AL FARABI INTERNATIONAL CONGRESS ON APPLIED SCIENCES -III

November 16-17, 2021 Malatya, Turkey

PROCEEDING BOOK

EDITOR
Haluk CÖMERTOĞLU

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CONGRESS ID
Arapgir Municipality

CONGRESS TITLE

AL FARABI
INTERNATIONAL CONGRESS ON APPLIED SCIENCES -III

DATE AND PLACE

November 16-17, 2021 Malatya, Turkey

ORGANIZATION

Arapgir Municipality and Institute of Economic Development and Social Research (iksad) of Turkey

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TOTAL NUMBER OF PAPERS: 72

THE NUMBER OF PAPERS BY FROM TURKEY: 16
OTHER COUNTRIES: 56

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All applications have undergone a double-blind peer review process

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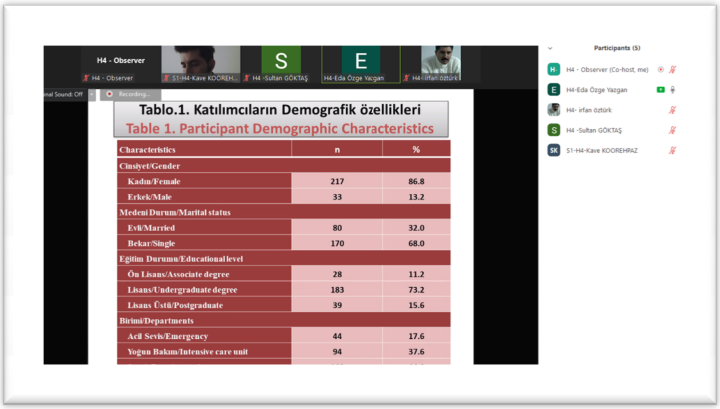
Photo Gallery



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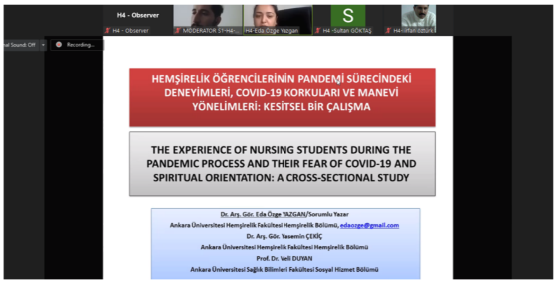

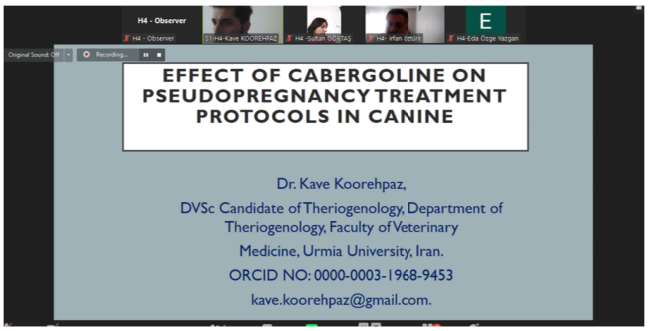

Conference Venue:

ONLINE and Face to Face

AL-FARABI

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Arapgir -Malatya, Turkey
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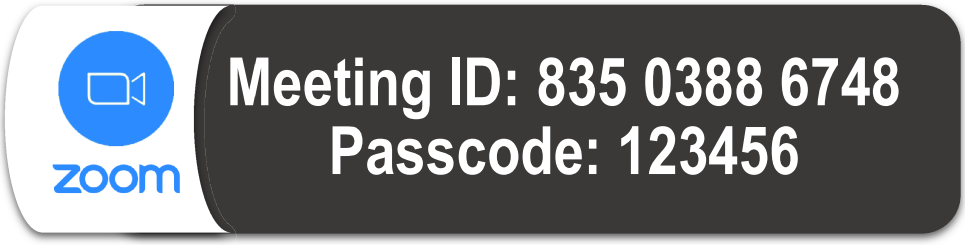
CONGRESS PROGRAM



Date: 16.11.2021	
Turkey Time:	10:00-12:30
Session-1	Hall-4

Moderator: Dr. Öğr. Üyesi Sabire YERLİKAYA

Title	Autors	Affiliation
PROPOLİSİN Staphylococcus aureus ATCC 25923 ÜZERİNDEKİ İNHİBİTÖR ETKİSİ	Sabire YERLİKAYA Hülya ŞEN ARSLAN	Karamanoğlu Mehmetbey University
THE VOLATILE ORGANIC COMPUNDS PROFILE, PARTICULATE MATTER AND CARBON DIOXIDE ANALYSED FROM A LOCAL DEPARTMENT STORE	Andreea ŢEPENEU Lucian COPOLOVICI Cristian MOISA Andreea LUPITU Dana COPOLOVICI	"Aurel Vlaicu" University, Romania
DETERMINATION OF SOME BIOACTIVE COMPONENTS, ANTIOXIDANT AND ANTIBACTERIAL PROPERTIES OF APRICOT KERNEL MILK	Zehra Tuğba MURATHAN Nurcan ERBİL Fatma ADA	Malatya Turgut Özal Üniversitesi, Malatya, Türkiye
RHEOLOGICAL PROPERTIES STUDY OF CURD FAT CONTENT, OBTAINED BY ACID-RENNET COAGUALTION OF COW MILK	Achraf Bouisfi, Firdaouss Bouisfi, Mohamed Chaoui	University Moulay Ismail, Meknes, Morocco.
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ISOLATION AND CHARACTERIZATION OF FUNGAL PRODUCERS OF NATURAL CHOLESTEROL-LOWERING AGENTS	Emine Seydametova	Universiti Malaysia Pahang, Malaysia

Date: 16.11.2021		
Ankara Time:		**10:00-12:30**
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Moderator: Prof.Dr.Süreyya Meriç Pagano and Prof.Betül TAŞDELEN		
Title	**Autors**	**Affiliation**
NANOREMEDIATION TECHNOLOGIES: SUSTAINABLE & EFFICIENT REMEDIATION PATHWAYS TOWARDS SDG #6	Aderemi Timothy Adeleye Chuks K. Odoh Lanre Anthony Gbadegesin Omoniyi Ahmed Olalekan Oludare O. Osiboye Kehinde.H. Moberuagba	Chinese Academy of Sciences (CAS), Dalian, China Veritas University, Abuja, Nigeria Tai Solarin University, Nigeria
PREPARATION AND CHARACTERIZATION OF CHITOSAN/CARBOXYMETHYL CELLULOSE/ITACONIC ACID HYDROGELS	Caner ERAT Betül TAŞDELEN Süreyya Meriç Pagano	Tekirdag Namık Kemal Üniversitesi, Tekirdağ-Turkey
PHYSICOCHEMICAL PROPERTIES AND CHEMICAL ANALYSIS OF PHOENIX DACTILYFERA L. SEED OIL	Yasmina Halabi Chaimae Nasri Hicham Harhar Abdelkbir Bellaouchou Mohamed Tabyaoui	Mohammed V University, Rabat, Morocco
ENHANCED REMOVAL OF ANIONIC DYE FROM AQUEOUS SOLUTION ON POLYMER-PHOSPHATE BIOCOMPOSITE: KINETICS AND EQUILIBRIUM STUDIES	Bouthayna Kjidaa, Rachid Mamouni, Khalid Aziz Ahmed Azrrar Nabil Saffaj	Ibn Zohr University, Morocco.
COMPARITIVE STUDY ON PHYTOCHEMICAL ANALYSIS OF BOERHAAVIA SPECIES	Alby Chandran ., Reena T ., Suchithra. G	Malankara Catholic College, Mannonmaniam Sundaranar University, Thirunnelveli, Tamilnadu, South India.
SYNTHESIS AND PHYSICOCHEMICAL PROPERRTIES OF A POLYVINYL ACETATE BINDER ADDED TO A VINYL PAINT	Boussak Hassina, Demim Soraya, Louci Seiad Linda, Hammadou Souaad	M'Hamed Bougara University of Boumerdes, Boumerdes, Algeria.
SYNTHESIS OF MGO NANOPARTICLES USING BIO-WASTE EGGSHELL MEMBRANE AND ITS ANTIFUNGAL ACTIVITY	Divya T, Prashanna Suvaitha S, Venkatachalam K	University of Madras, Guindy Campus, Chennai
DESIGN AND SYNTHESIS OF A FUNCTIONALISED 2-AMINOBODIPY FOR RAPID VISUAL DETECTION OF PHOSGENE	Rua Alnoman	Taibah University, Yanbu, Saudi Arabia
INVESTIGATING OF PANI-BASED HYBRID COMPOSITE PERFORMANCE FOR THE OG DYESTUFF REMOVAL	Abdelaziz Imgharn , Abdelghani Hsini , Yassine Naciri, Mohamed Laabd , Rajae Lakhmiri , Badredine Souhail , Abdallah Albourine	Ibn Zohr University, Morocco. Abdelmalek Essaâdi University, Morocco

Date: 16.11.2021		
Turkey Time:		13:00-15:30
Session-2		Hall-4

Moderator: Prof. Dr . Loredana Litu and Prof. Dr . Maria Harja

Title	Autors	Affiliation
AN OVERVIEW OF WEAPONS OF MASS DESTRUCTION IN TERMS OF EXPLOSIVES	Ali GEYGEL, Ali Rıza DEMİRTAŞ, Dilek ÖZTAŞ, Aytunç ATEŞ	Ankara Yıldırım Beyazıt Üniversitesi Fen Bilimleri Enstitüsü,
A RESEARCH ON THE SECRET AND SPREAD OF IMPROVED WEAPONS OF MASS DESTRUCTION	Ali GEYGEL, Ali Rıza DEMİRTAŞ, Dilek ÖZTAŞ, Aytunç ATEŞ	Ankara Yıldırım Beyazıt Üniversitesi Fen Bilimleri Enstitüsü,
FACIL SYNTHESIS OF TIO 2 /AG PHOTOCATALYST FOR REMOVAL OF DYE (METHYLENE BLUE) FROM WASTEWATER	Maria Harja, Catalina Duduman (Nutescu),Gabriela Ciobanu Lidia Favier Gabriela Buema Consuelo Gomez de Castro	"Gheorghe Asachi" Technical University of Iasi, Romania Univ. Rennes, France National Institute of Research and Development Mangeron Boulevard, Iasi, Romania
POTASSIUM CARBONATE/ BICARBONATE AQUEOUS SOLUTIONS PROTED WITH ETHYLENEDIAMINE AS EFFICIENT CO 2 CAPTURE SOLVENT	Elisabeta Droniuc (Hultuana), Ramona Tataru-Farmus, Gabriela Ciobanu, Maria Harja	"Gheorghe Asachi" Technical University of Iasi Iasi, Romania
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DYES REMOVAL USING A LOW COST ADSORBENT: INSIGHT INTO BEHAVIOR AND MECHANISM	Gabriela Buema Loredana Litu, Maria Harja	National Institute of Research Mangeron Boulevard, Iasi, Romania "Gheorghe Asachi" Technical University of Iasi
THERMOELECTRIC PROPERTIES OF THE PREDICTED NEW POLYTYPES OF GAN: A FIRST-PRINCIPLES STUDY	Bakhtiar Ul Haq , S. AlFaify , R. Ahmed	King Khalid University, , Abha, Saudi Arabia. University of the Punjab, Pakistan

Date: 16.11.2021		
Turkey Time:		**13:00-15:30**
Session-2		**Hall-5**

Moderator: Dr. Laura Comănescu

Title	Autors	Affiliation
TARİHİ YAPILARDAKİ DOĞAL AYDINLATMA UYGULAMALARI	Tuğba İNAN GÜNAYDIN Gizem ÖZAL Z. Hafsa ÖZDEMİR	Niğde Ömer Halisdemir Üniversitesi
IDENTIFICATION AND MINIMIZATION OF WASTE IN A FORMICA PROCESSING INDUSTRY USING LEAN MANUFACTURING TOOLS	Ziaullah Jan	UET Peshawar, Industrial Engineering, Peshawar, Paksitan
INVESTIGATION Of The EFFECT Of The DIFFERENT NUMBER LAYERS ON FILAMENT WINDING GLASS FIBER REINFORCED POLYMER (GFRP) PIPES UNDER COMPRESSION FORCE	Emrah MADENCİ, Lokman GEMİ, Yasin Onuralp ÖZKILIÇ, Zeynep Kübra GÜVEN	Necmettin Erbakan Üniversitesi
STRUCTURAL ANALYSIS OF PARTICLE FRACTIONS RELEASED DURING TEXTILE FRICTION PHENOMENA	Visileanu Emilia, Carmen Mihai, Razvan Scarlat	The National Research and Developement Institute
METAMORFİK ÇEKİRDEK KOMPLEKSLERDE DÜŞÜK-AÇILI NORMAL FAY BOYUNCA GELİŞEN MAGMATİK KAYAÇLARA BİR ÖRNEK, GÜNEYDOĞU TÜRKİYE: JEOLOJİK, TEKTONİK VE MİNERALOJİK ÇIKARIMLAR	Esra YILDIRIM Nail YILDIRIM	Fırat Üniversitesi Maden Tetkik ve Arama Genel Müdürlüğü
Glacial geomorphosites - inventory. Study case: Capra Basin (Făgăraş Mts.), Romania	Alexandru Nedelea, Laura Comănescu	University of Bucharest, Romania
CONTRIBUTION OF ECOLOGICAL MODELING IN DEVELOPMENT OF SCIENTIFIC RESEARCH OF COUNTRIES: A CASE STUDY OF DROUGHT EARLY WARNING SYSTEM IN MOROCCAN RANGELANDS	Zbiri Asmae, El Alaoui-Faris Fatima Ezzahrae, Hachmi Azeddine Haesen Dominique DAVID A.VACCARI	Mohammed V University, Morocco. Vlaamse Instelling Voor Technologisch Onderzoek (VITO), Belgium, Stevens Institute of Technology, Hoboken, NJ, Civil, Environmental and Ocean Engineering, United States
CONTINGENT VALUATION ON PROPOSED IMPROVEMENTS IN ENSURING SUSTAINABLE WATER, HYGIENE, AND SANITATION IN SDSSU BISLIG CAMPUS ON THIS NEW NORMAL BROUGHT BY COVID 19 PANDEMIC PROJECT	Anastacio G. Pantaleon, Jr. Hannah G. Pantaleon	North Eastern Mindanao State University – Bislig Campus

Date: 16.11.2021		
Turkey Time:		**16:00-18:30**
Session-3		**Hall-4**

Moderator: Dr. Öğr. Üyesi. Cüneyt TAMER

Title	Autors	Affiliation
REVERSE TRANSKİPTAZ-POLİMERAZ ZİNCİRİ REAKSİYONU VE REKOMBİNAZ POLİMERAZ AMPLİFİKASYONUNUN TESPİT LİMİTLERİ ÜZERİNE KARŞILAŞTIRMALI BİR ÇALIŞMA	Cüneyt TAMER	Ondokuz Mayis University, Samsun, TURKEY
HERD MANAGEMENT WITH LEAN SIX SIGMA METHODOLOGY TO INCREASE EFFICIENCY IN LIVESTOCK ENTERPRISES	İrfan ÖZTÜR	Harran üniversitesi
GROWTH PERFORMANCE OF TILAPIA FED WITH MORINGA LEAF POWDER MIXED FEED	Zubyda Mushtari Nadia Prosun Roy Newton Saha Sayed Mashequl Bari Abdus Salam	Sher-e-Bangla Agricultural University, Bangladesh Patuakhali Science and Technology University University of Rajshahi
INVESTIGATION OF STRESS CORROSION CRACKING IN TITANIUM ALLOY (TI6AL4V) WITH AND WITHOUT CADMIUM COATING	Fawad Yousaf Malik, Nazeer Ahmad Anjum Rubeena Kousar Ghulam Murtaza Shoaib Ahmed	University of Engineering and Technology, Taxila, Pakistan
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ESTIMATION OF POPULATION PARAMETERS FOR A DATA DEFICIENT Rasbora rasbora (HAMILTON, 1822) STOCK FROM THE PAYRA RIVER, SOUTHERN BANGLADESH	Newton Saha Prosun Roy Moazzem Hossain Arifur Rahman Ferdous Ahamed Yeamin Hossain	Patuakhali Science and Technology University ,Bangladesh Bangladesh Agricultural University, University of Rajshahi,Bangladesh

Date: 16.11.2021		
Turkey Time:		**16:00-18:30**
Session-3		**Hall-5**

Moderator: Dr. Öğr. Üyesi Tarkan KOCA and Mai Duc Nghia

Title	Autors	Affiliation
COMPARATIVE STUDY BETWEEN TWO POLYETHYLENE RING AND THICK-WALLED DISC PROSTHESES ON THE DISTRIBUTION OF VON MISES STRESSES AND STRAINS IN THE SPINE: CALCULATED BY THE CODE OF ANSYS WORKBENCH 16.2.	Samir Zahaf Amar Chemmami Mouloud Dahmane Azzeddine Belaziz Slimane Debbaghi Abdelkader Mestar	National Polytechnic School of Oran -MA, Algeria. University of Djilali Bounaama-Khamis Meliana, Ain Defla-Algeria. USTO-MB, El Menaour, Oran Algeria University campus of châab erssas, Constantine, Oran Mohamed Boudiaf University, Oran Algeria
COMPARATIVE STUDY BETWEEN PATCH REPAIR AND RIVETING IN DAMAGED STRUCTURE CALCULATED BY THE FINITE ELEMENT METHOD	ZAHAF Samir TERFA Abdelaaziz BOUHEDJA Makhlouf	University of Djilali Bounaama-Khamis Meliana, Ain Defla- Algeria
ANALYSIS OF THE EFFECT OF PARTY SIZE ON CYLON PERFORMANCE IN CYLON SEPARATIONS	Ayşegül BALİKCİ Tarkan KOCA	İnönü Üniversitesi
MHD MIXED CONVECTIVE HEAT TRANSFER IN A SQUARE ENCLOSURE FILLED WITH COPPER-WATER NANOFLUID	EL HATTAB Mohamed, LAFDAILI Zakaria	Ibn Zohr University, Morocco
USAGE AND ANALYSIS OF DIFFERENT TYPES OF TURBULATORS IN GAS BOILER	Berna ÇERİ Tarkan KOCA	İnönü Üniversitesi
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APPLICATION OF CFD THEORY IN WORKING CYCLE SIMULATION OF THE 4CHE YANMAR DIESEL ENGINE	Mai Duc Nghia	Air Force Officer's college, Nha Trang City, VietNam
THE CONSTRUCTION OF A SOLAR THERMODYNAMIC MICRO POWER PLANT IN THE ORIENTAL REGION OF MOROCCO: MOTIVES AND REASONS	Firyal LATRACHE Zakia HAMMOUCH Benaissa BELLACH Mohammed GHAMMOURI	University Mohammed First, Oujda, Morocco.
NUMERICAL ANALYSIS OF UNDEREXPANDED SONIC JET USING VANED NOZZLE FOR JET CONTROL	Revathy R K., Balamani G.	Madras Institute of Technology, Chennai, TamilNadu, India.

Date: 17.11.2021		
Turkey Time:		10:00-12:30
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Moderator: Dr. Kave Koorehpaz

Title	Autors	Affiliation
EFFECT OF CABERGOLINE ON PSEUDOPREGNANCY TREATMENT PROTOCOLS IN CANINE	Kave Koorehpaz	Urmia University, Iran
INDUCTION AND SYNCHRONIZATION OF ESTRUS IN CANINE	Kave Koorehpaz	Urmia University, Iran
PROBLEMS AND SOLUTION SUGGESTIONS FOR THE EDUCATION AND TRAINING SYSTEM IN THE COVID-19 PROCESS	Sultan GÖKTAŞ	Harran Üniversitesi
THE EXPERIENCE OF NURSING STUDENTS DURING THE PANDEMIC PROCESS AND THEIR FEAR OF COVID-19 AND SPIRITUAL ORIENTATION: A CROSS-SECTIONAL STUDY	Eda Özge YAZGAN, Yasemin ÇEKİÇ, Veli DUYAN	Ankara Üniversitesi
THE EXPERIENCE OF NURSES IN TURKEY DURING THE PANDEMIC PROCESS AND THEIR FEAR OF COVID-19 AND DEATH ANXIETY: A CROSS-SECTIONAL STUDY	Yasemin ÇEKİÇ, Eda Özge YAZGAN, Veli DUYAN	Ankara Üniversitesi
SQUEEZE FILM ANALYTICAL CHARACTERISTICS FOR THE HUMAN HIP JOINT	Inas Yayha	University of Kufa, Najaf, Iraq
THE ROLE OF OBJECT-ORIENTED PROGRAMMING IN THE SYSTEM OF PROFESSIONAL TRAINING FOR A BACHELOR'S DEGREE IN COMPUTER SCIENCE	Olexandr Kryvonos, Myroslava Kryvonos	Zhytomyr Ivan Franko State University, Zhytomyr, Ukraine

Date: 17.11.2021		
Turkey Time:		13:00-15:30
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Moderator: Doç. Dr. Abdullah GÖKTAŞ and Dr. Гамидов Эльшад Гамид		
Title	Autors	Affiliation
NUMBERS OF CORVIDAE IN THE TUUL RIVER IN THE TERRITORY OF ULAANBAATAR	Цэгмид Намсрайжав Маловичко Л.В Пунцагсоном Угтахбаяр Milivoje Urosevic	Монгольский сельскохозяйственный университет, Улаанбаатар, Монголии Российский государственный аграрный университет-МСХА имени К.А. Тимирязева Центр сохранения коренных пород, Белград, Сербии
ALTERNATIVE MANAGEMENT OF DEGRADED SEED PRODUCTION SAINFOIN STANDS	Emil Vasilev Viliana Vasileva	Maize Research Institute, Bulgaria Institute of Forage Crops, Pleven, Bulgaria
INCREASING HOUSE-HOLD DEMAND FOR WOOD FUEL: A THREAT TO FORESTRY DEVELOPMENT IN NIGERIA	Oyewole, A. L., Oyewole, S. O. , Ishola B. F.	Research Institute of Nigeria, Jericho, Ibadan, Nigeria
UNDERSTANDING OF SOIL EROSION BASED ON WADIES MORPHOMETRIC PARAMETER INCONSISTENCIES	Asep Hidayatulloh, Mohamed Elhag , Jarbou Bahrawi, Jaka Budiman	King Abdul Aziz University, Jeddah, Saudi Arabia
ENVIRONMENTAL ANALYSIS OF AROMATIC HYDROCARBON TOXICITY: A CASE STUDY	HAMMOUYA Amel CHAIB Rachid	Mokhtar University, Algeria. Frères Mentouri Constantine University, Algeria.
BOUNDARY VALUE PROBLEM FOR SECOND ORDER OPERATOR-DIFFERENTIAL EQUATIONS	Гамидов Эльшад Гамид	Азербайджанский Государственный Педагогический Университ
R PROGRAMMING LANGUAGE AS THE MAIN TEACHING TOOL OF TEACHING STATISTICS TO FUTURE IT SPECIALISTS AND COMPUTER SCIENCE TEACHERS	Maria Khomyak	Lesya Ukrainka Volyn national university, Lutsk, Ukraine.
PLANNING A FAST MOVEMENTS FOR TWO-LINK PLANAR ROBOT ARM USING SEQUENTIAL QUADRATIC PROGRAMMING	Bendali Nadir	University of Khemis Miliana, Road of Theniet El Had, Khemis Miliana, Algeria.
STRUCTURAL AND OPTICAL PROPERTIES OF ZNS THIN FILMS AS A FUNCTION OF NA SUBSTITUTION RATIO	Abdullah GÖKTAŞ	Harran Üniversitesi

Date: 17.11.2021		
Turkey Time:		13:00-15:30
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Moderator: Prof. Adil Geybulla		
Title	Autors	Affiliation
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ANTERIOR DEEP BITE AND TMD-CASE REPORT	Daniela Srbinoska, Vesna Trpevska, Maja Radeva Aneta Mijoska	University Dental Clinical Center "St. Panteleimon", St. Kiril and Metodij" Skopje, R. North Macedonia,
ABNORMAL POSITIONS OF STRUCTURES IN THE FACE AND THEIR CLINICAL IMPLICATIONS	Stoyan Novakov Nina Yotova	University of Plovdiv, Plovdiv, Bulgaria
THE CLINICAL CHARACTERISTIC OF PM IN PATIENTS UNDER 40 YEARS.	Sghibneva-Bobeico Nina, Musteata Vasile Robu Maria Musteata Larisa	State University of Medicine and Pharmacy "N. Testemitanu"
ESTIMATED WEEKLY INTAKE AND THE POTENTIAL TARGET CANCER RISKS OF EXPOSURE TO PARTICULATE MATTER (PM 2.5) AMONG COMMUNITIES LIVING NEAR BOSOWA CEMENT INDUSTRY, INDONESIA	Anwar Mallongi , Stang , Annisa Utami Rauf , Ratna Dwi Puji Astuti , Maimunah	Hasanuddin University, Makassar, Indonesia
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DIFFERENT TECHNIQUES IN CANINE RETRACTION-CASE REPORTS	Vesna Trpevska, Daniela Srbinoska, Aneta Mijoska, Ivan Tanatarec	PHO University „St. Panteleimon",Republic of North Macedonia PHO „DR. TANATAREC", Bitola, Republic of North Macedonia,

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INHIBITORY EFFECTS OF PROPOLIS AGAINST *Staphylococcus aureus* ATCC 25923

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ABSTRACT

In this study, the inhibitory effects of propolis ethanolic extract (EEP) on the survival Staphylococcus aureus ATCC 25923 was investigated. After Staphylococcus aureus ATCC 25923 has been activated in nutrient broth medium, pathogen was added to chicken broth. Samples were stored at 4 ºC for 7 days. Samples were treated with 5%, 10% and 15% EEP on 1., 3., 5.and 7. days of storage. Samples were treated with EEP at 25ºC for 15 minutes. For this purpose samples were divided into three groups. First group was the control samples (has Staphylococcus aureus ATCC 25923 without EEP), the second group was inoculated with 70% ethanol (EA), the third group was inoculated with EEP, after pathogen inoculation. All samples significantly ($P< 0.05$) reduced the count of Staphylococcus aureus ATCC 25923 in chicken broth compared with the control samples. It was calculated 16.0 cfu/ml Staphylococcus aureus ATCC 25923 in control samples. Treatment with EA is found to be the least effective (14,41 log cfu/ml) on 7.day of storage. EEP reduced the numbers of pathogen in all samples. 15% EEP has the most antimicrobial effect (5,90 log cfu/ml) on 3.day of storage. 15%, 10%, 5% EEP were found as the most effective treatment on all storage days, respectively. The results of this study indicate that EEP as a natural food preservative may be used to reduce Staphylococcus aureus ATCC 25923 in chicken broth at 4ºC.

