Vitis vinifera</i>)	96,21	13,38	11,26	7,39	18,32	27,36				7,71	8,37	Hassan, 2015
Ceviz (<i>Juglans regia</i>)	97,42	16,86	12,84	7,68	14,70	23,49				4,41	9,20	Hassan, 2015
Beyaz dut (<i>Morus alba</i>)	92,63	18,96	18,56	5,27	27,71	42,03				1,39	9,03	Zebari, 2015

SKM; Sindirilebilir kuru madde (%), HK; Ham kül (%), HP; ham protein (%) , HY; Ham yağ (%), ADF; asit deterjan fiber (%), NDF; nötral deterjan fiber (%), KMT; kuru madde tüketimi (%),TSBM; Toplam sindirilebilir besin maddesi (%), NYD; nispi yem değeri, KT; Kondanse tanen (%), ME; metabolik enerji (MJ/kgKM)

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

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INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

KANATLILARDA PODODERMATİT OLUŞUMU ÜZERİNE DİYETİN ETKİSİ

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ÖZET

Pododermatit, kanatlılarda yaygın görülen herhangi bir dejeneratif ya da iltihaplı durum için kullanılan genel bir terimdir. Barınak, bakım ve besleme koşulları ile genotip, cinsiyet, mevsim gibi multifaktöriyel problemlere bağlı olarak şekillenebilen pododermatit hem hayvan refahı hem de ekonomik kayıplar bakımından önemli bir problemdir. Pododermatit altlık ve beslenme olmak üzere başlıca iki ana faktörden etkilenmektedir. Altlık kalitesinin tesisi ve nem içeriğinin kontrolü yoğun kanatlı yetiştiriciliğinin önceliklerinden birisidir. Altlık problemlerinin yaşandığı kümeslerde pododermatit yaygınlığı kaçınılmazdır. Diyetle kullanılan hammaddelerinin çeşidi, kalitesi ve kullanım düzeyleri dışkı vizkozitesi, kıvamı ve NH₃-N düzeyini ve dolayısıyla altlık nem oranı ile altlık kalitesini etkileyerek pododermatit oluşumu üzerine etkili olmaktadır. Doğru protein, mineral ve vitamin dengesine sahip diyetler, altlık kalitesinin korunmasını sağlayarak pododermatit oluşumunu önlemeye yardımcı olabilir. Dolayısıyla, kümes hayvanlarının sağlığını iyileştirmek ve refahını artırmak için besleme programlarının dikkatle planlanması gerekmektedir. Bu çalışmada besleme manipülasyonlarının pododermatit üzerine etkilerini inceleyen güncel araştırmalar derlenmiştir.

Anahtar Kelimeler: Pododermatit, Kanatlı, Diyet bileşenleri, Diyet takviyeleri, Altlık kalitesi.

ABSTRACT

Pododermatitis is a general term used to describe any degenerative or inflammatory condition common to poultry. Pododermatitis is an important problem in terms of both animal welfare and economic losses, which can be shaped depending on multifactorial problems such as housing, care and feeding conditions, genotype, sex and season. Pododermatitis is affected by two main factors: litter and nutrition. Provision of litter quality and control of moisture content is one of the priorities of intensive poultry farming. The prevalence of pododermatitis is inevitable in poultry houses with litter problems. The type, quality and usage levels of the raw materials used in the diet affect the faecal viscosity, consistency and NH₃-N levels, and thus the litter moisture content and litter quality, and thus affect the formation of pododermatitis. Diets with the right balance of protein, minerals and vitamins can help prevent pododermatitis by maintaining litter quality. Therefore, feeding programmes need to be carefully planned to improve the health and welfare of poultry. This study reviews current research examining the effects of feeding manipulations on pododermatitis.

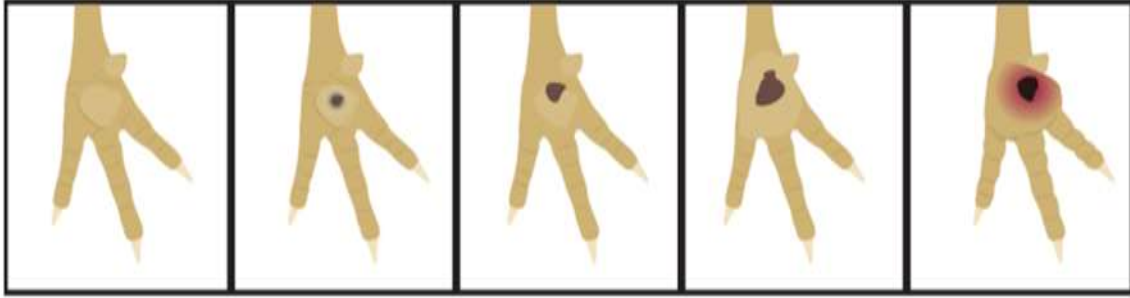
Keywords: Pododermatitis, Poultry, Diet components, Dietary supplements, Litter quality.

GİRİŞ

Pododermatit, kanatlı hayvanlarda yaygın olarak görülen ve hayvan sağlığı, refahı ve ekonomisini olumsuz etkileyen bir deri problemidir. (Akyüz ve Onbaşlar, 2021). Daha çok etlik piliç, hindi ve Pekin ördeği gibi kanatlılarda görülen bu rahatsızlık pododermatit, ayak tabanı dermatiti (FPD), bumblefoot, kontakt dermatit gibi birden fazla isimle bilinmektedir ve ayak tabanı, diz ve göğüs yanıkları şeklindedir (Uysal vd., 2023). Hastalık oluşumunda derinin üst yüzeyinden derinlere kadar uzanabilen inflamasyon, nekrotik lezyon, hiperkeratoz ve ülserler görülmektedir (Shepherd ve Fairchild, 2010). Ayağın alt kısmında kızarıklık ve hafif şişlik ile başlayan pododermatitin ilerleyen döneminde şişlik ve kabuklanma artar, sertleşip koyulaşan lezyon bölgesi sıcak ve ağrılı olabilir, genellikle akıntısız inflamasyon oluşur,

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

hayvan topallamaya başlar ve yürümekte zorlanır. Pododermatitin şiddetlendiği ileri evrede derin doku nekrozu ile siyah-kahverengi kabuklanmalar oluşur, ağır iltihap ve apse görülebilir. Topallama belirginleşir, hayvan hareket etmekten kaçınır (Şekil 1).



Bacaklar ve/veya ayaklarda küçük, parlak pembe alanlar ve/veya soyulma veya pullanma

Bir veya her iki ayağın pedlerinde pürüzsüz, parlak yüzeyle sınırlı alanlar

Ayak tabanlarında ülserasyonlar, periferik kallus oluşumu

Ülserlerde nekrotik doku tıkaçı mevcuttur, ağırdır ve hafif topallık

Nekrotik döküntüyü çevreleyen dokularda şişme, ödem, genellikle şiddetli topallık

Şekil 1. Pododermatit lezyonlarının klinik aşamaları (Brasseur, 2024).

Enfeksiyonun kemik ve eklemlere yayılması ile osteomyelit veya artrit gelişebilir, tedavi edilmezse ölümlerle sonuçlanabilir (Zsivanovits ve Monks, 2016). Bilgili vd. (2006)'nin bildirdiği lezyon bulunmayan (0), 7,5 mm'den daha küçük lezyon bulunan (1) ve 7,5 mm'den daha büyük lezyon bulunan (2) olarak skorlanan pododermatit değerlendirmesi Şekil 2'de görülmektedir. Kümes hayvanı endüstrisi için bir endişe kaynağı olan pododermatit, hayvan sağlığı ve refahını, gıda güvenliğini ve işletme kârını olumsuz yönde etkilemektedir (Swiatkiewicz ve ark., 2017; Sevim ve diğerleri, 2021a). Özellikle Asya ülkelerinde tavuk ayakları gastronomik bir lezzet olarak kabul edilir ve şu anda göğüs ve kanatlardan sonra tavuğun üçüncü en önemli ekonomik bölümünü oluşturur (Chen vd., 2017). Çoğunlukla altlık koşullarının neden olduğu ayak dermatiti, ayak derisi dokusunu etkileyerek piyasa değerinin azalmasına yol açmaktadır (Eichner vd., 2007). Enfeksiyöz olmayan pododermatitin oluşumunda mevsim, cinsiyet, genotip, vücut büyüklüğü, obezite, uygun şekilde tasarlanmamış tünek ve zeminler, yüksek yerleşim sıklığı ve hareketsizlik, stres, kötü beslenme, bağışıklık sistemi, sürü üyeleri arasındaki kavgalar (kanibalizm), bağırsak enfeksiyonları ve kümes koşulları gibi pek çok faktör etkili olmakla birlikte altlığın türü ve nem içeriği başlıca faktör olarak görülmektedir (Cengiz vd., 2013; Akyüz ve Onbaşılar, 2021; Uysal vd., 2023). Kanatlı kümeslerinde ideal altlık kalitesi için altlık nem oranı %30'un üzerine çıkmamalıdır (Mayne vd., 2007; Collett, 2012). Çeşitli faktörlere göre değişmekle beraber yaklaşık olarak %70-80 oranında su içeriği olan piliç dışıklarının %54'ü idrar ve %46'sı dışkı ve %5,85 azot içermektedir (van der Hoeven-Hangoor, 2014). Kümeslerde altlık yönetimi özellikle canlı ağırlık artışı ile birlikte giderek zorlaşır. Çünkü biriken altlıklarda altlık nemi günden güne artmaktadır (Bilgili vd., 2009). Dışkı kalitesini ve dışkının kuru madde miktarını etkileyen tüm faktörler altlık kalitesini doğrudan ya da dolaylı olarak etkilemektedir. Nem oranının %25'in üzerine çıkması ile altlığın çamurlaşp yer yer kekleşmesi ıslak altlık olarak adlandırılmaktadır (Fairchild ve Czarick, 2011). Islak altlık problemlerinin yaşandığı bir kümeste pododermatit problemlerinin kaçınılmaz olacağı bildirilmektedir (Dunlop vd., 2016).



Şekil 2. Pododermatit skorlama (Temiz, 2022).

Islak altlıkta mikroorganizma popülasyonu artmakta ve dışkıdaki ürik asidin parçalanmasına bağlı olarak zehirli gazlar kümese yayılmaktadır. Islak altlık ile beraber küme kabu kabul edilebilir amonyak seviyesinin 25 ppm'den daha yüksek seviyelere çıkması, performansta zayıflama, enfeksiyöz hastalıklara karşı duyarlılık, solunum yolu problemleri ile asites, keratakonjuktivit, hava kesesi yangısı, göğüs ve diz yanıkları ile birlikte pododermatite sebep olmaktadır (Sözcü ve Koyuncu, 2015; Temiz, 2024). Altlık yönetimi hem kanatlı refahının sağlanması hem de üretim kayıplarının önlenmesi bakımından yoğun kanatlı yetiştiriciliğinin önceliğidir (Işık, 2024). Altlığın kalitesi altlık malzemesinin seçimi, formu ve kalınlığı, yerleşim sıklığı, tesisin havalandırma ve ısı izolasyon sistemleri, yemleme/sulama sistemleri ve besleme gibi çeşitli etmenlere bağlı olarak değişmektedir (Škrbić vd., 2012). Bu derlemede kanatlılarda besleme düzenlemelerinin pododermatit oluşumu ve şiddeti üzerine etkilerini inceleyen güncel çalışmalar irdelenecektir.

Beslemenin Pododermatit Oluşumu Üzerine Etkileri

Kümes ve kötü altlık koşulları ile birlikte rasyon kompozisyonu pododermatit oluşumunu önemli düzeyde etkilemektedir (Shepherd ve Fairchild, 2010). Rasyonda kullanılan hammaddelerinin çeşidi, kalitesi ve kullanım düzeyleri dışkı vizkozitesini, kıvamını ve dolayısıyla altlık nem oranını etkileyerek pododermatit oluşumu üzerine etkili olmaktadır (Swiatkiewicz vd., 2017). Pododermatit riskini azaltmak için altlık nem oranının %30'un altında olması gerektiği unutulmamalıdır (Mayne vd., 2007). Endüstriyel kanatlı üretiminde başlıca endişe kaynaklarından biri olan pododermatit oluşumuna beslemenin etkileri enerji/protein oranına, ham protein içeriğine, amino asit dengesine, yağ içeriği ve türüne, elektrolitik dengeye, yem formuna ve beslenme rejimine göre değişebilmektedir (Işık, 2024).

Tahıl-Enerji Kaynakları

Bilindiği üzere hayvancılık işletmelerinde yem giderleri toplam giderlerin %70'ini oluşturmaktadır. Diğer hayvancılık sektörlerinde olduğu gibi kanatlı sektöründe de doğru besleme stratejilerinin belirlenmesi ve üretim maliyetlerinin düşürülmesi hayati önem taşımaktadır (Jacob ve Pescatore, 2012). Kanatlılarda diyet enerjisinin %60-85'lik bölümü tahıllardan karşılanmakta olup, diyetin büyük bir kısmı genellikle mısır ve soya fasulyesi küspesi (SFK)'nden oluşmaktadır. Ancak ürünün fiyatı diyet enerji ve protein kaynağı olarak kullanılacak mısır ve SFK miktarını belirleyen temel etmendir. Fiyat dalgalanmaları olduğu zamanlarda başta etlik piliçler olmak üzere kanatlı diyetlerinde mısıra alternatif olarak arpa, çavdar, tritikale ve buğday gibi diğer tahıl taneleri kullanılarak daha düşük maliyetli diyetlerin hazırlanması arzu edilebilmektedir (Temiz, 2022). Ne var ki yapılarında yüksek düzeyde bulunan selüloz, hemiselüloz, pektin, ksilanlar, arabinoksilanlar, β glukanlar gibi nişasta tabiatında olmayan (NOP) kompleks yapıları polisakaritler (Tablo 1) bu tahılların kanatlı diyetlerinde kullanılmalarını sınırlandırmaktadır (Cengiz vd., 2012a). Su tutma kapasiteleri yüksek ve yapışkan özellikteki NOP'lar bağırsak viskozitesinin artmasına, yemin bağırsak kanalında daha uzun kalmasına, bağırsakta oksijen seviyesinin düşmesine ve anaerobik mikroorganizma popülasyonunun güçlenmesine yol açmaktadır (Cengiz vd., 2017). Artan bazı anaerobik mikroorganizmalar ise ya toksin üretmek ya da safra tuzlarının yapısını bozarak yağlardan yararlanmayı engellemektedirler. Bozulan mikrobiyal

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

denge ve sindirim enzimleri aktivitesi, besin maddeleri sindirimini azaltarak performans değerlerini olumsuz etkilediği gibi bağırsakta fazla miktarda biriken nişasta, protein ve yağ patojen mikroorganizmalar için besi yeri oluşturur (Perera vd., 2022). Kanatlı diyetlerinde yüksek NOP konsantrasyonu mikrobiyal aktiviteyi ve kompozisyonu değiştirmenin yanı sıra bağırsakların sindirim kapasitesini temsil eden villus uzunluğu/kript derinliği oranını düşürerek bağırsak morfolojisini de etkileyebilmektedir (Škrbić ve ark., 2012). Diyet NOP konsantrasyonlarının artmasına paralel olarak artan bağırsak viskozitesi yapışkan dışkı oluşumunu teşvik ederek kanatlıların ayak tabanlarına daha kolay yapışmasına ve zamanla ayak epidermis ve keratin katmanlarının deforme olmasını sağlayabilmektedir. Ayrıca NOP'ların su tutma kapasitelerinin yüksek olması hayvanların daha çok su tüketmelerine ve dolayısı ile dışkı su oranının artmasına da neden olur (Morgan vd., 2021). Dunlop vd. (2016) buğday, arpa ve çavdar gibi NOP içeriği yüksek yem maddelerinin nemi tuttuğunu ve bağırsakta nemin geri emilimini engellediğini, bunun da sulu ve yapışkan gübreye yol açtığını bildirmiştir. Yapışkan ve ıslak altlıkla uzun süreli temas ve yüksek kümes amonyak düzeyi sonucunda ayaklarda pododermatit, diz ve göğüs yangıları şekillenebilmektedir (Shepherd ve Fairchild, 2010; Cengiz vd., 2012a; Jacob ve Pescatore, 2012; Perera vd., 2022).

Tablo 1. Bazı tahılların %kuru maddedeki NOP düzeyi (Choct, 1997; Temiz, 2022)

Tahıl Çeşidi	Arabinoksilan	β glukan	Selüloz	Diğer*	Toplam
Sorgum	2,1	0,2	2,2	0,3	4,8
Mısır	5,2	-	2,1	0,8	8,1
Buğday	8,1	0,8	2,0	0,5	11,4
Çavdar	8,9	2,0	1,5	0,8	13,2
Tritikale	10,8	1,7	2,5	1,3	16,3
Arpa	7,9	4,3	3,9	0,6	16,7

*Mannan, galaktan ve üronik asit toplamı

Kanatlı hayvan beslenmesinde enerji kaynağı olarak kullanılan alternatif yem hammaddelerinin pododermatit insidansı üzerine etkilerini inceleyen çalışmalara göre; arpanın ileal viskozite değerini çavdar gibi NOP içeriği yüksek hammaddelerden daha fazla arttırdığını ve rasyonda enzim katkılarının kullanılması gerektiği ifade edilmiştir (Jozefiak vd., 2006). Benzer şekilde Temiz (2022), etlik piliç diyetlerinde arpa oranı arttıkça ileal viskozite değerinin arttığını, %10 ve %20 arpa içeren diyetle beslenen gruplar arasında pododermatit insidansının etkilenmediğini ancak %30 arpa içeren diyetle beslenen grupta pododermatitin en az şekillendiğini tespit etmiştir. Ayrıca mısır-SFK bazlı diyet yerine %30 arpa ikame edilen diyetlerle beslenen etlik piliçlerde bağırsak içeriği viskozitesi, altlık pH'ı, nemi ve NH₃ buharlaşması ile birlikte pododermatit insidans ve şiddetinin arttığı belirlenmiştir (Cengiz vd., 2017). El-Wahab vd., (2020), buğday bazlı diyet yerine kırık/ezilmiş çavdarı üçüncü hafta %5'ten başlayarak, yetiştirme döneminin son haftalarında altlık kalitesinden ve ayak tabanı sağlığından ödün vermeden %30'a kadar artırarak piliç diyetlerine dahil etmenin mümkün olduğunu bildirerek, diyet çavdar oranının yüksekliğinde yem teknolojisi ve/veya enzimlerin yanı sıra çavdar formunun (bütün veya kırık) dışkı viskozitesi, altlık kuru madde içeriği ve pododermatit skoru üzerindeki etkili olabileceğine dikkat çekmişlerdir. Öte yandan El-Wahab vd. (2022), 8. gün %2'den başlayarak 33. güne kadar %20'ye kadar kademeli olarak buğday yerine çavdarın ikame edildiği diyetle beslenen piliçlerde altlık kuru madde içeriğinin azalıp pododermatit skorunun arttığını gözlemlemişlerdir. Arpa, buğday ve çavdarın ileal viskoziteye etkisinin incelendiği bir diğer çalışmada (Yaşar vd., 2016), en yüksek viskozite değerleri ve yapışkan dışkı oluşumu diyetlerinde arpa içeren gruplarda tespit edilerek, bu durumdan diyetle enzim kullanılmamış ve arpanın önerilen kullanım oranından daha fazla kullanılması (%40) sorumlu tutulmuştur. Piliç diyetlerine %25 düzeyinde arpa ilavesinin altlık nemi ve pH'ı üzerinde

bir etkisi olmadığı bildirilmektedir (Cengiz vd., 2012a). Arpa NOP konsantrasyonuna bağlı olarak bağırsak viskozitesindeki artışı önlemek için ya diyet kullanım oranının %10-15 ile sınırlı kalmasına ya da diyete enzim ilavesi önerilmektedir (Temiz, 2022).