Keywords: Chicken broth, pathogen, ethanolic extract

PROPOLİSİN *Staphylococcus aureus* ATCC 25923 ÜZERİNDEKİ İNHİBİTÖR ETKİSİ

ÖZET

Bu çalışmada, propolis etanolik ekstraktının (EEP) canlı Staphylococcus aureus ATCC 25923'ün üzerindeki inhibitör etkileri araştırılmıştır. Staphylococcus aureus ATCC 25923 nutrient broth besiyerinde aktive edildikten sonra tavuk suyuna inoküle edilmiştir. Örnekler 4 ºC'de 7 gün depo edilmiştir. Örnekler, depolamanın 1., 3., 5. ve 7. günlerinde %5, %10 ve %15 konsntrasyonunda EEP ile muamele edilmiştir. Numuneler EEP ile 25ºC'de 15 dakika muamele edilmiştir. Bu amaçla örnekler üç gruba ayrılmıştır. Birinci grup, kontrol numunelerini (EEP'siz, Staphylococcus aureus ATCC 25923'e sahip), ikinci grup %70 etanol (EA) ile muamele edildiğini, üçüncü grup patojen inokülasyonundan sonra EEP inoküle edildiğini ifade etmektedir. Tüm numuneler ($P< 0.05$), kontrol numuneleriyle karşılaştırıldığında, tavuk suyunda Staphylococcus aureus ATCC 25923 sayısını önemli ölçüde azaltmıştır. Kontrol örneklerinde 16.0 kob/ml konsantrasyonunda Staphylococcus aureus ATCC 25923 tespit edilmiştir. En az etkili muamelenin depolamanın 7. gününde EA (14,41 log kob/ml) ile muamele olduğu bulunmuştur. EEP, tüm örneklerde patojen sayısını azaltmıştır. En yüksek etkiye sahip olan örnek, depolamanın 3. gününde %15 EEP (5,90 log cfu/ml) muamelesi olmuştur Tüm depolama günlerinde sırasıyla %15, %10 ve %5 EEP en etkili muamele olarak tespit edilmiştir. Bu çalışmanın sonuçları, doğal bir gıda koruyucusu olarak EEP'nin 4ºC'de tavuk suyunda Staphylococcus aureus ATCC 25923'ü azaltmak için kullanılabileceğini göstermektedir.

Anahtar kelimeler: Tavuk suyu, patojen, etanolik extract

1. INTRODUCTION

Staphylococcus aureus (S. aureus) is a opportunistic pathogen for humans and animals and is responsible for various infections, food-poisoning (Deurenberg and Stobberingh, 2008; Chambers and DeLeo, 2009). Food safety is a major global concern in food industry. *Staphylococcus aureu*s is, among the reported foodborne pathogen, significant source of foodborne diseases (Scharff, 2012). *S. aureus* is the most often isolated pathogen from food samples in Singapore since 2006 (MOH, 2015). Poultry, red meat, egg, seafood and dairy products are associated with staphylococcal food poisoning (Le Loir et al., 2003; Yuan and Yuk, 2018).

Propolis is collected by bees from buds, leaves and similar parts of trees such as pine, oak, birch, eucalyptus, poplar, chestnut and some herbaceous plants. It is a sticky, resin-like odor, is used in the hive for many purposes by mixing with wax, and its color varies from dark yellow to brown. According to the researches made at the beginning of the 20. century, it was determined that the source of propolis is poplar trees. In addition, there are trees such as pine, birch, elm, oak, ash, maple, hazelnut, alder, plum, willow, eucalyptus, chestnut, linden, acacia that honeybees use as a source of propolis; These plant species used vary from region to region, according to climate, collection time and season. Propolis also contains some plant-specific proteins in its structure. For this reason, it has been stated that the waxy part of propolis has a vegetable wax structure (Kumova et al., 2002; Durán et al., 2007; Yerlikaya, 2017).

Chicken meat; it is a very nutritious food source that contains low-fat, adequate protein, minerals such as iron, phosphorus, potassium, and especially vitamins such as riboflavin and niacin. 100 g of chicken meat meets 40-50% of daily protein, 25-30% of daily vitamin B6, 42.5% of daily niacin, 26.1% of daily selenium. Chicken meat has 20-25% protein, 13% fat content and 100 g chicken meat gives 195 kcal energy (Anonymous, 2010). Proteins are of great importance for the construction of new tissues in the body and the maintenance and repair of existing ones. As a source of animal protein, meat and meat products have a great place in nutrition. Chicken meat, in terms of healthy nutrition, it is one of the best sources due to its high quality protein, low fat and vitamin-mineral content. It is more preferred by the consumer with its affordable price compared to red meats (Yerlikaya, 2017).

In this study, the inhibitory effects of propolis ethanolic extract (EEP) on the survival *Staphylococcus aureus* ATCC 25923 was investigated.

2. MATERIAL-METHOD

2.1. Material

Propolis was collected from Pertek district of Tunceli, *Staphylococcus aureus* ATCC was taken from Selçuk University and brought to laboratory of Karamanoğlu Mehmetbey University, Department of Food Engineering under aseptic conditions.

2.2. Methods

2.2.1. Ethanolic propolis extract

For 5% ethanolic propolis extract, 5 g propolis was dissolved in 95 ml ethanol; for 10% ethanolic propolis extract, 10 g propolis was dissolved in 90 ml ethanol. Thawing was continued for a week in a sealed container in a dark environment. The solution was shaken twice a day, and the solution obtained at the end of the period was filtered through Whatman no: 1 filter paper and placed in sterile bottles with cap and kept at + 4 ° C until used for analysis (Lu et al. 2005).

2.2.2. *Staphylococcus aureus* ATCC 25923 inhibition

After *Staphylococcus aureus* ATCC 25923 has been activated in nutrient broth medium, pathogen was added to chicken broth. Samples were stored at 4 ºC for 7 days. Samples were treated with 5%, 10% and 15% EEP on 1., 3., 5.and 7. days of storage. Samples were treated with EEP at 25ºC for 15 minutes. For this purpose samples were divided into three groups. First group was the control samples (has *Staphylococcus aureus* ATCC 25923 without EEP), the second group was inoculated with 70% ethanol (EA), the third group was inoculated with EEP, after pathogen inoculation. Appropriate diluations were inoculated on petri dishes with Baird Parker agar using spread plate technique. It was incubated at 37°C for 24 hours (AOAC, 2000).

2.3. Statistical analysis

The results were analyzed statistically using SPSS 22 (IBM Corp., Armonk, New York, USA) program. Sample means were compared using Two Way ANOVA. According to Levene test of variances, samples with p <0.05 values were evaluated with Tukey test from Post Hoc test (Şen Arslan, 2017).

3. RESULT-DISCUSSION

The effects of the propolis concentration (Table 1), storage days (Table 2) and inretaction of them (Table 3 and Figure 1) on *S.aureus* inhibition were found to be statistically significant (p<0.05). Table 1, Table 2 and Table 3 shows the results of the two-way Anova Comparison Test for *S.aureus* inhibition values.

Table 1. The effects of propolis concentration on *S.aureus*

Factor	***S. aureus log kob/ml***
CB	16.33 ± 0.02^{a}
Ethanol	11.80 ± 0.02^{b}
5% propolis	9.24 ± 0.07^{c}
10% propolis	7.56 ± 0.12^{d}
15% propolis	6.60 ± 0.15^{e}

(Comparison of the means of four replicates with the Two-Way ANOVA test shows that there is a significant difference between the $^{a-e}$ means on the averages ($p < .05$). CB: chicken broth)

As can be seen in Table 1, *S. aureus* was determined as 16.33 log cfu/ml in control sample (chicken broth). 15% propolis has the highest inhibitory effect as 6.60 log cfu/ml. It is determined 10% propolis (7.56 log cfu/ml) has more antmicrobial effect than 5% propolis (9.24 log cfu/ml). All propolis concentration has more antimicrobial activity than ethanol (11.80 log cfu/ml).

Table 2. The effects of storage days on *S.aureus*

Storage (day)	***S. aureus log cfu/ml***
1	8.67 ± 0.78^{b}
3	8.99 ± 0.82^{b}
5	11.65 ± 0.75^{a}
7	11.92 ± 0.88^{a}

Table 2 shows, pathogen concentration was determined as 8.67 log cfu/ml in first day; as 11.92 log cfu/ml in 7. day of storage. The number of *S.aureus* was detected to increase towards to the end of storage.

Table 3 shows *S.aureus* increased in control samples (from 13.19 log cfu/ml to 19.92 log cfu/ml) and in samples with ethanol (from 9.03 log cfu/ml to 14.41 log cfu/ml) in all storage days. The highest inhibitory effect was detected with 15% propolis in 3.day (5.90 log cfu/ml) of storage.

Santos et al. (2002) conducted research on propolis obtained from certain regions of Brazil. Inhibitory activity of propolis aqueous ethanolic extract and its derivatives against some bacteria was determined. These bacteria were found to be sensitive to propolis.

Another study was conducted to determine the antibacterial (*S. aureus* and *E. coli*), antifungal (*Candia albicans*) and antiviral (*Avian influenza*) effects of propolis samples collected from different geographical regions. While all samples were found to be effective against fungi and Gram (+) samples; it was stated that the most effect was shown with antiviral activity (Kujumgiev et al., 1999).

Table 3. The effects on *S.aureus*

Factor	***S.aureus* log cfu/ml**
CB*1st day	13.19 ± 0.47^{cd}
Ethanol*1st day	9.03 ± 0.21^{fgh}

%5 propolis*1st day	7.46±0.21^{hıj}
%10 propolis*1st day	6.87±0.12^{j}
%15 propolis*1st day	6.81±0.16^{j}
CB*3rd day	14.43±0.02^{c}
Ethanol*3rd day	10.48±0.20^{efg}
%5 propolis*3rd day	7.21±0.06^{ıj}
%10 propolis*3rd day	6.94±0.08^{j}
%15 propolis*3rd day	5.90±0.05^{j}
CB*5th day	17.80±0.17^{b}
Ethanol*5th day	13.26±0.24^{cd}
%5 propolis*5th day	10.83±0.17^{ef}
%10 propolis*5th day	9.00±0.24^{ghı}
%15 propolis*5th day	7.34±0.17^{hıj}
CB*7th day	19.92±0.24^{a}
Ethanol*7th day	14.41±0.17^{c}
%5 propolis*7th day	11.47±0.24^{de}
%10 propolis*7th day	7.42±0.17^{hıj}
%15 propolis*7th day	6.36±.0.24^{j}

(Comparison of the means of four replicates with the Two-Way ANOVA test shows that there is a significant difference between the $^{a-j}$ means on the averages ($p < .05$). CB: chicken broth)

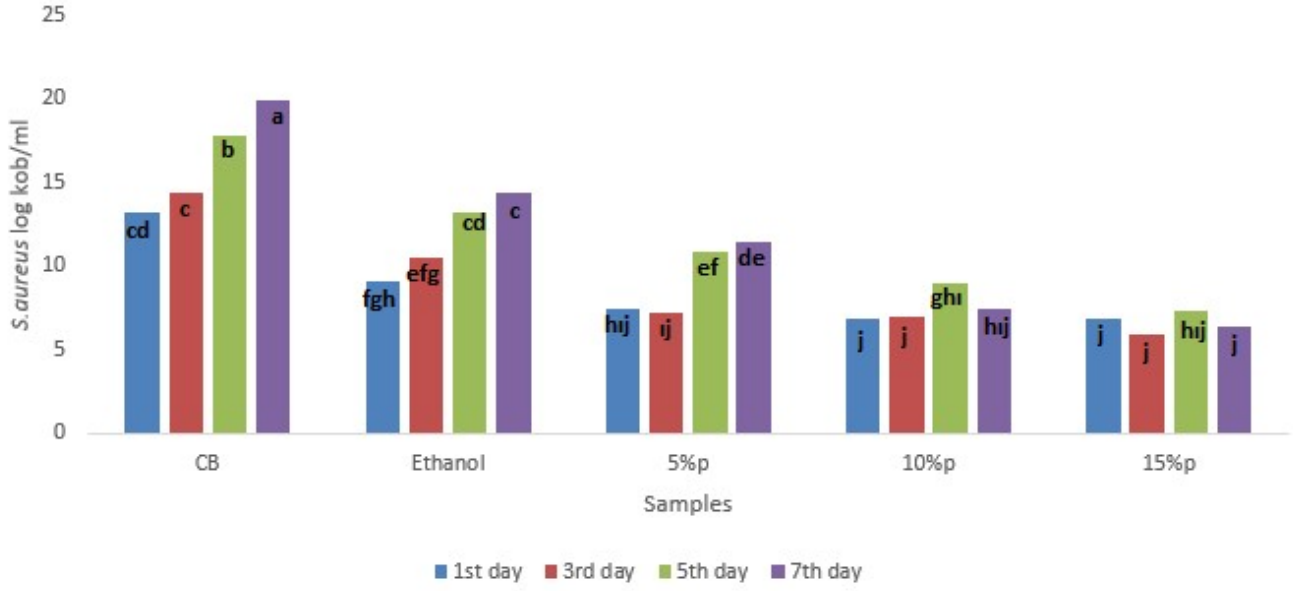

Figure 1. The effects of propolis concentration and storage day interaction on *S.aureus*

Figure 1 indicates 15% propolis has the highest antimicrobial effect in all storage day. 10% propolis has more inhibitory effect than 5% propolis in all storage day. It was seen an increase in pathogen concentration in 5.day of storage in samples has 5%, 10% and 15% propolis. But this increase decreased in 7.day in samples has 10% and 15% propolis.

Serra and Escola (1995) conducted a study involving 12 different propolis samples. They investigated the antimicrobial activities of phenolic compounds obtained from propolis samples and as a result, they found a relationship between bacteriostatic activity and flavonoids. They stated that at least 60-80 µg/ml propolis is required to inhibit S. aureus.

Silici and Kaftanoğlu (2003) investigated the antibacterial effects of propolis samples collected from Bursa, İzmir, Kayseri, Sivas, Yozgat, Erzurum, Hatay and Artvin regions on *S. aureus* and *E. coli*. While all of the samples showed inhibitory activity on *S. aureus*, the inhibitory activity observed on *E. coli* was relatively weak.

4. CONCLISION

In recent years, there has been an increased interest in using natural preservatives instead of chemicals on pathogens contaminating foods. Studies on this subject have generally been related to plant extracts. In addition, propolis is also known to have high antimicrobial activity due to the phenolic compounds it contains. For this reason, many studies are conducted to investigate the inhibitory effect of propolis on pathogenic bacteria such as *S.aureus.*

According to this study, it is seen that the inhibitory effect of 15% propolis ethanolic extract on *S.aureus* is more than 5% propolis ethanolic extract and 70% ethanol. The strongest effect was observed in the sample with 15% propolis in 3.day of storage at 4°C. Propolis ethanolic extracts as a natural preservative, can be used to inhibit *S.aureus* at 4°C.

5. REFERENCES

1. Anonim, (2010) http://www.senpilic.com.tr/tr/icerik/besin-degerleri
2. AOAC (2000). Official Methods of Analysis (18th ed.). Arlington, VA, Association of Official Analytical Chemists.
3. H.F. Chambers, F.R. De Leo (2009). **Waves of resistance:** *Staphylococcus aureus* **in the antibiotic era** Nat. Rev. Microbiol., 7, pp. 629-641
4. R.H. Deurenberg, E.E. Stobberingh, (2008). **The evolution of** *Staphylococcus aureus* Infect. Genet. Evol., 8, pp. 747-763
5. Durán, N., Marcato, P., Buffo, C., De Azevedo, M. and Esposito, E., (2007), Poly (ε-caprolactone)/propolis extract: microencapsulation and antibacterial activity evaluation, Die Pharmazie-An International Journal of Pharmaceutical Sciences, 62 (4), 287-290
6. Kujumgiev, A., Tsvetkova, I., Serkedjieva, Y., Bankova, V., Christov, R. ve Popov, S., (1999), Antibacterial, antifungal and antiviral activity of propolis of different geographic origin, Journal of ethnopharmacology, 64 (3), 235-240.
7. Kumova, U., Korkmaz, A., Avcı, B. C. and Ceyran, G., (2002), Önemli bir arı ürünü: propolis, Uludağ Arıcılık Dergisi, 2002 (2).
8. Le Loir Y., Baron F., Gautier M., (2003). *Staphylococcus aureus* **and food poisoning** Genet. Mol. Res., 2, pp. 63-76
9. Lu LC, YW Chen, CC Chou (2005). Antibacterial activity of propolis against *Staphylococcus aureus*. Int J. Food Microbiol. 102, 213-220
10. MOH (Ministry of Health), (2015). Singapore **A review of the local epidemiology and surveillance, prevention and control of foodborne illnesses in Singapore** Epidemiol. News Bull., 41, pp. 10-17
11. R.L. Scharff (2012). **Economic burden from health losses due to foodborne illness in the United States** J. Food Prot., 75, pp. 123-131
12. Santos, F. A., Bastos, E. M. A., Uzeda, M., Carvalho, M. A. R., Farias, L. M., Moreira, E. S. A. ve Braga, F. C., (2002), Antibacterial activity of Brazilian propolis and fractions against oral anaerobic bacteria, Journal of ethnopharmacology, 80 (1), 1-7.
13. Serra, J. ve Escola, R., (1995), A study of the bacteriostatic activity of propolis, Deutsche Lebensmittel-Rundschau, 91 (8), 242-246.
14. Silici, S. ve Kaftanoğlu, O., (2003), Türkiye'nin farklı coğrafik bölgelerinden toplanan propolis örneklerinin antimikrobiyel analizi, Uludağ Arıcılık Dergisi, (3).
15. Şen Arslan H (2017). Bazı tıbbi aromatik bitki ekstraktlarının fenolik madde içerikleriyle amilaz, glukozidaz ve lipaz enzimleri üzerine etkileri. Erciyes Üniversitesi, Fen Bilimleri Enstitüsü Yüksek Lisans tezi, Kayseri.
16. Yerlikaya, S., (2017). Propolis ilave edilmiş tavuk ve sığır eti ekstraktlarının (tozlarının) depolama süresince bazı fizikokimyasal özelliklerinin belirlenmesi, Selçuk University, Ph.D. Thesis
17. Yuan W., Yuk H.G. (2018). Antimicrobial efficacy of s*zygium antisepticum* plant extract against S*taphylococcus aureus* and methicillin-resistant S. *aureus* and its application potential with cooked chicken Food Microbiology, Volume 72, 176-184

THE VOLATILE ORGANIC COMPUNDS PROFILE, PARTICULATE MATTER AND CARBON DIOXIDE ANALYSED FROM A LOCAL DEPARTMENT STORE

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ABSTRACT

Introduction: People spend a long time indoors. Indoor air quality it has become very important and studied having a considerable impact on human health. The most common indoor pollutants are particulate matter (PM), formaldehyde (HCHO), volatile organic compounds (VOC), and carbon dioxide (CO_2).
Aims: We studied the modifications of volatile organic compounds and concentrations of PMs, formaldehyde, and carbon dioxide in different departments of a general store.
Materials and Methods: The particulate matter (PM1, PM2.5, and PM 10), formaldehyde, and carbon dioxide concentrations have been determined daily in the morning at the first hour and at a peack hour using a multiparameter. Volatile organic compounds (terpenes, aldehydes, ketones, and alcohols) have been monitored using a gas chromatography-mass spectrometry technique.
Results: The volatile organic compounds concentrations are changing with the daytime and influx of buyers. Aldehydes dominate the profile of volatile organic compounds for non-food departments and terpenes for food departments.
Conclusion: In the present research work, we demonstrated that different pollutants could be presented in the market, and their profiles depend on departments,daytime and influx of buyers.

Keywords: indoor pollution, volatile organic compounds, formaldehyde, particulate matter, carbon dioxide.

KAYISI ÇEKİRDEĞİ SÜTÜNÜN BAZI BİYOAKTİF BİLEŞENLERİ, ANTİOKSİDAN VE ANTİBAKTERİYEL ÖZELLİKLERİNİN BELİRLENMESİ

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ÖZET
Bu araştırmanın amacı vegan beslenmede tercih edilen, ayrıca laktoz intoleransı olan kişilerin tüketmeyi tercih ettiği bitkisel sütler grubuna yeni eklenen kayısı sütünün toplam fenolik madde, toplam flavanoid madde içeriklerinin, 3 farklı yöntemle (DPPH, ABTS, FRAP) antioksidan kapasitelerinin ve antibakteriyel özelliklerinin belirlenmesidir. Bu amaçla bir gece suda bekletilen kayısı çekirdeklerinin kabukları soyulmuş; 50 g çekirdek 1 lt distile suyla homojenize edilip tülbentten geçirilmiştir. Örneğin toplam flavanoid madde miktarı 19.3 mg/100g ve toplam fenolik madde miktarı 49.5 mg/100g olarak belirlenmiştir. Antioksidan kapasitesi DPPH yöntemiyle % 59.8, ABTS yöntemiyle % 60.56 ve FRAP yöntemiyle 293.5 µmol Fe II/g olarak tespit edilmiştir. Antibakteriyel özelliklerin belirlenmesi amacıyla test bakterisi olarak *Bacillus subtilis* subsp. *spizizenii* ATCC 6633, *Bacillus licheniformis* ATCC 14580, *Staphylococcus aureus* ATCC 6538, *Enterobacter aerogenes* ATCC 13048, *Pseudomonas aeruginosa* ATCC 9027, *Escherichia coli* ATCC 8739 ve *Klebsiella pneumoniae* ATCC 33495; pozitif kontrol olarak ise Eritromisin kullanılmıştır. Kayısı sütü örneğinin çalışmada kullanılan hiçbir test bakterisi üzerinde antibakteriyel aktivite sergilemediği belirlenmiştir.

Anahtar Kelimeler: Kayısı sütü, Bitkisel süt, Antioksidan, Fenolik, Flavanoid, Antibakteriyel

DETERMINATION OF SOME BIOACTIVE COMPONENTS, ANTIOXIDANT AND ANTIBACTERIAL PROPERTIES OF APRICOT KERNEL MILK

ABSTRACT
The aim of this study is to determine the total phenolic substance, total flavonoid substance content, antioxidant capacity with 3 different methods (DPPH, ABTS, FRAP) and antibacterial properties of apricot milk, which have just added to the group of herbal milks preferred by vegan diets or lactose intolerant people. For this purpose, the apricot kernels, which were kept in water overnight, were peeled; 50 g of seeds were homogenized with 1 lt of distilled water and passed through cheesecloth. The total flavonoid content was determined as 19.3 mg/100g and the total phenolic content was determined as 49.5 mg/100g. The antioxidant capacity was determined as 59.8% by DPPH method, 60.56% by ABTS method and 293.5 µmol Fe II/g by FRAP method. *Bacillus subtilis* subsp. spizizenii ATCC 6633, *Bacillus licheniformis* ATCC 14580, *Staphylococcus aureus* ATCC 6538, *Enterobacter aerogenes* ATCC 13048, *Pseudomonas aeruginosa* ATCC 9027, *Escherichia coli* ATCC 8739, and *Klebsiella pneumoniae* ATCC 33495 was used to determined antibacterial activity, Erythromycin was used as positive control. It was determined that the apricot milk sample did not exhibit antibacterial activity on any test bacteria used in the study.

Keywords: Apricot milk, Herbal milk, Antioxidant, Phenolic, Flavanoid, Antibacterial

1.GİRİŞ

Yeterli, dengeli ve sağlıklı beslenme, toplumu oluşturan bireylerin güçlü ve başarılı bir şekilde yaşamasının temel koşullarından biridir. Temel besin ihtiyaçlarını sağlamanın yanı sıra insan fizyolojisi ve metabolik fonksiyonlara faydalı, dolayısıyla hastalıklardan korunma ve sağlıklı yaşamda etkili gıdalar veya gıda bileşenleri son zamanlarda ilgi duyulan ürünler haline gelmişlerdir (Keskin, 2019).

Kayısı, Prunuphora alt cinsinde bulunan, tür adı *Prunus armeniaca L*. olan sert çekirdekli meyvedir. Anadolu Dünya'nın en önemli kayısı üretim merkezlerindendir (Asma, 2011). Dünya kayısı üretimi 2019 yılında 4.083.861 tondur. Türkiye Dünya taze kayısı üretiminde yıllara göre değişmekle birlikte 2016 yılında 846.606 tonluk üretimle birinci sırada yer almakta ve sahip olduğu potansiyel ile bu durumu uzun yıllar devam ettirmesi beklenmektedir (FAO, 2021). Ortalama olarak 1 kg kayısıdan 39.2 gr çekirdek ve 12.45 g tohum elde edilmektedir (Anonim, 2021). Bu da ülkemizde yılda yaklaşık olarak 10.000- 11.000 ton arasında kayısı tohumu üretildiğini göstermektedir. Bu tohumların bir kısmı ihraç edilirken, bir kısmı gıda, ilaç veya kozmetik sanayiinde kullanılmaktadır.

Ülkemizdeki besin alerjisi tüm dünyada olduğu gibi giderek artmaktadır. Çocuklarda ise en sık alerjiye neden olan besinler inek sütü ve yumurtadır (Sicherer, 2011). Her yaşta inek sütüne karşı istenmeyen reaksiyonlar görülebilir. Bu reaksiyonların tümü alerji değildir. İnek sütü alerjisi, süt alımından sonra süt proteinlerinden bir veya daha fazlasına karşı görülen immünolojik reaksiyonlardır. İntolerans ise alerjik olmayan reaksiyonlar olarak tanımlanmaktadır (Özçeker ve Tamay, 2015). İnek sütünde alerjiye neden olabilecek 20'den fazla protein bulunmaktadır (Wal, 1998). Bunlardan en önemlileri kazeindir (a-kazein). Süt proteinleri pastörizasyon, evaporasyon gibi işlemlerden sonra da özelliklerini korurlar (Fiocchi ve ark., 2010; Restani ve ark., 1995). İnek sütü alerjisi durumunda diyetten inek sütü proteinleri çıkarılmalıdır (Kneepkens ve Meijer, 2009). Bu durumda bebek ve annelere Ca, D vitamini ve proteince zengin diyet verilmelidir. Yetişkinler ise inek sütü yerine bitkisel sütleri tercih edebilir.

İnek sütünün tüketiminden kaynaklanan laktoz intoleransı ve süt alerjisi gibi konular nedeniyle, dünya çapında bitki bazlı alternatif sütlerde talep artışı olmuştur. Gıda Endüstrisi, badem sütü ve soya sütü gibi, bitki kaynaklı alternatifler olan, çeşitli süt içecekleri sunarak bu talepleri ele almıştır. Bu sütler sağlıklı olarak ilan edilmiş ancak kısa ya da uzun vadeli tüketimlerinin beslenme fizyolojisi açısından etkileri çok az araştırılmıştır (Vanga ve Raghavan, 2018).

Özellikle badem sütü vejetaryenlerin, laktoz intoleransı olanların son zamanlarda tercih ettiği bitkisel, laktozsuz süttür. Yaşlılar, kalp damar hastaları ve diyabet hastaları için alternatif bir ürün olarak görülmektedir (Ceylan, 2013). Bu bitkisel süt labne peyniri gibi ürünlerin yapımında da kullanılmaktadır.

Literatür incelendiğinde kayısı çekirdeği sütü ile ilgili herhangi bir bilimsel çalışma görülmemektedir. Bu çalışmada yeni bir ürün olan kayısı çekirdeği sütünün bazı biyoaktif bileşenleri, antioksidan ve antibakteriyel özellikleri incelenmiştir.

2.MATERYAL METOT

Materyal

Hacıhaliloğlu kayısı çeşidine ait çekirdekler Malatya ilinden 2018 hasat döneminde temin edilmiştir. Sert kabuk kısımları ayrılan tohumlar bir gece distile suda bekletilmiş ve kahverengi kabukları çıkarılmıştır (Şekil 1). Daha sonra 50 g tohum 1 lt distile su ile

homojenize edilmiş ve ince gözenekli bir tülbentten süzülmüştür. Ekstrakt 1'e 20 dilüe edilerek analizlerde kullanılmıştır.

Şekil 1. Kayısı sütünün hazırlanması

Metot

Toplam Flavanoid Madde Analizi

Toplam flavanoid madde analizi Quettier ve ark. (2000) geliştirmiş oldukları yönteme göre 415 nm dalga boyunda spektrofotometre ile belirlenmiştir. Quersetin ile hazırlanmış olan kalibrasyon eğrisinden yararlanılarak toplam flavonoid madde miktarı hesaplanmıştır.

Toplam Fenolik Madde Analizi

Toplam fenolik madde tayini Folin-Ciocalteu yöntemi kullanılarak, spektrofotometrede 750 nm'de belirlenmiştir (Spanos ve Wrolstad, 1992). Örneklerin toplam fenolik madde içerikleri gallik asit standardı kullanılarak hesaplanmıştır.

Antioksidan Kapasite Analizleri

DPPH Metodu

DPPH (1,1-diphenyl-2-picrylhydrazyl) metodu Bakhshi ve Arakawa (2006)'ya göre 515 nm dalga boyunda spektrofotometrede belirlenmiştir. Antioksidan kapasite %DPPH=(Akontrol-Aörnek)/Akontrol x 100 formülüyle hesaplanmıştır.

ABTS Metodu

ABTS yöntemi Re ve ark. (1999)'a göre yapılmış, 734 nm'de karışımın absorbansı ölçülmüştür. Antioksidan kapasite %DPPH=(Akontrol-Aörnek)/Akontrol x 100 formülüyle hesaplanmıştır.

FRAP Metodu

FRAP yöntemi Benzie ve Strain (1996)'e göre yapılmış, absorbans 593 nm'de ölçülmüştür. Standart eğri $FeSO_4$ solüsyonu kullanılarak hazırlanmıştır (100-1000 µl). Sonuçlar µmol Fe (II)/g cinsinden hesaplanmıştır.

Antibakteriyel Aktivite Analizleri

Antibakteriyel aktivite analizlerinde kullanılmak üzere hazırlanan ve konsantre edilen ekstraktlar 0.22 µm por genişliğine sahip mikrofiltre yardımı ile steril edildikten sonra kullanılıncaya kadar -20 °C'de muhafaza edilmiştir.

Örneklerden elde edilen su ekstraktlarının antibakteriyel aktivitesi agar kuyu difüzyon metoduna göre test edilmiştir (Rauha ve ark., 2000). Test bakterisi olarak *Bacillus subtilis* subsp. *spizizenii* ATCC 6633, *Bacillus licheniformis* ATCC 14580, *Staphylococcus aureus* ATCC 6538, *Enterobacter aerogenes* ATCC 13048, *Pseudomonas aeruginosa* ATCC 9027, *Escherichia coli* ATCC 8739 ve *Klebsiella pneumoniae* ATCC 33495; pozitif kontrol olarak ise Eritromisin kullanılmıştır. Analizler esnasında test maddesi olarak, her bir ekstrakttan 150 µl kullanılmıştır. Analiz sonucunda petriler 37 ºC'de 48 saat inkübe edilmiş ve oluşan inhibisyon zonları dijital kumpas yardımıyla mm olarak ölçülmüştür.

İstatistiksel Analizler
Çalışmada tüm analizler 3 tekrarlı olarak yapılmış ve elde edilen verilerin değerlendirilmesinde SPSS 15. paket programı kullanılmıştır.

3.BULGULAR VE TARTIŞMA

Kayısı sütüne ait toplam flavanoid madde, toplam fenolik madde, DPPH, ABTS ve FRAP metoduyla antioksidan aktivite değerleri Tablo 1' de verilmiştir. Örneğin toplam flavanoid madde miktarı 19.3 mg/100g ve toplam fenolik madde miktarı 49.5 mg/100g olarak belirlenmiştir. Ceylan ve Özer (2020) badem sütü örneklerinde toplam fenolik madde içeriğinin 0.34 mg/mL olduğunu bildirmişlerdir. Colic ve ark. (2017) 23 farklı badem genotipinde toplam fenolik madde analizi yapmışlardır. Fenolik madde miktarı en yüksek 1392 mg/L ve en düşük 204 mg/L olarak tespit edilmiştir. Milbury ve ark. (2006), 8 farklı badem örneğinde yaptıkları araştırmada en yüksek fenolik madde içeriğini 241 mg /100 g, en düşük fenolik madde içeriğini 127 mg/100 g bulmuşlardır. Yiğit ve ark. (2009) acı ve tatlı kayısı çekirdeklerinin metanol ve suda ayrı ayrı ekstraktını hazırlayarak fenolik içeriklerine bakmışlardır. Fenolik madde içeriği en fazla 7.9 µg/mL ile tatlı kayısı çekirdeğinin su özütünde bulunurken, en az 0.4 µg/mL acı kayısı çekirdeğinin su ekstraktında bulunmuştur.
Örneğin antioksidan kapasitesi DPPH yöntemiyle % 59.8, ABTS yöntemiyle % 60.56 ve FRAP yöntemiyle 293.5 µmol Fe II/g olarak tespit edilmiştir. Yiğit ve ark. (2009) acı ve tatlı kayısı çekirdeklerinin metanol ve suda ayrı ayrı ekstraktını hazırlayarak antioksidan aktivitelerine ve fenolik içeriklerine bakmışlardır. DPPH metodunu kullanarak yaptıkları çalışmada tatlı çekirdeğin su ve metanol ekstraktları sırasıyla %89.9 ve %87.7 oranında antioksidan aktivite göstermiştir. Tatlı çekirdeğin aksine acı çekirdek ekstraktlarında aktivite gözlenmemiştir. Ceylan ve Özer (2020) badem sütü örneklerinde DPPH metoduyla antioksidan aktiviteyi % 67.11 olarak bildirmişlerdir. Çakır ve ark. (2018), kestane sütünün fiziksel, kimyasal ve biyokimyasal özellikleri üzerinde araştırma yapmış ve kestane sütünün antioksidan aktivitesinin yüksek olduğunu tespit etmişlerdir. Tyug ve ark. (2010), soya sütü tozunda yaptıkları araştırmada FRAP değerini 825.71 µmol Fe (II)/100g olarak tespit etmişlerdir.

Tablo 1. Kayısı sütünün bazı biyokimyasal özellikleri ve antioksidan aktivitesi

	ABTS (%)	**FRAP (µmol Fe II/g)**	**DPPH (%)**	**Toplam Fenolik Madde Miktarı (mg/100g)**	**Toplam Flavanoid Madde Miktarı (mg/100g)**
Kayısı Sütü	60.56±2.6	293.5±10.2	59.8±6.1	49.5±3.1	19.31±1.7

Örneklerin antibakteriyel özelliklerinin belirlenmesi amacıyla test bakterisi olarak *Bacillus subtilis* subsp. *spizizenii* ATCC 6633, *Bacillus licheniformis* ATCC 14580, *Staphylococcus aureus* ATCC 6538, *Enterobacter aerogenes* ATCC 13048, *Pseudomonas aeruginosa* ATCC 9027, *Escherichia coli* ATCC 8739 ve *Klebsiella pneumoniae* ATCC 33495; pozitif kontrol olarak ise Eritromisin kullanılmıştır (Tablo 2). Kayısı sütü örneğinin çalışmada kullanılan hiçbir test bakterisi üzerinde antibakteriyel aktivite sergilemediği belirlenmiştir. Alan ve ark. (2013), kayısı ve kayısı çekirdeklerinin antimikrobiyal etkisi üzerine yaptığı çalışmada taze kayısının farklı mikroorganizmalar (*Klebsiella pneumoniae* 13883,*Staphylococcus aureus* 6538,*Escherichia coli* ATCC 8739, *Bacillus megaterium* DSM 32, *Enterococcus faecalis* ATCC 29212, *Streptococcus faecalis*, *Candida albicans*,*Saccharomyces cerevisiae*) üzerinde etkili olduğunu ancak kayısı çekirdeğinin hiçbir etki göstermediğini tespit etmişlerdir. Singh ve ark. (2020) soya sütünün test bakterileri üzerinde herhangi bir antimikrobiyel aktivite göstermediğini, ancak fermente soya sütünün farklı oranlarda antimikrobiyel aktiviteye sahip olduğunu bildirmişlerdir.

Tablo 2. Kayısı sütünün antibakteriyel aktivite değerleri

	Kayısı sütü (mm)	Eritromisin (mm)
***Pseudomonas aeruginosa* ATCC 9027**	-	-
***Klebsiella pneumoniae* ATCC 33495**	-	12.88± 0.47
***Bacillus licheniformis* ATCC 14580**	-	31.55± 0.16
***Staphylococcus aureus* ATCC 6538**	-	30.52± 0.06
***Enterobacter aerogenes* ATCC 13048**	-	10.87± 0.47
***Escherichia coli* ATCC 8739**	-	12.24± 0.08
***Bacillus subtilis* subsp. *spizizenii* ATCC 6633**	-	-

4.SONUÇLAR VE ÖNERİLER

Kayısı sütü vegan beslenmesinde ve laktoz intoleransı gibi rahatsızlığı olan kişilerde bitkisel süt olarak tercih edilebilir. Antioksidan aktivitesi % 50'nin üzerinde olan kayısı sütü iyi bir biyoaktif bileşen kaynağı olarak görülebilir. Ancak kayısı çekirdeği siyanojenik glikozit olarak bilinen amigdalin adlı maddeyi içermektedir. Kayısı çekirdeği yiyerek zehirlenmiş olan özellikle çocuk yaşta çok sayıda vaka bulunmaktadır. Bu durum özellikle acı çekirdeklerde daha fazla görülmektedir. Çünkü acı badem ve kayısı çekirdekleri çok daha fazla amigdalin içermektedir. Amigdalinin insanlardaki toksik dozu kg vücut ağırlığı başına 0.5-3.5 mg arasında değişmektedir. Sonuç olarak kayısı çekirdeğinin günlük tüketim dozu belirlenerek kullanılması önemlidir.

REFERANSLAR

1. Alan, Y., Atalan, E., Erbil, N., Zorver, F., Kiycak, G., Çiçek, A.İ. (2013), "Malatya Kayısısı (*Prunus armeniaca L.)* ve Kayısı Çekirdeklerinin Antimikrobiyal Aktivitesi", Anadolu Doğa Bilimleri Dergisi, 4(2): 60-69.
2. Anonim (2021), "Iğdır İli Kayısı İşleme Tesisi Ön Fizibilite Raporu", Serka, Iğdır.
3. Asma, B.M. (2011), "Her Yönüyle Kayısı", Uyum Ajans, Ankara.
4. Bakhshi, D., Arakawa, O. (2006), "Effects of UV-b Irradiation on Phenolic Compound Accumulation and Antioxidant Activity in 'Jonathan' Apple Influenced By Bagging, Temperature and Maturation", Journal of Food, Agriculture & Environment, 4(1): 75-79.
5. Benzie, I.F.F., Strain, J.J. (1996), "The Ferric Reducing Ability of Plasma (FRAB) as a Measure of "Antioxidant Power": The FRAB Assay", Analytical Biochemistry, 239: 70-76.
6. Ceylan, M. M. (2013). "Badem Sütü Üretimi ve Optimizasyonu", Mustafa Kemal Üniversitesi, Fen Bilimleri Enstitüsü, Gıda Mühendisliği Ana Bilim Dalı, Hatay.
7. Ceylan, M. M., Özer, E. A. (2020). "Optimisation of Almond Milk Producing Using Response Surface Method", Journal of Agriculture, 3(1): 6-32.
8. Colic, D.S., Aksic, F.M., Lazarevic, K.B., Zec, G.N., Gasic, U.M.,Zagorac, D.C., Natic, M. (2017), Fatty Acid and Phenolic Profiles of Almond Grown in Serbia, Food Chemistry, 234: 455-463.
9. Çakır, H.E., Şirin, Y., Can, Z., Kolaylı, S. (2018), "Bitkisel Kaynaklı Süt: Kestane Sütünün Bazı Fiziksel, Kimyasal ve Antioksidan Özellikleri", International Eurasian Conference on Biological and Chemical Sciences (EurasianBioChem 2018).
10. FAO Statical Databases. 2021. http://faostat.fao.org (17.10.2021)
11. Fiocchi, A., Schünemann, H.J., Brozek, J., Restani, P., Beyer, K., Troncone, R. (2010), "Diagnosis and Rationale for Action Against Cow's Milk Allergy (DRACMA): a Summary Report", Journal of Allergy Clinical Immunology, 126: 1119-1128.
12. Keskin, A.Y. (2019), "Yaşlılarda Beslenme", İstanbul Üniversitesi, Açık ve Uzaktan Eğitim Fakültesi, İstanbul.
13. Kneepkens, C.M., Meijer, Y. (2009), "Clinical practice. Diagnosis and Treatment of Cow's Milk Allergy", European Journal of Pediatry, 168(8): 891-6.

14. Millbury, P.E., Chen, C.Y., Dolnikowski, G., Blumberg. J. (2006), "Determination of Flavonoids and Phenolics and Their Distribution in Almonds", Journal of Agriculture and Food Chemistry, 54: 5027-5033.
15. Özçeker, D., Tamay, Z. (2015), "Çocuklarda İnek Sütü Alerjisine Yaklaşım". FNG & Bilim Tıp Dergisi, 1(2):108-114.
16. Quettier-Deleu, C., Gressier, B., Vasseur, J., Dine, T., Brunet, J., Luyck, M., Cazin, M., Cazin, J.C., Bailleul, F., Trotin, F. (2000), "Phenolic Compoundsand Antioxidant Activities of Buck Wheat (*Fagopyrum esculentum* Moench) Hullsand Flour", Journal of Ethnopharmacology, 72: 35-40.
17. Rauha, J. P., Remes, S., Heinonen, M., Hopia, A., Kahkonen, M., Kujala, T., Pihlaja, K., Vuorela, P. (2000), "Antimicrobial Effects of Finnish Plant Extracts Containing Flavonoids and Other Phenolic Compounds", International Journal of Food Microbiology, 56: 3-12.
18. Re, R., Pellegrini, N., Proteggente, A., Pannala, A., Yang, M., Rice-Evans, C. (1999), "Antioxidant activity Applying an Improved ABTS Radical Cation Decolorization Assay", Free Radical Biology and Medicine, 26(9/10): 1231-1237.
19. Restani, P., Velonà, T., Plebani, A., Ugazio, A.G., Poiesi, C., Muraro, A. (1995), "Evaluation by SDS-PAGE and Immunoblotting of Residual Antigenicity in Hydrolysed Protein Formulas", Clinical and Experimental Allergy, 25: 651-8.
20. Sicherer, S.H., 2011. Epidemiology of Food Allergy. J Allergy Clin Immunol. 127:1105-18.
21. Singh, B. P., Bhushan, B., Vij, S. (2020), "Antioxidative, ACE inhibitory and antibacterial activities of soy milk fermented by indigenous strains of lactobacilli", Legume Science, 2(4), 54.
22. Spanos, G.A., Wrolstad, R.E. (1992), "Phenolic of Apple, Pear and White Grape Juices and Their Changes With Processing and Storage", Journal of Agriculture and Food Chemistry, 40(9): 1478-1487.
23. Tyug, T.S., Prasad, N., Ismail, A. (2010), "Antioxidant Capacity, Phenolics and Isoflavones in Soybean By-Products", Food Chemistry, 123: 583-589.
24. Vanga, S.K., Raghavan, V. (2018), H"ow Well Do Plant Based Alternatives Fare Nutritionally Compared To Cow's Milk", Journal of Food Science and Technology, 2: 10-20.
25. Wal, J.M.1(998), "Cow's Milk Allergens", Allergy, 53: 1013-22.
26. Yigit, D., Yigit, N., Mavi, A. (2009), "Antioxidant and Antimicrobial Activities of Bitter and Sweet Apricot (*Prunus armeniaca L.*) Kernels", Brailian Journal of Medicine and Biological Research, 42(4): 346-352.

RHEOLOGICAL PROPERTIES STUDY OF CURD FAT CONTENT, OBTAINED BY ACID-RENNET COAGUALTION OF COW MILK

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ABSTRACT

Starting from January 2020 until June 2020, the applicability of the usual rheological models (Ostwald model, Herschel-Bulkley and Casson) was examined to curd flow curves over a wide range of shear rates. The objective behind this study is to describe how the fat content of curds affect the curd paste rheology and what is the more effective rheological model for the viscosity prediction of curd based on fat content.

The raw milk samples for this study were collected from selected farms, known by their mastery of farming techniques, equipped with the new tools of livestock health control. The livestock is 165 milk cows from Prim'Holstein breed. The milk was standardized to the same quality parameters (protein content, Total solids, pH), the curd paste was obtained by Combining Acid and Rennet Coagulation, all curd samples follow the same process requirements and parameters.

Keywords: rheology; shear rate; fat; curd; milk.

SYNTHESIS AND CHARACTERIZATION, BIOLOGICAL EVALUATION AND ANTI-CORROSION ACTIVITY OF SOME HETEROCYCLIC COMPOUNDS (OXAZEPINE, TETRAZOLE) DERIVED FROM SCHIFF BASES

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ABSTRACT

This work included synthesis of several new Schiff bases by condensation of some benzaldehyde derivatives and 4,4′-Oxydianiline to get Schiff bases (a1-a3) and with some acetophenone derivatives to get new Schiff bases (b4-b6). Then, synthesized Schiff bases were reacted with phthalic anhydride to get new compounds of oxazepines (c7-c12). In addition, sodium azide was reacted with synthesized Schiff bases in THF to get new derivatives of tetrazole. The synthesized compounds were described by physical properties and spectroscopy recorded by (^{1}HNMR, ^{13}CNMR and FT-IR) and the components pureness was curtained by TLC.

The biological efficacies of some synthesized compounds were also tested against Gram-(-) bacteria such as S. saprophyticus ATCC, S. aureus ATCC, E. faecalis ATCC2, and B. cereus ATCC, as well as Gram-(-) bacteria such as P. mirabilis ATCC, M. catarrhalis ATCC, K. pneumoniae ATCC, and E. coli. The ability of these compounds to inhibit mild steel corrosion in 1 mol.l^{-1} H2SO4 was tested. The gram positive and gram negative bacteria were used to test the biological activity.

Keywords: Schiff bases, oxazepine, tetrazole, biological activity.

MICROWAVE SYNTHESIS SCHIFF BASE FROM DRUG AND 1,10-PHENANTHROLINE/8-HYDROXYQUINOLINE AS A CO-LIGAND WITH COMPLEXES: CYTOTOXIC, ANTIMICROBIAL, AND DNA INTERACTION EFFICACY

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ABSTRACT

The Schiff-base of the N_2O donor ligand is made by combining benzophenone and trimethoprim in a 1:1 molar ratio. Various spectroscopies are used to describe the ligand. Multiple new mixed ligand complexes of two ligands are produced with Ni(II), Co(II), and Cu(II) ions, where (L1)=Schiff-base (L2)=1,10-phenanthroline(1,10-Phen) and deprotonated 8-hydroxyquinoline (8-HQ). The ultimate result of thermal breakdown for specific complexes is metal oxide, according to research. Also, thermal gravimetric analysis (TGA) detects that the water molecules associated with the complexes are either coordinated or crystalline. Co(II), Ni(II), and Cu(II) complexes of the Schiff base's preparation process have octahedral geometry (for 1,10-Phen). On the other hand, Cu (II) complexes have a square planar shape (for 8-HQ). Their estimated field values coincide with their postulated geometry. In addition, antifungal and antibacterial mixed ligand complexes were tested against pathogenic strains of four fungi: Aspergillus fumigatus, Syncephalastrum racemosum, Geotricum candidum, and Candida albicans. Two Gram (-); Pseudomonas aeruginosa and Escherichia coli and two Gram(+) bacteria; and Bacillus subtilis, Streptococcus pneumonia. The anticancer cell lines studied were MCF-7, HaCaT, and A549. Highly outcome of mixed Cu(II) complexes was the prominent notice.