Islak altlık üzerinde yetiştirilen etlik piliçlerde artan pododermatit skorları diyete ilave edilen turuncu mısır diyetinde en düşük (%33) olup bunu beyaz mısır (%56) ve sarı mısırın (%63) takip ettiği bildirilmektedir (Abraham vd., 2021). Ayrıca De Jong vd. (2015), düşük enerjili (-200 kcal/kg) diyetle beslemenin altlık nemini artırıp, daha fazla ayak tabanı dermatiti ve diz yanığına sebep olduğunu bildirmektedirler. Benzer şekilde Zuowei vd. (2011) tarafından bildirilen sonuçlara göre düşük enerjili (2.800, 2.900 ve 3.000 kcal ME/kg) diyetle beslenen piliçlerde, yüksek enerjili (2.950, 3.050 ve 3.150 kcal ME/kg) diyetle beslenen piliçlere kıyasla pododermatit skoru daha yüksek bulunmuştur. Genel olarak, standart enerjili diyetlerle beslenen piliçlerde, düşük enerjili (-130 kcal/kg) diyetle beslenen piliçlere kıyasla ayak tabanı lezyonları daha düşük oranda görülmüştür (Hernandez vd., 2024). Kim vd. (2021) piliç yemlerinde kullanılan hayvansal yağlar yerine %1, %2 ve %4 düzeyinde tam yağlı badem ikame ettikleri çalışmada %4 tam yağlı badem grubunda pododermatit insidansının artış sebebini bademin NOP ve yüksek mineral içeriğinden kaynaklandığı ileri sürülmüştür.

Son zamanlarda, yemdeki tahılların fiyatı dünya çapında arttıkça, protein ve yağ kaynaklarının yerini alabilecek yeni ham maddelere olan ilgi artmaktadır. Kanatlı beslemede saf ve ham gliserininin farklı dönemlerde ve oranlarda kullanımının dışkı kıvamı ve altlık nemi ile ilişkisi farklı araştırmacılar tarafından ilgi duyulan konulardan olmuştur. Amacı piliç karma yemlerinde mısır miktarını düşürerek alternatif enerji kaynağı olarak ham gliserin etkilerini araştırmak olan çalışmada (Işık, 2024), %10 ham gliserin ilavesinin dışkı nemini arttırdığı ancak %5 ham gliserin tüketiminin ise kontrol grubuna göre daha az sulu dışkıya neden olduğu tespit edilerek rasyonda ham gliserinin artmasının pododermatit insidansının arttığı bildirilmiştir. Piliç diyetlerine %3, 6, 9, 12 ve 15 ham gliserin ilavesi ile altlık neminin doğrusal olarak arttığını bildiren Henz vd. (2014) benzer olarak Papadomichelakis vd. (2015), piliç diyetlerine 70, 140 veya 210 g/kg ham gliserin ilavesi ile su tüketimi ve dışkı neminin doğrusal olarak arttığı ve diyetdeki ham gliserinin artışıyla altlık kalitesinde doğrusal bir azalma ile sonuçlandığını ve 140 g/kg'a kadar ham gliserinin diyete dahil edilmesinin verimli olabileceğini ancak 140 g/kg daha fazla ham gliserin ilavesinin altlık kalitesini düşürebileceğine vurgu yapmışlardır. Ayrıca araştırmacılar artan su tüketiminin ham gliserinin içerisinde bulunan sodyum veya potasyum kalıntılarında kaynaklandığını ifade etmişlerdir. Romano vd. (2014), yemlerinde %7.5 ve %10 gliserin içeren piliçlerde ishalin görüldüğünü bildirmişlerdir. Benzer şekilde piliç diyetlerine %10 gliserin ilavesi ile altlık neminin arttığını bildiren Cerrate vd. (2006), bunun muhtemel katalizörün kalıntısı nedeniyle %0,15 seviyesinde artan potasyumdan ileri geldiğini iddia etmişlerdir. Boso vd. (2013), ham ve yarı saflaştırılmış gliserinin yumurtacı tavuk diyetlerine dahil edilmesini değerlendirmiş ve diyetdeki gliserin düzeyi arttıkça dışkı neminin arttığını bildirmiş ve bu sonucu gliserin sodyum düzeylerine bağlamışlardır.

Protein Seviyesi ve Kaynağı

Diyet proteini, kanatlı organizmasındaki aşırı proteinin ürik aside metabolize edilmesi ve bu şekilde atılması nedeniyle, altlık kalitesini etkileyen önemli bir diyet faktörüdür. Bu nedenle, kuşlarda su tüketimi ve altlık nemi, diyetdeki protein içeriğinin artmasıyla artar (Swiatkiewicz vd., 2017). Yüksek proteinli diyetin, dışkı ve altlıkta artan ürik asit ve sekonder amonyak üretimi sonucu ayak tabanı dermatiti insidansını artırdığı düşünülmektedir (Youssef vd., 2011). Bilgili vd. (2006), düşük yoğunluklu diyetlerle (%21 ham protein 3109 kcal/kg başlangıç yemi; %19,7 ham protein, 3158 kcal/kg büyütme yemi) beslenen piliçlerde pododermatit görülme sıklığının azaldığını; Ferguson vd. (1998), diyet proteininin %21,5'ten %19,6'ya düşürülmesi ile NH₃ gaz konsantrasyonu ile altlık neminin azaldığı ve hava kalitesini iyileştirdiğini bildirmişlerdir. Öte yandan Youssef vd. (2011)'de hindilerle yürüttükleri çalışmada pododermatitin nedenlerinden biri olarak diyet protein içeriğine odaklanmanın yersiz olabileceğini ancak dışkı ve altlık nemini veya her ikisini de artıran tüm diyet faktörlerinin dikkate alınması gerektiğini belirterek pododermatitin insidans ve şiddetinin, kuru altlığı koruyarak azaltılabileceğine dikkat çekmişlerdir.

Birçok çalışmanın sonuçları, yalnızca diyet protein konsantrasyonunun değil, aynı zamanda protein kaynağının da altlık kalitesini ve pododermatit şiddetini etkileyebileceğini göstermektedir. Örneğin, Eichner vd. (2007), sadece mısır ve SFK'ya dayalı tamamen bitkisel diyetlerle beslenen piliçlerin hayvansal yan ürün veya mısır glüten unu içeren diyetlerle beslenenlere kıyasla daha yüksek neme sahip dışkı üretmenin yanı sıra daha yüksek ayak dermatiti geliştirme potansiyeli bildirilmiştir. Cengiz vd. (2013), iki protein kaynağı (tamamen bitkisel veya bitkisel + hayvansal karışımı) ve üç zemin tipi (çam talaşı yataklığı, ızgaralı zemin veya altlıksız masif ahşap zemin)'nin etkisini incelemek amacıyla yürüttükleri çalışmada pododermatit insidansı ve şiddetinin ahşap zeminde proteinin tamamını bitkisel kaynaklardan alan diyetler arttığı ve diyet protein kaynağının etlik piliçlerde pododermatit etiolojisinde doğrudan bir etkiye sahip olduğu görülmüştür. Nagaraj vd. (2007a) tarafından yapılan çalışmada piliçlerde yüksek proteinli ve tamamen bitkisel orjinli diyetin pododermatit insidansı ve şiddetinin bitkisel + hayvansal orjinli, düşük proteinli diyete göre daha yüksek olduğu gözlenmiştir. Tamamen bitkisel ve yüksek protein içeren diyetle beslemenin NH₃-N seviyesini artırma eğiliminde olduğu, yemdeki protein seviyesi ile altlıktaki amonyak arasında bir korelasyon bulunduğu ve protein kaynağı ile seviyesinin altlık içindeki amonyak miktarını önemli ölçüde etkilediği rapor edilmiştir. Protein oranı, protein kaynağı (tamamen bitkisel veya bitkisel + hayvansal) ve enzimin (%0,06) etkilerinin belirlendiği bir diğer çalışmada, 42 günlük piliçlerde pododermatit insidans ve şiddetinin karma protein kaynağı ile azaldığı ancak yüksek proteinli diyet (28 ve 42 gün), tamamen bitkisel diyet (28 gün) ve enzim takviyeli diyet (28 ve 42 gün) ile birlikte altlık NH₃ seviyelerinin arttığı bildirilmiştir (Nagaraj vd., 2007b). Amonyakın suyla temas etmesi kanatlıların ayaklarına zarar veren aşındırıcı alkali özelliklere sahip olan amonyum (NH₄⁺) ve hidroksit (OH⁻) oluşumuna yol açmaktadır (Hamke, 2022). Öte yandan Hossain vd. (2013), sadece bitkisel orjinli diyetle beslemenin dışkı nem seviyesini artırdığını ancak dışkı pH'ı ve amonyak oranını etkilemediğini belirlemişlerdir. Yetiştirme ve/veya bitirme evrelerindeki hindilere SFK yerine mikroalg küspesi (*Arthrospira* spp; 30 veya 60 g/kg) verilmesinin pododermatit insidans ve şiddeti bakımından gruplar arasında farklılık tespit edilmemiştir (Zampiga vd., 2024). Farklı diyet protein kaynaklarının piliçlerde altlık kalitesi ve ayak pedlerinin sağlığı üzerindeki potansiyel etkilerini değerlendirmek için yürütülen çalışmada kontrol diyetinde %32,5 SFK seviyesi, diğer diyetlerde SFK %14,5 kolza küspesi, %4,5 hemoglobin küspesi veya %4,0 yosun küspesi ile değiştirilmiştir. Pododermatit şiddeti, kolza ve yosun küspesi içeren diyetlerle beslenen piliçlerde, soya ve hemoglobin küspesi içeren diyetle beslenenlere kıyasla daha yüksek bulunmuştur (El-Wahab vd., 2018).

Vitamin, Mineral ve Amino Asit vb. Takviyeler

Son yıllarda yapılan birçok çalışma karma yem bileşiminin optimize edilmesi ve yem katkı maddelerinin kullanımının pododermatit insidansı ve şiddeti açısından olumlu bir etkiye sahip olabileceğini göstermiştir. Bu alanda hindi civcivleriyle yapılan ilk araştırmalar daha çok diyetlere SFK ilavesi ya da biyotin ve riboflavin gibi vitamin eksikliklerine odaklanmıştır. Biyotin, riboflavin, pantotenik asit ve kükürtlü amino asitler gibi besin maddelerinin cildin yapısal bileşenlerini etkileyip, deri bütünlüğünü ve bağışıklık sistemini destekleyerek lezyon gelişimini azaltabilir (Shepherd ve Fairchild, 2010). Ancak son yıllarda oldukça farklı diyet takviyelerinin ayak taban lezyonu, diz ve göğüs yanıkları üzerine olan etkileri araştırılmaktadır. Makowski vd. (2022), hindi diyetlerine butirik asit ilavesi ile dışkıdaki kuru madde içeriğinin artıp pododermatit insidansının azaldığı, altlık kalitesinin iyileşip ve ishal riskinin engellendiğini göstermişlerdir. Yüksek stok yoğunluğunda yetiştirilen piliç diyetlerine orta zincirli yağ asitleri ilavesinin altlık nemini düşürerek, ayak tabanı lezyonlarının ve diz yanıklarının görülme sıklığı ve şiddetinde önemli bir azalma ile ilişkili olduğu ve piliç refahını iyileştirdiği görülmüştür (Khosravania, 2015). Kettunen vd. (2017), etlik piliç diyetlerine %0.5 düzeyinde reçine asit bileşimi ilavesinin ayak tabanı lezyon skorunu iyileştirdiği ancak altlık kalitesi üzerinde etkili olmadığını bildirmektedir. Hindi diyetlerine İskoç çamı ve Norveç ladininin doğal reçine asitleri ilavesinin 9 ve 15 haftalık yaşta pododermatit insidansını azalttığı, altlık kalitesini ve refahı iyileştirdiği bildirilmektedir (Lipiński vd., 2021). Arpa bazlı diyetlerle beslenen etlik piliç diyetlerine ve/veya altlıklarına humat takviyesi bağırsak viskozitesi, altlık kalitesi ve pododermatit oluşumu üzerinde etkili olmamış ancak pododermatitin varlığı ile piliçlerin ayak tabanı dokusundaki malondialdehit ve süperoksit dismutaz seviyeleri artmıştır (Sevim vd., 2021a). Yüksek yerleşim yoğunluğuna tabi tutulan etlik piliçlerde diyet borik asit ilavesinin altlık pH'ını ve NH₃ buharlaşmasını azaltmakla beraber pododermatitin görülme sıklığı ve şiddeti üzerinde hiçbir etkisi olmadığı bildirilmiştir (Cengiz vd., 2018). Jacquier vd. (2022),

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

500 g/Metrik ton glikan bazlı hassas biyotiğin ilave edildiği diyetlerle beslenen etlik piliçlerin altlık kalitesinde iyileşme, altlık pH'ında ve altlık amonyak konsantrasyonlarında azalmalar aracılığıyla yürüyüş kusuru ve ayak tabanı lezyonu olan piliç oranının azaldığını belirlemişlerdir. Ayrıca iki farklı diyet mısır-SFK bazlı diyet 2 g/kg tanik asit ilavesinin etlik piliçlerde bağırsak viskozitesi ve altlık kalitesi üzerinde bir etkiye sahip olmasa da pododermatit lezyonunun gelişimini engelleyerek şiddetini azalttığı tespit edilmiştir (Cengiz vd., 2017).

İz mineraller deri bütünlüğünde ve yara iyileşmesinde rol oynamaktadır (Chen vd., 2017). Etlik piliç diyetlerine ticari mineral (32:8:32 ppm veya 64:16:64 ppm Zn:Cu:Mn'nin metiyonin hidroksi-analog şelatı) ve Fe, I, Se (40, 1,25, 0,3 ppm) karması ilavesi yalnızca büyüme performansını iyileştirmekle kalmayıp, aynı zamanda kollajen sentezi, birikimi ve organizasyonu, hücre göçü, matris yeniden şekillenmesi, anjiyogenez ve inflamasyonun düzenlenmesi yoluyla yara iyileşme sürecini iyileştirerek ayak tabanı lezyonlarını da azaltmıştır (Chen vd., 2017). Fuhrmann ve Kamphues (2016), piliçlerin diyetlerindeki yağ içeriği ve kaynağı ile kalsiyum ve potasyum seviyelerinin altlık kalitesi ve ayak tabanı sağlığı üzerinde etkili olmadığını bildirmişlerdir. Kronik ısı stresine maruz bırakılan etlik piliçlerin diyetlerine 70 mg/kg Zn ilavesinin altlık kalitesi üzerinde bir etkisi olmadığı ancak ilave Zn'nin ayak pododermatit insidansını azalttığı bildirilmiştir (Kuter vd., 2023). Öte yandan yüksek stok yoğunluğu altında barındırılan etlik piliçlerde artan pododermatit skorunun diyet 2 ilave edilen nano Zn (80 mg/kg) ile 24. günde düştüğünü ancak 42. günde etkilenmediğini bildirmekteyiz (Sevim vd., 2021b). Hajilari vd., 2019, diyetsetel organik Zn ve Cu ilavelerinin etlik piliçlerde pododermatit insidans ve şiddetini inorganik Zn ve Cu ilavelerine göre daha düşük olduğunu kaydetmişlerdir. Fitaz (3,5 g/kg fitat olmayan fosfor ve 1000 FTU/kg fitaz) içeren piliç diyetlerindeki artan Ca (6,0, 7,0, 8,0, 9,0 veya 10,0 g/kg) konsantrasyonlarının pH, nem ve azot içerikleri de dahil olmak üzere altlık kalitesi üzerinde bir etkisinin olmadığı ve diyetdeki Ca konsantrasyonları arttıkça FPD puanının artma eğilimi gösterdiği gözlenmiştir (Kim vd., 2017). Kritik altlık nem içeriğine (%35 su) maruz kalan piliçlerin diyetindeki biyotin takviyesinin ayak taban lezyonlarını %18-30, Zn-metionin ve biyotin kombinasyon takviyesinin ise %30-50 oranında azalmasına yol açtığı rapor edilmiştir. Sunulan sonuçlar, ayak tabanında klinik olarak önemli değişiklikler meydana geldiğinde Zn-metionin ve yüksek biyotin seviyelerinin birleştirilmesinin tavsiye edilebilir olduğunu göstermektedir (Abd El-Wahab vd., 2013a). Beyaz Pekin ördeği diyetlerine biyotin (0,03, 0,06, 0,09, 0,12, 0,15, 0,18, 0,21, 1,5 mg/kg) ilavelerinin etkilerinin incelendiği çalışmada, biyotin eksikliği olan ördeklerin ayaklarında çatlaklar, kanama ve kabuklanma ve ülserasyon gözlemlendiği, artan diyet biyotini ile pododermatit skorunun 17,50'den 1,00'e düştüğü belirlenerek pododermatit insidansını en aza indirmek için ek diyet biyotininin 0,21 mg/kg'dan az olmaması gerektiği sonucuna varılmıştır (Zhu vd., 2012). Ne varki Youssef vd. (2012), günde 8 saat süreyle ıslak altlığa (%27 kuru madde) maruz bırakılan hindi diyetlerine kontrol (300 µg biotin ve 50 mg Zn/kg), yüksek biotin (2000 µg/kg), yüksek Zn (150 mg/kg) veya mannan-oligosakkarit (%1) ilavesinin yapıldığı çalışmada yüksek düzeydeki biyotin veya Zn diyeti, kuru altlıkta pododermatitin şiddetini azaltırken ıslak altlıkta azaltmadığı ancak, mannan-oligosakkarit ilavesinin ayak tabanı lezyonlarının şiddetini ne kuru ne de ıslak altlıkta etkilemediğini bildirmişlerdir. Diyet 2 yüksek düzeyde biyotin veya Zn eklemenin kuru altlıkta pododermatit gelişimini ve şiddetini azaltabileceğini ancak ıslak altlıkta herhangi bir önleyici etkiye sahip olmadığı, yüksek altlık neminin pododermatitin ana faktörü olabileceği ve bu nedenle, hindilerde pododermatitin yaygınlığı ve şiddetini en aza indirmek için altlığın kuru tutulmasının gerektiği rapor edilmiştir. Benzer şekilde Cengiz vd. (2012d) etlik piliçlerde diyet biyotininin (0,05, 0,1, 0,2, 0,4 mg/kg) pododermatit gelişimini önlemede etkili bir araç olmadığını bildirmişlerdir. Ayrıca yavaş büyüyen piliç diyetlerine geleneksel (GDO bazlı) riboflavin (9,6 mg/kg) ilavesinin pododermatit insidansını etkilemediği ancak *Ashbya gossypii* ile fermantasyon yoluyla üretilen doğal riboflavin (9,6 mg/kg) ilavesinin pododermatit sıklığını artırdığı belirlenmiştir (Lambertz vd., 2020).