ISOLATION AND CHARACTERIZATION OF FUNGAL PRODUCERS OF NATURAL CHOLESTEROL-LOWERING AGENTS

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ABSTRACT

Hypercholesterolemia is the most important risk factor for coronary heart disease and stroke. Natural statins are cholesterol-lowering agents of well-proven effectiveness and safety. They selectively inhibit 3-hydroxy-3-methylglutaryl-coenzyme A reductase, the regulatory enzyme in cholesterol biosynthesis. The development of fermentation processes for the production of statins using active microbial producers might be a commercially attractive approach. The overall aim of this study was to isolate soil microfungi and identify potential producers of natural statins to species level. In the present study, fungal cultures were isolated from uncultivated and cultivated soils. After submerged fermentation, these isolates were tested for their ability to produce natural statins. Cultural properties of the selected isolates were studied on several diagnostic agar media: Czapek-Dox Agar, Czapek Yeast Autolysate Agar, Malt Extract Agar and Yeast Extract Sucrose Agar. Micro-morphological observations were made in accordance with a standard procedure. For physiological characterization, growth on Czapek Yeast Autolysate Agar at 25°C and 30°C and on Czapek Yeast Autolysate with 5% NaCl agar medium were determined. In addition, the growth of the isolates on Nitrite-Sucrose agar and their growth, as well as acid and base productions on Creatine-Sucrose agar were also assessed. Molecular identification of each fungal isolate was conducted based on PCR amplification of the ITS1-5.8S-ITS2 rDNA region and its sequence data analysis. Fungal identification methods used in this study confirmed that the selected isolates ESF2M and ESF19M are referable to *Penicillium citrinum*, while ESF20P and ESF26P were most closely related to *Penicillium janthinellum*. The most active statin producer ESF21P showed the highest homology with *Penicillium brefeldianum*. In conclusion, the current research study has demonstrated successes and advances in the effort towards the isolation and characterization of the fungal producers that are capable of synthesizing natural statins.

Keywords: identification, microfungi, screening, soil, statins.

NANOREMEDIATION TECHNOLOGIES: SUSTAINABLE & EFFICIENT REMEDIATION PATHWAYS TOWARDS SDG #6

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ABSTRACT
Sustainable Development Goal 6 (SDG #6) is about "clean water and sanitation for all". It is one of 17 Sustainable Development Goals established by the United Nations General Assembly in 2015, the official wording is: "Ensure availability and sustainable management of water and sanitation for all". No thanks to the existence of COVID-19 pandemic, it has grossly caused great harm to the urban poor living in the slums with no or little access to adequate clean water. The health practitioners have directly confirmed the importance of sanitation, hygiene and unrestricted access to clean water in order to prevent diseases. One of the major pressing issues currently affecting society is the inadequate state-of-the-art and operative pathways to address the environmental degradation, therefore there is need for sustainable technology in this regard. Nanoremediation is a viable technology capable of tackling environmental contamination, especially dealing with recalcitrant contaminants**.** Nanotechnology is suitable in environmental technology for the protection of our environment with following benefits: prevention or treatment of pollution; cleanup of long-term environmental issues such as accumulated hazardous waste sites. Such environmental cleanup includes removal of heavy metals and other toxic contaminants from the environment and the strategy is known as remediation. Remediation of toxic pollutants can be accomplished via traditional pathways (such as physical, chemical & biological remediation technologies). The important of these traditional techniques for environmental remediation have been acknowledged, however, there is no single technique that can achieve remediation in total. Therefore, there is a call to strategically develop efficient nanotechnology-based alternative pathways using nanomaterials or nanomaterial-composites for total decontamination of these recalcitrant contaminants from the environment. Therefore, in this work we provide a meticulous recent advances and future outlooks of nanoremediation technologies for efficient and cost-effective environmental decontamination towards SDG #6.

Keywords: Nanoscience, Nanotechnology, Remediation, Environmental Pollutants, Pollution, SDG #6

KİTOSAN/KARBOKSİMETİL SELÜLOZ/İTAKONİK ASİT HİDROJELLERİN HAZIRLANMASI VE KARAKTERİZASYONU

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ÖZET
Bu çalışmada, kitosan (CS)/karboksimetil selüloz (CMC)/ itakonik asit (IA) hidrojellerini farklı kombinasyonlarda içeren yeni hidrojeller sentezlenmiştir. Hazırlanan hidrojeller, hem fourier transform kızılötesi spektroskopisi (FTIR) hem de taramalı elektron mikroskobu (SEM) kullanılarak karakterize edilmiştir. Hidrojellerin şişme ve difüzyonu özellikleri adsorpsiyon prosesinde kullanılabilirliği açısından değerlendirilmiştir.
Kitosan tozu (CS), Fluka kimyasal, asetilasyon derecesi %14 ile sağlandı. Viskozite ortalama moleküler ağırlık 70.000 kDa'dır. Itaconic asit (IA), Fluka Chemical Company'den, Karboksimetil selüloz (CMC) ise Sigma-Aldrich Chemical Company'den analitik kalitededir. Tüm çözeltiler distile su kullanılarak hazırlanmıştır. 0.1 g CS, %1 asetik asit (10 mL) içinde çözündürülmüş, daha sonra 2.5 mL glutaraldehit (ağırlıkça %0.4) CS çözeltisine ilave edilmiştir. 10 mL CS çözeltisine belirli bir miktarda IA (0.02 mg) ve CMC (0.02 mg) ilave edilmiştir. Viskoz reaksiyon çözeltisi hızlı bir şekilde karıştırıldıktan sonra bir cam tüpe (5 mm iç çap) yerleştirilmiş ve kapağı kapatılmıştır. Daha sonra karışım dondurucuda -12◦C'de 48 saat soğutulmuştur. Jelleşmeden sonra, hidrojeller tüpten çıkarılmış ve daha sonra 25°C'de oda sıcaklığında damıtılmış suda eritilmiştir. Bu ekstraksiyon işlemi, artık monomerlerin ve çapraz bağlanmamış polimerlerin jelden çıkarılmasına yardımcı olmaktadır. Özütlenen jeller, jel fraksiyonu hesaplanmadan önce sabit bir kuru ağırlığa ulaşana kadar vakumlu fırında (30°C) saklanmıştır.
Hazırlanan hiderojellerin kimyasal karakterizasyonu için Fourier Dönüşümü Kızılötesi Spektroskopisi (FTIR) (Bruker VERTEX 70 ATR) yüzey özellikleri elektron tarama mikroskobu (SEM) (FEI-QUANTA FEG 250) kullanılarak karakterize edilmiştir.
FT-IR spektrumunda, geniş tepe, kitosan içinde meydana gelen hidroksil gruplarına (OH) ve hidrojen bağı oluşumuna karşılık gelen 3284.57 cm^{-1}'de görünmüştür. Polimer omurgasındaki ana tepelerden sp3 hibritleştirilmiş CH germe titreşim bandı, glutaraldehit konsantrasyonu için 2918.01 cm^{-1} ve 2873.83 cm^{-1} olmak üzere iki tepede kaydedilmiştir. Kitosan için, NH_2 grubunun titreşimi, yaklaşık 1542.53 cm^{-1}'de banttan sorumluyken, karbonil grubu yaklaşık 1640.54 cm^{-1}'de kaydedilmiştir. Karakteristik C=N imin tepe noktaları, glutaraldehit çapraz bağlı kitosan hidrojel için yaklaşık 1640.54 cm^{-1}'de görülebilir. Bu bant glutaraldehitin karbonil (C=O) grubu ile kitosanın amin ($-NH_2$) grubunun reaksiyona girdiğini kanıtlar. 1720 cm^{-1}'de itakonik asidin karbonil (C=O) germe bandı da CH_2 makaslama için 1428 cm^{-1} olarak ortaya çıkar ve CMC'nin karakteristik bir zirvesidir. 1059.55 cm^{-1}'deki bant, karboksimetileter grubundan kaynaklanmaktadır. Hazırlanan CS(CMC/IA hidrojelin birbirine bağlı gözenekli ağ yapısına sahip olduğu SEM görüntüsünde belirgin şekilde görülmüştür. Gözeneklerin bağlantısı hidrojellerin şişmesinde önemli bir rol oynamış ve adsorpsiyon prosesinde kullanılabilirliğini göstermiştir.

Anahtar kelimeler: CMC, hidrojel, Itakonik asit, Kitosan, karakterizasyon

PREPARATION AND CHARACTERIZATION OF CHITOSAN/CARBOXYMETHYL CELLULOSE/ITACONIC ACID HYDROGELS

ABSTRACT

In this work, new hydrogel composites containing chitosan (CS)/carboxymethyl cellulose (CMC)/ itaconic acid (IA were snthesized. The prepared hydrogels were characterized using both fourier transform infrared spectroscopy (FTIR) and scanning electron microscopy (SEM). The properties of the hydrogels were evaluated in terms of swelling and diffusion characteristics to be used adsorption process.

Chitosan powder (CS) was supplied by Fluka chemical, acetylation degree 14%. The viscosity average-molecular weight is 70,000 kDa. Itaconic acid (IA) was purchased from Fluka Chemical Company. Carboxymethyl cellulose (CMC) was purchased from Sigma-Aldrich Chemical Company. All the reagents were of analytical grade and used as received. All the solutions were prepared using distilled water. Briefly, CS (0.1 g) was dissolved in 1% acetic acid (10 mL). Later, 2.5 mL of glutaraldehyde (0.4 wt. %) was added to CS solution. A certain amount of IA (0.02 mg) and CMC (0.02 mg) were added to 10 mL of CS solution. The viscous reaction solution was stirred quickly and were placed in a glass tube (5 mm inner diameter) and stoppered. Afterwards, mixture was cooled in freezer at −12◦C for 48 h. After gelation, the hydrogels were removed out of tube and then thaw in distilled water at room temperature at 25°C. This extraction process helps to remove residual monomers and uncross-linked polymers from the gel. Extracted gels were stored in vacuum oven (30°C) until reaching to a constant dry weight before calculating the gel fraction. Fourier Transform Infrared Spectroscopy (FTIR) (Bruker VERTEX 70 ATR) was used for the chemical characterization of the synthesized hydrogels and their surface characteristics was characterized using electron scanning microscopy (SEM)-energy dispersive Xray analyzer (EDX) (FEI-QUANTA FEG 250).

In the FT-IR spectrum of SC/CMC/IA of hydorgel, the broad peak appears at 3284.57 cm^{-1} corresponding to hydroxyl groups (OH) and hydrogen bond formation that occurred within the chitosan. The sp3 hybridized C-H stretching vibration band from the main peaks in the polymer backbone was recorded in two peaks 2918.01 cm^{-1} and 2873.83 cm^{-1} for glutaraldehyde concentration. For chitosan, the vibration of the NH2 group is responsible for the band at about 1542.53 cm^{-1} whereas the carbonyl group is reported at about 1640.54 cm^{-1}. The characteristic C=N imine peaks can be seen at around 1640.54 cm^{-1} for the glutaraldehyde cross-linked chitosan hydrogel. This band proves that carbonyl (C=O) group of glutaraldehyde and the amine (-NH2) group of the chitosan are reacted. The carbonyl (C=O) streching band of itaconic acid at 1720 cm^{-1} is also appeared 1428 cm^{-1} for CH_2 scissoring is a characteristic peak of CMC. The band at 1059.55 cm^{-1} is due to carboxymethylether group. Surface characteristics of the prepared hydrogel was determined with SEM analysis. It is clear that the prepared hydrogel possess interconnecting porous network structure. The connectivity of the pores played an essential role in the swelling of the hydrogels.

Keywords: CMC, Chitosan, hydrogel, Itaconic acid, characterization.

1.GİRİŞ

Nadir toprak elementlerin az miktar kullanımı, ürünün kalitesini önemli ölçüde artırmaktadır. Yüksek teknoloji ürünlerinde de kullanım miktarı az olmaktadır. Renkli ekranlarda, mikrofonlarda cep telefonu devreleri ve ünitelerinin küçük ve fonksiyonel olmasında, güneş pillerinde önemli yer almaktadır (USGS, 2002).

Adsorpsiyon prosesleri içme suları ve atıksularda yaygın olarak kullanılmaktadır. Adsorplanacak maddenin sudaki çözünürlüğü, adsorplanacak maddenin molekül yapısı, Moleküle bağlı grupların yerleri, adsorban yüzey alanı, partikül büyüklüğü, sıcaklık, pH temas süresi adsorpsiyon prosesinin verimini etkilemektedir. Aadsorbant madde yüzeyinde adsorplanmış bir maddenin, kendisine oranla adsorplanma derecesi daha yüksek olan bir madde tarafından yer değiştirmesi desorpsiyon olarak tanımlanmaktadır. Hidrojeller, suda çözünmeden şişebilir ve üç boyutlu, çapraz bağlı polimerik yapılar olup, kimyasal veya fiziksel çapraz bağların varlığı nedeniyle suda çözünmezler (Know ve diğ., 2008). Şekil 1'de görülen çapraz bağlı polimerdeki su sever grupların fazla sayıda olması daha fazla şişmeye sebep olur. Bir hidrojelin çapraz bağlı yapısı Şekil 1'de verilmiştir (Nursevin ve diğ., 1998).

Çapraz bağlı ve birleştirici ağ yapılı polimerler uygun çözücü ortamına konulduktan sonra, çözücünün yapıya girmesi ile şişme başlar. Bu durum; en büyük şişme değerine ulaşıldığı denge durumudur (Taşdelen ve diğ., 2017).

% Şişme (%S) 1.1. eşitliği ile belirlenir.

$$\%S = \frac{Mt-Mo}{Mo} \quad (1.1)$$

Burada, M0; başlangıçtaki kuru hidrojel polimer kütlesi, Mt; t süre sonraki şişmiş hidrojelin kütlesidir. Dinamik şişme testleri sonucu oluşturulan şişme kinetiği eğrileri ikinci dereceden varsayılır ve;

$$\frac{ds}{dt} = ks(Smax - S)^2 \quad (1.2)$$

eşitliği uygulanır. Eşitlikte dS/dt; şişme hızını, Smak; jelin denge anındaki (tden) şişme değerini, S; t anındaki şişme değerini ve ks; şişme hız sabitini göstermektedir. Eşitliğin t=0 için S=0 ve t=tden için S=Smak sınır koşullarında matematiksel düzenlenmesi sonucu;

$$\frac{t}{s} = A + Bt \quad (1.3)$$

eşitliği elde edilir. Eşitlikte A(=1/Smak2ks); başlangıç şişme hızının (1/ro) tersi, B(=1/Smak) ise en büyük şişme değerinin tersidir.

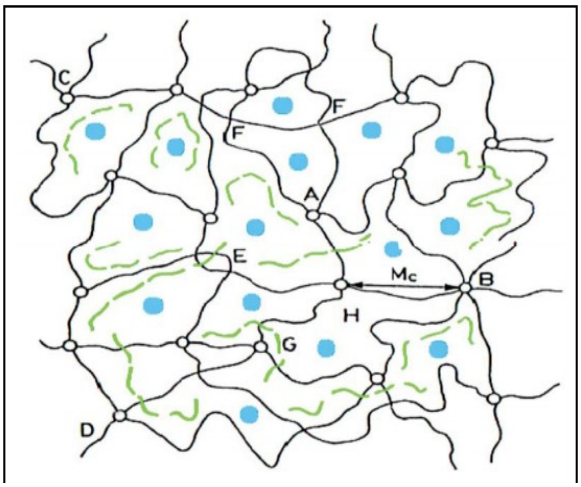
Hidrojel ve yarı-IPN yapıların şişme kinetiği ve difüzyon türünün açıklanmasında Fick yasası en temel uygulanandır. Şişme özelliği gösteren polimerlerin şişme kinetiği;

$$F = \frac{Mt}{Md} = ktn \quad (1.4)$$

eşitliği yardımıyla incelenmektedir. Bu eşitlikte Mt; t anında jelin içerdiği çözücü kütlesi, Md; dengedeki jelin içerdiği çözücü kütlesi, n; çözücünün difüzyon türünü gösteren difüzyon üsteli, k; difüzyon sabitini göstermektedir. F; jelin t anında aldığı çözücü miktarının dengede alınan çözücü miktarına oranıdır ve şişme kesri olarak tanımlanır.

$$D = nr^2\left(\frac{k}{4}\right).\frac{1}{n} \quad (1.5)$$

Eşitlikte yer alan n ve k değerleri lnF-lnt grafiklerinden hesaplanan difüzyon üsteli ve difüzyon sabiti değerleridir. r değeri şişmiş hidrojelin cm cinsinden yarıçapıdır.



Şekil 1. Hidrojellerin Çapraz Bağlı Yapısı (Nursevin ve diğ., 1998).

Selüloz doğada en yaygın ve geri kazanılabilir ve ayrışabilir malzemedir. Ancak, suda ve organik ve inorganik solventlerde çözünmediği için sınırlı uygulama alanı bulmaktadır. CMC mükemmel film oluşturma yeteneğine sahiptir, biyolojik bozunur ve düşük toksik etki gösterebilmektedir. CMC ayrıca güçlü hidrofilik özellik göstermekte ve stabil iç yapısı bulunmaktadır. Bütün bu özellikler ile kompozit filmlerin perfromansını iyileştirmek için kullanılabilmektedir (Yang ve diğ., 2018).
Yeni bir karboksimetil selüloz kaplı metal organik materyalin imalatı (MOF-5-CMC) kurşun iyonlarını sulu çözeltilerden uzaklaştıran adsorbandır. Yapılan çalışmada adsorpsiyon malzemesi karakterize edilmiştir, temas süresi, pH, orjinal fonksiyonları incelenmiştir. Pb(II) çözeltisinin konsantrasyonu ve adsorpsiyon kapasitesindeki adsorpsiyon sıcaklığı incelenmiştir. Adsorpsiyon dengesine 120 dakikada ulaşılmamıştır (Jin ve diğ. 2019).
Bir diğer çalışmada, yeni bir nanoboyutlu üretmek için etkili bir çapraz bağlayıcı reaktifi olan glutaraldehit yoluyla katı-katı immobilize karboksimetil selüloza katı bir destek olarak titanyum oksit (Nano-Ti02) kullanılmıştır (Mahmoud 2017).
Özetle Seryum çok değerli bir element olmakla birlikte giderimi için alterantif ucuz metodların araştırılması gereği bulunmaktadır.
Bu çalışmada esas olarak karboksimetil selüloz (CMC) bazlı hidrojel kompozitlerin sentezlenerek sulu çözeltiden seryum ve lityum'un adsorpsiyonu için kullanımı amaçlanmıştır. Hazırlanan hidrojeller, hem fourier transform kızılötesi spektroskopisi (FTIR) hem de taramalı elektron mikroskobu (SEM) kullanılarak karakterize edilmiştir. Hidrojellerin şişme ve difüzyonu özellikleri adsorpsiyon prosesinde kullanılabilirliği açısından değerlendirilmiştir. Adsorpsiyon prosesini takiben desorpsiyon ile geri kazınmları ve hidrojelin yeniden kullanımı kapasitesi değerlendirilmiştir. Doğal bileşenler kullanılmakla birlikte hidrojel komozisyonu ve adsorpsiyon prosesi sırasında suya herhangi bir toksik bileşenin geçiş riskini değerlendirmek üzere *Daphnia magna* standart toksisite test metodu kullanılarak ekotoksisite izlenmiştir.

2.MATERYAL VE METOD

2.1.Hidrojellerin Hazırlanışı

Belirli miktarlarda hidrojel bileşeni (leri), (kitosan, itakonik asit ve CMC) 12,5 ml (%1)'lik asetik asit çözeltisi ile karıştırılıp çözülmeye bırakılmıştır. Daha sonra %6'lık 2,5 ml çapraz bağlayıcı olan gluteraldehit ilave edilmiştir. Hazırlanan çözeltinin tam anlamıyla hazır olması için ortalama 10-15 dk karıştırılmış olup, ardından hazırlanan karışım cam tüpler içine alınarak ağzı kapatılarak buzluğa bırakılmıştır. 2-3 gün sonunda cam tüpler yavaşça kırılarak jeller çıkarılmış ve distile su içerisinde bekletilerek saflaştırılmıştır ve takiben kurutulmuştur. Hazırlanan hidrojeller in kompoziyonları Çizelge 1'de özetlenmiştir.

Çizelge 1. Hazırlanmış hidrojellerde kullanılan kimyasal miktarları

Hidrojel	Miktar (gr)
Saf Karides (SK)	0,1 gr (metilen bis akrilamid-çapraz bağlayıcı ,Amonyum persülfat başlatıcı)
CMC (0.6'lık)	0,2 gr (metilen bis akrilamid-çapraz bağlayıcı ,Amonyum persülfat başlatıcı)

CMC ve SK	0,2 gr CMC ve 0,1 Saf Karides (metilen bis akrilamid-çapraz bağlayıcı ,Amonyum persülfat başlatıcı)
Kitosan (CS)	0,2 gr (metilen bis akrilamid-çapraz bağlayıcı ,Amonyum persülfat başlatıcı)
A2 (1)	0,01 gr İtakonik Asit ve 0,1 Saf Karides (metilen bis akrilamid-çapraz bağlayıcı ,Amonyum persülfat başlatıcı)
A3 (2)	0,02 gr İtakonik Asit ve 0,1 Saf Karides (metilen bis akrilamid-çapraz bağlayıcı ,Amonyum persülfat başlatıcı)
A5 (1)	0,01 gr İtakonik Asit ve 0,2 Kitosan (metilen bis akrilamid-çapraz bağlayıcı ,Amonyum persülfat başlatıcı)
A6 (2)	0,02 gr İtakonik Asit ve 0,2 Kitosan (metilen bis akrilamid-çapraz bağlayıcı ,Amonyum persülfat başlatıcı)
A7 (1)	0,1 gr Saf Karides - 0,01 İtakonik Asit ve 0,01 gr CMC (metilen bis akrilamid-çapraz bağlayıcı ,Amonyum persülfat başlatıcı)
A8 (2)	0,1 gr Saf Karides - 0,01 İtakonik Asit ve 0,02 gr CMC (metilen bis akrilamid-çapraz bağlayıcı ,Amonyum persülfat başlatıcı)
A9 (1)	0,01 gr Kitosan – 0,01 gr İtakonik Asit ve 0,01 gr CMC (metilen bis akrilamid-çapraz bağlayıcı ,Amonyum persülfat başlatıcı)
A10	0,01 gr Kitosan – 0,02 gr İtakonik Asit ve 0,02 gr CMC(metilen bis akrilamid-çapraz bağlayıcı ,Amonyum persülfat başlatıcı)

2.2. Hidrojellerin Şişme Değerleri

Birinci aşamada hazırlanan hidrojellere şişme deneyleri uygulanmıştır. Belirli bir miktar alınan hidrojeller hassas terazi'de tartılarak t=0 dakikadaki ağırlığı kaydedilmiş, daha sonra sabit sıcaklıkta, içerisinde distile su dolu olan erlenlerde şişmeye bırakılmıştır. Hidrojellerin 5, 10, 15, 20, 25, 30, 45, 60, 120, 180, 240, 300, 360, 1440 ve 1500 dakikalar sonunda, hidrojeller oda sıcaklığında bekletilip kurutulduktan sonra tartımları yapılmıştır.

2.3. Şişme Difüzyon Değerleri

Birinci aşamada hazırlanan hidrojellere şişme deneyleri uygulanmıştır. Belirli bir miktar alınan hidrojeller hassas terazi'de tartılarak t=0 dakikadaki ağırlığı kaydedilmiş, daha sonra sabit sıcaklıkta, içerisinde distile su dolu olan erlenlerde şişmeye bırakılmıştır. Hidrojellerin 5, 10, 15, 20, 25, 30, 45, 60, 120, 180, 240, 300, 360, 1440 ve 1500 dakikalar sonunda, hidrojeller oda sıcaklığında bekletilip kurutulduktan sonra tartımları yapılmıştır. İkinci aşamada şişmesi hesaplanan hidrojellerin şişme kinetikleri buna istinaden hidrojellerin su difüzyonunun logaritmik formu kullanılarak lnF – lnt grafikleri çizilmiştir.