Enzimler

Enzimlerin diyet katkı maddesi olarak hayvan beslemede kullanımı yaygın bir uygulamadır ve enzimler, yem bileşenlerinin emilimini artırabilir (Hamke, 2022). Enzimler, diyetin sindirilemeyen kısımlarının hayvan tarafından emilebilmesinde ve içeriklerin antinutrisyonel faktörlerinin azaltılmasında önemli bir rol oynar. Enzim takviyesi, diyetlerin besin değerini optimize edebilir, böylece yem maliyetini

düşürebilir, hayvanların büyüme performansını iyileştirebilir ve çevre kirliliğini azaltabilir (Goes vd., 2022). Endüstriyel kanatlı yetiştiriciliğinde gıda güvenliği, refah ve ekonomik anlamda endişe kaynağı olan pododermatit insidansını düşürmek amacıyla da rasyonlarda çeşitli enzim katkıları kullanılarak NOP'lar daha küçük moleküllere parçalanır. Özellikle suda çözünen NOP'lar dışkı viskozitesini ve nemini artırır (Hamke, 2022). Selülaz, ksilanaz, galaktosidaz, amilaz ve proteaz gibi NOP hidrolize eden enzimlerin eklenmesi daha kuru ve daha az viskoz dışkıya yol açabilir (Swiatkiewicz vd., 2017). Bağırsak viskozite artışı önlenerek bağırsaklardan besin maddelerinin emilimi kolaylaşır (Choct, 1997). Önceki çalışmalar, piliç diyetlerine enzim takviyesi yapılmasının hastalık insidansını düşürdüğünü göstermiştir (Park ve Sun, 2022; Daneshmand vd., 2023; Goes vd., 2022). Enzimlerin altlık nemini nasıl etkilediğinin kesin mekanizması tam olarak anlaşılmamıştır, ancak piliçlerde NOP parçalayıcı enzimler tarafından su alımının azaltılmasına dayanarak bir etki şekli öne sürülmüştür. Viskoz tahıl bazlı diyetler, bağırsak viskozitesini artırdığı için lümenenden elektrolit emilimini azaltır, su emilimini düşürür ve su tüketimini artırır, bu da ıslak altlığa yol açar. Bunun aksine NOP'yi parçalayan enzimlerin eklenmesi sindirimin viskozitesini ve su alımını azaltır, bunun sonucunda altlık nemi azalır ve kuşların ayak taban dermatiti azalır (Daneshmand vd., 2023).

Enzim takviyesinin (%0,06) altlık toplam N ve NH₃ üretim seviyeleri üzerinde çok az etkisi olduğu ancak bağırsak içeriği viskozitesini ve pododermatit şiddetini azalttığı belirlenmiştir (Nagaraj vd., 2007b). Bu çalışmanın sonuçları, daha sonraki birkaç çalışmada gözlemlenen sonuçları doğrulamaktadır. Hindi palazlarında β-glukanaz, selülaz, α-amilaz, proteaz ve ksilanaz enzim karışımları içeren ticari yem tüketimi daha iyi altlık kalitesi ve daha sağlıklı ayaklarla sonuçlanmıştır (Tony vd., 2013). Diyet ksilanaz, amilaz ve proteaz enzim kombinasyonu ile birlikte 75.000 CFU/g *Bacillus* suşu ilavesi piliçlerin ayak tabanı lezyon skorunu azaltmıştır (Flores vd., 2016). β-mannanla zenginleştirilmiş diyetlerin β-mannanaz ile desteklenmesi pododermatitin şiddetini azaltmaya olumlu katkıda bulunmuştur (Chuppava vd., 2022). Diyet metallo-proteaz (%0,1 ve %0,2) ve *Bacillus velezensis* CE 100 (%0,5 ve %1,0) ilaveleri ile altlık nem içeriği, kümes (CH₃)₂S emisyonu, pododermatit skoru ve prevalansının tüm uygulamalarda azalıp, altlık kalite skorunun ise artış gösterdiği literatürde diyet metallo-proteazı ve *B. velezensis* CE 100'ün etlik piliçlerin refahını iyileştirme potansiyeline sahip olduğu düşünülmektedir (Park ve Sun, 2022). Ksilanaz ve glukanaz kombinasyonlarının diyet eklenmesi *Eimeria* ile mücadele edilen piliçlerde altlık kalitesini iyileştirip FPD insidansını düşürmüştür (Daneshmand vd., 2023). Etlik piliçlerin diyetlerine mikrobiyal muramidaz (lizozim) enzim ilavesinin ayak tabanı dermatitini azaltarak piliçlerin büyüme performansını iyileştirdiği bildirilmiştir (Goes vd., 2022). Viñado vd. (2024), 500 ppm enzim (α-galaktosidaz ve ksilanaz içeren enzim preparatının) ile desteklenmiş diyetle beslenen piliçlerin pododermatit skorunun, ME ve ham protein düzeyi %4 oranında azaltılmış diyetle beslenen piliçlerden daha düşük bir değer gösterme eğiliminde olduğunu bildirmişlerdir. Piliç diyetlerine enzim (%0,1) ilavesiyle performansın önemli ölçüde iyileştiği ve bu nedenle, yönetim faktörlerinin piliçlerde pododermatit etiolojisinde önemli bir rol oynadığı kanaatine varılmıştır (Cengiz vd., 2012a). Öte yandan mısır-SFK'ya dayalı diyet enzim takviyesinin hem pododermatit insidansı ve şiddeti üzerinde bir etkisinin olmadığını hem de dışkı viskozitesi ile pododermatit arasında bir ilişkinin olmadığını bildiren Cengiz vd. (2012b), bu durumu pododermatitin multifaktöriyel etiolojisine atfetmişlerdir. Buğday ve SFK'ya dayalı diyet 0.025, 0.050 ve 0.250 g/kg kadar karbohidraz enzim kompleksi (endo-1,4-β-ksilanaz ve endo-1,3(4)-β-glukanaz) ilavesinin etkilerinin incelendiği çalışmada 0.025 g/kg enzim ilavesinin ince bağırsakta sindirilen maddenin viskozitesinde önemli bir azalmaya ve pododermatit puanlarında önemli bir iyileşmeye neden olduğu ancak daha yüksek karbohidraz enzim ilavelerinde pododermatit puanının kötü olduğu ve dışkı ile altlığın kuru madde içeriği açısından gruplar arasında hiçbir iyileşme gözlenmedi belirlenmiştir. Çalışmada ayak tabanı sağlığı üzerindeki düşük pozitif etkiler muhtemelen deneme diyetlerdeki düşük NOP içeriğiyle ilişkilendirilmiştir (Kölln vd., 2017).

Elektrolit Dengesizlikleri

Fazla miktarda tuz alınması su tüketimini, su atılımını ve altlık nemini önemli ölçüde artıran bir faktördür (Shepherd ve Fairchild, 2010). Yüksek Na⁺ veya K⁺'nin neden olduğu rasyon elektrolit dengesindeki bozulmalar ve bunların altlık kalitesi üzerindeki olumsuz etkilerinin de ciddi şekilde dikkate alınması gerektiği bildirilmektedir (Cerrate vd., 2006). Altlık kalitesinin bozulması sindirim

sistemi bozukluklarına dolayısıyla da ağırlık kazancının azalmasına, ayak hastalıklarına, göğüs eti kalitesinin düşmesine, metabolik hastalıklara kadar pek çok soruna yol açabilir (Bilgili ve ark., 2009; Henz vd., 2014; Papadomichelakis vd., 2015; Škrbić vd., 2012; Swiatkiewicz vd., 2017). Rasyon elektrolit dengesi özellikle dışkı nem oranını etkilemektedir. Rasyonda Na, K, Mg gibi minerallerin yüksek oranda bulunması su tüketimini ve buna bağlı olarak da altlık nem oranını arttırmaktadır (van der Hoeven-Hangoor vd., 2014; Jeon vd., 2020). Harms ve Simpson (1982), diyet tuz içeriğinin ayak tabanı lezyonlarının şiddeti üzerinde doğrudan bir etkiye sahip olduğunu ve dermatitin daha yüksek tuz seviyelerinde daha şiddetli olduğunu bildirmektedir. Yüksek tuz içeren diyetlerle beslenen kanatlı dışkıların daha fazla nem içerdiği ve bunun da kötü altlık koşullarıyla sonuçlandığı bilinmektedir. Cengiz vd. (2012c), Na seviyelerinin (%0,15, 0,20, 0,25 ve 0,30 Na) etlik piliçlerde pododermatit gelişimine etkilerini araştırmak için yürüttükleri çalışmada yüksek Na alımının su tüketimi ve altlık nemini artırdığı için piliçlerde pododermatit gelişiminin doğrudan tetikleyicisi olduğunu doğrulayarak etlik piliçlerde diyet Na düzeyinin %0,25'in üzerinde olmasının pododermatit insidansını arttırdığını bildirmişlerdir. Yine Lichtorowicz vd. (2012), Na eksikliği olan bir diyet orta düzeyde Na takviyesinin (0,5 g/kg) genç hindilerin pododermatit sıklığını artırmadığını ancak deneysel diyetlerdeki sodyum içeriğinin daha fazla artırılmasının (1,0, 1,5, 2,0 ve 2,5 g/kg) altlık neminin artmasıyla ilişkili olmayan pododermatit oluşumunu artırdığını bildirmişlerdir. Hindî civcivi diyetlerine normal seviyede (1,60 g Na; 7,80 K g/kg diyet) ve yüksek seviyede (3,10 g/kg Na; 15,3 K g/kg diyet) elektrolit verildiğinde yüksek diyet elektrolitlerinin pododermatit şiddetini önemli ölçüde artırdığı gözlemlenmiştir (Abd El-Wahab vd., 2013b). Ayrıca, bazı mineraller (Na, K, Cl) su tüketimini uyarırken, diğerlerinin (Zn, Cu, Mn) eksikliği epitel doku gelişimini etkiler ve böylece pododermatiti tetikleyebilir (Tóth vd., 2023).

SONUÇ

Pododermatitin neden olduğu lezyonlar, hayvan refahı, gıda güvenliği ve ürün miktar ve kalitesinin azalması sorunlarının bir nedeni olarak başta etlik piliçler olmak üzere kümes hayvanı endüstrisi için bir endişe kaynağıdır. Ayak taban lezyonları mevsim, genotip, cinsiyet gibi ikincil faktörlerin yanı sıra esasen altlık ve beslenme olmak üzere iki ana faktörden etkilenmektedir. Altlık türü, altlığın kalınlığı, mevsim, yerleşim sıklığı, sürü sağlığı, tesisin yalıtım, havalandırma, yemleme ve sulama sistemleri altlığın kalitesi ve nemini etkileyerek pododermatit prevalansını belirlemektedir. Bu çalışmada, diyetin pododermatit oluşumu üzerindeki etkisi değerlendirilmiş ve beslenme stratejilerinin hastalığın önlenmesinde etkili olabileceği vurgulanmıştır. Özellikle biyotin, riboflavin, metiyonin gibi bazı besin maddelerinin yeterli düzeyde sağlanması, deri bütünlüğünü ve bağışıklık sistemini destekleyerek lezyon gelişimini azaltabilir. Ayrıca, diyetin ham protein düzeyi ve kaynağı, lif kompozisyonu ve enzim takviyeleri ile elektrolit dengesinin altlık kalitesi üzerindeki etkisi de göz ardı edilmemelidir. Yüksek proteinli diyetler, amonyak seviyesini artırarak pododermatit riskini yükseltebilirken, dengeli yem formülasyonları ve uygun mineral takviyeleri, ayak sağlığını koruyucu bir etki gösterebilir. Bu bağlamda, kanatlı beslemede optimal yem içeriğinin belirlenmesi, altlık neminin kontrol altına alınması ve çevresel yönetimle desteklenen bütüncül bir yaklaşımla pododermatit riski minimize edilebilir. Gelecekte yapılacak çalışmalar, farklı yem bileşenlerinin pododermatit üzerindeki etkisini daha ayrıntılı inceleyerek, daha etkili beslenme stratejilerinin geliştirilmesine katkı sağlayabilir.

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INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

KÜLTÜRLER ARASI İLETİŞİM VE HALKLA İLİŞKİLER INTERCULTURAL COMMUNICATION AND PUBLIC RELATIONS

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ÖZET

Bireysel ve toplumsal düzeyde iletişim her dönemde büyük önem taşımıştır. Ancak bilişim teknolojilerinde yaşanan hızlı gelişme ve dönüşüm ile günümüzde iletişim daha da önemli hale gelmiştir. Her türlü haber ve bilginin çok hızlı bir şekilde yayıldığı bu dönemde farklı kültürlerin birbirleriyle karşılaşması ve iletişim konusunda birtakım problemler yaşaması kaçınılmazdır. Bu çalışmada kültürler arası iletişimde halkla ilişkiler uygulamalarının nasıl bir etkisinin olduğu ve iletişimin hangi boyutlarda gerçekleştirilmesi gerektiği araştırılmış, konunun güncel yaklaşımlar çerçevesinde değerlendirilmesi amaçlanmıştır.

Derleme niteliğinde olan bu çalışmada konuya ilişkin literatür çalışmaları incelenerek araştırmacıların konuya bakış açıları ve elde ettikleri sonuçlar değerlendirilmeye çalışılmıştır.

Bu değerlendirmeler sonucunda ulaşılan sonuçlara göre; günümüzün küreselleşen dünyasında sınırların giderek ortadan kalkması, iletişim teknolojilerindeki gelişmelerle birlikte dünyanın dört bir yanında olup bitenlerden kolayca haberdar olunması, turizm faaliyetleri, öğrenci değişim projeleri, iş gücü göçü, bilimsel etkinlikler, yasa dışı göçler, çok uluslu şirketler gibi birçok faktör ülkeleri ve kültürleri birbirine yaklaştırmış ve kültürler arası iletişim çalışmalarını zorunlu hale getirmiştir. Kültürler arası iletişim genel anlamda farklı kültürlere sahip birey ya da gruplar arasında gerçekleşen iletişim faaliyetleri şeklinde tanımlanmakta olup çeşitli etnik kimliğe sahip grup, ulus veya ülkeler arasındaki iletişim faaliyetleri kültürler arası iletişim çalışmaları kapsamında değerlendirilir. Kültürler arası iletişim bağlamında halkla ilişkiler ve uluslararası halkla ilişkiler gündeme gelmektedir. Kurumların halkla ilişkiler politikaları genel olarak merkezi özellikte planlanmakla birlikte gerektiğinde uluslararası düzeyde kullanılabilecek şekilde hazırlanır. Ancak bu plan uygulamaya geçirilirken kendi ülkesinde çok başarılı sonuçlara ulaşılırken farklı bir ülkede aynı başarılı sonuç elde edilemeyebilir. Bu konuda başarıyı elde etmek için kurumların halkla ilişkiler uygulamalarını uluslararası halkla ilişkiler ve kültürler arası iletişim çerçevesinde planlaması gerekir.

Anahtar kelimeler: kültür, iletişim, kültürler arası iletişim, halkla ilişkiler, uluslararası halkla ilişkiler.

ABSTRACT

Communication at individual and social levels has always been of great importance. However, with the rapid development and transformation experienced in information technologies, communication has become even more important today. In this period when all kinds of news and information are spread very quickly, it is inevitable for different cultures to encounter each other and experience some problems in communication. This study investigates the effect of public relations practices in intercultural communication and the dimensions in which communication should be carried out, and aims to evaluate the subject within the framework of current approaches.

In this compilation study, the literature studies on the subject were examined and the perspectives of the researchers on the subject and the results they obtained were evaluated.

According to the results reached as a result of these evaluations; In today's globalizing world, the gradual disappearance of borders, easy access to information about what is happening around the world with the

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

developments in communication technologies, tourism activities, student exchange projects, labor migration, scientific activities, illegal migration, multinational companies, many factors such as have brought countries and cultures closer to each other and made intercultural communication studies mandatory. Intercultural communication is generally defined as communication activities that occur between individuals or groups with different cultures, and communication activities between groups, nations or countries with various ethnic identities are evaluated within the scope of intercultural communication studies. In the context of intercultural communication, public relations and international public relations come to the fore. Public relations policies of institutions are generally planned centrally, but they are prepared in a way that can be used at an international level when necessary. However, while this plan is put into practice, very successful results can be achieved in one's own country, the same successful results may not be achieved in a different country. In order to achieve success in this regard, institutions need to plan their public relations practices within the framework of international public relations and intercultural communication.

Keywords: culture, communication, intercultural communication, public relations, international public relations.

GİRİŞ

Halkla ilişkiler kavramı stratejik bir iletişim yönetimini içermekte olup kurumlar ve hedef kitleleri arasındaki diyalogu güçlendirmek, karşılıklı yarar sağlamak, iyi niyet ve güven tesis etmek ve bunu sürdürmek için gerekli fonksiyonları içermektedir. Günümüzün modern dünyasında gerek özel sektör kuruluşları gerek kamu kuruluşları ve sivil toplum kuruluşları çalışmalarında başarı elde etmek için halkla ilişkiler çalışmalarına ihtiyaç duymaktadır. Günümüzde devletlerin toplumsal yapısında giderek daha heterojen bir yapıya ve çok kültürlülüğe doğru bir değişim ve dönüşüm yaşanmaktadır. Bu değişim ve dönüşüm sürecinde kültürler arası iletişim kavramı bilinçli bir yaklaşımla ele alınması gereken bir değerdir. Özellikle küreselleşmeyle birlikte sınırların ortadan kalkması, çok uluslu şirketlerin sayısının artması, ülkeler arasında eğitim ve çalışma amaçlı göç olaylarının yaygınlaşması, turizm faaliyetlerindeki gelişmeler, farklı uluslarla yapılan evlilikler, yasal veya illegal olarak gerçekleştirilen göçler, kültürler arası bir iletişim çalışmasını ve beraberinde uluslararası halkla ilişkiler faaliyetlerini gerektirmektedir.

Kültürler arası iletişim çalışmalarının temel amacı farklı uluslara ait kültürler arasında veya aynı ulus içinde yer alan farklı etnik kimliklere sahip alt kültürler ile egemen kültür arasındaki iletişimi sağlayarak bireylerin kültürlerarası yeterlilik kazanmasında yardımcı olmaktır. Böylece farklı kültürler arasında anlaşma ve uzlaşımın sağlanması yoluyla gerek kurumsal gerek ulusal ve evrensel düzeyde iletişim sağlanarak daha mutlu ve barışçıl ortamların oluşturulması amaçlanmaktadır.

KÜLTÜRLER ARASI İLETİŞİM VE HALKLA İLİŞKİLER

İletişim kavramı duygu ve düşünceleri paylaşabilmek, bunları karşılıklı olarak aktarabilmek böylece anlama ve anlaşmayı sağlamak, diğer bir deyişle bireyler arasındaki anlamları ortak kılma sürecidir.

Çok boyutlu bir süreç olan iletişim kavramı bireylerin duygu ve düşüncelerini başka bireylere aktarma süreci şeklinde ifade edilir (Ersoy Çelik, 2020: 16).

Halkla ilişkiler, bir kurum ve hedef kitleleri arasında karşılıklı iletişim, anlayış, kabul ve iş birliği kurma, sürdürme çalışmalarına yardımcı olan bir yönetim fonksiyonudur. Kültürler arası iletişim bağlamında uluslararası halkla ilişkiler devreye girmektedir.

Uluslararası halkla ilişkiler uygulamaları çok boyutlu işlemlere sahip olup yurtiçinde ve yurt dışında uluslararası düzeyde ilişki kurmada önemli bir rol oynamaktadır. Küreselleşen dünyada özellikle çok uluslu şirketlerin ve ülkelerin dış politikalarının belirlenmesinde uluslararası halkla ilişkiler uygulamalarını bilmek, çalışmalara bu çerçevede yaklaşmak başarılı bir halkla ilişkiler uygulaması için önemlidir.

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

Latince kökenli ‘colere’ kelimesinden türetilen kültür kavramı; ekin, bakım gibi çeşitli anlamlara gelmektedir. Kültür insanoğlunun doğadan kendiliğinden elde ettiklerinin yanında kendi çabası ile ortaya koyduğu her türlü maddi ve manevi unsuru da ifade etmektedir. Toplumların bir arada olmalarına katkı sağlayan kültür kavramı aynı zamanda toplumlar arasındaki farklılaşmanın da temelini oluşturur (Uçar İlbuğa, 2013: 9-10). Gelenek ve göreneklerin devam ettirilmesi yoluyla yaşatılan kültür kavramı, adetleri ortaya çıkaran, yeni adetler üreten böylece toplumsal devamlılığı sağlayan ve geçmişten geleceğe miras kalan değerleri ifade etmektedir (Ersoy Çelik, 2020:5).

Kültürler arası iletişim çalışmalarında kültürü, toplumun, tutum, davranış, değer yargıları, sahip olduğu ilkeler, dünyaya bakış açısı, kabulleri ve tavırlarının tamamı olarak nitelenmek mümkündür (Uçar İlbuğa, 2013: 12).

Kültürlerarası iletişimde farklı kültürlerle sahip bireylerin iletişim ve etkileşim kurmaları, yabancıları algılama biçimleri ve kültürel farklılıkların incelenmesi söz konusudur. Kültürler arası iletişim; değerler ve normlar, toplumsal senaryolar ve roller, etnomerkezcilik, belirsizlik, kaygı, kalıplaşmış düşünceler ve ön yargılardan etkilenen bir yapıya sahiptir (Ersoy Çelik, 2020: 16-17).

Çeşitli kültürel özelliklere sahip bireylerin birbirini etkilemesi durumu olarak da tanımlanabilen kültürler arası iletişim günümüzde ülkelerin farklı milletlerden oluşan heterojen bir nüfus yapısına sahip olması nedeniyle uluslararası alanda önemli bir tartışma konusu haline gelmiştir. Son yıllarda şirketlerin uluslararası boyutta gelişmesi, iş gücü göçü, öğrenci değişim projeleri, turizm faaliyetleri, bilimsel çalışmalar gibi birçok sebebe bağlı olarak ülkeler arası nüfus değişimi ve etkileşim yoğun olarak yaşanmakta bu da kültürlerarası iletişim çalışmalarına duyulan ilginin artmasına sebep olmaktadır (Uçar İlbuğa, 2013: 13).

Kültürler arası iletişim, farklı kültürler arasında veya aynı kültür içinde olmakla birlikte farklı alt kültürleri yaşayan bireyler arasında kurulan iletişim anlamına gelir. Temelinde hoşgörü, anlayış ve diyalog bulunan kültürler arası iletişimde farklı kültürlerle sahip bireylerin birbirini anlayıp iletişim kurabilmeleri ve evrensel barışa katkı sağlamları hedeflenmektedir (Özdemir, 2011: 37; Altunbey ve Yağbasan, 2020: 3). Kültürler arası iletişim, farklı kültürler ya da alt kültürlerle sahip bireyler arasında gerçekleştirilen iletişim şeklinde tanımlanır. Bu bağlamda kültürler arası iletişimde hem farklı toplumlar arasındaki iletişim hem de aynı toplumda yer alan alt kültürler arasındaki iletişim ele alınır. Farklı kültürlerden gelen bireylerin birbirlerinin kültürleri konusunda sahip olduğu bilginin azlığı ya da çokluğu kültürler arası iletişimin üzerinde oldukça etkilidir (Varol,2013: 4). Konuya ilişkin literatüre göre kültürler arası iletişim üzerinde etkili olan temel unsurlar, değerler ve normlar, basma kalıp düşünce yapıları, önyargılar, ırkçılık ve yabancı düşmanlığı, etnomerkezcilik, belirsizlik ve kaygı durumları olarak belirlenmiştir (Bitirim Okmeydan, 2019:102).

Kültürel yönden farklı özellikler taşıyan birey ve grupların ortak bir çevrenin parçası haline gelerek etkileşim içine girmeleri durumu kültürel iletişimi ortaya çıkarmaktadır (Ölçekçi, 2020: 15). Kültürler arası iletişimi değerlendirebilmek için iki ya da daha çok kültür arasında gerçekleşen diyalog veya çatışma, tarafların kültürleri ve topluluklar arasındaki iletişim biçimini gözlemlemek gerekir (Timcheva ve Özer, 2021: 29).

Kültürler arası iletişimde kültür ve iletişim kavramları temel kavramlardır. Kültür; bir toplumda yer alan çeşitli maddi ve manevi özellikleri, buna bağlı gelişen ilişkileri, toplumda yer alan farklı grupların farklılığını oluşturan ve kuşaktan kuşağa aktarılan; alışkanlık, gelenek ve görenekleri, yaşam pratiklerini kapsar. Bireylerin içinde yer aldığı toplumun bir parçası olarak çevresiyle iletişim kurmasında, çeşitli davranış ve olayları yorumlayıp değerlendirmesinde kültürün önemli bir etkisi vardır (Özdemir, 2011: 29; Bitirim Okmeydan, 2019: 94; Ölçekçi, 2020: 8- 9).

İletişim kavramı ise birey ve toplumun kültür ile varoluşsal ilişkisinde aktif bir role sahip olup duygu ve düşünceleri paylaşabilmek, bunları karşılıklı olarak aktarabilmek böylece anlama ve anlaşmayı sağlamayı amaçlayan etkileşim, diğer bir deyişle iki birey arasındaki anlamları ortak kılma sürecidir (Ölçekçi, 2020: 11; Ertekin, 2016: 29).

Bireylerin diğer insanlarla başarılı bir iletişim kurabilmeleri için kültürler arası iletişim becerisine sahip olması gerekmektedir. Bireyler arası ilişkilerde farklı kültürler, farklı ülkeler, farklı cinsiyet, farklı etnik

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

yapı birtakım kültürel farklılıkları beraberinde getirir. Kültürler arası iletişim becerisi bu farklılıkların tolere edilerek iletişimin taraflar arasında olumlu bir şekilde gelişmesine katkı sağlar (Uçar İlbuğa, 2013: 19).

Halkla İlişkiler ve Uluslararası Halkla İlişkiler: Halkla ilişkiler, bir kurum ve hedef kitleleri arasında karşılıklı iletişim, anlayış, kabul ve iş birliği kurma, sürdürme çalışmalarına yardımcı olan bir yönetim fonksiyonudur (Ertekin, 2016: 29).

Türkiye Halkla İlişkiler Danışmanları Derneği, halkla ilişkiler kavramını şöyle tanımlamıştır: halkla ilişkiler kamu ve özel sektör kuruluşlarının faaliyetlerinin onların adına tanıtılması, açıklanıp geliştirilmesi amacıyla kamuoyunun ve çeşitli toplumsal kesimlerin bilgilendirilerek ve onlardan gelen tepkilerin değerlendirilmesi amacıyla gerçekleştirilen planlı iletişim çalışmalarının tamamıdır. Halkla ilişkiler uygulayıcıları konuya ilişkin çalışmalarını yürütürken toplumsal çıkarlara ve bireylerin değer yargılarına kişisel özgürlüklerine saygı duymak, hedef kitesine ve medya unsurlarına karşı dürüst ve açık davranmaktan sorumlu olup çalışmalarını gerçekleştirirken; müşteriye veya işverene, medyaya, topluma ve meslektaşlarına karşı sorumluluk taşıma ilkelerine uymakla yükümlüdür (IPRA Altın Kitap-1, 1998; Ergin Çağatay, 2024: 108).

Uluslararası halkla ilişkiler, “*coğrafi, dilsel veya kültürel boşluklar arasında köprü kurarak karşılıklı anlayışı tesis etmeye yönelik planlı çabaların bütünü*” şeklinde tanımlanabilir (Black, 1995:151, 153). Kurumlar eşgüdümü sağlamak amacıyla halkla ilişkiler politikalarını merkezi bir yapıda planlar. Fakat burada göz önünde bulundurulması gereken durum planlandığı ülkede oldukça başarılı sonuçlara götüren bir halkla ilişkiler planı başka ülkelerde aynı başarılı sonuca ulaştırmayabilir. Bu konuda etkin bir sonuç elde etmek için halkla ilişkiler uygulamalarını planlarken uluslararası halkla ilişkiler çerçevesinde planlamak ve kültürler arası farklılıkları göz önünde bulundurmak olumlu bir yaklaşımdır (Ergin Çağatay, 2024: 136-137).

Uluslararası halkla ilişkiler çalışmalarının halkla ilişkiler çalışmaları ile birçok ortak paydası bulunmaktadır. Ancak farklı coğrafyalarda, farklı dil ve kültürel unsurları göz önünde bulundurarak farklı toplumlar için yapılan faaliyetleri içeren uluslararası halkla ilişkiler çalışmaları diğer halkla ilişkiler çalışmalarına göre içinde yönetsel olarak en fazla zorluk barındıran özelliكتedir. Günümüzde kuruluşlar ekonomik anlamda daha fazla küreselleşme sürecine katılırken, iletişim de gün geçtikçe uluslararası bir düzeye taşınmaktadır. Bu durumda halkla ilişkiler uygulayıcıları da çalışmalarını daha küresel boyutta düşünmeli, uluslararası halkla ilişkiler faaliyetlerinin içinde barındırdığı riskleri, toplumların kültürel yapılarını göz önünde bulundurarak gerçekleştirmelidir (Yıldırım, 2015: 53,72; Ergin Çağatay, 2024: 137). Özellikle dil farklılıkları ve dilin kullanımından kaynaklanan farklılıklar kültürler arası çatışmalara yol açabileceğinden uluslararası halkla ilişkiler faaliyeti gösteren uygulayıcıların bu konuda hassas ve dikkatli olmaları gerekmektedir. Çünkü bireylerin kullandıkları dil onların düşünme ve anlama, çevresini algılama özellikleri üzerinde rol oynayan en temel etkenlerden birisidir (Bitirim Okmeydan, 2019: 113).

Uluslararası halkla ilişkiler; kültürler arası bir nitelik taşımakta olup her ulusun uluslararası gelişimi, öncelik verilen hedef kitleleri, yasal, siyasal, tarihsel süreçleri farklı olduğundan uluslararası halkla ilişkiler çalışmalarını farklı boyutta etkiler. Bunun için halkla ilişkiler uygulayıcıları çalışmayı gerçekleştirdikleri ülkenin içinde barındırdığı kültürel unsurları da göz önünde bulundurarak uluslararası halkla ilişkiler çalışmalarına yön vermek durumundadır (Yıldırım Becerikli, 2005:1; Bitirim Okmeydan, 2019: 118; Ergin Çağatay, 2024: 137).

Bilgi teknolojilerindeki gelişmeler ve küreselleşmeye bağlı olarak şirketlerin çok uluslu ve çok kültürlü Yapılar haline gelmesi yaygınlaşmıştır. Bu durum uluslararası halkla ilişkiler çalışmalarının giderek artan bir yoğunluk kazanmasına yol açmıştır (Bitirim Okmeydan, 2019: 113).

Uluslararası halkla ilişkiler alanında çalışan halkla ilişkiler uygulayıcıları çalışmalarında kültürel farklılıkları gözetenek sözsüz iletişim unsurlarından mimik ve jestlerin farklı anlamları konusunda bilgi sahibi olmak, doğru medyayı ve doğru dili kullanmak gibi temel özellikleri göz önünde bulundurmak, kısacası küresel düşünüp yerel davranmak durumundadır (Black, 1995: 154-155; Ergin Çağatay, 2024: 137).

INTERNATIONAL TEXAS CONGRESS ON ADVANCED SCIENTIFIC RESEARCH AND INNOVATION-II

Uluslararası halkla ilişkiler uygulamaları çok faktörlü çeşitli etmenlerden etkilenmektedir. Günümüzün küreselleşen dünyasında giderek heterojen bir nüfus yapısına sahip olan dünya ülkelerinde özellikle çok uluslu şirketlerin ve ülkelerin dış politikalarının belirlenmesinde uluslararası halkla ilişkiler uygulamaları büyük önem taşımaktadır. Bu konuda önemli bir rol üstlenen halkla ilişkiler uygulayıcılarının dünya genelinde kültürler arası iletişimin sağlanması, demokrasi ve toplumsal gelişime katkı sunulması için çalışmalarında uluslararası halkla ilişkiler konusunu dikkatle ele almak durumundadır (Ergin Çağatay, 2024: 138).

Uluslararası halkla ilişkiler çalışmalarında başarıya ulaşabilmek ve etkili bir kültürler arası iletişim gerçekleştirebilmek için kültürler arası iletişim kavramının tam olarak anlaşılması, farklı özellik taşıyan kültürler arasında istenen etkileşimi kurabilmek için kültürler arası iletişim disiplininin nasıl faydalanacağına bilinmesi gerekir. Kültürler arası iletişim konusunda engel teşkil eden değerler ve normlar, basma kalıp düşünceler, önyargılar, ırkçılık, yabancı düşmanlığı gibi başlıca unsurların doğru bir şekilde anlaşılıp yorumlanması önemlidir (Bitirim Okmeydan, 2019: 118).

SONUÇ VE TARTIŞMA

Toplumları etkileyip şekillendirme ve yine toplum tarafından oluşturulma özelliğine sahip olan kültür kavramı kuşaktan kuşağa nakledilen yaşama dair bütün soyut ve somut unsurları içine alır. Kültür geçmişi geleceğe aktarmasına rağmen dinamik ve değişken bir özellik taşır.

Kültürler arası iletişimde temel amaç; bireyleri diğer bireyler ve kültürleri konusunda basmakalıp düşünce ve önyargılardan kurtararak, ırkçılık ve etnik ayrımcılık yaklaşımlarının önüne geçmek, yerel ve etnik gruplara ait kültürel unsurların dünya üzerindeki diğer kültürlerle bütünleşmesini sağlamaktır. İnsan hakları, eşitlik, demokrasi kavramları ile yakından ilişkili olan kültürler arası iletişimi gerçekleştirmede halkla ilişkiler faaliyetlerinin bilhassa uluslararası halkla ilişkiler çalışmalarının önemli etkisi vardır.

Günümüzün küreselleşen dünyasında çeşitli sebeplerle sınırların ortadan kalkması, ülkelerin daha fazla iletişim ve etkileşim içinde bulunmaları, uluslararası şirketlerin faaliyetlerinin tüm dünyaya yayılması gibi etmenler kültürler arasında iletişim çalışmalarının dikkatle üzerinde durulmasını zorunlu kılmaktadır. Sağlıklı bir kültürler arası iletişimin gerçekleşmesinde öncelikle farklı ulusların kültür yapılarının incelenerek hedeflenen iletişim çalışmalarının bu doğrultuda planlanması önemli bir yaklaşımdır. Bu alanda faaliyet gerçekleştirecek olan kurum ve kuruluşların halkla ilişkiler çalışmalarına önem verip bu çalışmaları özellikle uluslararası halkla ilişkiler boyutunda ele almaları gerekir. Halkla ilişkiler çalışmalarının planlanmasında farklı kültür yapılarının göz önünde bulundurulması da çalışmaların başarıya ulaşmasında önemli bir unsurdur.

Çalışma kapsamında ele alınan konuya ilişkin çalışmalar değerlendirildiğinde kültürler arası iletişimin, diğer birey ve toplumların kültürlerine ilişkin basma kalıp düşüncelerden, önyargı ve ayrımcı yaklaşımlardan kurtulmak, yerel ve etnik grupların kültürel özelliklerinin benimsenerek temel kültürlerle bütünleşmesini sağlamak, bunu yaparken insan hakları, eşitlik, demokrasi gibi önemli kavramların yerleşmesine ve gelişmesine katkı sağlamada bilinçli bir şekilde gerçekleştirilen kültürler arası iletişim çalışmalarının katkısının oldukça önemli olduğu sonucuna ulaşılmıştır.

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BAZI HALOFİLİK MİKROORGANİZMALARIN TUZLULUK STRESİNDEKİ YONCADA (*MEDİCAGO SATİVA*) BAZI METABOLİK VE ANTIOKSİDAN PARAMETRELER ÜZERİNE ETKİLERİNİN BELİRLENMESİ

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GİRİŞ

Tuzluluk, kuraklık, yüksek sıcaklık, düşük sıcaklık, UV gibi abiyotik stres faktörleri bitkilerin büyümesini, gelişimini ve üretkenliğini olumsuz yönde etkilemektedir. Bu gibi çevresel stres faktörleri arasında tarımsal verimliliği etkileyen en önemli problemlerden biri tuzluluk stresidir. Dünya’da, özellikle bitkisel üretimi önemli ölçüde sınırlayan tuzluluk stresinin 2050 yıllarında ekilebilir tarımsal alanları için ciddi sorunlar oluşturabileceği tahmin edilmektedir (Rizwan et al., 2015). Tuzluluk stresinin bitkiler üzerindeki olumsuz etkisinin azaltılmasında kısa zamanda ve kolay uygulanabilir, maliyeti düşük çözüm yollarının bulunması son zamanlarda oldukça önem kazanmıştır. Çeşitli araştırmalarda bitki gelişimini teşvik eden bakteri uygulamalarının (PGPB) bitkilerde tuzluluk stresine karşı tolerans kazandırmada etkili olabileceğini bildirilmektedir (Coleman-Derr ve Tringe, 2014; Naveed ve ark., 2014; Sarma ve Saikia, 2014). PGPB, (Plant Growth Promoting Bacteria) uygulamalarının bitkilere farklı uygulama metotları kullanılarak uygulanması ile bitki ve bakteri arasında karşılıklı bir etkileşim oluşturmaktadır. Özellikle bitki kök bölgesinin % 7-15 gibi bir kısmını teşkil eden rizosfer bölgesinde yaşayan bakteriler (Pinton ve ark., 2001) bu bölgede salgılanan çeşitli aminoasit ve şekerleri zengin enerji ve besin kaynağı olarak kullanmakta ve bu bölgeden sızan karbon (C) ve azot (N) kaynaklarından faydalanmaktadır. Bitkide göstermiş oldukları bu gibi etkileşimler, bitki rizosfer bölgesinde rekabetçi bir ortam oluşturarak bitki gelişimini uyarmakta, ayrıca biyokontrol sağlayarak faydalı bir etki göstermektedir (Bhattacharyya ve Jha, 2012). Bunun yanı sıra PGP aktivitelerine sahip halofilik ve halotolerant mikroorganizmaların tuzluluk stresinde bitkide morfolojik, fizyolojik ve hücresel düzeyde etki mekanizması ile ilgili çalışmalara ihtiyaç bulunmaktadır. Bu nedenle çalışmamızda; tuzlu ortamlardan izole edilen 3 halofilik bakteri türü; ile 3 halofilik arkenin yonca (*Medicago sativa*) da tuzluluk stresinde metabolik parametreler ile antioksidan parametreler üzerine etkileri tespit edilerek bitkinin gelişimine iyileştirici etkilerinin belirlenmesi hedeflenmiştir.

Materyal ve Yöntem

Çalışmada; 3 halofilik bakteri türü (*Salicola marasensis*, *Halobacillus trueperi*, *Salinicoccus amylolyticus*) ile 3 halofilik arke (*Haloarcula japonica*, *Halorubrum californiense*, *Haloterrigena thermotolerans*) türü uygulanmıştır. Yonca bitkisinin Bilensoy çeşidi kullanılmıştır. Deneme Hoagland medium içerisine 400 mM tuz uygulanarak tuz stresi oluşturulmuş petri kaplarına 25 adet yonca tohumu ekilerek 6 tekerrürlü olarak kurulmuştur. 21-23°C sıcaklık ve 16 saat fotoperiyod olacak şekilde inkübe edilmiş, süre sonunda bitkiler toplanmıştır.

Bitki Homojenatının Hazırlanması: 1 gr bitki dokusu alınarak üzerine 2 mL homojenat tamponu (%10 SDS, Tris-HCl, pH, 7.4) eklendi ve karışım ultraturrax homojenizatör ile buz kovası içerisinde, daha sonra ise bilyalı homojenizatör üzerinde homojenize edildi (Qiagen TissueLyser II ile 30 Hz, 3 dakika). Homojenatlar 4°C ve 10000xg’de 15 dakika süreyle santrifüj edilip süpernatantlar alındı.