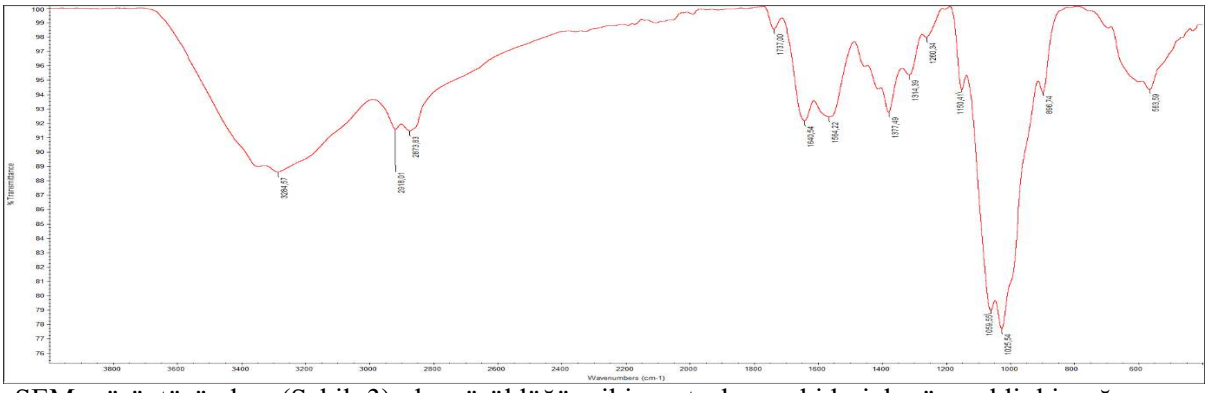
3.BULGULAR

3.1.Sentezlenen Hidrojellerin Karakterizasyonu

3284.57 cm^{-1}'de görülen geniş tepe, kitosan içinde meydana gelen hidroksil gruplarına (OH) ve hidrojen bağı oluşumuna karşılık gelir. Polimer omurgasındaki ana tepelerden sp3 hibritleştirilmiş CH germe titreşim bandı, glutaraldehit konsantrasyonu için 2918.01 cm^{-1} ve 2873.83 cm^{-1} olmak üzere iki

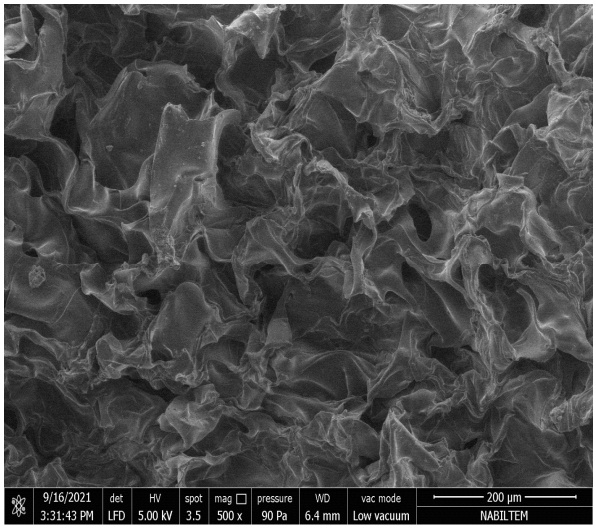
tepede kaydedildi. Kitosan için, NH2 grubunun titreşimi, yaklaşık 1542.53 cm^{-1}'deki banttan sorumluyken, karbonil grubu yaklaşık 1640.54 cm^{-1}'de rapor edilmektedir. 1720 cm^{-1}'de itakonik asidin karbonil (C=O) germe bandı da görülmektedir. CH2 makaslama için 1428 cm^{-1}, CMC'nin karakteristik bir zirvesidir. 1059.55 cm^{-1}'deki bant, karboksimetil eter grubuna bağlıdır. Şekil 2'de FTIR grafiği verilmiştir.

Şekil 2. FTIR grafiği



SEM görüntüsünden (Şekil 3) de görüldüğü gibi sentezlenen hidrojel gözenekli bir ağ yapısına sahiptir.

CS/CMC/IA hidrojelin SEM görüntüsünden, hazırlanan hidrojelin birbirine bağlı gözenekli ağ yapısına sahip olduğu açıktır. Gözeneklerin bağlantısı hidrojellerin şişmesinde önemli bir rol oynadı. Şekil 3'de CS/CMC/IA SEM görüntüsü verilmiştir.



Şekil 3. CS/CMC/IA SEM görüntüsü

3.2. Hazırlanan Hidrojeller Şişme Değerleri

Kitosan'a CMC ve IA ilavesinin yapıya yüksek miktarda su tutma yeteneği kazandırdığı gözlemlenmiştir (Chen ve diğ., 2003; Sun ve diğ., 2006). Bu, CMC ve IA'nın yapısındaki hidroksil ve karboksil gruplarından kaynaklanmaktadır. Çizelge 2'de hidrojellerin hesaplanan şişme değerleri verilmiştir. Hidrojellerin 5, 10, 15, 20, 25, 30, 45, 60, 120, 180, 240, 300, 360, 1440 ve 1500 dakikalar sonunda şişme değerleri eşitlik 1.1 de verildiği gibi hesaplanmıştır. En iyi şişme sonucu A10 hidrojelinde alınmıştır. Bundan sonraki adsorpsiyon deneyleri için A10 hidrojelleri kullanılacaktır.

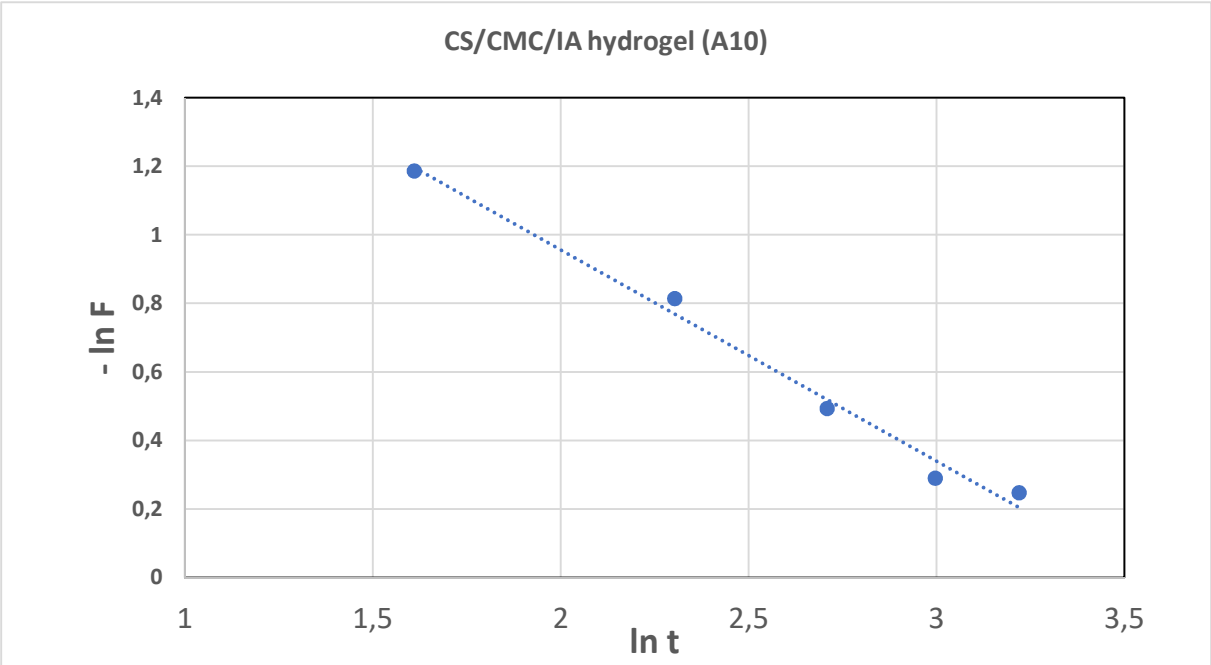
Çizelge 2. Hazırlanmış hidrojellerin şişme değerleri

Hidorjeller	Mo(g)	Mt(g) 24sa	%S
Saf Karides (SK)	0.0099	0.0869	777.78
CMC	0.0139	0.0785	464.74
CMC/Saf karides	0.0159	0.0993	524.52
Chitosan (CS)	0.0551	0.2329	322.68
A2	0.0093	0.0553	494.62
A3	0.0151	0.0472	212.5
A5	0.018	0.1063	490.5
A6	0.0187	0.1165	522.9
A7	0.0111	0.076	584.6
A8	0.009	0.032	255.5
A9	0.0161	0.0927	475.7
A10	0.0146	0.1037	610.2

3.3. Şişme Difüzyon Değerleri

Grafiklerde görüldüğü üzere hidrojellerin şişme yüzdesi arttıkça hidrojellerin difüzyon katsayıları da artar.

Şekil 4'de lnF – lnt grafiklerini ve Çizelge 3'te şişmeye bağlı difüzyon değerleri verilmiştir.



Şekil 4. lnF – lnt grafik

Çizelge 3. Hazırlanmış hidrojellerin difüzyon değerleri

Hidorjeller	k	n	D
A2	0,562	0,1093	1.7×10^{-9}
A3	0,272	0,373	3.9×10^{-4}
A5	0,245	0,383	3.6×10^{-4}
A6	0,269	0,3184	9.7×10^{-5}
A7	0,534	0,1254	1.5×10^{-8}
A8	0,55	0,134	6.1×10^{-8}
A9	0,215	0,4177	5.1×10^{-4}
A10 (CS/IA/CMC)	0,595	0,0952	1.6×10^{-10}
Pure schrimp	0,624	0,0626	2.7×10^{-15}
CMC/Pure schrimp	0,299	0,2295	4.3×10^{-6}
Chitosan (CS)	0,227	0,1321	5.9×10^{-11}

3.4. Ce(III) Adsorpsiyonuna pH etkisi

Adsorpsiyon çalışmalarında adsorban'a etki eden en önemli parametrelerden bir tanesi pH parametresidir. Adsorbant moleküllerinin duyarlı olduğu pH aralıkları vardır. Bu çalışmada hidrojel ile Ce metalinin sudan uzaklaştırılmasında farklı pH aralıklarında adsorpsiyon çalışmaları yapılmıştır. Çalışmada; sıcaklık 25 ***°C*** ,adsorpsiyon süresi 24 sa, çalkalama hızı 150 rpm ve adsorbent miktarı 0,1 gr başlangıç seçilerek deneysel çalışmalar yapılmıştır. pH etkisinin Ce giderim verimine etkisinin belirlenmesi çalışmasında numune pH'ları 0,1 N NaOH ve 0,2 N H_2SO_4 çözeltileri kullanılarak numune pH'ı aralıkları 3-5-7 aralığına ayarlanmıştır. Deney sonuçlarında da görüldüğü üzere artan pH değerlerinin Ce giderim verimine pozitif etki yapmadığı gözlemlenmektedir.

Çizelge 4. Deney koşulları A10 Adsorbant Miktarı: 0.1 gr, Sıcaklık: 25°C , Çalkalama Hızı: 150 rpm, Adsorpsiyon Süresi: 1440 dk)Çizelge 4. A10 hidrojellerin adsorpsiyon değerleri

pH	Ce Giriş (mg/l)	Ce Çıkış(mg/l)	Adsorpsiyon Giderim Verimi (%)
3	20	15,62	21,9
5	20	14,87	25,65

7	20	14,74	26,3

4.SONUÇLAR VE ÖNERİLER

CS hidrojellerinin kütle şişme yüzdeleri değerlendirildiğinde, çapraz bağlayıcı (GA) konsantrasyonunun artmasıyla kütle şişme yüzdelerinin azaldığı belirlenmiştir. Bu durum, yüksek konsantrasyonlu çapraz bağlayıcı kullanıldığında polimer zincirlerinin birbirine daha sıkı bağlanmasıyla açıklanabilmektedir.

Hidrojellerin şişme kapasitesi oldukça yüksektir. Elde edilen sonuçlar incelendiğinde A10 jelinin şişme karakteristik açısından incelendiğinde şişme özelliklerinin yüksek olması hidrojellerin çevre mühendisliği açısından başka alanlardan değerlendirebileceği düşünülmüştür.
Seryum adsorpsiyon çalışmaları sonucunda yüksek verimler elde edilememiştir. Seryum adsorpsiyon çalışmalarında seçici hidrojellerin üretilmesi tavsiye edilir.

Teşekkür: Bu çalışma NKÜBAP ofisince desteklenen NKÜBAP.06.YL.21.90 projesi çerçevesinde gerçekleştirilmiştir.

KAYNAKLAR

1. Chu, H. C., Chen, K. M., "Reuse of Activated Sludge Biomass: II. The Rate Processes for The Adsorption of Basic Dyes on Biomass", Process Bio., 37,1129- 1134, (2006).
2. Diggles, M. (2002), U.S. Geological Survey Petroleum Resource Assessment of the National Petroleum Reserve in Alaska (NPRA)
3. Know, Y., Song, M., Hwang, Y. G., Chang, S. H., Hong, W. J., (2008), "Effect of materials structure and composition on properties of siloxane-containing hydrogels", Current Applied Physics, 8: 486-489.
4. Nursevin, H., Saraydın, D., Karadağ, E., Çaldıran, Y., Güven, O., (1998), "Influence of some aromatic amino acid on the swelling behavior of acrylamide/maleic acid hydrogel", Polymer Bulletin, 40: 575-581.
5. Mahmoud (2017). Developments in polyester composite materials – An in-depth review on natural fibres and nano fillers.
6. Yang, Q.L., Zhang, C.G., Shi, Z.Q., Wang. J.Y., Xiong. C.X., Saito. T. ve Isogai. A. (2018), Luminescent and transparent nanocellulose films containing europium carboxylate groups as fl exible dielectric materials. ACS Appl Nano Mater1: 4972–4979.
7. Shen Z, Jin F, O'Connor D, Hou D. Toprak için katılaştırma/stabilizasyoniyileştirme: Yeni canlılığa sahip eski bir teknoloji. Çevre Bilim Teknolojisi2019;53(20):11615–7.
8. Ooi CH., Ito A., Otake T., Yeoh FY., (2017), Cerium removal by activated carbon derived from palm kernel shell, Advanced Material Letters, 8, 145-149,
9. Tasdelen, B. (2017), Colloids and Surfaces A: Physicochem. Eng. Aspects 519, 245–253.
10. Tommasi F, Thomas PJ, Pagano G et al (2020), Review of rare earth elements as fertilizers and feed additives: a knowledge gap analysis. Arch Environ Contam Toxicol.

PHYSICOCHEMICAL PROPERTIES AND CHEMICAL ANALYSIS OF PHOENIX DACTILYFERA L. SEED OIL

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ABSTRACT

Dates (Phoenix dactylifera L.) are a popular fruit in Middle Eastern countries. In fact, it is the staple food of millions of people in these countries. Furthermore, dates play an important economic, social and ecological role for people living in arid and semi-arid regions. Date seeds, also called as pits or seeds, are waste products from date processing and packaging plants. Therefore, seeds contain many valuable substances such as carbohydrates, vegetable oil, dietary fiber, bioactive compounds, and natural antioxidants. The main purpose of this study was to analyze the chemical composition of date seed oil extracted from ten native date palm seed varieties. Also to analyze the physicochemical parameters of acid value (AV), peroxide value (PV), saponification value (SP), iodine value (IV), K232, K270, and cetane index for oxidative status, quality, and safety of date seed oil. The choice of the seed variety was based on popularity and quality. The lipid extraction was carried out by a soxhlet apparatus using a standard solvent with a seed isolated from a matured date, the yield ranged from 3% to 7% depending on the variety. A wide range of saturated, mono, and polyunsaturated fatty acids are present in the kernel. The saturated fatty acids include caprylic (C8:0), capric (C10:0), lauric (C12:0), myristic (C14:0), palmitic (C16:0), margaric (C17:0), stearic (C18:0), and arachidic (C20:0) acids. The unsaturated include palmitoleic (C16:1), margaroleic (C17:1), oleic (C18:1), gadoleic (C20:1), Linoleic (C18:2) and linolenic (C18:3) acids. Likewise, the analysis of the quality index of oil shows that seed oil is fresh and is less susceptible to autoxidation due to its low peroxide value. Indeed, the recorded iodine value of kernel oil was lower than 100, so this oil can be considered as anon-drying oil. According to these, and several results, date seed oil has a potential application, especially in cosmetic formulations such as body creams, shaving soap and shampoos, and pharmaceutical products.

Keywords: Chemical composition; date seed oil; fatty acids; Phoenix dactylifera L.; physicochemical parameters.

References

[1] Akbari, M., Razavizadeh, R., Mohebbi, G. H., & Barmak, A. (2012). Oil characteristics and fatty acid profile of seeds from three varieties of date palm (Phoenix dactylifera) cultivars in Bushehr-Iran. *African Journal of Biotechnology*, *11*(57), 12088-12093.

[2] Reddy, M. K., Rani, H. D., Deepika, C. N., Samrawat, S., Akshara, V., & Rajesh, K. (2017). Study on physicochemical properties of oil and powder of date palm seeds (Phoenix dactylifera). *Int J Curr Microbiol App Sci*, *6*(12), 486-492.

[3] Al-Shahib, W., & Marshall, R. J. (2003). Fatty acid content of the seeds from 14 varieties of date palm Phoenix dactylifera L. *International journal of food science & technology*, *38*(6), 709-712.

ENHANCED REMOVAL OF ANIONIC DYE FROM AQUEOUS SOLUTION ON POLYMER-PHOSPHATE BIOCOMPOSITE: KINETICS AND EQUILIBRIUM STUDIES

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ABSTRACT
In the present study, a polymer-phosphate biocomposite was synthesized and applied for the treatment of solutions containing anionic dye molecules by batch adsorption process. In addition, the adsorption efficiency was optimized under different parameters namely initial concentration, contact time, temperature and pH. According to the obtained results, the kinetic and equilibrium adsorption were fitted by the pseudo-second order model and Langmuir isotherm, respectively. However, the maximum monolayer adsorption capacity was found to be 147,82 mg/g under the optimal conditions. Concerning the thermodynamic parameters, the negative values of $\Delta G°$ and $\Delta H°$ positive values confirm the spontaneous and exothermic nature of the adsorption process. The regeneration study confirms that the present biocomposite can be regenerated up to the fifth cycle successfully.

Keywords: polymer-phosphate biocomposite; batch adsorption; anionic dye; regeneration.

COMPARITIVE STUDY ON PHYTOCHEMICAL ANALYSIS OF BOERHAAVIA SPECIES

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ABSTRACT
Phytochemical study refers to the extraction, screening and identification of the medicinally active substances found in plants. Some of the bioactive substances that can be derived from plants are flavonoids, alkaloids, carotenoids and tannin and antioxidant compounds. In the present investigation an attempt has been made to evaluate the total phenol, total flavonoid content and antioxidant capacity of two species of *Boerhaavia erecta* Linn and *Boerrhaavia diffusa* Linn in methanol, acetone and water extracts. The preliminary phytochemical screening indicated the presence of steroid, terpenoid, phenolic compounds, carbohydrates and saponins in the sample. Among the plants studied *Boerhaavia erecta* have higher the total phenol, total flavonoid content and antioxidant capacity. The phytochemical and antioxidant evaluation of *B. diffusa* and *B. erecta* indicates a high pharmacological value of the plants. The plant screened for phytochemical constituent seemed to have the potential to act as a source of useful drugs and to improve the health status of consumers because of the presence of various compounds that are vital for good health. Based on the results of the present investigation, it can be concluded that *Boerhaavia erecta* can be considered as more ideal material for a holistic medical application.

Keywords: Phytochemical, *Boerhaavia diffusa*, *Boerhaavia erecta*, flavonoid, carotinoids, alkaloids, steroid, terpenoid, tannin, antioxidant

SYNTHESIS AND PHYSICOCHEMICAL PROPERRTIES OF A POLYVINYL ACETATE BINDER ADDED TO A VINYL PAINT

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ABSTRACT

A careful choice of paint will first be adapted to the context (environment) and the medium on which the paint will be applied. The polyvinyl acetate (PVA) added to the paints serves to homogenize the raw materials and constitutes the "film" (the felt), it plays the role of a binder. The purpose of this study was to synthesize a vinyl acetate emulsion copolymerization for use as a binder in a vinyl paint for anti-fouling coatings of walls or other solids. In order to improve some physico-chemical characteristics such as: the density, viscosity, pH and dry extract of our paint, took different percentage of PVA (5, 10 and 15%) proposed by the company ENAP. It was also concluded that there is an improvement in drying time which is a very important factor for paints, which means an improvement in the film aspect of the paint, adhesion, resistance to wet brazing and reduction of flouring have also been improved. The best percentage of this improvement choice was detected on 15% PVA paint.

Keywords: copolymerization, vinyl paint, polyvinyl acetate, emulsion, binder.

SYNTHESIS OF MGO NANOPARTICLES USING BIO-WASTE EGGSHELL MEMBRANE AND ITS ANTIFUNGAL ACTIVITY

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ABSTRACT

In the present study, Magnesium oxide nanoparticle was synthesized using bio-waste egg shell membrane as a template and reducing agent. The synthesis process was carried out by two step method which involves soaking followed by annealing. The synthesized MgO nanoparticles were characterized by the following techniques such as XRD, UV-Visible, FT-IR and Zeta potential analysis. According to XRD results, the MgO nanoparticles occur in a face-centered cubic structure and the crystallite size of MgO nanoparticles was found to be 33.98 nm. In UV-Visible spectroscopy analysis, the absorption spectra of MgO nanoparticle was observed in 280 nm and it proves that the synthesized MgO nanoparticle can be used in bio-medical application. In FT-IR analysis, the peak at 455 cm^{-1} shows the stretching vibration of Mg-O. The stability of MgO nanoparticles was found to be -20.5 mV, which indicates good stability. The synthesized MgO nanoparticles were subjected to antifungal activity by the agar-well diffusion method. The results demonstrated that the zone of inhibition of MgO nanoparticles was high in *Mucor racemosus (24 mm), Aspergillus niger (18 mm), Aspergillus flavus (19 mm), Aspergillus terrus (20 mm).* Finally, the synthesized MgO nanoparticles can be treated as an assorted fungal disease.

DESIGN AND SYNTHESIS OF A FUNCTIONALISED 2-AMINOBODIPY FOR RAPID VISUAL DETECTION OF PHOSGENE

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ABSTRACT

Phosgene is an important industrial chemical, with several million tons produced globally each year. The main commercial use of phosgene is in the synthesis of other chemicals such as pesticides, herbicides, medicines, plastics and dyes. It is perhaps surprising that there are few reports of the use of fluorescence-based sensors for phosgene. Boron dipyrromethenes (BODIPYs) have attracted considerable attention due to their fluorescence properties, including high fluorescence quantum yields and absorption coefficients, good photochemical stability and narrow absorption and emission bandwidths. Because of these properties, they have found extensive use in range of applications in biomolecular labels, drug delivery agents, cation sensors, laser dyes, electroluminescent films and fluorescent switches. 2-aminoBODIPYs **IIa-e** have been prepared successfully via Buchwald–Hartwig amination of the 2-iodoBODIPY **I** (fully blocked) with a range of anilines and a primary alkylamine. This palladium catalysed amination was used to prepare the 2-nitroaniline-substituted BODIPY **III**. Reduction of the nitro group by hydrogenation gave the novel fluorescence-quenched 2-aminoaniline-substituted BODIPY **IV** in good yield (95%). The structures of the synthesized compounds were confirmed by ^{1}H, ^{13}C, ^{19}F and ^{11}B NMR, and IR. The presence of the nitrogen group in the 2-position gives a broadened red-shifted absorption maximum and quenched fluorescence. Therefore, These 2-aminoBODIPY compounds are non emissive and quantum chemical calculations and electrochemistry are consistent with charge transfer from the amine substituent. Reaction of 2-aminoaniline-substituted BODIPY **IV** with triphosgene gave the corresponding benzimidazolone-substituted BODIPY **V** in excellent yield (98%). The bright yellow fluorescence of the triphosgene reaction product **V** can be easily visualized by the naked eye. The low-energy maximum (λ_{abs}) of beznimidazolone **V** is 515 nm and is assigned to the S_0-S_1 (π-π^*) electronic transition associated with the BODIPY core. The molar absorption coefficient (ε) is 64,024 $M^{-1}cm^{-1}$. The detection limit for phosgene was determined to be 160 nM in solution at room temperature.