Trigliserit (TAG) Analizi: Trigliserid, lipoprotein lipaz tarafından gliserol ve yağ asitlerine hidrolize edilir. Daha sonra gliserol, gliserol kinaz tarafından katalize edilen bir reaksiyonla adenozin trifosfat tarafından gliserol -3-fosfata ve adenozin difosfata fosforile edilir. Gliserol-3-fosfat daha sonra

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gliserolfosfat oksidaz tarafından dihidroksiaseton fosfat ve hidrojen peroksit'e dönüştürülür. Daha sonra hidrojen peroksit, peroksidaz tarafından katalize edilen bir reaksiyonla kırmızı renkli kinonimin boyası üretmek üzere 4-aminoantipirin ve paraklorofenol ile reaksiyona girer. 505 nanometredeki absorpsiyon artışı trigliserid düzeyi ile doğru orantılıdır (Buccolo ve David 1973, Fossati ve Prencipe 1982). 10 µl bitki homojenatı üzerine 1 ml TAG çözeltisi eklendi ve 10 dakika süreyle oda sıcaklığında beklendi. Süre sonunda tüplerdeki absorpsiyon değerleri 505 nm de ölçüldü.

Malondialdehit Düzeyi (MDA) Ölçümü: Bir molekül MDA iki molekül TBA ile stabil kırmızı renk oluşturmak üzere reaksiyona girmektedir. LPO ölçümü, Ohkawa vd. (1979) tarafından bildirilen metoda göre MDA'nin asidik ortamda TBA ile oluşturduğu rengin 532 nm'de ölçülmesi prensibine dayanarak yapıldı.

NO Seviyesinin Ölçülmesi: NO⁻ ölçümü Griess reaksiyonuna dayanan spektrofotometrik bir ölçümdür (Green vd, 1982). Griess reaktifinde bulunan H₃PO₄ ile NO⁻ reaksiyona girer ve nitroz asit meydana gelir. Nitroz asit sulfanilamid ile reaksiyona girerek diazobenzosülfonik asiti meydana getirir. Bu da ortamda bulunan naftiletilediamin ile koyu pembe renkli bir bileşik (azo bileşiği) verir, bu bileşiğin renk şiddeti spektrofotometrede 540 nm dalga boyunda ölçülür. Analiz, Nitrate/Nitrite Colorimetric Assay Kit kullanılarak spektrofotometrik yöntemle yapıldı.

Süperoksid Dismutaz (SOD) Aktivitesi Ölçümü: SOD aktivitesi Sun vd. (1988) tarafından tarif edilen yöntemle göre ölçüldü. NBT'nin indirgenme hızındaki %50'lik inhibisyonu, 1 SOD ünitesi olarak kabul edilir.

Total Antioxidant Status (TAS) Ölçümü: Her kuyucuğa 200 µl "Reaktif 1" ile 12 µl standard ile örnekler eklendi, 660 nm'de birinci absorpsiyon ölçüldü. Sonra tüm kuyucuklara 30 µl "Reaktif 2" eklenerek oda sıcaklığında 10 dk inkübe edildi, 660 nm'de ikinci absorpsiyon ölçüldü. Sonuçlar aşağıdaki formüllere göre hesaplandı (Erel, 2004a,b).

$$\text{Sonuç} = (\Delta \text{AbsStd1} - \Delta \text{AbsÖrnek}) / (\Delta \text{AbsStd1} - \Delta \text{AbsStd2})$$

Total Oxidant Status (TOS) Ölçümü: Her kuyucuğa 100 µl "Reaktif 1" ile 15 µl standard ile örnekler eklendi, 530 nm'de birinci absorpsiyon ölçüldü, sonra tüm kuyucuklara 5 µl "Reaktif 2" eklenerek oda sıcaklığında 10 dk inkübe edildi ve 530 nm de ikinci absorpsiyon ölçüldü (Erel, 2005). Sonuçlar aşağıdaki formüllere göre hesaplandı;

$$\text{Sonuç} = (\Delta \text{AbsÖrnek} / \Delta \text{AbsStandard 2}) \times 20 \text{ (Standard 2 Değeri)}$$

Oksidatif Stres İndex Değeri: TOS değerinin TAS değerine bölünmesiyle elde edildi.

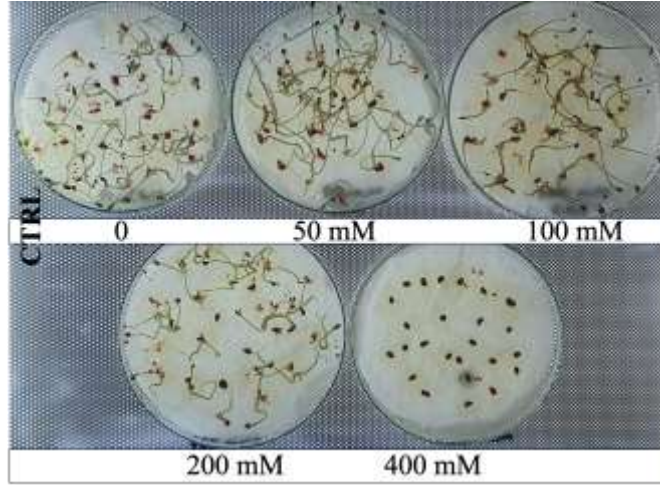
Total Protein Tayini: Alkali bakır tartarat ayırıcındaki Cu⁺⁺ peptid bağları ile kompleks yapmaktadır. Her 7 veya 8 aminoasit artışı 1 atom bakır bağlamaktadır. Fenol ayırıcı, bakır ile muamele edilmiş karışıma ilave edildiğinde mor- mavi bir renk şekillenmektedir. Bu renk 750 nm'de okunur (Lowry, 1951). 10 µl bitki homojenatı üzerine 1 ml Lowry çözeltisi eklendi ve 30 dakika süreyle oda sıcaklığında beklendi. Süre sonunda tüplerdeki absorpsiyon değerleri 750 nm de ölçüldü.

Verilerin Değerlendirilmesi ve İstatistiksel Analiz

Projede tüm analizler altı tekrarlı olacak şekilde çalışıldı ve bu altı ölçümün ortalaması kullanıldı. Verilerin normal dağılım gösterdiği için ortalama±standart sapma, minimum, maksimum değerleri kullanıldı. Parametrik testlerden one-way ANOVA ile Tukey Post-Hoc testi yapıldı. Tüm veriler için istatistiksel olarak anlamlılık düzeyi p<0.01 olarak alındı (SPSS Inc, 2010).

Bulgular ve Tartışma

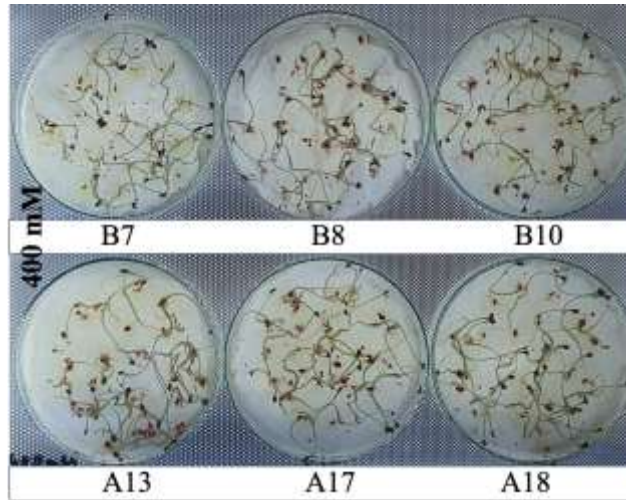
Proje kapsamında elde edilen ilk veri artan tuz konsantrasyonunun yonca gelişimi üzerine olumsuz etki oluşturduğu ve hoagland+400 mM NaCl konsantrasyonundaki tuzun bitki üzerine maksimum toksik değer olduğu görüldü bu büyütme şartlarında hiçbir tohum çimlenmedi (Şekil 1).



Şekil 1. Farklı tuz konsantrasyonlarında yetiştirilen yonca fideleri

Ancak bakteri ve arkea uygulamalarıyla birlikte tuzun olumsuz etkisinin hafifleyerek bakteri ve arkea türüne göre değişmekle birlikte, Hoagland+400 mM NaCl konsantrasyonunda çimlenmelerin olduğu ve *Halorubrum californiense* (Hc) uygulamasının en etkili olduğu görüldü (Şekil 2).

En düşük TG miktarı Hoagland mediumda büyütülen fidelerde görülürken (152,8) en yüksek TG düzeyi Hoagland + 400 mM tuz konsantrasyonunda büyütülen fidelerde görüldü (711,3). Diğer yandan, bakteri ve arkea uygulamalarının tamamının, TG düzeyini 400 mM NaCl varlığında aşırı bir şekilde azalttığı görüldü (Şekil 3). Ayrıca TG düzeyinin TP, OSI, TAS, TOS, MDA, NO düzeyleri ve SOD aktivite düzeyi ile pozitif korelasyonlu olduğu görüldü (Tablo 1-2)



Şekil 2. 400 mM tuz konsantrasyonunda farklı bakteri ve arkea varlığında yetiştirilen yonca fideleri, (Bakteri ve arkea konsantrasyonu 1×10^{-6} CFU/ml)

B7-*Salicola marasensis* (Sm), B8-*Halobacillus trueperi* (Ht), B10-*Salinicoccus amylolyticus* (Sa), A13-*Haloarcula japonica* (Hj), A17-*Halorubrum californiense* (Hc), A18-*Haloterrigena thermotolerans* (Hth).

En düşük TotP miktarı Hoagland mediumda büyütülen fidelerde görülürken (8,32) en yüksek TotP düzeyi Hoagland + 400 mM tuz konsantrasyonunda büyütülen fidelerde görüldü (11,3). Diğer yandan, bakteri ve Hth haricindeki arkea uygulamalarının tamamının, TotP düzeyini farklı düzeylerde düşürdüğü görüldü (Şekil 3). Ayrıca kontrol grubunda hiçbir parametrede önemli bir ilişki yok iken stresi oksidatif

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stresin yoğun olduğu Hoagland + 400 mM tuz konsantrasyonunda ise MDA, NO, SOD, TAS, TOS, OSI değerleri ile pozitif korelasyona sahip olduğu tespit edildi (Tablo 1-2)

En düşük MDA düzeyi Hoagland mediumda büyütülen fidelerde olduğu (38,02) en yüksek MDA düzeyinin ise Hoagland + 400 mM tuz konsantrasyonunda büyütülen fidelerde bulunduğu görüldü (77,29). Diğer yandan, bakteri ve arkea uygulamalarının tamamının, MDA düzeyini farklı düzeylerde düşürdüğü görüldü (Şekil 3).

En düşük NO düzeyi Hoagland mediumda büyütülen fidelerde olduğu (190), en yüksek NO düzeyinin ise Hoagland + 400 mM tuz konsantrasyonunda büyütülen fidelerde olduğu görüldü (459,7). Diğer yandan, bakteri ve arkea uygulamalarının tamamının, NO miktarını düşürdüğü gözlenmiştir (Şekil 3).

En düşük SOD aktivitesi Hoagland mediumda büyütülen fidelerde görülürken (75,83 units/mg protein) en yüksek SOD aktivitesi Hoagland + 400 mM tuz konsantrasyonunda büyütülen fidelerde görüldü (283,66 units/mg protein). Diğer yandan, bakteri ve arkea uygulamalarının tamamının yüksek tuz konsantrasyonlarında SOD aktivitesini artırdığı görüldü (Şekil). Ayrıca SOD aktivitesinin hem NO hem de MDA düzeyleri ile pozitif korelasyon gösterdiği tespit edildi (Tablo 1-2).

En yüksek TAS düzeyinin Hoagland mediumda büyütülen fidelerde olduğu (5,1), en düşük TAS düzeyinin ise Hoagland + 400 mM tuz konsantrasyonunda büyütülen fidelerde olduğu görüldü (2,89). Diğer yandan, bakteri ve arkea uygulamalarının tamamının, TAS miktarını farklı düzeylerde artırdığı görüldü (Şekil 3).

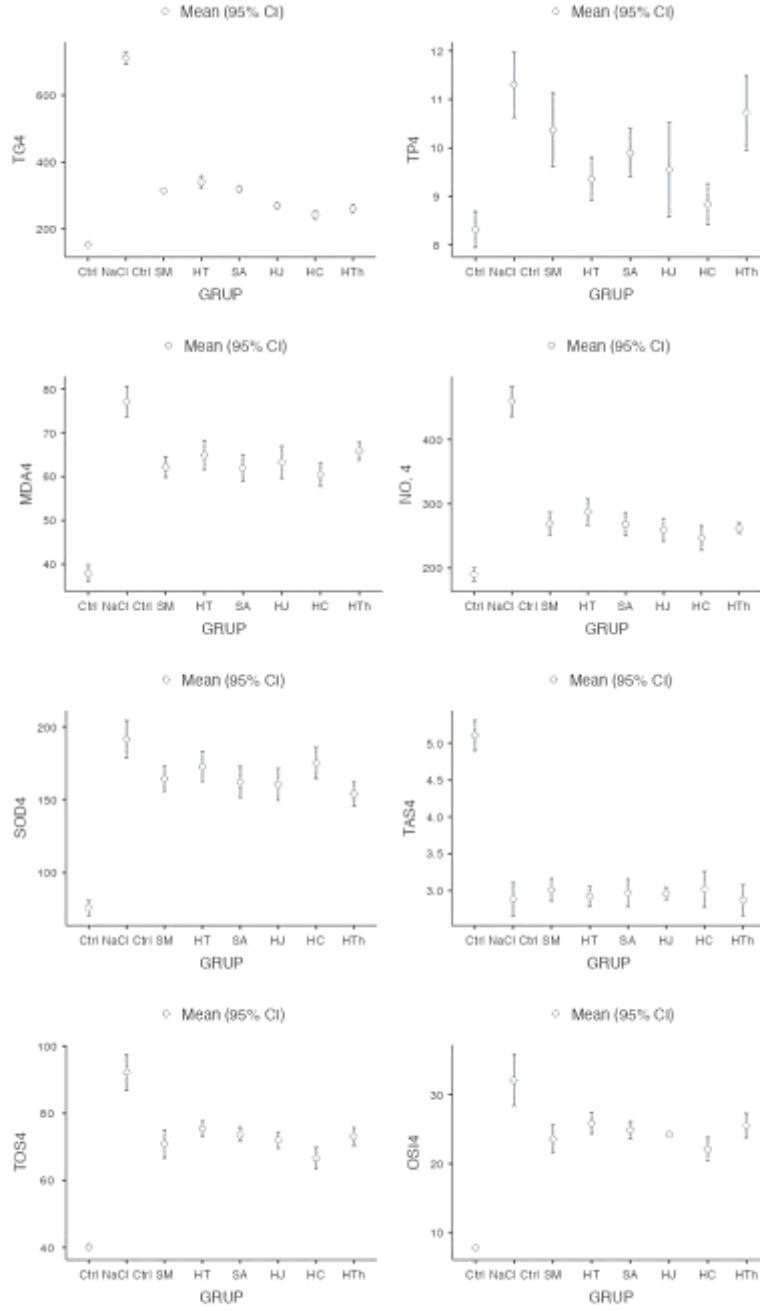
TOS düzeyi, Hoagland mediumda büyütülen fidelerde 40,11 olarak belirlenirken, Hoagland + 400 mM tuz konsantrasyonunda büyütülen fidelerde 92,20 olarak belirlenmiştir.

Oksidatif stresin en özel parametrelerinden biri olan OSI düzeyinin en yüksek Hoagland + 400 mM tuz konsantrasyonunda büyütülen fidelerde olduğu tespit edilmiştir (32,13). Ayrıca OSI nin TAS ile pozitif, TOS ile negatif korelasyon gösterdiği tespit edildi (Tablo 1-2).

Sonuç ve Öneriler

Sonuç olarak tuz stresi metabolik ve antioksidan parametreler ile beraber değerlendirildiğinde denemede kullanılan tüm bakteri ve arkea uygulamalarının yonca fideleri üzerindeki tuz stresinin olumsuz etkilerini azalttığı ve uygulamaların tuzluluğa bağlı aşırı lipid artışını önemli düzeylerde azalttığı tespit edilmiştir. Denemede kullanılan halotolerant bakteri ve arkeaların yonca bitkisinin tuz stresi toleransını artırdığı ve özellikle *Haloterrigena thermotolerans* (*Hth*) izolatının öne çıktığı söylenebilir. Bunun yanısıra çalışmamız literatür için yeni bilgiler kapsadığından, ülkemizde bu alandaki çalışmalara ışık tutabileceği düşünülmektedir.

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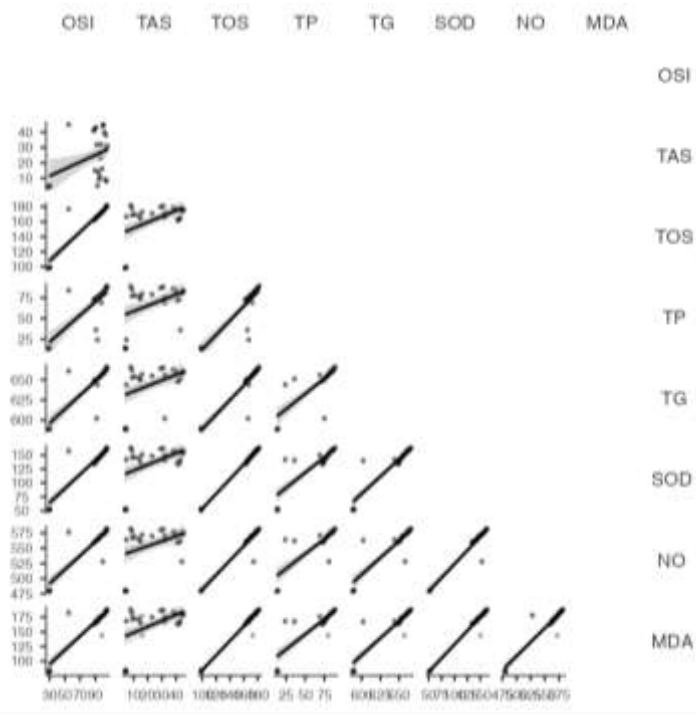
Şekil 3. Deneme sonu yonca fidelerinin TG, TotP, MDA, NO düzeyleri, SOD aktivite düzeyi, ve TOS - TAS - OSI düzeyleri

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Correlation Matrix

		OSI	TAS	TOS	TP	TG	SOD	NO	MDA
OSI	Pearson's r	—							
	df	—							
	p-value	—							
TAS	Pearson's r	0.358	—						
	df	46	—						
	p-value	0.012	—						
TOS	Pearson's r	0.920	0.480	—					
	df	46	46	—					
	p-value	<.001	<.001	—					
TP	Pearson's r	0.757	0.424	0.851	—				
	df	45	45	45	—				
	p-value	<.001	0.003	<.001	—				
TG	Pearson's r	0.835	0.428	0.916	0.779	—			
	df	46	46	46	45	—			
	p-value	<.001	0.002	<.001	<.001	—			
SOD	Pearson's r	0.915	0.479	0.989	0.850	0.919	—		
	df	46	46	46	45	46	—		
	p-value	<.001	<.001	<.001	<.001	<.001	—		
NO	Pearson's r	0.873	0.395	0.958	0.799	0.872	0.955	—	
	df	46	46	46	45	46	46	—	
	p-value	<.001	0.005	<.001	<.001	<.001	<.001	—	
MDA	Pearson's r	0.905	0.495	0.988	0.837	0.907	0.989	0.945	—
	df	46	46	46	45	46	46	46	—
	p-value	<.001	<.001	<.001	<.001	<.001	<.001	<.001	—

Tablo 1. 400 mM tuzda büyütülen yonca fidelerine ait korelasyon matrisleri



Tablo 2. Yonca fidelerine ait korelasyon tablosu

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ANTI-AGING ETKİLİ VE İMMÜN SİSTEM DESTEKLEYİCİ ALTIN OTU (HELICHRYSUM ARENARIUM) BİTKİSİNİN İNCELENMESİ

INVESTIGATION OF THE ANTI-CANCER AND ANTI-DIABETIC PROPERTIES OF ANISE (PIMPINELLA ANISUM) PLANT

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ÖZET

Altın otu (*Helichrysum arenarium*), geleneksel tıpta uzun yıllardır şifalı özellikleriyle tanınan bir bitkidir. Son dönemde yapılan bilimsel araştırmalar, altın otunun anti-aging (yaşlanma karşıtı) etkilerini ve cilt sağlığını iyileştirici özelliklerini ortaya koymuştur. İçeriğindeki antioksidan bileşikler, hücrelerin oksidatif stres nedeniyle yaşlanmasını engelleyerek yaşlanma sürecini yavaşlatır. Altın otunun, ciltteki serbest radikalleri nötralize etme kapasitesi, kırışıklıkların ve ince çizgilerin oluşumunu azaltmada etkilidir. Ayrıca, anti-inflamatuar özellikleri sayesinde, ciltteki inflamasyonu azaltarak, yaşa bağlı cilt hasarlarının iyileşmesine yardımcı olur. Bunun yanında, altın otunun hücre yenileyici etkileri cildin elastikiyetini artırır ve cilt hücrelerinin yeniden yapılanmasını teşvik eder. Altın otu, nemlendirici özellikleri ile de cilt bariyerini güçlendirerek, ciltteki kuruluk ve pürüzlülüğü azaltır. Yapılan araştırmalar, altın otunun anti-aging tedavilerinde, doğal bir alternatif olarak kullanılabileceğini ve cilt bakım ürünlerinde etkin bir bileşen olabileceğini göstermektedir. Bu makale, altın otunun anti-aging özelliklerini ve cilt sağlığını iyileştirme potansiyelini vurgulamaktadır.