Keywords: BODIPY: Boron dipyrrin, 4,4-difluoro-4-bora-3a,4a-diaza-s-indacene

NMR: Nuclear magnetic resonance

INVESTIGATING OF PANI-BASED HYBRID COMPOSITE PERFORMANCE FOR THE OG DYESTUFF REMOVAL

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ABSTRACT

A novel polyaniline-based composite was developed *via* an *in situ* interfacial polymerization procedure. The composite was efficiently employed for the first time as an adsorbent to adsorb Orange G (OG) dyestuff from water. The OG dye adsorption performance was investigated as a function of several operating conditions like adsorbent dose, pH, initial OG concentration and time of contact. The OG removal efficiency reached a maximum of 99.7% at pH 2, owing to electrostatic interactions between anionic OG dye and positively charged hybrid composite surface. The adsorption study demonstrated that a pseudo-second-order and Freundlich models were appropriate to anticipate the OG adsorption process. Regeneration investigation showed that the adsorbent could be effectively reused up to four cycles.

Keywords: polyaniline-based composite ; hybrid composite ;Regeneration ; OG dye adsorption

EL YAPIMI KİTLE İMHA SİLAHLARININ GİZLENMESİ VE YAYILMASI ÜZERİNE BİR ÇALIŞMA

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ÖZET

Kimyasal, Biyolojik, Radyoaktif, Nükleer ve Patlayıcı (KBRN-P) maddeler ile bunlara ilişkin çalışmalar her geçen gün giderek artmakta ve yeni gelişmeler gözlenmektedir. Çalışma yapan ülkeler bu silahların savunma amaçlı olduklarını iddia etseler de bu husus caydırıcı bir unsur ve kuvvet çarpanı olarak kullanılmaktadır. Savaş veya bir iç karışıklık durumunda devlet dışı örgütler veya terörist unsurlarca yapılacak olan KBRN-P içerikli saldırıların sonuçları son derecede zarar verici ve korkutucu olacaktır. Bu doğrultuda, ülkemizi ve dünyamızı etkileyecek olan KBRN-P tehdit ve tehlikelerine karşı halkın sağlığının ve çevrenin korunması, can ve mal kaybının en aza indirilmesi maksadıyla gerekli tedbirlerin alınması gerekmektedir. Bu tedbirler kapsamında Kitle imha silahları (KİS) olarak da adlandırılan Kimyasal, Biyolojik, Radyoaktif ve Nükleer (KBRN) maddelerin özellikleri, etkileri, gizlenme ve dağılma/saçılma yollarının gerek güvenlik kuvvetleri gerek bu konu üzerinde çalışan diğer birimlerce bilinmesi meydana gelebilecek zarar/ziyanın azaltılması ve engellenmesini sağlayacaktır. Devlet dışı aktörler veya terörist gruplar tarafından basit ve ileri düzey elektronik ve kimyasal bilgiler kullanılarak piyasadan temin edilebilecek malzemeler ile El Yapımı Kitle İmha Silahlarını hazırlayabilmektedir. Tasarımcının bilgi birikimine göre şekillenen bu düzeneklerden bazıları endüstriyel veya ticari maksatlı üretilmekte olsa da, art niyetli kişilerce kötü amaçlarda da kullanılabilir. Kitle imha silahları hakkında farkındalık ve bilinç oluşturma hedeflenen bu çalışmada; el yapımı kitle imha silahlarının özellikleri, gizlenme ve yayılma şekilleri hakkında güncel bilgilerin derlemesi yapılacaktır.

Anahtar Kelimeler: El Yapımı Kitle İmha Silahları, Kimyasal Silah, KBRN-P

A RESEARCH ON THE SECRET AND SPREAD OF IMPROVED WEAPONS OF MASS DESTRUCTION

ABSTRACT

Chemical, Biological, Radioactive, Nuclear and Explosive (CBRN-P) substances and studies related to them are increasing day by day and new developments are observed. Although countries claim that these weapons are for defense purposes, this issue is used as a deterrent and force multiplier. In the event of war or civil unrest, the consequences of attacks with CBRN-P content by non-state organizations or terrorist elements will be extremely damaging and frightening. In this direction, necessary measures should be taken in order to protect the health of the public and the environment, and to minimize the loss of life and property against CBRN-P threats and dangers that will affect our country and the world. Within the scope of these measures, the properties and effects of Chemical, Biological, Radioactive and Nuclear (CBRN) substances, also called Weapons of Mass Destruction (WMD), are known by both security forces and other units working on this issue, reducing the damage/loss that may occur and will prevent it. It can prepare Improvised Weapons of Mass Destruction using materials that can be obtained from the market by using simple and advanced electronic and chemical knowledge by non-state actors or terrorist groups. It can prepare Improvised Weapons of Mass Destruction using materials that can be obtained from the market by using simple and advanced electronic and chemical knowledge by non-state actors or terrorist groups. In this study, which aims to raise awareness and consciousness about weapons of mass destruction; Up-to-date information will be compiled on the characteristics, concealment and spread of improvised weapons of mass destruction.

Keywords: Improvised Weapons of Mass Destruction, Chemical Weapon, CBRN-E

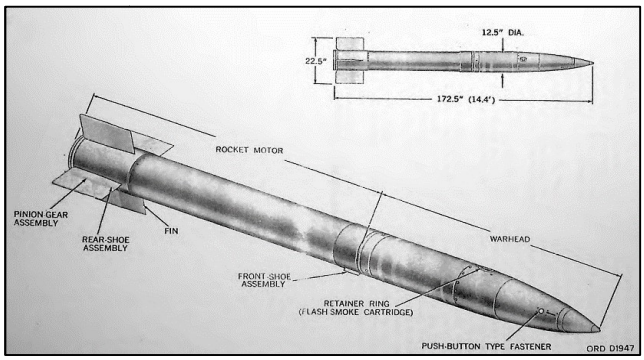
1. GİRİŞ

Terörist faaliyetler ulusal, uluslararası, ideolojik, etnik, politik, dini ve ekonomik gibi farklı alanlarda gerçekleştirilebilmektedir. Ayrıca kitlesel ölümlere sebebiyet vermesi açısından Kimyasal, Biyolojik, Radyolojik ve Nükleer (KBRN) terörizmi konusu önem arz etmektedir. Savaş veya bir iç karışıklık durumunda devlet dışı örgütler veya terörist unsurlarca yapılacak olan KBRN-P içerikli saldırıların sonuçları son derecede zarar verici ve korkutucu olacaktır. Bu doğrultuda, ülkemizi ve dünyamızı etkileyecek olan KBRN-P tehdit ve tehlikelerine karşı halkın sağlığının ve çevrenin korunması, can ve mal kaybının en aza indirilmesi maksadıyla gerekli tedbirlerin alınması gerekmektedir. Bu tedbirler kapsamında Kitle imha silahları (KİS) olarak da adlandırılan Kimyasal, Biyolojik, Radyoaktif ve Nükleer (KBRN) maddelerin özellikleri, etkileri, gizlenme ve dağılma/saçılma yollarının gerek güvenlik kuvvetleri gerek bu konu üzerinde çalışan diğer birimlerce bilinmesi meydana gelebilecek zarar/ziyanın azaltılması ve engellenmesini sağlayacaktır. Devlet dışı aktörler veya terörist gruplar

tarafından basit ve ileri düzey elektronik ve kimyasal bilgiler kullanılarak piyasadan temin edilebilecek malzemeler ile El Yapımı Kitle İmha Silahlarını hazırlayabilmektedir. Tasarımcının bilgi birikimine göre şekillenen bu düzeneklerden bazıları endüstriyel veya ticari maksatlı üretilmekte olsa da, art niyetli kişilerce kötü amaçlarda da kullanılabilir.

2. ARAŞTIRMA VE BULGULAR

Kitle imha silahları, konvansiyonel silahların defalarca kullanılması sonucunda ortaya çıkan zararı, sadece bir kez kullanılmaları sonucunda meydana getirebilen, aynı zamanda konvansiyonel silahların oluşturmadığı, saldırı sonrası olumsuz etkileri de bulunan silahlar olarak da tanımlanabilir. Konvansiyonel türdeki silahların günümüzde en çok kullanılanları top, tüfek, nükleer bomba taşımayan balistik füzeler vb. dir .



Şekil 1. Konvansiyonel Mühimmat Örneği

2.1. Kitle İmha Silahlarının Tercih Edilme Nedenleri

İnsanlık tarihi boyunca toplumlar, diğer toplumlara karşı üstünlük sağlamak amacıyla eldeki mevcut imkânları ve zamanın sağlamış olduğu teknolojiyi kullanmışlardır. Bilim ve teknolojideki gelişme ile birlikte kullanılan silahlar patlayıcı maddeden, kimyasal, biyolojik ve nükleer silahlara doğru değişim göstermiştir.

Devletlerarasındaki güç dengesizliğinin büyümesi ile birlikte, ekonomik ve askeri anlamda zayıf olan devletler aralarındaki dengeyi sağlamak için daha ucuz ve kolay üretilebilen kitle imha silahlarına yönelerek avantajlı duruma geçme arayışına girebilmektedirler. Bu yüzden;

- KİS'lerin yapımı nispeten konvansiyonel silahlara göre daha ucuz ve kolaydır.
- KİS'lerin yapımında kullanılan malzemeler piyasadan çok kolay temin edilebilmektedir.
- Teknik cihazlar olmadan tespit edilmesi çok güçtür.
- Az miktarda maddelerle bile büyük miktarda zayiata sebebiyet verebilmektedir.
- Halk ve devletler üzerinde konvansiyonel silahlara göre psikolojik olarak daha fazla hasara sebebiyet verebilmektedir.

2.2. Kitle İmha Silah Saldırıları ile Elde Edinmek İstenen Olası Sonuçlar

- Kitlesel olarak zayiat verdirmek,

- Ülkelerin müdahale sistemlerini zaafa uğratmak,
- Hayatın normal akışını sekteye uğratmak,
- Tesisleri kullanılamaz duruma getirmek,
- Halkı paniğe sevk etmek,
- Halkın devlete karşı güvenini sarmak,

2.3. Kitle İmha Silahlarının Kategorileri

Kitle İmha Silahlarının herhangi bir standardı olmamakla birlikte üretim ve kullanım şekilleri açısından sınıflandırmak mümkündür.

- Kimyasal Ajanlar,
- Biyolojik Ajanlar,
- Radyasyon Yayma Düzenekleri (Kirli Bombalar)
- Patlayıcı Maddeler (Araç Bombalar)
- El Yapımı Kitle İmha Silahları.

El yapımı kitle imha silahları hakkında farkındalık ve bilinç oluşturma hedeflenen bu çalışmada; el yapımı kitle imha silahlarının özellikleri, gizlenme ve yayılma şekilleri konularına değinilecektir.

2.3.1. El Yapımı Kitle İmha Silahları

El yapımı kitle imha silahları; tasarımcının istediği herhangi bir şeye benzeyebilir yani standardı yoktur. Söz konusu düzeneklerin bazıları yasal yollardan üretilebilir özellikte olabilir. Benzer özelliklere sahip olmaları erken tespit ve güvenli bir şekilde etkisizleştirme için bir ipucu olabilir.

İçerisinde bulunan patlayıcı ya da KBRN malzemeler katı, sıvı veya gaz halde bulunabilir, Maddenin yayılımı; kırılma, infilak etme, püskürtücü ya da mekanik hareketle, vektörlerle olabilir.

2.3.1.1. Kırıcı Düzenekler

İçerisine gizlenerek yerleştirilmiş kimyasal, biyolojik veya radyoaktif maddelerin kırılarak çevreye yayılmasını sağlayan düzeneklerdir. Ampul, balon, termos, plastik veya kâğıt torba, cam kavanoz, şişe gibi malzemelerin içerisinde yerleştirilmek suretiyle yapılır.

2.3.1.2. İnfilaklı Düzenekler

İnfilaklı düzenekler, maddenin konulduğu dış kabın parçalanması ve içerisinde bulunan maddenin çevreye yayılması için patlayıcı madde kullanılarak yapılan düzeneklerdir. Genellikle, kullanılacak patlayıcı madde miktarı, sadece dış kabın parçalanmasını sağlayacak kadardır. Büyük miktarlarda patlayıcı madde var ise içerisinde kimyasal ve biyolojik maddeden ziyade radyolojik maddelere karşı alınacak tedbirlere ağırlık verilmelidir.

İnfilaklı düzeneklerde, içerisinde ortama yayılması istenilen kimyasal, biyolojik ve radyoaktif maddenin bulunduğu dış kap, patlayıcı maddenin enerjisini sağlayacak akım kaynağı, patlayıcı maddeyi istenilen yer ve zamanda patlatabilecek anahtar sistemi, anahtar sisteminden gelecek akımı faaliyete geçirecek başlatıcı ve istenilen etkiyi sağlayacak patlayıcı madde bulunur.

2.3.1.3. **Mekanik Püskürtmeli Düzenekler**

Bu düzeneklerde de infilaklı düzeneklerde olduğu gibi maddenin konulduğu bir dış kap bulunmaktadır ancak bu kapta patlayıcı madde yoktur. Kimyasal ve biyolojik ajanların ortama yayılması için basınç sistemi bulunan bir düzenek kullanır. Bir aracın egzozuna düzenek eklenerek ya da ilaçlama aletleri kullanarak gerçekleştirilebilir.

Mekanik püskürtme düzenekler, basınçlı hava depoları, yangın söndürme cihazları, pervane motorları, ticari maksatlı yapılmış süpürgeler, büyük tarım ilaçları püskürtücüleri gibi endüstriyel maksatlı kullanılan malzemelerden faydalanılarak kolaylıkla yapılabilir.

2.3.1.4. **Vektörler**

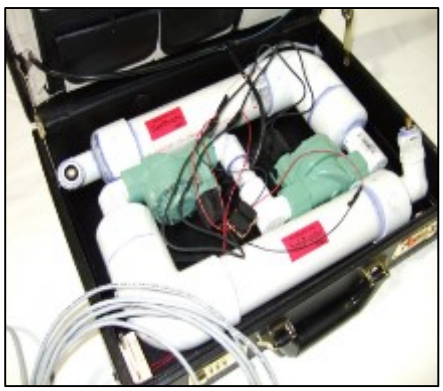
Canlı organizmaların yayılmasını sağlamak içini genellikle vektörler kullanılır. Vektör, bakteri taşıyıcısı olup bakteri bulaştırılmış böcek türü bir canlı, giyecek, yiyecek ya da su olabilir. Vektörler hava şartlarına bağımlı değildir ve bu tip yayma önceden tahmini ve kontrolü en zor olandır.

2.3.1.5. **El Yapımı KİS'lerin Yayılması ve Gizlenmesinde Kullanılan Bazı Düzenekler**

Kitle imha silahlarının dolgu maddesinde etken olarak kullanılan kimyasal, biyolojik, radyoaktif ve nükleer maddelerin açığa çıkmasında/faaliyete geçmesinde genellikle patlayıcı maddeler kullanılmaktadır. El yapımı patlayıcı madde düzeneği genellikle (5) temel unsurdan oluşur. Bunlar; el yapımı patlayıcı maddenin enerjisini sağlayacak akım kaynağı ve sağlanan enerjinin aktarılması için akım taşıyıcı, el yapımı patlayıcı maddenin istenilen yer zamanda faaliyete geçirecek olan anahtar sistemi, anahtar sisteminden gelen akımı faaliyete geçirecek başlatıcı ile bunların bir arada bulundurularak örtü/gizleme ve dış etkilerden korunmasını sağlayacak dış kap, istenilen etkiyi yerine getirecek ana dolgudur. Dış kabın durumuna ve ana dolguya göre başlatıcı olarak kullanılan fünye veya fünye ile birlikte yemleme/patlayıcı madde kullanılarak kitle imha silahları faaliyete geçirilmektedir.

Aşağıda bazı örnekleri bulunan El Yapımı Kitle İmha Silahlarının belirli bir standardı bulunmamakta olup, bu düzenekler tasarımcının bilgisine ve hayal gücüne göre şekillenmektedir.

2.3.1.5.1. İkili ve Tekli Kimyasal Püskürtme Düzenekleri

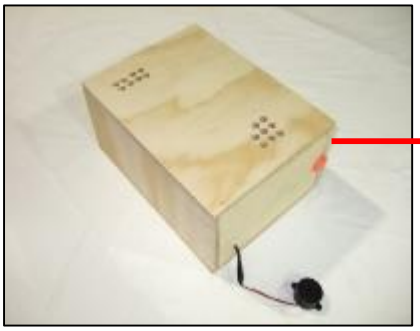


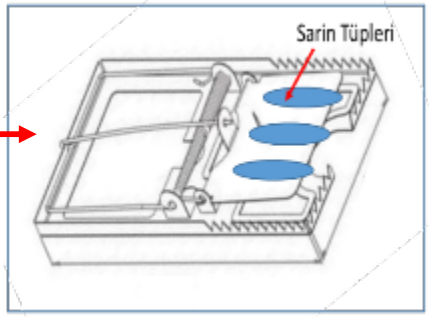
Resim 1 ve 2. İkili ve Tekli Kimyasal Püskürtme Düzenekleri

2.3.1.5.2. 19 litrelik ve 60 litrelik Yayma Düzenekleri

Resim 3 ve 4. 19 litrelik ve 60 litrelik Yayma Düzenekleri

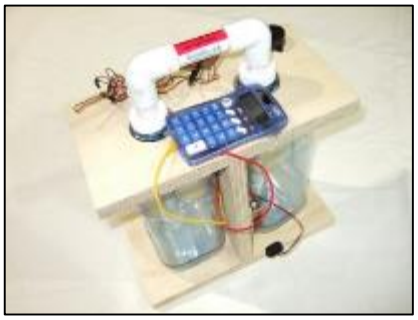
2.3.1.5.3. Kimyasal Kırıcı Düzenek





Şekil 2. Kimyasal Kırıcı Düzenek

2.3.1.5.4. Kimyasal veya Biyolojik Patlayıcı Yayma Düzenekleri

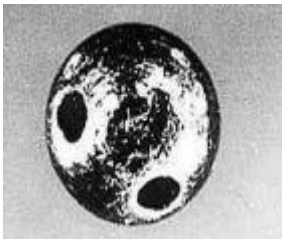


Resim 5 ve 6. Kimyasal ve Biyolojik Patlayıcı Yayma Düzenekleri

2.3.1.5.5. Biyolojik Madde Yayma (Mektup ve Kitap Bomba) Düzenekleri

Resim 7 ve 8. Biyolojik Madde Yayma Düzenekleri

2.3.1.5.6. Vektör Şemsiyesi Düzeneği



Şekil 3. Vektör Şemsiyesi Düzeneği

2.3.1.5.7. Sırt Çantası ve İntihar Yeleği Düzenekleri

Resim 9 ve 10. Sırt Çantası ve İntihar Yeleği Düzenekleri

2.3.1.5.8. İnsansız Hava Aracına İrtibatlanmış Püskürtme Düzeneği

Resim 10 ve 11. İnsansız Hava Araçlarına İrtibatlı Püskürtme Düzenekleri

3. SONUÇ

Geleceğin tehdidi olarak görülen kitle imha silahlarının, ilk bakışta ne olduğu ve etkisinin ne olabileceği ve bu etkinin ne kadar süreceği, konvansiyonel silahlar kadar kolay anlaşılamamaktadır. Bu sebeple müdahale edecek ekiplerin, geniş, kapsamlı ve amaca uygun tanımlama yapması, etkili ve doğru müdahale edilmesi ile mücadele çabalarına yardımcı olacaktır.

Ülkemizde, KBRN içeren maddeler kullanarak meydana gelen olaylar ile ilgili hukuki zemin oluşturulmuş olsa da, işleyişte mevzuatla belirlenmiş ve konu ile alakalı kurumların görevleri ile imkân ve kabiliyetlerine ilişkin bazı hususlarda koordinasyon ve eğitim eksiklikleri bulunduğu değerlendirilmektedir.

Bu kapsamda; kolluk görevlileri, gümrük personelleri, sınırlarda görevli diğer personeller, AFAD ekipleri ve konu ile ilgili diğer birimlerin mevcut el yapımı kitle imha silahlarına ait tehditler, gizlenme ve yayılma yolları hakkında bilgi sahibi olması gerekmektedir.

4. KAYNAKÇA

IHS Jane’s CBRN Hanbook, Fourth Edition, Louisiana State University.

DTRA. (2021). CWMD (Kitle İmha Silahlarına Karşı Mücadele) / CIWMD İşlemleri / Teknisyen Eğitmen Geliştirme Kursu Notları.

DTRA. (2014). El Yapımı Kitle İmha Silahları Katılımcı Kılavuzu, Part One ABD.

Rockets (bulletpicker.com). (Erişim Tarihi: 05.11.2021).

Anadolu Üniversitesi Yayını. (2018). KBRN Savunma ve Güvenlik. Eskişehir.

Karlsson, Malin, (2021). Where is Super Terörizm?

AFAD, KBRN Temel Bilgiler.

Claude A. Lambert, (2020), The Chemical and Biological Attack Threat of Commercial Unmanned Aircraft Systems.

Inert training devices for bomb squad training SafeBombs, LLC , EOD training aids fake explosives bomb squad trining explosive inert training devices. (Erişim Tarihi: 05.11.2021).

KİTLE İMHA SİLAHLARINA PATLAYICI MADDELER AÇISINDAN GENEL BİR BAKIŞ

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ÖZET
Kimyasal silahların üretilerek kullanılmaya başlaması ile birlikte, canlıların yaşamları çok büyük bir tehlike ve tehdit altına girmiştir. Kitle imha silahları (KİS) olarak da adlandırılan 'Kimyasal, Biyolojik, Radyoaktif ve Nükleer' (KBRN) maddeler kullanıldıklarında; bölge, asker ve sivil ayırt etmeksizin kitlesel olarak canlıların hastalanmasına, yaralanmasına ve ölümüne sebebiyet vermektedir. Kitle imha silahlarının üretimlerinin, geliştirilmelerinin ve ulaşılmasının kolay olması nedeniyle terör örgütleri tarafından gelecekte yoğun olarak kullanılabileceği öngörülmektedir. Kitle imha silahlarının dolgu maddesinde etken olarak kullanılan kimyasal, biyolojik, radyoaktif ve nükleer maddelerin açığa çıkmasında/faaliyete geçmesinde genellikle patlayıcı maddeler kullanılmaktadır. Doğada saf halde bulunmayan patlayıcı maddeler, basit ve ileri seviyede kimyasal bilgi ile devlet dışı örgütler / terör örgütleri tarafından piyasadan temin edilen malzemeler kullanılarak hazırlanmaktadır. Ülkemizde "Denizlerde ve Yurt Sathında Karşılaşılan Patlayıcı Maddeler ve Şüpheli Cisimlere Uygulanacak Esaslara İlişkin Yönetmelik"te tanımı yapılan "El Yapımı Geliştirilmiş Patlayıcı Madde ve Düzenler ile Bombalar" temelde 5 unsurdan oluşur. Bunlar; el yapımı patlayıcı maddenin enerjisini sağlayacak akım kaynağı ve sağlanan enerjinin aktarılması için akım taşıyıcı, el yapımı patlayıcı maddenin istenilen yer zamanda faaliyete geçirecek olan anahtar sistemi, anahtar sisteminden gelen akımı faaliyete geçirecek başlatıcı ile bunların bir arada bulundurularak örtü/gizleme ve dış etkilerden korunmasını sağlayacak dış kap, istenilen etkiyi yerine getirecek ana dolgudur. Dış kabın durumuna ve ana dolguya göre başlatıcı olarak kullanılan fünye veya fünye ile birlikte yemleme/patlayıcı madde kullanılarak kitle imha silahları faaliyete geçirilmektedir. Bu çalışmada; Kimyasal, Biyolojik, Radyoaktif ve Nükleer (KBRN) maddeler hakkında güncel bilgilerin derlenmesi yapılarak, dağıtıcı/saçıcı olarak kullanılan patlayıcı maddeler ayrıntılı olarak aktarılacaktır.

Anahtar Kelimeler: Kimyasal Silah, KBRN, Kitle İmha Silahları

AN OVERVIEW OF WEAPONS OF MASS DESTRUCTION IN TERMS OF EXPLOSIVES

ABSTRACT
With the production and use of chemical weapons, mankind has faced a great threat. When Chemical, Biological, Radioactive and Nuclear (CBRN) materials, also called weapons of mass destruction (WMD), are used; It causes massive illness, injury and death of living beings, regardless of the region, military or civilian. It is predicted that weapons of mass destruction will be used extensively in the future by terrorist organizations due to their easy production, development and accessibility.

Explosive materials are generally used in the release/activation of chemical, biological, radioactive and nuclear materials used in the filling material of weapons of mass destruction. Explosives, which are not found in pure form in nature, are prepared using simple and advanced chemical knowledge and materials obtained from the market by non-state organizations/terrorist organizations. Hand-made explosives and devices and bombs, which are defined in the Regulation on the Principles to be Applied to Explosives and Suspicious Objects Encountered at Seas and at the Countryside in our country, simply consist of 5 elements. These; The current source to provide the energy of the handmade explosive material and the current carrier to transfer the energy provided, the key system to activate the handmade explosive at the desired time, the initiator to activate the current coming from the key system, and the outer cover / concealment and protection from external effects by keeping them together. the container is the main filling that will achieve the desired effect. Depending on the condition of the outer container and the main filling, the detonator is used as a starter, or by using the detonator together with the baiting/explosive material, weapons of mass destruction are activated. In this study, general information about Chemical, Biological, Radioactive and Nuclear (CBRN) materials will be compiled and explosive materials used as weapons of mass destruction and dispersant/scatter will be explained in detail.

Keywords: Chemical Weapon, CBRN, Weapons of Mass Destruction

5. GİRİŞ

Çağımızda dünya ordularında bulunan askeri silahlar; içerisinde patlayıcı bulunan (konvansiyonel) silahlar ve konvansiyonel olmayan (nükleer, kimyasal ve biyolojik silahlar) kitle imha silahları (KİS) olarak iki ana grupta incelenmektedir. Konvansiyonel silahlar; ülkelerin ordularında bulunan klasik silahlar diye tabir edilen, kullanıldıklarında kitlesel kayıplara sebebiyet verme ihtimali düşük, tabanca, tüfek, top mühimmatları, füzeler gibi silah ve mühimmatlara verilen isimdir. Konvansiyonel kelime anlamı olarak alışılagelmiş, geleneksel anlamı taşısa da anlaşmaya bağlı, uzlaşma anlamına da gelmektedir. Ülkeler, üretmiş oldukları yeni silahları kullanmakta olup, eski teknoloji ile üretilmiş silahları ise başkaca ülkelerle uzlaşma ve çeşitli anlaşmalar yaparak büyük oranda pazarlamaktadır.

Kitle imha silahlarının etkilediği alan ve canlı sayısı konvansiyonel silahlara göre daha fazla olduğu bilinmektedir. Basitçe ve el yordamıyla yapılmış/tadil edilmiş, ana imla hakkı olarak Kimyasal, Biyolojik, Radyoaktif, Nükleer ve Patlayıcı (KBRN-P) maddelerden biri ya da birkaçı kullanılmış bir kitle imha silahı, ekonomik değeri ve patlayıcı yükü çok daha fazla olan bir konvansiyonel silahtan daha etkili olduğu değerlendirilmektedir. Örneğin yaklaşık (1) dolar maliyetinde bir biyolojik ajanın etkileyebileceği alan ve canlı sayısı, milyon dolar değerindeki bir veya daha fazla füzenin etkileyeceği alan ve canlı sayısından misliyle fazla olacaktır. Bu sebepten; KİS'ler konvansiyonel silahların çok sayıda kullanılmaları sonucu meydana getirdikleri zaiyatı tek seferde kullanılarak meydana getirebilmektedir. Ayrıca KİS kullanımı konvansiyonel silah kullanımı sonucu saldırı sonrası olumsuz etkilenmeyi uzun süre barındırabilen silahlar olarak da gündeme gelmektedir.

6. ARAŞTIRMA VE BULGULAR

6.1. Kitle İmha Silahlarının Kategorileri

Kitle İmha Silahlarının herhangi bir standardı olmamakla birlikte üretim, kullanım ve yayma şekilleri açısından sınıflandırmak mümkündür.

- Kimyasal Harp Maddeleri,
- Biyolojik Ajanlar,
- Radyolojik Madde Yayma Düzenekleri (Kirli Bombalar)
- Patlayıcılar (Araç Bombalar vb.)
- El Yapımı Kitle İmha Silahları.

6.2. Kimyasal Harp Maddeleri:

Toksik etkileri sonucunda; "canlıları öldürme, yaralama veya temel yaşam fonksiyonlarını bozarak etkisiz hale getirme gibi özelliklere sahip kimyasal maddelere genel olarak kimyasal savaş ajanı" denilmektedir. 13 Ocak 1993'te imzalana Kimyasal Silahlar Sözleşmesi; "kimyasal savaş ajanlarını kullanmak için gerekli cihaz ve mühimmatlar ile bunların kullanımına yönelik özel olarak tasarlanmış her türlü teçhizatı kimyasal silah" olarak tanımlamıştır. Kimyasal silahların "savaş alanında düşman ülkelere karşı kullanılmasıyla ortaya çıkan duruma ise kimyasal savaş" denilmektedir.

Kimyasal savaşın ilk örnekleri Taş Devrine (M.Ö. 10.000) dayanmaktadır. O zamanlarda Güney Afrikalı savaşçılar, yılan, akrep ve bazı bitki köklerinden elde edilen toksik maddelerle savaş okları icat etmişler ve kullanmışlardır. Daha sonra M.Ö. 2000 yıllarında, Hindistan'da bulunan savaşçılar, harp sahasında büyük ateşler yakarak düşmanın direncini kırmak maksadıyla dumandan faydalanmışlardır. Yakın tarihte de Kimyasal Silah kullanımına bazı ülkeler tarafından devam edilmiş, kullanılan kimyasal silaha karşı tedbirler alındıkça da mevcut kimyasal ajanlar sentezlenerek birçok kimyasal ajanın keşfi yapılmıştır.

Yakın tarihte modern (mühimmatlar içerisinde) kimyasal harp maddeleri ilk kez I. Dünya Savaşı'nda kullanılmıştır. Bundan dolayı I. Dünya Savaşı "Kimyagerlerin Savaşı" olarak adlandırılmaktadır. Söz konusu savaşta, kimyagerlerin 18 ve 19. yüzyılda icat ettikleri klor (1774), hidrojen siyanür (1782), siyanojen klorid (1802), fosgen (1812), hardal gazı (1822) ve kloropikrin (1848) gibi kimyasal maddeler kullanılmıştır.

6.2.1. Kimyasal Harp Maddelerinin Sınıflandırılması:

- Sinir Ajanları (Tabun, Soman, VX…)
- Yakıcı Ajanlar (Hardal, HN-1, Levizit..)
- Kan Zehirleyici Ajanlar (Siyanür, Arsin..)
- Boğucu Ajanlar (Fosgen, Klor…)
- Kargaşa Kontrol Ajanları (Göz yaşartıcı gazlar)
- Uyuşturucu Ajanlar (Uyuşturucu ve uyarıcılar)

6.3. Biyolojik Harp Maddeleri:

Biyolojik silahlar; ölümcül, kolay üretilebilen, tespit edilmesi neredeyse imkânsız olan, maliyetleri düşük fakat etkilediği alan ile verdiği zayiatı fazla olan, kullanım sonucu meydana getirdikleri hastalıkların tedavilerinin çok zor olduğu harp maddelerinden oluşurlar. Bu nedenle biyolojik silahlar benzersizdir.

Biyolojik harp ajanları kötü niyetli kişilere ve terörist unsurlara çeşitli avantajlar sağladığı gibi kullanıcının da etkilenmesinden dolayı dezavantajı da vardır. Örneğin; biyolojik ajan kullanılarak yapılan bir saldırı, balistik bir füze kullanımının aksine ani bir etkileşimi olmayacağından ilgi çekmez. Yani yapılan biyolojik saldırıdan belki haftalar sonra haberdar olunacaktır.

Biyolojik ajanların terör gruplarınca kullanılması, karşı tedbirlerin geliştirilmesi daha kolay olan kimyasal harp maddelerinin yayılmasından çok daha etkili ve maliyeti düşük olduğu değerlendirilmektedir.

Biyolojik Harp Maddelerinin Özellikleri;

- Canlı /cansız maddelerden oluşurlar, tespiti zordur,
- Geniş bir spektrumu vardır, deri tahrişinden ölüme kadar sonuçları olabilir,
- Hastalıklar kişiden kişiye yayılır,
- Hastalık belirtileri gribe benzer,
- Elde etmesi göreceli olarak kolaydır, hemen hemen herkes tarafından üretilebilirler.

6.3.1. Biyolojik Savaş Ajanlarının Sınıflandırılması

Biyolojik savaş ajanlarının tespiti, etki alanlarının azaltılması veya tamamen bitirilmesi ve neden olan hastalığın tedavisinin bulunması (ilaç, aşı vb) açısından sınıflandırılma önemli bir yere sahiptir. Genel olarak kaynaklarına göre:

- Bakteriler,
- Virüsler,
- Biyolojik Toksinler

Olmak üzere üç ana başlıkta incelenebilir. Kaynaklarına göre sınıflandırmanın dışında bulunan bazı biyolojik ajanlara da mevcuttur. Bunlar; "riketsiyalar, klamidyalar ve mantarlar"'dır.

6.3.2. Bakterilerin Özellikleri;

- Gözle görülemeyen küçük, serbest yaşayan organizmalardır,
- Katı veya sıvı ortamda çoğalabilirler,
- Sitoplazma, hücre zar ve nükleer materyaller içerir,
- Basit bölünme ile ürer,
- Genellikle antibiyotiklere yanıt verirler,
- Tabiatta hemen her yerde bulunurlar,
- Bazı sektörlerde (gıda, sağlık, eczacılık ve kozmetik) faydalı kullanım alanları vardır.

Biyolojik Harp Maddesi olarak daha önce kullanılmış ve kullanılabilecek önemli bakteriler ve meydana getirdikleri hastalıklar şunlardır:

- Bacillus anthracis bakterisi – Şarbon hastalığı (deri ve akciğer şarbonu)
- Brucella bakterisi ve türevleri - Brucellosis-Bruselloz
- Yersinia pestis bakterisi – Veba hastalığı
- Vibrio cholerae bakterisi – Kolera hastalığı
- Francisella tularensis – Tularemi hastalığı

Bu bakteriler ulusal güvenlik açısından yüksek risk teşkil eden grupta yer almaktadır.

6.3.3. Virüslerin Özellikleri;

- Bakterilere nazaran daha küçüktürler,
- İçlerinde çoğalabilecekleri ve yaşayabilecekleri canlı organizmalara gerek duyarlar,
- İçerisinde girdikleri canlı organizmanın kaynağından beslenirler,
- Antibiyotiklerle tedavi edilemez,
- Antiviral ilaçlara yanıt verirler fakat bu ilaçlar da kısıtlıdır,
- Virüslerden esas korunma aşı ile mümkündür fakat tüm virüslere karşı aşı geliştirmek oldukça güç ve maliyetlidir.

Biyolojik Savaş Ajanı olarak kullanılmış ve kullanılabilecek virüsler ile meydana getidikleri hastalıklar şunlardır:

- Variola majör virüsü - Çiçek hastalığı
- Arenavirüsler virüsler- Ebola
- HIV - AIDS
- Poliovirus - Çocuk felci
- İnfluenza virüsleri - Grip hastalığı

6.3.4. Biyolojik Toksinlerin Özellikleri

Biyolojik toksinler; çok az miktarda vücuda alınsa da ölümcül olabilmektedir, doğal ortamlarda kalıcılık sağlayabilmektedir, üretimi basittir ve nakledilmeleri ve yayılmaları oldukça basittir. Tüm bu nedenlerden dolayı biyolojik toksinler mühim ve kullanılma riski yüksek bir biyolojik savaş ajanıdır.

Kötü niyetli kişilerce, tarihte, bitki, hayvan ve çeşitli organizmalardan elde edilmek suretiyle özellikle de terör saldırıları ile önemli kişilere suikastlarda kullanılmış ve kullanılmaya devam edileceği değerlendirilmektedir.

6.3.5. Biyolojik Harp Maddelerinin Vücuda Giriş Yolları

Biyolojik Savaş Ajanların vücuda giriş yoları, solunum, sindirim ve deri olarak sıralandırılabilir. Ayrıca üreme ve göz gibi organlardan da vücuda giriş sağlayabilmektedir.

6.3.6. Biyolojik Harp Maddelerini Elde Edilme Yolları

Terör unsurları ve kötü niyetli kişiler bazı biyolojik saldırılarda kullanmak maksadıyla biyolojik savaş ajanlarını çeşitli yöntemle elde edebilmektedirler. Bunların başında dünya çapında muhtelif sayıda bulunan mikrop (germ) bankalarından satın almak suretiyle elde etmek gelir. Aşı üretim merkezleri yâ da hastalıkların tedavisi için kullanılan laboratuvarlardan çalma da bir yöntem olarak kullanılmaktadır. Eğer eğitimleri varsa da doğal yöntemlerle kültürleme yaparak da elde edilebilinir. Son olarak da terörizmi destekleyen başka bir ülke tarafından da temin edilebilir.

2.4. Radyolojik Madde Yayma Düzenekleri (Kirli Bombalar)

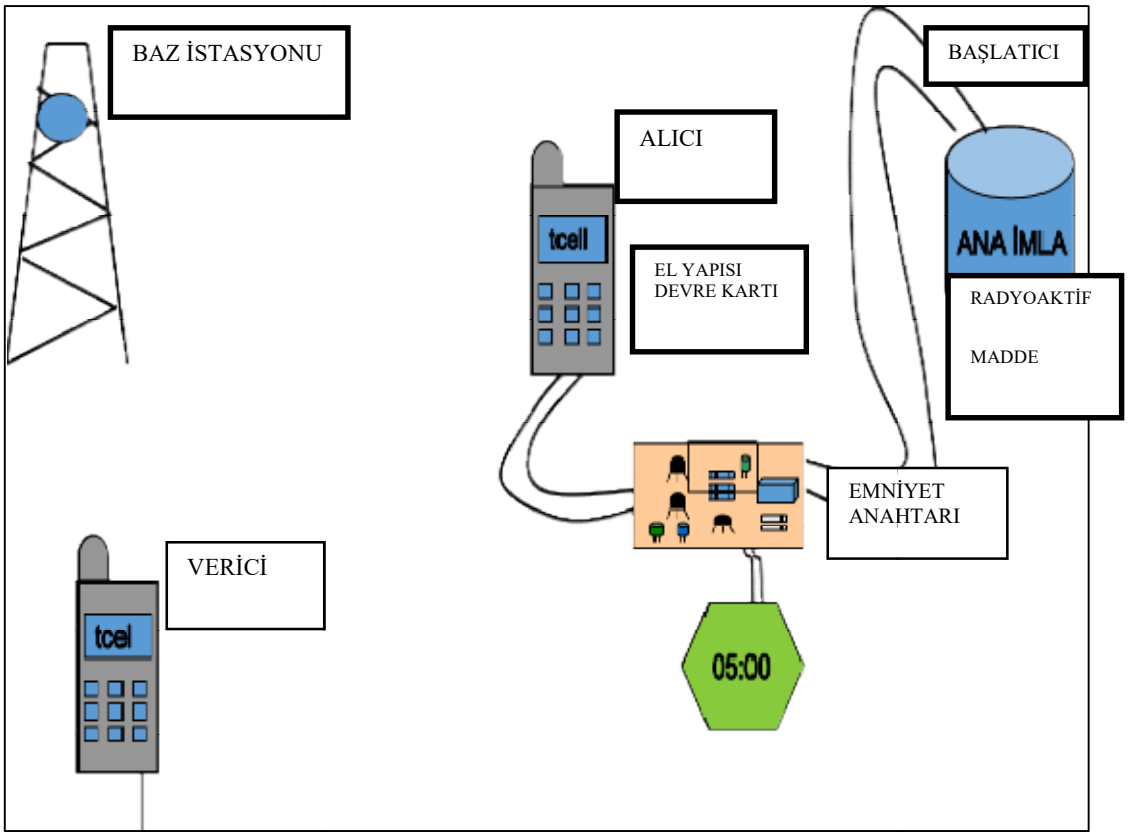
Çalışma şekli klasik el yapımı patlayıcı düzeneklerle benzerlikler gösteren, infilak etmesi durumunda, radyolojik maddenin yayılmasıyla canlıları ölümüne ve ciddi hastalıklara sebebiyet verdiren, ayrıca toplumda panik havası ve infial yaratmak maksadıyla çeşitli terör yapılarınca kullanılan standart dışı düzeneklere kirli bomba diyebiliriz.

Temel bir Kirli Bomba düzeneğinin ana unsurlarını "başlatıcı (patlayıcı/fünye), akım taşıyıcı (kablo), akım kaynağı (pil, akü vb.), anahtar sistemi (saat, telsiz vb.), dış kap (konteynır) ve ana imla hakkı (radyoaktif madde)" olarak tanımlamak mümkündür. Söz konusu unsurların elamanlarının tamamı bir arada olacağı gibi birinin/birkaçının (dış kap gibi) eksik olması sorun teşkil etmeyebilir. Düzeneğin amacı, patlayıcı/fünye yardımıyla radyoaktif maddenin açığa çıkarılarak yayılmasının sağlanmasıdır. Kirli bomba ile klasik el yapımı patlayıcıyı (EYP) birbirinden ayıran en önemli etken ana imla haklarının birbirinden farklı olmasıdır. Klasik bir EYP'de ana imla hakkı patlayıcı madde (TNT, Plastik Patlayıcı, Nitrat bazlı patlayıcılar v.b) olmak zorunda iken kirli bomba düzeneğindeki ana imla hakkı radyoaktif madde olmasıdır. Kirli bomba düzeneklerinde kullanılan patlayıcı sadece radyoaktif maddenin yayılımını sağlamak için başlatıcı (fünye) olarak kullanılmaktadır.

Kirli bomba düzeneklerinde kullanılan anahtar sistemleri, endüstriyel, hobi ve güvenlik amaçlı üretilmiş kumanda sistemleri (oyuncak kumandaları v.b), el telsizleri, cep telefonları ve tadil edilmiş alıcı ve ateşleme anahtarları kullanılmaktadır.

Son dönemde Drone ve İHA olarak tabir edilen insansız hava araçları da içerisine veya üzerine yüklenen kirli bomba düzeneğini, hedef olarak belirlenen noktalara havadan taşımak amacıyla kullanılabileceği değerlendirilmektedir.

Kirli bombanın kullanılması ile olay anında can kayıpları ve yaralanmalar yaşanabileceği gibi radyolojik maddeye maruziyetin etkilerini canlılar günler hatta haftalar sonra görebilmektedir. Bununla birlikte radyoaktif maddenin geniş alana yayılması gıda ve su kaynaklarını da kontamine ederek çevreye ciddi hasarlar verebilmektedir. Terörist unsurlarının kirli bomba kullanma nedenlerinden bir diğeri de toplumda kargaşa, endişe hali ve istikrarsızlık yaratmaktır.



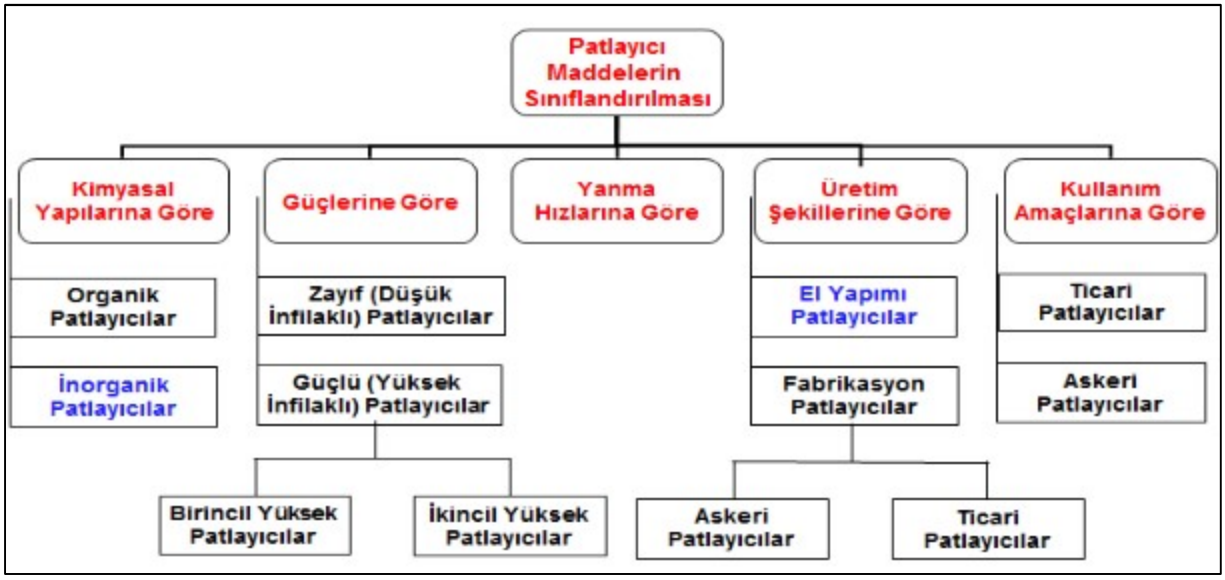
Şekil 1. Kirli Bomba Çalışma Prensibi

2.5. Patlayıcılar

Harp maksatları için kullanılan bütün patlayıcıları, silâh sevk sistemlerini, patlayıcı ihtiva eden ordudonatım malzemelerini, nükleer silahları ve kimyasal maddeleri de içeren; uçak bombaları, harp başlıkları, güdümlü ve balistik füzeler, el bombaları, roketler, ağır silah mühimmatları, mayınlar, el yapımı geliştirilmiş patlayıcı madde ve düzenler ile bombalar, torpidolar, su bombaları, tahrip kalıpları, payroteknik malzemeler, kesici veya sevk ediciler, elektronik patlayıcılar ile benzer şekilde patlama sonucu kişide ölüm veya yaralanma, teçhizat ve binalarda hasara sebep olabilecek her türlü maddelere ***patlayıcı madde*** denmektedir.

Ayrıca, dışarıdan gelen ısı, sürtünme, şok gibi bir etki sonucu reaksiyona girerek gaz haline geçen ve bu esnada büyük miktarda basınç, ısı, ışık ve ses yayan kimyasal maddeleri ifade eder.

2.5.1. Patlayıcı Maddelerin Sınıflandırılması



Tablo 1. Patlayıcı Maddelerin Sınıflandırılması

Terör örgütleri, fabrikasyon, askeri ve ticari patlayıcıları terör eylemlerinde kullanabildikleri gibi özellikle son dönemlerde piyasadan temin edilebilen malzemelerle hazırlanan el yapımı kimyasal karışımlardan elde ettikleri patlayıcıları da kullanmaktadırlar. Terörist unsurlar bu tür patlayıcıları genellikle kırsalda güvenlik güçlerine karşı ve araç bomba türü eylemlerde kullanılmaktadırlar.

Bomba yüklü araç, oldukça güçlü, değişken ve gizlenebilir bir silahtır. Dünyanın çeşitli yerlerinde, değişik zamanlarda ve değişik yöntemler vasıtasıyla, terörist gruplar tarafından sıkça kullanılmış ve halen kullanılmaya devam edilen eylem türüdür. Patlayıcı literatüründe araç bomba ve bombalı araç kavramları birbirlerine karıştırılmaktadır. Araç Bomba, aracın iç aksamlarına, bagajına veya araç ile çekilen römorka patlayıcı madde ile ateşleme sisteminin yerleştirildiği, aracın bombanın taşıyıcı kabı haline getirildiği bir El Yapımı Patlayıcı Madde (EYP) türüdür. Bombalı araç ise, aracın veya araç içerisindeki kişilerin hedef alındığı ve bu amaçla el yapımı patlayıcı madde düzeneği yerleştirilmiş araçlardır.

Resim 1. Araç Bomba Örneği

Resim 2. Bombalı Araç Örneği

Araç bomba saldırında hedefin özelliğine göre bisikletten kamyona kadar uzanan geniş yelpazedeki taşıyıcı araçlar kullanılabilmektedir.

Resim 3. Bisiklete Yerleştirilmiş Düzenek Örneği

Bisiklet ve motosiklet bombalarda, patlayıcı maddenin yerleştirilebileceği yerler sınırlıdır. Genellikle, tekerleklerin ve gövdenin iç kısımları ve oturakların alt kısımları tercih edilmektedir. Patlayıcı imla hakları el yapımı metal kaplar ile atılmış patlamamış mühimmatlar kullanılarak araçların kapasitesine göre tesir verilecek yere yönlendirilerek yerleştirilmektedir.

2.5.2. Tespit Etmeye Yönelik Emareler

- Araç sürücüsünün aşırı sinirli ve heyecanlı tavırlar sergilemesi.
- Aracın plakasının sahte olması. *(Orijinalinden farklı bir görünümde, mühürsüz veya yeni boyanmış olması)*
- Aracın yeni boyanmış görünümünde olması *(Çalıntı araçlar için)*.
- Normal radyo anteni dışında, araç telefonu anteni veya değişik türde anten bulunması.
- Araç çevresinde bulunan bant ve kablo parçaları.
- Aracın içinden çıkan ve nereye bağlı olduğu belli olmayan kabloların bulunması.
- Araç çevresinde bulunan bant ve kablo parçaları.
- Aracın içinden çıkan ve nereye bağlı olduğu belli olmayan kabloların bulunması.
- Araç çevresinde bulunan bant ve kablo parçaları.
- Aracın içinden çıkan ve nereye bağlı olduğu belli olmayan kabloların bulunması.