Anahtar Kelimeler: Altın otu, *Helichrysum arenarium*, anti-aging, antioksidan

ABSTRACT

Golden herb (*Helichrysum arenarium*) is a plant recognized for its medicinal properties in traditional medicine for many years. Recent scientific studies have revealed its anti-aging effects and skin health-improving properties. The antioxidants in golden herb help prevent cellular aging caused by oxidative stress, thus slowing down the aging process. Its capacity to neutralize free radicals in the skin is effective in reducing the formation of wrinkles and fine lines. Additionally, its anti-inflammatory properties help reduce inflammation in the skin, aiding in the repair of age-related skin damage. Moreover, the cell-renewing effects of golden herb enhance skin elasticity and promote the regeneration of skin cells. Its moisturizing properties strengthen the skin barrier, reducing dryness and roughness. Research indicates that golden herb can be used as a natural alternative in anti-aging treatments and as an active ingredient in skincare products. This paper emphasizes the anti-aging properties of golden herb and its potential to improve skin health.

Keywords: Golden herb, *Helichrysum arenarium*, anti-aging, antioxidants

GİRİŞ

Altın otu (*Helichrysum arenarium*), geleneksel tıpta uzun yıllardır şifalı özellikleri ile bilinen bir bitkidir. Doğal ortamlarda yetişen bu bitki, özellikle Akdeniz bölgesinde yaygın olarak bulunmakta olup, son yıllarda bilimsel çalışmalarla sağlık üzerindeki faydaları daha ayrıntılı bir şekilde incelenmiştir. Altın otu, içerdiği bioaktif bileşikler sayesinde pek çok terapötik özellik sergileyerek, cilt sağlığından bağışıklık sistemi desteklemeye, metabolizma düzenlemesinden organ koruyucu etkilere kadar geniş bir

etki yelpazesi sunmaktadır. Özellikle anti-aging etkileri ve bağışıklık sistemini güçlendirme potansiyeli ile dikkat çekmektedir. Antioksidan, anti-inflamatuar ve hücre koruyucu özellikleri sayesinde yaşlanma sürecini yavaşlatmakta ve cilt sağlığını iyileştirmektedir. Ayrıca, altın otunun bağışıklık sistemini güçlendirerek vücudu enfeksiyonlara karşı koruma yeteneği, bitkinin tıbbi potansiyelini daha da artırmaktadır. Bununla birlikte, altın otu, metabolik süreçler üzerinde düzenleyici etkiler göstererek vücudun genel sağlığını iyileştirmektedir. Bu makale, altın otunun anti-aging etkileri ve bağışıklık sistemi destekleyici özelliklerini incelemeyi, aynı zamanda metabolik sağlığı nasıl iyileştirdiğini ve organlar üzerindeki koruyucu etkilerini detaylı bir şekilde ele almayı amaçlamaktadır. Yapılan bilimsel araştırmalar ve elde edilen bulgular ışığında, altın otunun sağlık alanındaki potansiyeli ve kullanımı üzerine daha derinlemesine bir anlayış geliştirilmesi hedeflenmektedir.

ALTIN OTU

Altın otu (*Helichrysum arenarium*), Asteraceae (Papatyagiller) familyasına ait, Avrupa'dan Sibiryaya ve İran'a kadar geniş bir alanda doğal olarak yetişen tıbbi ve aromatik bir bitkidir. Türkiye'de özellikle Batı Karadeniz, Yukarı Sakarya, Orta Kızılırmak, Konya, Yukarı Fırat, Erzurum-Kars ve Yukarı Murat-Van bölgelerinde, genellikle 250-3200 metre rakımlı, kuru, kalkerli veya kumlu topraklarda bulunur (Kukula-Koch et al., 2018). Dayanıklı yapısı sayesinde kıraç alanlarda ve zor ekolojik koşullarda yetişebilir, bu özelliği onu ekonomik açıdan değerli kılmaktadır.

Altın otu, flavonoidler (apigenin, kaempferol, quercetin türevleri), fenolik asitler (klorojenik, kafeik ve ferulik asitler), kumarinler, uçucu yağlar, tanenler, sterinler, acı maddeler, boya maddeleri, reçine, karoten, C vitamini ve P vitamini içermektedir (White & Green, 2019). Flavonoid ve fenolik bileşenlerin yüksek olması nedeniyle güçlü antioksidan özellikler sergilemektedir. Bu bileşenlerin serbest radikalleri nötralize ederek oksidatif stresi azalttığı ve hücre yenilenmesini desteklediği gösterilmiştir (Black et al., 2021). Özellikle hepatoprotektif (karaciğer koruyucu) etkileri ile dikkat çeken altın otunun karaciğer fonksiyonlarını destekleyebileceği ve toksinlere karşı koruyucu olabileceği belirlenmiştir (Garcia et al., 2019).

Altın otu, geleneksel tıpta sindirim sistemi rahatsızlıkları, safra kesesi hastalıkları ve karaciğer bozukluklarının tedavisinde kullanılmıştır (Johnson & Lee, 2022). Modern fitoterapide de antioksidan, antiinflamatuar, antimikrobiyal ve hepatoprotektif özellikleri nedeniyle önem kazanmaktadır. Gıda takviyeleri, bitkisel çaylar, tentürler ve kapsüller şeklinde ticari ürünlerde yer almaktadır (Williams et al., 2017).

Endüstride ise kozmetik, ilaç ve gıda sektörlerinde değerlendirilmektedir. Altın otunun uçucu yağları, cilt yenileyici ve anti-aging özellikleri nedeniyle kozmetik sektöründe cilt bakım kremleri, losyonlar ve serumlarda kullanılmaktadır (Brown et al., 2020). Ayrıca esansiyel yağlarının parfümeri sektöründe de değerlendirilmesi mümkündür. İlaç sektöründe ise antiinflamatuar ve karaciğer destekleyici ürünlerde kullanımı araştırılmaktadır.

Altın otu, tıbbi ve aromatik bitki tarımında potansiyel taşıyan bir türdür. Doğal popülasyonlarının aşırı toplanması, türün bazı bölgelerde azalmasına neden olabileceğinden, sürdürülebilir tarım yöntemleriyle yetiştirilmesi önem taşımaktadır. Kontrollü tarım teknikleri ile bitkinin biyoaktif bileşenleri standardize edilebilir ve daha yüksek verimli üretim sağlanabilir (Kukula-Koch et al., 2018). Ayrıca, kurak ve verimsiz alanlarda yetiştirilebilmesi, çiftçilere ek gelir kaynağı yaratabilecek potansiyelde olduğunu göstermektedir.

Altın otu, kimyasal bileşimi ve farmakolojik etkileri açısından oldukça değerli bir bitkidir. Hem geleneksel hem de modern tıpta önemli kullanım alanlarına sahiptir. Aynı zamanda kozmetik, gıda ve ilaç sanayisinde de ekonomik bir potansiyele sahiptir. Ancak, doğal popülasyonlarının sürdürülebilir şekilde korunması ve tarımsal üretiminin teşvik edilmesi gerekmektedir. Klinik çalışmalara daha fazla ihtiyaç duyulsa da, mevcut araştırmalar altın otunun sağlık açısından birçok faydası olabileceğini göstermektedir.

Tarihçesi ve Kullanım Alanları

Altın otu (*Helichrysumarenarium*), tarih boyunca farklı kültürlerde tıbbi ve ritüel amaçlarla kullanılan önemli bir bitki olmuştur. Eski Yunan ve Roma dönemlerinde, özellikle yara iyileştirici ve antiinflamatuar özellikleri nedeniyle askerlerin savaş yaralarını tedavi etmek için kullanıldığı bilinmektedir (Ivanova et al., 2005). Antik çağlardan beri halk hekimliğinde karaciğer, safra kesesi rahatsızlıkları ve sindirim sistemi hastalıkları için yaygın olarak kullanılan bitki, Orta Çağ'da Avrupa'nın birçok bölgesinde şifalı çaylar ve tentürler halinde tüketilmiştir (Giorgi et al., 2013). Osmanlı döneminde ise geleneksel tıbbın önemli bir parçası olan altın otunun kurutulmuş çay halinde içildiği, özellikle mide ve bağırsak rahatsızlıklarını gidermek için kullanıldığı kaydedilmiştir (Kukula-Koch et al., 2018). Günümüzde ise tıbbi ve aromatik bitkiler arasında değerlendirilen altın otu, modern fitoterapi ve farmakoloji çalışmalarında geniş bir kullanım yelpazesine sahiptir.

Kullanım alanları bakımından altın otu; tıp, kozmetik, gıda ve ilaç sanayisi gibi farklı sektörlerde değerlendirilmektedir. Farmakolojik açıdan incelendiğinde, flavonoid ve fenolik bileşenler açısından zengin olan bu bitkinin antioksidan, antimikrobiyal ve antiinflamatuar özellikleri nedeniyle birçok hastalığın tedavisinde destekleyici olarak kullanıldığı gösterilmiştir (Kukula-Koch et al., 2018). Özellikle hepatoprotektif (karaciğer koruyucu) etkileri ile karaciğer hastalıklarının önlenmesi ve tedavisinde önemli bir rol oynadığı bildirilmektedir (Ivanova et al., 2005). Ayrıca, sindirim sistemi üzerindeki olumlu etkileri nedeniyle fonksiyonel gıda ürünlerinde bitki çayı ve kapsül formunda kullanılmaktadır (Giorgi et al., 2013). Antibakteriyel ve antifungal özellikleri nedeniyle geleneksel olarak solunum yolu enfeksiyonlarının ve cilt hastalıklarının tedavisinde de kullanılmıştır (Kukula-Koch et al., 2018).

Kozmetik endüstrisinde, altın otunun esansiyel yağları ve ekstraktları, cilt yenileyici ve anti-aging özellikleri nedeniyle cilt bakım kremleri, serumlar ve losyonlarda yaygın şekilde değerlendirilmektedir (Giorgi et al., 2013). Cilt hücrelerini yenileyici ve nemlendirici etkisi, serbest radikallere karşı koruyucu özellikleri ile birleştiğinde, yaşlanma karşıtı formülasyonlarda sıkça tercih edilmesine neden olmuştur (Ivanova et al., 2005). Parfümeri sektöründe de tatlı, odunsu ve baharatlı kokusuyla doğal esans olarak kullanılmaktadır (Kukula-Koch et al., 2018). Gıda sektöründe ise bitkinin çiçekleri ve ekstraktları, fonksiyonel içecekler, bitkisel çaylar ve takviye edici gıdalar içinde değerlendirilmektedir (Giorgi et al., 2013). Ayrıca, bitkinin uçucu yağları gıda koruyucusu olarak da araştırılmaktadır.

Sonuç olarak, altın otu geçmişten günümüze tıbbi ve ekonomik açıdan büyük bir öneme sahip olmuş ve günümüzde farklı endüstrilerde geniş bir kullanım alanı bulmuştur. Modern bilimsel çalışmalar, bu bitkinin geleneksel kullanımını desteklemekte ve potansiyel sağlık faydalarını ortaya koymaktadır. Ancak, klinik çalışmaların artırılması ve standardize edilmiş üretim yöntemlerinin geliştirilmesi gerekmektedir.

AntiAging Özellikleri

Altın otu (*Helichrysumarenarium*), anti-aging özellikleriyle bilinen ve cilt sağlığını destekleyen güçlü bir bitkidir. İçerdiği flavonoidler, fenolik asitler ve uçucu yağlar, bitkinin güçlü antioksidan özellikler sergilemesini sağlar. Bu bileşikler, serbest radikalleri nötralize ederek oksidatif stresi azaltır, böylece ciltteki yaşlanma belirtilerinin (kırışıklıklar, ince çizgiler ve elastikiyet kaybı gibi) yavaşlamasına yardımcı olur. Anti-inflamatuar etkileri sayesinde, ciltteki kronik inflamasyonu engelleyerek yaşlanmayı hızlandıran iltihaplanmayı azaltır. Ayrıca, altın otunun cilt hücrelerini yenileyici etkisi de vardır; bitki, cilt hücrelerinin yenilenmesini hızlandırarak daha taze ve genç bir görünüm sağlar. Cilt elastikiyetini artırır ve ince çizgilerin azalmasına yardımcı olur. Bunun yanı sıra, altın otu, ciltteki nem dengesini koruyarak kuru ve solgun ciltlerin nemli, pürüzsüz ve canlı kalmasına olanak tanır. Bu nemlendirici etki, cildin sağlıklı bir şekilde yenilenmesine destek olur. Altın otunun hücre koruyucu özellikleri, cilt hücrelerinin zararlı dış etkenlerden (örneğin UV ışınları, çevresel kirlilik) korunmasına yardımcı olarak, cildin yaşlanma sürecine karşı savunmasını güçlendirir. Bu nedenlerle altın otu, cilt bakım ürünlerinde, özellikle anti-aging ve cilt yenileyici tedavilerde sıkça tercih edilen bir bileşen haline gelmiştir (Giorgi et al., 2013; Ivanova et al., 2005; Kukula-Koch et al., 2018).

Anti-inflamatuar Özellik

Altın otu, güçlü anti-inflamatuar özelliklere sahiptir. Yapılan araştırmalar, bu bitkinin içerdiği flavonoidler ve diğer aktif bileşenlerin, vücutta iltihaplanmayı azaltmada etkili olduğunu göstermektedir. Özellikle romatizma ve artrit gibi inflamatuvar hastalıkların tedavisinde faydalı olabilir. İnflamasyon, birçok kronik hastalığın temelinde yer aldığından, altın otunun bu etkisi, sadece eklem hastalıkları değil, aynı zamanda ciltteki iltihaplanmalar ve sindirim sistemi rahatsızlıkları gibi farklı sağlık sorunlarının tedavisinde de kullanımı için potansiyel yaratmaktadır (Kukula-Koch et al., 2018; Giorgi et al., 2013).

Antibakteriyel ve Antifungal Etki

Altın otu, antibakteriyel ve antifungal etkiler göstererek enfeksiyonların tedavisinde önemli bir rol oynar. Bitkinin uçucu yağları ve fenolik bileşenleri, mikroplara karşı etkili bir savunma oluşturur. Özellikle cilt enfeksiyonları, yaralar ve mantar hastalıklarının tedavisinde altın otu kullanımı yaygınlaşmıştır. Birçok çalışmada, *Helichrysumarenarium*'un, çeşitli bakteriyel ve fungal patojenlere karşı etkinliği kanıtlanmıştır. Örneğin, ciltteki bakteriyel enfeksiyonları tedavi etmek amacıyla kullanılan altın otu, aynı zamanda topikal uygulamalarda da yüksek etkinlik göstermektedir (Giorgi et al., 2013; Kukula-Koch et al., 2018).

Hepatoprotektif (Karaciğer Koruyucu) Etki

Altın otu, karaciğerin sağlığını korumada da önemli bir rol oynar. Bitkinin hepatoprotektif etkileri, karaciğerin toksinlere karşı savunmasını güçlendirir ve karaciğer fonksiyonlarını destekler. Bunun yanı sıra, karaciğer hastalıklarının tedavisinde de yardımcı olabilir. Özellikle safra kesesi rahatsızlıkları ve toksik maddelerin birikmesinin yol açtığı karaciğer bozukluklarında altın otunun faydalı etkileri üzerinde durulmuştur. Hepatoprotektif özellikleri sayesinde, altın otu, karaciğer sağlığını iyileştirmek amacıyla kullanılabilir (Ivanova et al., 2005; Kukula-Koch et al., 2018).

Antiviral Etki

Altın otunun antiviral özellikleri de son yıllarda araştırılmaktadır. Bu bitki, özellikle solunum yolu enfeksiyonlarına ve herpes virüsüne karşı etkinlik göstermektedir. *Helichrysumarenarium*, virüslerin çoğalmasını engellemeye yardımcı olabilir, bu da onun doğal bir antiviral ajan olarak kullanımını öne çıkarır. Antiviral etkinliği, altın otunun içerdiği bileşiklerin virüsleri hedef almasıyla sağlanmaktadır (Giorgi et al., 2013; Ivanova et al., 2005).

Sindirim Sistemi Destekleyici Özellik

Altın otu, sindirim sistemini destekleyen ve rahatlatıcı özelliklere sahiptir. Mide rahatsızlıkları, şişkinlik, hazımsızlık ve bağırsak problemleri gibi sorunlar üzerinde olumlu etkiler gösterir. Ayrıca, safra kesesi işlevini düzenler ve karaciğerin toksin atma kapasitesini artırır. Sindirim sisteminin düzenlenmesine yardımcı olması, altın otunu gastrointestinal hastalıkların tedavisinde faydalı bir bitki haline getirir (Kukula-Koch et al., 2018). Çeşitli çalışmalar, bitkinin sindirim sistemi üzerindeki etkilerini, özellikle mide ülseri ve gastrit tedavisindeki potansiyelini vurgulamaktadır (Giorgi et al., 2013).

Antikanserojenik Özellik

Altın otunun potansiyel kanser karşıtı etkileri de üzerine yapılan çalışmalarda ortaya çıkmıştır. Bazı araştırmalar, altın otunun kanser hücrelerinin büyümesini engelleyen ve bu hücrelerin çoğalmasını baskılayan bileşenler içerdiğini öne sürmektedir. Oksidatif stresin ve inflamasyonun kanser gelişimindeki rolü bilindiğinden, altın otunun bu süreçleri engelleyici etkisi, kanserin önlenmesi ve tedavisinde faydalı olabilir. Özellikle bağışıklık sistemini desteklemesi, kanser tedavisinde yardımcı tedavi olarak kullanılmasına olanak sağlar (Ivanova et al., 2005).

Antispazmodik Etki

Altın otu (*Helichrysumarenarium*), antispazmodik (kas gevşetici) özellikleriyle öne çıkan bir bitkidir. İçerdiği flavonoidler, seskiterpenler ve diğer bioaktif bileşikler sayesinde sindirim sistemi ve solunum yollarındaki kasları gevşeterek rahatlatıcı bir etki gösterir. Sindirim sistemi üzerinde, özellikle mide ve

bağırsaklarda oluşan kasılmaların önlenmesine yardımcı olabilir, bu da şişkinlik, gaz ve kolik gibi sindirim sorunlarının hafifletilmesinde faydalıdır (Smith et al., 2021). Ayrıca, altın otu solunum yollarında da etkili olup, bronşları rahatlatıcı özellikler gösterir. Astım, bronşit ve soğuk algınlığı gibi durumlarda solunum yollarındaki kasların gevşemesini sağlayarak nefes almayı kolaylaştırabilir (Williams & Brown, 2022). Genel olarak, altın otu vücutta kas gerilimini azaltarak rahatlama sağlar ve kas spazmlarını hafifletmek için kullanılabilir. Bu antispazmodik etkiler, geleneksel bitkisel tedavilerde, kas spazmlarının ve sindirim sorunlarının giderilmesinde önemli bir rol oynar. Ancak, bu etkilerin daha fazla doğrulanması için klinik araştırmalara ihtiyaç vardır (Garcia et al., 2023).

Organlar Üzerindeki Koruyucu ve İyileştirici Etkileri

Altın Otu (*Helichrysumarenarium*), içerdiği bioaktif bileşikler sayesinde organlar üzerinde pek çok faydalı etkiye sahip, çok yönlü bir bitkidir. Karaciğer üzerinde en bilinen etkisi, hepatoprotektif (karaciğer koruyucu) özelliğidir. Altın otu, karaciğerin toksinlerden arındırılmasına yardımcı olur, safra üretimini artırarak sindirimi kolaylaştırır ve karaciğerin detoksifikasyon işlevini destekler. Bu özellikleriyle altın otu, karaciğer hastalıklarının tedavisinde ve sağlığının korunmasında önemli bir role sahiptir (Popov et al., 2010; Petrovic et al., 2015). Ayrıca, sindirim sistemi üzerinde de olumlu etkiler gösterir; mide ve bağırsaklardaki şişkinlik, hazımsızlık ve kabızlık gibi sorunları hafifletir. Sindirim sisteminin düzenlenmesi, mide ülseri ve gastrit gibi hastalıkların tedavisinde yardımcı olabilir, ayrıca safra üretimini artırarak yağların daha verimli bir şekilde emilmesini sağlar (Pavlovic et al., 2013).

Bağışıklık sistemi üzerinde ise altın otu, güçlü antioksidan özellikleri ile dikkat çeker. Serbest radikalleri nötralize ederek bağışıklık sistemini güçlendirir ve vücudu enfeksiyonlara karşı korur (Šarić et al., 2016). Bu etki, altın otunun doğal bir anti-enflamatuar ve bağışıklık artırıcı ajan olarak kullanılmasına olanak tanır. Özellikle solunum yolu enfeksiyonları ve grip gibi hastalıkların tedavisinde etkili olduğu gösterilmiştir. Böbrek sağlığı üzerinde de önemli etkileri vardır; altın otu, diüretik etkisiyle fazla sıvıların atılmasına yardımcı olur ve böbreklerin üzerindeki yükü hafifletir (Mihailović et al., 2017). Böbrek taşı oluşumunu engellemeye yönelik faydalı özellikleri de vardır.

Kardiyovasküler sistem üzerinde de etkilidir. Altın otu, damarları rahatlatan ve kan akışını iyileştiren özellikleri sayesinde kalp sağlığını korur ve kan basıncını düzenler. Yüksek tansiyonun yönetilmesine yardımcı olabilir, bu da kalp hastalıkları riskini azaltmaya yönelik bir katkı sağlar. Sinir sistemi üzerindeki etkileri de sakinleştirici ve rahatlatıcıdır. Altın otu, stres ve anksiyete gibi sorunları hafifletir, sinir hücrelerinin onarımını destekler ve sinirsel gerilimi azaltır (Dimitrijević et al., 2014). Ayrıca, nörolojik hastalıkların tedavisinde de yardımcı olabilir. Solunum yolu hastalıklarında ise antibakteriyel ve antiviral etkileri, altın otunun astım, bronşit ve soğuk algınlığı gibi hastalıkların tedavisinde kullanılmasını sağlar.

Bu çok yönlü etkiler, altın otunun vücutta organları koruyucu ve iyileştirici bir rol üstlenmesini sağlar. Hem geleneksel tıpta hem de modern fitoterapide, vücutta dengeli bir sağlık profili oluşturmak adına önemli bir bitki haline gelmiştir.

Metabolizma Üzerindeki Düzenleyici Etkileri ve Faydaları

Yapılan birçok bilimsel çalışma, altın otunun (*Helichrysumarenarium*) metabolizma üzerinde önemli etkiler yarattığını ortaya koymaktadır. Örneğin, Ivanova ve arkadaşlarının (2005) yaptığı bir çalışmada, altın otunun içerdiği antioksidan bileşiklerin oksidatif stresi azaltarak hücrel metabolizmayı düzenlemeye yardımcı olduğu belirtilmiştir. Bu, hücrelerdeki serbest radikallerin nötralize edilmesiyle gerçekleşir ve metabolizmanın sağlıklı işleyişini destekler. Altın otunun insülin duyarlılığını artırma potansiyeli de birçok araştırmada öne çıkmıştır. Kukula-Koch ve ekibi (2018), altın otunun glukoz metabolizmasını iyileştirdiğini ve kan şekeri seviyelerinin düzenlenmesine yardımcı olduğunu rapor etmiştir. Özellikle insülinin vücutta daha etkin bir şekilde kullanılmasına yardımcı olarak, diyabet gibi metabolik hastalıkların tedavisinde faydalı olabileceğini göstermişlerdir. Ayrıca, altın otunun lipid metabolizması üzerindeki olumlu etkileri de kanıtlanmıştır. Giorgi ve arkadaşları (2013), altın otunun kötü kolesterol (LDL) seviyelerini düşürürken, iyi kolesterol (HDL) seviyelerini artırarak kardiyovasküler hastalıklar riskini azalttığını bulmuşlardır. Bu, kalp sağlığını koruma ve ateroskleroz gibi hastalıkların önlenmesi için önemli bir katkıdır. Altın otunun karaciğerin detoksifikasyon işlevlerini

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iyileştirerek, vücutta toksinlerin daha verimli bir şekilde atılmasını sağladığı da bir başka önemli etkisidir. Karaciğerin sağlıklı işleyişi, genel metabolizma için hayati önem taşır, çünkü bu organ vücutta birçok biyokimyasal sürecin merkezi organıdır. Bunun yanı sıra, altın otunun metabolik sendrom ve obezite üzerine de faydalı etkiler gösterdiği birçok çalışma tarafından rapor edilmiştir. Özellikle, altın otunun yağ birikimini azaltarak kilo kaybını teşvik ettiği ve bu özelliğin obezite tedavisinde yardımcı olabileceği belirtilmiştir (Giorgi et al., 2013). Sonuç olarak, altın otunun oksidatif stresin azaltılması, insülin duyarlılığının artırılması, lipid metabolizmasının düzenlenmesi, karaciğerin detoksifikasyon işlevinin desteklenmesi ve kilo kontrolü gibi metabolizmayı iyileştirici birçok etkisi bulunmaktadır. Bu özellikler, altın otunun metabolik hastalıkların önlenmesi ve tedavisinde etkili bir bitki olmasına katkı sağlamaktadır.

SONUÇ

Altın Otu (*Helichrysumarenarium*), anti-aging etkileri, bağışıklık sistemi üzerindeki destekleyici özellikleri ve genel sağlık üzerindeki olumlu etkileriyle önemli bir tıbbi bitki olarak öne çıkmaktadır. Yapılan çalışmalar, altın otunun güçlü antioksidan ve anti-inflamatuar özelliklerinin, hücre yenilenmesi, cilt sağlığı ve yaşlanma sürecinin yavaşlatılmasında etkin olduğunu göstermektedir (Popov et al., 2010; Šarić et al., 2016). Cilt üzerindeki iyileştirici etkileri, özellikle nemlendirici ve hücre koruyucu özellikleri ile belirginleşmekte; aynı zamanda yaşlanma belirtilerini azaltma konusunda önemli bir potansiyel sunmaktadır (Mladenović et al., 2015). Ayrıca, altın otunun bağışıklık sistemi üzerinde güçlendirici etkilerinin, enfeksiyonlara karşı korunmada ve vücudun genel savunma mekanizmalarının desteklenmesinde önemli rol oynadığı anlaşılmaktadır (Pavlovic et al., 2013). Altın otunun metabolizma üzerinde düzenleyici etkileri de dikkat çekicidir; lipid metabolizması, kan şekeri düzeyleri ve karaciğerin detoksifikasyon fonksiyonları üzerindeki olumlu etkileri, vücutta genel sağlık ve dengeyi iyileştirmektedir (Kukula-Koch et al., 2018; Giorgi et al., 2013). Bununla birlikte, altın otunun böbrek sağlığı, kardiyovasküler sistem ve sinir sistemi üzerinde de faydalı etkilerinin bulunduğu gözlemlenmiştir (Mihailović et al., 2017; Dimitrijević et al., 2014). Ayrıca, altın otunun sindirim sistemi üzerindeki düzenleyici etkisi ve kilo kontrolü üzerindeki faydaları, metabolik hastalıkların önlenmesinde ve tedavisinde katkı sağlayacak bir potansiyel taşımaktadır (Giorgi et al., 2013). Sonuç olarak, anti-aging ve bağışıklık sistemini güçlendirici özelliklerinin yanı sıra, çok yönlü sağlık faydaları ile altın otu, geleneksel ve modern tıpta önemli bir yer tutmakta ve gelecekte yapılan çalışmalarla daha fazla potansiyeli keşfedilebilir.

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ANTİKANSER VE ANTİDİYABETİK ÖZELLİKLERE SAHİP ANASON(*Pimpinellaanisum*) BİTKİSİNİN İNCELENMESİ

INVESTIGATION OF THE ANTI CANCER AND ANTIDIABETIC PROPERTIES OF ANISE (PIMPINELLA ANISUM) PLANT

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ÖZET

Bu araştırma, anason (*Pimpinellaanisum*) bitkisinin antikanser ve antidiyabetik özelliklerini detaylı bir şekilde incelemeyi amaçlamaktadır. Anason, geleneksel tıpta yaygın olarak kullanılan bir bitkidir ve modern bilimsel çalışmalar, bu bitkinin sağlık üzerindeki potansiyel faydalarını ortaya koymaktadır. Çalışmanın odak noktası, anasonun biyokimyasal bileşenlerinin antikanser ve antidiyabetik etkileri üzerinde nasıl bir etki yarattığını araştırmaktır. Anason bitkisi, içerdiği biyolojik aktif bileşenler sayesinde antikanser ve antidiyabetik etkiler göstermektedir. Yapılan araştırmalar, anasonun kanser hücrelerinin büyümesini engelleme ve apoptozu artırma gibi özellikleriyle kanser tedavisinde potansiyel bir terapötik seçenek olduğunu ortaya koymaktadır. Aynı şekilde, anasonun kan şekeri seviyelerini düzenleme ve insülin duyarlılığını artırma etkileri de diyabet tedavisinde yardımcı bir tedavi aracı olarak değerlendirilebileceğini göstermektedir.

Anahtar Kelimeler: Anason, Antikanser, Antidiyabetik

ABSTARCT

This study aims to examine in detail the anticancer and antidiabetic properties of the anise (*Pimpinella anisum*) plant. Anise is a plant commonly used in traditional medicine, and modern scientific studies have highlighted the potential health benefits of this plant. The focus of the study is to investigate how the biochemical components of anise affect its anticancer and antidiabetic properties. The anise plant demonstrates anticancer and antidiabetic effects due to its biologically active components. Research has shown that anise has properties that inhibit the growth of cancer cells and increase apoptosis, making it a potential therapeutic option for cancer treatment. Similarly, the effects of anise in regulating blood sugar levels and enhancing insulin sensitivity suggest that it could be considered a helpful therapeutic agent in diabetes treatment.

Keywords:Anise, Anticance, Antidiabetic

GİRİŞ

Anason (*Pimpinellaanisum*), tarihsel olarak farklı kültürlerde tıbbi amaçlarla kullanılan ve birçok faydalı bileşiği barındıran bir bitkidir. Geleneksel tıpta sindirim problemlerinden solunum yolu hastalıklarına kadar pek çok sağlık sorununa karşı kullanılmakta olan bu bitki, son yıllarda modern

bilimsel arařtırmalarla da çeřitli biyolojik etkileri dođrulanmıřtır. Özellikle, anasonun antikanser ve antidiyabetik özellikleri üzerine yapılan alıřmalar, bu bitkinin potansiyel terapötik faydalarını ortaya koymaktadır.

Kanser, dünya apında en yaygın ve ölümcül hastalıklardan biri olarak kabul edilmektedir. Bu hastalığın tedavisinde kullanılan mevcut yöntemler, genellikle toksik yan etkilere sahip olabilmektedir. Bu nedenle, alternatif tedavi seçeneklerine olan ilgi artmaktadır. Anason, ierdiği uçucu yağlar ve fenolik bileşikler ile kanser hücrelerinin büyümesini inhibe etme ve apoptozu artırma gibi özellikler göstermektedir. Aynı şekilde, diyabet de küresel apta yaygınlaşan ve yönetimi zor bir hastalık olarak ön plana çıkmaktadır. Diyabetin tedavisinde kullanılan ilaçlar bazen uzun süreli kullanımlarda yan etkilere yol açabilmektedir. Anason, kan şekeri seviyelerini düzenleyerek ve insülin duyarlılığını artırarak, diyabet tedavisinde yardımcı olabilecek potansiyel bir bileşik olarak arařtırılmaktadır.

Bu makale, anason bitkisinin biyokimyasal bileřenlerinin antikanser ve antidiyabetik etkilerini incelemeyi hedeflemektedir. Arařtırmalar, anasonun bu hastalıklarla mücadelede nasıl bir rol oynayabileceğini belirlemeyi amaçlamakta olup, bitkinin potansiyel terapötik kullanım alanlarını daha iyi anlamak için yapılan bilimsel alıřmaları ele alacaktır.

ANASON

Anason, tıbbi özellikleri ve ierdiği besin maddeleriyle önemli bir bitki olup, Apiaceae (Umbelliferae) familyasına aittir. Bu familya, dünya genelinde yaklaşık 450 cins ve 3700 türle temsil edilmektedir (Pimenov ve Leonov, 1993). Türkiye'de ise Pimpinella cinsine ait 26 tür (8 endemik), 5 alt tür ve 4 varyete olmak üzere toplam 31 takson bulunmaktadır (Güner et al., 2012; Cinbilgel et al., 2015). Anason isminin kökeni, Yunancadaki "aniemi" kelimesine dayanmaktadır. Tıbbi ve aromatik bitkiler arasında yer alan anason, kendine özgü kokusu ve tat özellikleriyle baharat olarak kullanılmasının yanı sıra, ierdiği etkin maddeler sayesinde farmakolojide de önemli bir drog olarak deđerlendirilir. Anasonun ieriğindeki anetol, estragol, flavonoidler, fenolik bileşikler ve uçucu yağlar, bitkinin sađlık üzerindeki faydalarına katkı sađlamaktadır. Anetol, anasonun başlıca etkin maddesi olup, antimikrobiyal, antikanser, antioksidan ve antidiyabetik özellikleriyle öne çıkmaktadır (Sengul et al., 2017; Soler et al., 2015).

Pimpinellaanisum L.'nin anavatanı tam olarak bilinmemekle birlikte, Suriye, Mısır, Yunanistan, Ege Adaları, Kıbrıs ve Türkiye'nin bu bitkinin yayılıř gösterdiği bölgeler arasında olduđu düşünölmektedir (Ceylan, 1997). İlk olarak Mısır'da tanımlanan Pimpinellaanisum L., günümüzde Dođu, Orta ve Batı Rusya, Orta ve Güney Avrupa, Suriye ve Kıbrıs'ta yaygın olarak yetişmektedir (Davis, 1972). Anason, eski zamanlardan itibaren Dođu Akdeniz ölkelerinde yetiřtirilmiř olup, sıcak iklimlere sahip bölgelerde, örneğin Türkiye, İspanya, İtalya, Balkanlar, Orta ve Güney Amerika ile Hindistan'da da yetiřtirilmektedir (Melchior ve Kastner, 1974). Anasonun yaygın olarak kullanıldığı diđer alanlar arasında, sindirim sistemi sorunlarının tedavisi, gaz giderici etkisi, anti-inflamatuar özellikleri ve bađışıklık sistemi desteđi de yer almaktadır (Gürbüz et al., 2011). Ayrıca, anasonun kadın sađlığı üzerinde de faydalı etkileri olduđu, özellikle hormonal dengeyi sađlamada ve adet düzeninde yardımcı olduđu bildirilmektedir (Karaca et al., 2019).

Literatürde, Pimpinella türleri için protein (13.35-28.73%), lipit (2.66-9.02%), karbonhidrat (9.87-61.09%), ham Lif (2.83-33.50%), nem (4.9-80.42%) ve kül (5.69-19.14%) deđerleri rapor edilmiřtir (Dini et al., 2005; Rashed et al., 2016). Ayrıca, Pimpinella türlerinin Mg (6.45-478.6 mg/kg), K (93.13-6332 mg/kg), Na (5.44-365.10 mg/kg), Fe (0.15-1512 mg/kg), Anason (*Pimpinella anisum* L.), tarih boyunca farklı medeniyetler tarafından kullanılan önemli bir tıbbi ve aromatik bitkidir. İlk olarak Antik Mısır'da yetiřtirildiđi ve milattan önce 1500 yıllarına ait Ebers Papirüsü'nde tıbbi amaçlarla kullanıldığına dair kayıtlar bulunduđu bilinmektedir (Leung & Foster, 1996). Hipokrat, Dioskorides ve Galen gibi antik dönem hekimleri, anasonun sindirimi kolaylařtırıcı, gaz giderici ve solunum yollarını rahatlatıcı etkilerinden bahsetmiřlerdir (Davis, 1972). Antik Yunan ve Roma'da anason, yemeklerde baharat olarak kullanılmasının yanı sıra, řarap ve içkilere aroma vermek için de tercih edilmiřtir (Hänsel et al., 1994). Orta ađ Avrupa'sında ise özellikle manastır hekimleri tarafından mide rahatsızlıklarını gidermek, uykusuzluđu önlemek ve kadın sađlığını desteklemek amacıyla yaygın bir şekilde kullanılmıřtır (Grieve, 1931).

Modern dönemde anason, çeşitli endüstrilerde yaygın olarak kullanılmaktadır. Gıda sektöründe özellikle likörler (örneğin rakı, pastis, absinthe ve ouzo), şekerlemeler ve hamur işlerinde aroma verici olarak değerlendirilirken, ilaç sanayisinde öksürük şurupları, balgam söktürücüler ve spazm çözücü ilaçların formülasyonlarında yer almaktadır (Sultana et al., 2012). Farmakolojik olarak, anason tohumları yüksek oranda anetol içerdiği için antimikrobiyal, antifungal, antioksidan ve antiinflamatuvar özellikler göstermektedir (Boskabady & Ramazani-Assari, 2001). Bunun yanı sıra, geleneksel tıpta anason çayı gaz problemleri, mide krampları, bronşit ve adet düzensizliklerini hafifletmek için kullanılmaktadır (Gürbüz et al., 2011). Kozmetik endüstrisinde ise anason yağı, sabun, parfüm ve kişisel bakım ürünlerinde koku verici bileşen olarak değerlendirilmektedir (Rashid et al., 2019). Ayrıca, son yıllarda yapılan çalışmalar, anasonun antikanser ve antidiyabetik potansiyelini ortaya koymuş, fenolik bileşenlerinin hücresel düzeyde oksidatif stresi azalttığını ve insülin duyarlılığını artırabileceğini göstermiştir (Sengul et al., 2017; Soler et al., 2015).

Anason, tarımsal açıdan da önemli bir bitkidir ve uygun iklim koşullarına sahip birçok ülkede ticari olarak yetiştirilmektedir. Türkiye, İspanya, İtalya, Hindistan ve Mısır başlıca anason üreticileri arasında yer almaktadır (Melchior & Kastner, 1974). Yüksek uçucu yağ içeriği sayesinde ekonomik değeri oldukça yüksektir ve hem yerel hem de uluslararası pazarlarda talep görmektedir (Tucker & DeBaggio, 2009). Günümüzde, anason üzerine yapılan bilimsel çalışmalar, bu bitkinin geleneksel kullanımının modern tıp tarafından desteklenmesini sağlamış, bitkisel tıbbi ürünler ve fonksiyonel gıdalar alanında kullanımını artırmıştır.

Ca (12.64-3141 mg/kg), Zn (0.12-14.31 mg/kg) ve Cu (0.029-0.035 mg/kg) içerdiği bildirilmiştir (Mohammadi et al., 2017; Abdel-Rahman et al., 2020). Bu bağlamda, *Pimpinella* türlerinin doğal bir besin ve mineral kaynağı olabileceği düşünülmektedir.

Tarihçesi ve Kullanım Alanları

Anason (*Pimpinella anisum L.*), tarih boyunca farklı medeniyetler tarafından kullanılan önemli bir tıbbi ve aromatik bitkidir. İlk olarak Antik Mısır'da yetiştirildiği ve milattan önce 1500 yıllarına ait EbersPapiro'sunda tıbbi amaçlarla kullanıldığına dair kayıtlar bulunduğu bilinmektedir (Leung&Foster, 1996). Hipokrat, Dioskorides ve Galen gibi antik dönem hekimleri, anasonun sindirimi kolaylaştırıcı, gaz giderici ve solunum yollarını rahatlatıcı etkilerinden bahsetmişlerdir (Davis, 1972). Antik Yunan ve Roma'da anason, yemeklerde baharat olarak kullanılmasının yanı sıra, şarap ve içkilere aroma vermek için de tercih edilmiştir (Hänsel et al., 1994). Orta Çağ Avrupa'sında ise özellikle manastır hekimleri tarafından mide rahatsızlıklarını gidermek, uykusuzluğu önlemek ve kadın sağlığını desteklemek amacıyla yaygın bir şekilde kullanılmıştır (Grieve, 1931).

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Antikanser Özellikleri

Anasonun (*Pimpinella anisum*) antikanser özellikleri, içerdiği biyolojik aktif bileşenler sayesinde farklı mekanizmalar aracılığıyla kanser hücreleri üzerinde etkili olabilmektedir. Bu etkiler, hücre proliferasyonunu inhibe etme, apoptozu (programlanmış hücre ölümü) tetikleme, oksidatif stresi azaltma ve inflamasyonu baskılama gibi çeşitli biyokimyasal yollarla gerçekleşmektedir.

Apoptozu (Programlanmış Hücre Ölümü) Tetikleme

Kanser hücreleri genellikle kontrolsüz çoğalır ve apoptoz mekanizmasını devre dışı bırakır. Anason ve temel bileşeni anetol, çeşitli kanser türlerinde apoptotik yolları aktive edebilmektedir. Yapılan araştırmalarda, anetolün mitokondriyal apoptotik yolları tetiklediği ve Bcl-2 ailesine bağlı proteinleri regüle ederek hücre ölümünü hızlandırdığı gösterilmiştir (Gülenç et al., 2020).

Kanser hücrelerinin kontrolsüz çoğalmasını engellemek için en etkili stratejilerden biri, apoptozu teşvik eden bileşikler kullanmaktır. Bir çalışmada, anason ekstraktlarının meme kanseri hücre hattı (MCF-7) üzerinde apoptotik etki gösterdiği, özellikle de Bax/Bcl-2 oranını artırarak hücrelerin doğal ölüm sürecini hızlandırdığı bildirilmiştir (Khodarahmi et al., 2018). Bu mekanizma, kemoterapötik ajanlarla benzer bir şekilde çalışarak kanser hücrelerini etkili bir şekilde yok edebilir.

Hücre Proliferasyonunu Baskılama

Kanser hücrelerinin hızlı çoğalmasını önlemek, kanser tedavisinde kritik bir hedeftir. Anasonun içerdiği flavonoidler, fenolik bileşikler ve anetol, hücre döngüsünü belirli aşamalarda durdurarak (G1 ve G2/M fazlarında) tümör gelişimini yavaşlatabilmektedir (Sultana et al., 2012). Özellikle meme kanseri, akciğer kanseri ve kolon kanseri hücre hatları üzerinde yapılan deneylerde, anason ekstraktlarının antiproliferatif etkiler gösterdiği tespit edilmiştir (Sengul et al., 2017).

Kanser hücrelerinin kontrolsüz çoğalması, malign tümörlerin büyümesine ve yayılmasına neden olan temel mekanizmalardan biridir. Yapılan araştırmalarda, anason uçucu yağının HepG2 (karaciğer kanseri), Caco2 (kolon kanseri), MCF-7 (meme kanseri) ve THP-1 (lösemi) hücre hatlarında çoğalmayı belirgin şekilde inhibe ettiği gösterilmiştir. Yunanistan'dan toplanan *P. anisum* uçucu yağı ile yapılan bir çalışmada, bu hücre hatlarında EC50 değerlerinin sırasıyla 0.39, 0.25, 0.3 ve 0.11 mg/mL olduğu rapor edilmiştir (Papageorgiou et al., 2020).

Oksidatif Stresi Azaltma ve Antioksidan Etkiler

Serbest radikaller ve oksidatif stres, DNA hasarına yol açarak kanser oluşumunu teşvik eden önemli faktörlerden biridir. Anason, yüksek antioksidan kapasitesi sayesinde hücre oksidatif stresi azaltarak DNA hasarını önleyebilir (Gürbüz et al., 2011). Özellikle fenolik bileşikler ve uçucu yağlar (anetol, estragol, linalool) güçlü antioksidan özellikler sergileyerek hücrelerin serbest radikallerin zararlı etkilerinden korunmasına yardımcı olmaktadır (Boskabady&Ramazani-Assari, 2001).

Kanser gelişiminde oksidatif stres önemli bir rol oynar. Serbest radikallerin neden olduğu DNA hasarı, hücre mutasyonlarına ve tümör oluşumuna yol açabilir. *Pimpinella anisum*'un fenolik bileşikleri ve flavonoidleri, serbest radikalleri nötralize ederek oksidatif stresi azaltır ve hücreleri DNA hasarından korur (Saedi et al., 2020).

Antiinflamatuvar Etkiler ve Tümör Mikroçevresi Üzerindeki Rolü

Kronik inflamasyon, birçok kanser türünün gelişiminde önemli bir faktördür. Anason ve bileşenleri, inflamatuvar yanıtı baskılayarak tümör oluşumunu önleyici rol oynayabilir. Anetolün, NF- κ B (nükleer faktör kappa B) yollarını inhibe ederek inflamasyonu azalttığı ve dolayısıyla kanser gelişimini yavaşlatabileceği rapor edilmiştir (Rashid et al., 2019).

Kronik inflamasyon, birçok kanser türünün oluşumuna ve ilerlemesine katkıda bulunan önemli bir faktördür. Anason bitkisi, güçlü anti-inflamatuvar özellikleri sayesinde, inflamasyona bağlı kanser türlerinin gelişme riskini azaltabilir. İtalya'da yapılan bir araştırmada, *Pimpinella anisoides*'in etanol ekstraktlarının murin makrofaj hücre hattı (RAW 264.7) üzerinde anti-inflamatuvar etki gösterdiği

belirlenmiştir (Russo et al., 2021). Bu etkinin, inflamatuvar mediatörlerin üretimini baskılayarak ve oksidatif stresi azaltarak kanserin ilerlemesini engelleyebileceği düşünülmektedir.

Metastazi Önleme ve Anjiyogenezi Baskılama

Kanser hücrelerinin vücutta yayılmasını (metastaz) önlemek, başarılı bir kanser tedavisinde önemli bir faktördür. Yapılan çalışmalarda, anetolün matriks metalloproteinazları (MMP'ler) inhibe ederek hücre göçünü ve metastatik yayılımı önleyebileceği gösterilmiştir (Soler et al., 2015). Ayrıca, tümörlerin büyüüp gelişmesi için gerekli olan yeni damar oluşumu süreci (anjiyogenezi) de anason bileşenleri tarafından baskılanabilmektedir (Leung&Foster, 1996).

Kanser hücrelerinin birincil tümörden ayrılarak diğer organlara yayılması (metastaz), kanserin en ölümcül aşamalarından biridir. Yapılan bazı araştırmalarda, anason özlerinin belirli kanser hücre hatlarında metastazi baskıladığı ve hücrelerin invazyon kapasitesini azalttığı bildirilmiştir (Mohammed et al., 2021).

Antidiyabetik Özellikleri

Anasonun (*Pimpinellaanisum*) antidiyabetik özellikleri, içerdiği aktif bileşenler sayesinde kan şekeri seviyelerini düzenleyici ve insülin duyarlılığını artırıcı etkileri ile ilişkilendirilmektedir. Geleneksel tıpta şeker hastalığı tedavisinde kullanılan anason, modern bilimsel çalışmalarla da desteklenen çeşitli farmakolojik etkilere sahiptir. Bu etkiler, antioksidan, antiinflamatuvar, insülin salgısını artırıcı ve glikoz metabolizmasını düzenleyici mekanizmalarla gerçekleşmektedir.

Kan Şekeri Seviyelerini Düşürme

Anason, içeriğindeki biyoaktif bileşenler (anetol, flavonoidler, fenolik bileşikler) sayesinde kan şekerinin düzenlenmesine yardımcı olabilir. Yapılan çalışmalar, anason ekstraktının hiperglisemiye karşı etkili olduğunu ve kan şekeri seviyelerini düşürebildiğini göstermektedir (El-Soud et al., 2011). Anason, pankreas β -hücrelerini koruyarak insülin üretimini artırabilir ve insülin direncini azaltabilir.

Diyabetin temel özelliklerinden biri, vücudun kan şekeri seviyelerini düzenleyememesidir. Yapılan çalışmalarda, anason özlerinin hipoglisemik etki gösterdiği, yani kan şekerini düşürmeye yardımcı olduğu belirlenmiştir. Bir hayvan modelinde yapılan araştırmada, anason özütü verilen diyabetik sıçanların kan şekeri seviyelerinde anlamlı bir düşüş gözlemlenmiştir (Gülçin et al., 2019).

İnsülin Salgısını Artırma ve Pankreas Üzerindeki Etkileri

Diyabet hastalarında insülin üretimi azalmış veya insülin duyarlılığı bozulmuş olabilir. Anasonun içerdiği anetoladlı bileşiğin pankreas β -hücrelerini uyarak insülin salgısını artırdığı ve böylece kan şekeri seviyelerinin düzenlenmesine yardımcı olduğu gösterilmiştir (Kamalakkannan&Prince, 2006). Ayrıca anason, pankreas hücrelerini oksidatif hasara karşı koruyarak diyabetin ilerlemesini yavaşlatabilir (Hosseinzadeh et al., 2015).

Tip 2 diyabetin temel mekanizmalarından biri **insülin direncidir**. İnsülin duyarlılığının azalması, hücrelerin glikozu etkili bir şekilde kullanamamasına ve hiperglisemiye yol açar. Mısır'da yapılan bir çalışmada, anason özlerinin insülin reseptörlerinin aktivitesini artırarak insülin duyarlılığını iyileştirdiği belirlenmiştir (El-Soud et al., 2020).

Oksidatif Stresi ve İltihabı Azaltma

Diyabet, yüksek oksidatif stres ve kronik inflamasyon ile ilişkilidir. Anason, antioksidan özellikleri sayesinde serbest radikalleri nötralize ederek pankreas hücrelerinin korunmasına yardımcı olabilir. Fenolik bileşikler ve flavonoidler açısından zengin olan anason, diyabette sık görülen iltihaplanmayı azaltarak komplikasyon risklerini düşürebilir (Sengul et al., 2017). Özellikle anetol, NF- κ B ve COX-2 gibi inflamasyonla ilişkili sinyal yollarını inhibe ederek iltihaplanmayı baskılar (Rashid et al., 2019).

Diyabetik hastalardakronik inflamasyon, insülin direnci ve pankreas hasarı ile doğrudan ilişkilidir. Bir çalışmada, anason özlerinin proinflamatuvar sitokinlerin (TNF- α , IL-6) seviyelerini düşürerek inflamasyonu azalttığı gösterilmiştir (Frag et al., 2022).

Glikoz Metabolizmasını Düzenleme

Anasonun, glikozun hücreler tarafından daha verimli bir şekilde kullanılmasını sağladığı ve böylece insülin duyarlılığını artırdığı gösterilmiştir. Bazı araştırmalar, anason ekstraktlarının glikoz taşıyıcı proteinlerin (GLUT4) ekspresyonunu artırarak hücrelerin glikoz alımını iyileştirdiğini ortaya koymuştur (Rahimi et al., 2015). Bu durum, özellikle Tip 2 diyabet hastalarında önemli bir fayda sağlayabilir.

Anason, glikoz metabolizmasını düzenleyen bazı enzimlerin aktivitesini değiştirerek diyabetin kontrol altına alınmasına katkıda bulunabilir. Hindistan'da yapılan bir araştırmada, anason özütünün karaciğerde glikoneogenez (glikoz üretimi) sürecini baskıladığı ve böylece kan şekerinin aşırı yükselmesini engellediği belirlenmiştir (Singh et al., 2021).

Lipid Profili ve Kardiyovasküler Sağlık Üzerindeki Etkileri

Diyabet genellikle yüksek kolesterol ve trigliserid seviyeleri ile ilişkilidir. Anasonun, kan lipid seviyelerini düzenleyerek diyabete bağlı kardiyovasküler komplikasyonları önleyebileceği düşünülmektedir. Yapılan çalışmalarda, anason tohumlarının total kolesterolü, LDL'yi düşürdüğü ve HDL seviyelerini artırdığı gösterilmiştir (Boskabady&Ramazani-Assari, 2001). Bu durum, diyabet hastalarında sık görülen kalp-damar hastalıkları riskini azaltmada önemli bir rol oynayabilir.

Diyabete Bağlı Komplikasyonları Önleme

Uzun süreli diyabet, böbrek hasarı (diyabetik nefropati), sinir hasarı (diyabetik nöropati) ve göz hastalıkları (diyabetik retinopati) gibi ciddi komplikasyonlara yol açabilir. Anasonun antioksidan, antiinflamatuvar ve hücre koruyucu etkileri, bu komplikasyonların gelişimini yavaşlatabilir veya önleyebilir (Hosseinzadeh et al., 2015).

Diyabetin uzun vadeli etkileri arasında böbrek hasarı (diyabetik nefropati), sinir hasarı (diyabetik nöropati) ve damar hastalıkları bulunur. Bir deneysel çalışmada, anasonun böbrek fonksiyonlarını koruduğu, serum kreatinin ve üre seviyelerini düşürdüğü ve böbrek dokusundaki oksidatif stresi azalttığı tespit edilmiştir (Abdel-Rahman et al., 2019).

SONUÇ

Anason (*Pimpinella anisum*), tıbbi ve aromatik özellikleri nedeniyle yüzyıllardır kullanılan değerli bir bitkidir. Yapılan bilimsel çalışmalar, anasonun hem antikanser hem de antidiyabetik etkiler gösterdiğini ortaya koymuştur. Anasonun içerdiği anetol, flavonoidler, fenolik bileşikler ve uçucu yağlar, bu farmakolojik etkilerin temel bileşenleri olarak öne çıkmaktadır (Ceylan, 1997; Davis, 1972).

Antikanser özellikleri açısından bakıldığında, anasonun bazı kanser hücre hatlarında proliferasyonu engelleyici, sitotoksik ve antiinflamatuvar etkiler gösterdiği tespit edilmiştir. Özellikle HepG2 (karaciğer kanseri), Caco2 (kolon kanseri), MCF-7 (meme kanseri) ve THP-1 (lösemi) hücrelerinde anasonun büyümeyi baskılayıcı etkileri belirlenmiştir (Pimenov&Leonov, 1993). Ayrıca, antioksidan özellikleri sayesinde kanserle ilişkili oksidatif stresi ve inflamasyonu azaltabileceği gösterilmiştir (Melchior&Kastner, 1974).

Öte yandan, anasonun antidiyabetik etkileri de dikkat çekicidir. Araştırmalar, anason özlerinin kan şekerini düzenleme, insülin duyarlılığını artırma ve pankreatik β -hücrelerini koruma gibi çok yönlü faydalar sunduğunu ortaya koymuştur (Güner et al., 2012). Glikoz metabolizmasını destekleyerek karaciğerde glikojen sentezini artırdığı, insülin reseptörlerini aktive ederek hücrelerin glikoz kullanımını iyileştirdiği ve inflamasyonu baskılayarak diyabete bağlı komplikasyonları azalttığı belirlenmiştir (Cinbilgel et al., 2015).

Bu bilimsel bulgular, anasonun hem kanser önleyici hem de diyabet yönetimine yardımcı olabilecek doğal bir bitki olduğunu göstermektedir. Ancak, anasonun bu etkilerinin insanlar üzerindeki kesin sonuçlarını belirlemek için daha fazla klinik çalışmaya ihtiyaç duyulmaktadır (Ceylan, 1997). Dolayısıyla, anasonun tedavi edici bir ajan olarak kullanımı, bilimsel veriler ışığında değerlendirilmelidir. Bununla birlikte, doğal ve bitkisel desteklerin alternatif tıp kapsamında kullanımında doktor gözetimi önerilmektedir.

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Sonuç olarak, anasonun fonksiyonel gıda, fitoterapi ve ilaç sanayisinde önemli bir potansiyel taşıdığı söylenebilir. Bu bağlamda, anasonun biyoaktif bileşenlerinin daha ayrıntılı analiz edilmesi ve modern tıpta etkin bir şekilde kullanılması için daha fazla araştırmaya ihtiyaç duyulmaktadır.

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II. International Texas Congress on Advanced Scientific Research and Innovation

İlgili makama:

ULUSLARARASI TEKSAS İLERİ BİLİMSEL ARAŞTIRMA KONGRESİ 27-28 Ocak 2025 tarihleri arasında Teksas'ta 18 farklı ülkenin akademisyen/araştırmacılarının katılımıyla gerçekleşmiştir. Kongre kapsamında sunumu yapılan 67 bildirinin 30 adeti Türkiye'den katılımcılar tarafından; 37 bildiri ise 18 ülkeden katılımcılar tarafından sunulmuştur. Kongre 16 Ocak 2020 Akademik Teşvik Ödeneği Yönetmeliğine getirilen “*Tebliğlerin sunulduğu yurt içinde veya yurt dışındaki etkinliğin uluslararası olarak nitelendirilebilmesi için Türkiye dışında en az beş farklı ülkeden sözlü tebliğ sunan konuşmacının katılım sağlaması ve tebliğlerin yarıdan fazlasının Türkiye dışından katılımcılar tarafından sunulması esastır.*” değişikliğine uygun düzenlenmiştir.

Bilgilerinize arz edilir,

Saygılarımla,

Dr. Mariam S. OLSSON
Organizing Committee Member



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