Tablo 2. Araç bombada kullanılabilecek araçlar, kapasiteleri ve emniyetli mesafeleri

Araç Cinsi		Maksimum Patlayıcı Kapasitesi	Havada Ölümcül (Blast) Etkisi	Minimum Parça Tesiri Mesafesi	Camların Kırılma Mesafesi
	Kısa Araç	227 kg.	30 m.	457 m.	381 m.
	Sedan Araç	455 kg.	38 m.	534 m.	534 m.
	Minibüs Panelvan	1.818 kg.	61 m.	838 m.	838 m.
	Kamyonet Traktör	4.545 kg.	91 m.	1.143 m.	1.143 m.
	Su/Yakıt Tankeri	13.636 kg.	137 m.	1.982 m.	1.982 m.
	Tır	27.273 kg.	183 m.	2.134 m.	2.134 m.

3. SONUÇ

Kitle İmha Silahları, büyük ölçekte canlılar, alt yapı veya diğer kaynakları yok etmek için kullanılan ve yüksek derecede imha yeteneğine sahip silahlardır. Genel manada kitle imha silahlarında KBRN maddeleri kullanılmakla birlikte patlayıcı maddelerin söz konusu siteme bütünleşmiş edilerek yayılımın kolaylaştırılması sağlanmaktadır. KBRN ve patlayıcı maddelerinin araştırılması, elde edilmesi, işlenmesi, saklanması, paketlenmesi, taşınması, kullanılması ve atık olarak işlem görmesi sırasında gerekli önlemler alınmadığı takdirde çevre ve insan sağlığını tehdit eden tehlikeli ve zehirli maddeleri, Kitle İmha Silahı (KİS) olarak tanımladığımız silah sistemleri ile düzeneklerinde kullanıldıkları ve gelecekte de artarak yaygınlaşacağı öngörülmektedir.

4. KAYNAKÇA

IHS Jane's CBRN Hanbook, Fourth Edition, Louisiana State University.
DTRA. (2021). CWMD (Kitle İmha Silahlarına Karşı Mücadele) / CIWMD İşlemleri / Teknisyen Eğitmen Geliştirme Kursu Notları.
DTRA. (2014). El Yapımı Kitle İmha Silahları Katılımcı Kılavuzu, Part One ABD.
Rockets (bulletpicker.com). (Erişim Tarihi: 05.11.2021).
Anadolu Üniversitesi Yayını. (2018). KBRN Savunma ve Güvenlik. Eskişehir.
AFAD, KBRN Temel Bilgiler.

DYES REMOVAL USING A LOW COST ADSORBENT: INSIGHT INTO BEHAVIOR AND MECHANISM

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ABSTRACT

Water pollution with different contaminants, such as toxic heavy metals and dyes has negative effects on human health. Consequently, the treatment of waters contaminated especially with Congo Red dyes is necessary. Several physico-chemical technologies have been proposed in order to remove Congo Red dye from an aqueous solution. Chemical oxidation has been used for dye removal from wastewaters, but this method causes secondary pollution. The adsorption process is recommended to remove Congo Red dye due to the advantages: low cost, simplicity of design, ease of operation, and lower production of secondary harmful substances. Many studies have been performed to investigate the use of various low-cost adsorbents for the removal of Congo Red dyes from aqueous solutions, such as: activated carbon prepared from coffee waste, pine bark, Spherical Fe_3O_4 Nanoparticles Functionalized with 1,2,4,5-Benzenetetracarboxylic Acid, ashitaba waste and a walnut shell-based activated carbon, hydrothermal treated shiitake mushroom, Waste Wood Biomass. Fly ash can be used as an alternative adsorbent for the waters contaminated with Congo Red dye. The fly ash represents a low-cost material available in various countries at high amounts. Therefore, in the present work study the fly ash in raw form was involved as adsorbent to remove Congo Red from aqueous media under two operating parameters: initial concentration and contact time. Prior to adsorption study, the fly ash was characterized using scanning electron microscopy (SEM), Fourier transform infrared spectroscopy (FTIR), powder X-ray diffraction analysis (XRD), thermogravimetric analysis (TG), and the Brunauer-Emmett-Teller (BET) surface area techniques. According to the data obtained, the adsorption process is dependent on initial concentration and contact time. The adsorption capacity increases with initial Congo Red dye concentration and contact time. Two isotherms models was applied. The adsorption behaviors confirm to the Langmuir isotherm with a maximum adsorption capacity of 22.12 mg/g. Also, the data were analyzed by three kinetics models, such as: Pseudo first order model, Pseudo second order model, and Intraparticle diffusion model. Based on correlation coefficient, kinetics ftted the Pseudo second order model, suggesting a chemical adsorption. The selected material used in this study can be employed in water remediation as a promising dyes adsorbent.

Keywords: fly ash, dyes, adsorption, equilibrium study, kinetic study.

This work was supported by a publications grant of the TUIASI, project number GI/P14/2021.

FACIL SYNTHESIS OF TIO_2/AG PHOTOCATALYST FOR REMOVAL OF DYE (METHYLENE BLUE) FROM WASTEWATER

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ABSTRACT

The over 7.100 tones/years different types of dyes are produced, from which 10% are lost during the dyeing process. The dyes from wastewater cause considerable environmental pollution and serious health risk. The methods developed for the removal of dyes from wastewaters are: photocatalysis, solvent extraction, the adsorption, oxidation, etc. From these the photocatalytic degradation realize the water cleaning without other wastes. Titanium dioxide (TiO_2) is used in the photocatalytic processes for its stability, photocatalytic activity, low-toxicity, low cost, etc., on the other hand in presence of TiO_2 the dyes are frecventlly total mineralized. For enhanced the photocatalytic activity of TiO_2 several methods are used, for example: doping with nobel metals, surface modification, shape tailoring. Silver is recommended for its remarkable catalytic activity, and due to its antibacterial properties.

TiO_2 dopped with Ag nanoparticles is relatively easily to obtaining through the sol-gel method.

The objective of this study is to evaluate the performance of the photocatalytic process in the elimination of methylene blue (MB) from aqueous solutions, under UV irradiation. The kinetic constants were determined for all synthesized materials. The experimental data proved that in absence of UV irradiation only 2% of the initial dye concentration can be degraded. In the presence of TiO_2 dopped with Ag, over 95% of the dye was decolorized. The enhancement of the photocatalytic performance of the Ag-TiO_2 might be attributed to narrowing of the band gap. The effect of the dose of catalyst on the MB degradation was studied at four values, 0.01, 0.02, 0.025, 0.03, 0.035 and 0.04 g catalyst/L, at an initial 4 ppm dye solution. The time of irradiation was 60 min. The degradation grade increases with the catalysis dose, reaching an optimum at 0.035g/L. All the dye molecules are probably adsorbed on TiO_2 in these conditions and the addition of higher amounts of TiO_2 have no

extra- effect on the degradation process. The photocatalysis followed a pseudo-first order reaction kinetic behavior, with rate constants ranging from 0.0009 to 0.0013 min^{-1}. The pseudo-first order rate constant values were 0.02 and 0.1 min^{-1} under UV light irradiation.

Keywords: TiO_2/Ag, photocatalytic degradation, Methylene blue, kinetics

This work was supported by a publications grant of the TUIASI, project number GI/P14/2021.

POTASSIUM CARBONATE/ BICARBONATE AQUEOUS SOLUTIONS PROTED WITH ETHYLENEDIAMINE AS EFFICIENT CO_2 CAPTURE SOLVENT

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ABSTRACT

In the last period carbon dioxide capture, recognized as a greenhouse gas, has an important attention in context of the climate change. Quantities of carbon dioxide resulted by natural or atropologic sources increased in last period, for example only CO_2 from fuel combustion in year 2016 was 36,000 Mt and the amount will be double in the next 50 years. There are main categories of gas treating processes: absorption into a physical, chemical ionic liquids; adsorption; membranes separation; biological fixation; etc. The absorption remains recommended processes for removal of CO_2. Potassium carbonate is considered to be proper for absorption of CO_2, due its advantages such as: low cost, low toxicity, efficiency and easy regeneration process, no corrosion etc. One of the biggest weaknesses of the potassium carbonate solutions in the absorption of CO_2 is the slow rate of reaction. That is the reason why different promoters (activators) have been required. The promoters enhance the CO_2 rate absorption by acting as catalyst to speed up the absorption process.

In this work, the transport properties of aqueous blend solution of potassium carbonate/bicarbonate activated with ethylenediamine (EDA) in the range 1-7% have been studied, in order to find the optimum amine's concentration. A SP-870 plus METERTECH UV–Vis spectrophotometer was used to monitor the K_2CO_3-$KHCO_3$/EDA systems, and to plot the diagram of absorbance, optical path =1cm. The viscosity and the density have been measured for a blending 25 wt % K_2CO_3, 4 % $KHCO_3$, amine concentrations between 1 and 7 wt %, at atmospheric pressure and temperatures from 313 K to 348 K. The viscosity was determined with a capillary Ubbelohde tube. For each experiment the temperature was accurately controlled ± 0.1 K using the Viscosimeter Thermostat 655. The experimental data of viscosity were correlated as a function of temperature. The densities for each solution have been measured with an Anton Paar digital vibrating glass tube densimeter, DMA 4500 model. The experimental data have been correlated with temperature through a semi- empirical equation with three coefficients which depend on the concentration of the amine.

The results are useful for the prediction of carbon dioxide diffusion coefficients in such solutions and mass transfer coefficients.

Keywords: absorption; activator; amine; density, solvent, viscosity.

SYNTHESIS, CRYSTAL STRUCTURE AND HIRSHFELD SURFACE ANALYSIS OF A NEW DECAVANADATE

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ABSTRACT

A new $(C_7N_3H_{20})_2V_{10}O_{28}.4.21H_2O$ decavanadate hydrate was synthesized by slow evaporation of a solution at room temperature. The structure was investigated by single-crystal X-ray diffraction. In the crystal structure, the layers of decavanadate groups, organic cations and water molecules are arranged parallel to the (010) plane. Also, the prepared compound has been analysed by FTIR spectroscopy and scanning electron microscopy (SEM). The structure of the title compound is stabilized by hydrogen bonds and van der Waals interactions. The cohesion of the structure is ensured by O-H. . .O and N-H. . .O hydrogen bonds. The three-dimensional Hirshfeld surface (3D-HS) and the relative two-dimensional fingerprint plots (2D-FPs) of $(C_7N_3H_{20})_2V_{10}O_{28}$ $.4.21H_2O$ compound revealed that the structure is dominated by O. . .H/H. . .O (70.8%) and H. . .H (18.5%) contacts.

IN SILICO DRUG REPURPOSING OF FDA-APPROVED ARTEMISININS AS POTENT CHEMOTHERAPEUTICS TARGETING BCL-2, CDK-6 & VEGFR-2: DENSITY FUNCTIONAL EXPLORATION AND MOLECULAR DOCKING STUDY

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ABSTRACT

According to WHO's global cancer profile, ~9.5 million deaths have occurred worldwide due to cancer. Cancer, also known as malignant tumor, is a disease described by the unrestrained growth and spread of abnormal cells without any boundary in an organism. Currently available anticancer drugs show poor selectivity causing cytotoxicity for dividing cells leading to serious side effects. In addition, the acquired resistance of different cancer types is a major drawback. These factors necessitate the discovery of new more active, and more selective anticancer drugs. The process for a new drug development, preclinical research and approval is expensive and time-taking, can take up to a decade. This lengthy discovery process unlocks the doors for drug repurposing as an alternative approach for cutting down the time required to develop a drug The strategy of using existing drugs originally developed for one disease to treat other indications has found success across medical fields. This paper focuses on drug repurposing of artemisinin and its derivatives (artenimol, artemether, artemotil and artesunate) that kill malaria parasites for anticancer agents specifically targeting Bcl-2, CDK-6 and VEGFR-2. The Artemisinins **1-5** were analyzed for compliance with Lipinski's drug-likeness rule and optimum ADME parameters. The results of which revealed all calculated physicochemical descriptors and pharmacokinetic properties are within the expected thresholds. Toxicity in terms of predicted median lethal dose (LD_{50}) in mg/kg weight of investigated Artemisinins **1-5** is also reported. Artemisinins **1-5** were subjected to molecular docking and DFT analysis to discern their molecular interactions at the active site of Bcl-2, CDK-6 and VEGFR-2. The molecular docking study revealed that Artemisinins **1-5** were able to target CDK-6 and VEGFR-2. DFT/B3LYP theoretical calculations for optimization, DFT, frequency, and HOMO/LUMO were performed to obtain electronic and structural properties, chemical reactivity descriptors. Hence, these findings will be highly beneficial in optimizing the utility of in development of Artemisinins **1-5** for cancer therapeutics specifically targeting CDK-6 and VEGFR-2.

Keywords: Artemisinins; VEGFR-2; ADME; molecular docking; DFT

THERMOELECTRIC PROPERTIES OF THE PREDICTED NEW POLYTYPES OF GAN: A FIRST-PRINCIPLES STUDY

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ABSTRACT
Novel polytypes of III-V semiconductors for high-performance thermoelectric applications have been extensively explored in recent years. Accordingly, we report some new polytypes of Gallium nitride (GaN); an important candidate of the III-V semiconductor family. These GaN polytypes exhibited structures similar to that of Berrylium oxide, Nickel arsenide, Silicon carbide, and Titanium arsenide. Their thermoelectric properties have been comprehensively investigated in the present study through the first-principles approaches. Our investigations of the different polytypes of GaN cover the study of the electronic structures, Seebeck coefficients, electrical and thermal conductivities, the power factors (PFs), and the figure of merit (zT) values. The electronic structure calculations showed them semiconductors of wide and direct bandgaps. The effect of the p-type and n-type doping on the thermoelectric properties of these polymorphs has been studied and explained in detail. These polytypes of GaN exhibited substantial Seebeck coefficient values, PFs, and zT and may find several useful applications in thermoelectric devices.

Keywords: GaN, Polytypism, Thermoelectric Properties, Seebeck Coefficients, Power Factors, First-principles Calculations

TARİHİ YAPILARDAKİ DOĞAL AYDINLATMA UYGULAMALARI

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ÖZET
Küresel ısınma ve azalan doğal enerji kaynakları bağlamında, binalarda enerji tüketiminin azaltılmasına odaklanmak gerekmektedir. Enerji etkin tasarım çözümlemeleri günümüzde yenilebilir enerji kaynaklarının azalmasından dolayı ön plana çıkmaktadır. Doğal aydınlatma enerjiyi etkin kullanmanın en önemli yollarından biridir.Bir mekandaki görsel konforun sağlanmasında ışık önemli etkiye sahiptir. Günışığı aydınlatması, enerji performansını ve kullanıcıların görsel konforunu iyileştirmek için bir tür pasif stratejidir. İnsan sağlığına, performansına ve verimine katkı sağlamaktadır. Doğal aydınlatmanın uygun şekilde tasarlanması enerji etkin mimari tasarımlarda büyük öneme sahiptir. Binanın aydınlatmasında birincil olarak doğal aydınlatma faktörleri göz önünde bulundurularak tasarımlar yapılmalıdır. İyi bir aydınlatmanın en temel özelliği yeterli düzeyde aydınlık seviyesini sağlayacak şekilde olmasıdır. Kültürel miras yapıları, inşa edildikleri dönemlerde güneş ışığından maksimum düzeyde faydalanma amacıyla farklı tasarım ilkeleri doğrultusunda inşa edilmiştir. Pencere açıklıkları, pencere duvar oranları, çatı pencereleri geçmişten günümüze doğal aydınlatmada önemli rol oynayan tasarım unsurlarıdır. Bu çalışmada Niğde'de seçilmiş olan farklı fonsiyonlara sahip farklı dönemlerde yapılmış olan tarihi bina örnekleri doğal aydınlatma tasarım yaklaşımları açısından değerlendirilmiştir. Tarihi yapılarda, farklı boyutlarda pencere açıklıkları veya tepe pencereleri ile aydınlatma gerçekleştirilmiştir. Yapının bulunduğu konum, iklim koşulları, inşa edilirken kullanılan malzeme pencere açıklıklarının boyutlarında etken faktör olmuştur. Çalışmada elde edilen bulguların benzer dönemlerde yapılmış olan benzer bina türleri açısından fikir vereceği düşünülmektedir.

Anahtar kelimeler: Doğal aydınlatma, enerji etkin binalar, tarihi binalar

DAYLIGHTING APPLICATIONS IN HISTORICAL BUILDINGS

ABSTRACT
Based on global warming and decreasing natural energy resources, it is necessary to focus on reducing energy consumption in buildings. Nowadays, energy efficient design solutions come to the fore due to the decrease in renewable energy sources. Natural light is one of the most important ways to save energy. Light has an important effect on providing visual comfort in a space. Daylighting is a kind of passive strategy to improve energy performance and users'visual comfort. It can contribute to human health, performance and productivity. Appropriate design of daylighting is of great importance in energy efficient architectural designs. In the lighting of the building, designs should be made primarily by considering the daylighting factors. The most basic feature of good lighting is to provide a sufficient level of illumination. Cultural heritage structures were built in accordance with different design principles in order to benefit from sunlight at the maximum level during the period they were built. Window openings, window wall ratios, skylights are design elements that play an important role in natural lighting from past to present. In this study, samples of historical buildings with different functions and constructed in different periods in

Niğde were evaluated in terms of daylighting design approaches. In historical buildings, lighting was realized with window openings or skylights of different sizes. The location of the building, the climatic conditions, the material used in the construction were factors in the size of the window openings. It is thought that the findings obtained in the study will give an idea in terms of similar building types built in similar periods.

Keywords: Daylighting, energy efficient buildings, historical buildings

IDENTIFICATION AND MINIMIZATION OF WASTE IN A FORMICA PROCESSING INDUSTRY USING LEAN MANUFACTURING TOOLS

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ABSTRACT

In a market as competitive as today's, companies require little lead time, low expenses and high throughput. In order to achieve this, companies cannot afford losing their limited budget over waste. To reduce the waste lean manufacturing is a widely used concept. Studies show that most of the seven types of waste (over production, over processing, defective parts, inventory, motion, waiting, transportation) in industries can be effectively eliminated by using lean tools which directly increases productivity of the company. This research aims to mitigate the effect of waste in a local Formica manufacturing industry using lean manufacturing techniques. These sheets are combined with chipboards, Bakelite, and Medium-density fiberboard MDF for decorative domestic applications. Out of these three products being manufactured, namely Medium -density fiberboard (MDF) has been taken up for the detailed analysis. The Formica sheets are made with decor paper that undergoes the coating of two chemicals, namely, melamine and urea. These two are combined in the short cycle machine in which the sheets are pressed against MDF at certain temperature and pressure. Data is collected and documented in MS Excel in the time span of four months. Data includes production and wastes of two machines i.e. impregnation and short cycle machine. To check the normality of data some statistical tests like Shapiro-Wilk test, Wilcoxon Mann-Whitney test and T-tests were performed. Current state map is laid out to identify 7 wastes. Several non-value added activities are identified and eliminated using lean tools. Production data showed that impregnation machine on average produced waste of 5.4% and short cycle machine produced waste of 5.6% which was exceeding the company expectation of 3%. To identify the cause of this problem, value stream mapping was used. The proposed solutions and suggestions reduced the production waste of impregnation machine from 5.4% to 3.1% and 5.6% in short cycle machine to 3.4%. Waste in inventory is reduced from 1.6 ton to 0.63 ton per month which is 1% of the total inventory.

Keywords: Lean manufacturing, MDF, Shapiro-Wilk test, Wilkoxon Mann-Whiteny Test

BASMA KUVVETİ ALTINDAKİ FİLAMAN SARIM CAM FİBER TAKVİYELİ POLİMER (CTP) BORULARDA FARKLI TABAKA SAYISININ ETKİSİNİN İNCELENMESİ

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ÖZET

Kompozit malzemeler üstün özellikleri sayesinde her sektörde yerini almıştır. Teknolojik ilerlemeler ve artan ihtiyaçlar bu malzemelerden beklentileri de arttırmıştır. Çözüm arayışı içinde bulunan araştırmacılar da gelişime açık bir alan olan kompozit malzemeler üzerine yoğunlaşmışlardır. Birçok üretim yöntemi bulunan cam takviyeli polimer (CTP) kompozit borular, yüksek mukavemet, kimyasal madde dayanımı, istenilen boyutta ve seri üretilebilmesi, farklı tabaka sayılarında ve konfigürasyonlarda değişen mekanik özellikleri sebebiyle mühendislik çalışmalarında kullanımı rağbet görmektedir. Filaman (elyaf) sarım yöntemi ile üretilen CTP kompozitler, liflerin sürekli olarak sarılmasıyla elde edilen yüksek mukavemetli malzemelerdir. Ayrıca geleneksel olarak kullanılan beton, çelik gibi borulara kıyasla daha hafif ve korozyon direnci yüksektir.

Bu çalışmada filaman (elyaf) sarım yöntemi ile 2,4 ve 6 tabakalı olarak üretilen ±55° sarım açısına sahip CTP borular kullanılmıştır. Amaç, CTP borularının tabaka sayısının değişiminin eksenel yük kapasitesine etkisini araştırmaktır. Bu amaç doğrultusunda üretilen filaman (elyaf) sarım CTP borularına basma deneyi yapılmıştır. ASTM D 3410 standardına göre uygulanan basma deneyleri 4 mm/dak hızında gerçekleştirilmiştir. Deney sonucu elde edilen verilerine göre kuvvet-deplasman grafiği oluşturulmuştur. Deney sırasında hasar gelişimleri incelenen numunelerde 2 tabakalı numunelerin burkulma etkisi ile hasarların oluştuğu, 4 tabakalı numunelerde burkulma etkisinin azaldığı, 6 tabakalı numunelerde ise burkulmanın oluşmadığı görülmüştür. 4 ve 6 tabakalı numunelerde hasarların ±55° elyaf sarım açısı doğrultusunda meydana geldiği gözlenmiştir. Elde edilen verilere göre tabaka sayısındaki artışla beraber yük taşıma kapasitelerinin de arttığı görülmektedir.

Anahtar Kelimeler: Cam takviyeli polimer (CTP), eksenel basma kuvveti, filaman sarım yöntemi, kompozit malzeme

INVESTIGATION Of The EFFECT Of The DIFFERENT NUMBER LAYERS ON FILAMENT WINDING GLASS FIBER REINFORCED POLYMER (GFRP) PIPES UNDER COMPRESSION FORCE

ABSTRACT

Composite materials have taken their place in every sector thanks to their superior properties. Technological advances and increasing needs have increased expectations from these materials. Researchers in search of solutions have focused on composite materials, which is an area open to development. Glass fiber reinforced polymer (GFRP) composite pipes, which have many production methods, are in demand in engineering studies due to their high strength, chemical resistance, ability to be produced in desired size and mass, and mechanical properties that change in different layer numbers and configurations. FRP composites produced by filament (fiber) winding method are high-strength materials obtained by continuous winding of fibers. In addition, it is lighter and has higher corrosion resistance than conventionally used pipes such as concrete and steel. In this study, GFRP pipes with a winding angle of ±55°, produced as 2,4 and 6 layers by filament (fiber) winding method, were used.

The aim is to investigate the effect of the variation of the number of layers of GFRP pipes on the axial load capacity. For this purpose, the compression test was carried out on the filament (fiber) winding GFRP pipes. Compression tests applied according to ASTM D 3410 standard were carried out at a speed of 4 mm/min. The force-displacement graph was created according to the data obtained as a result of the experiment. In the samples whose damage development was examined during the experiment, it was observed that the damage was caused by the buckling effect of the 2-layer samples, the buckling effect was reduced in the 4-layer samples, and it had no effect in the 6-layer samples. According to the data obtained, it is seen that the load carrying capacities increase with the increase in the number of layers.

Keywords: Glass fiber reinforced polymer (GFRP), axial compression force, filament winding method, composite material

1. GİRİŞ

Günümüzde, teknolojinin gelişmesiyle birlikte insanların ihtiyaçlarını karşılayabilmesi için kullanılan malzemeler yetersiz kalmış ve bu da yeni malzeme arayışlarını beraberinde getirmiştir. Doğadaki malzemelerin sınırlı ve özelliklerinin belirli olması tek bir malzemeden istenilen sonuç elde edilemediği için farklı özellikteki malzemelerin bir araya getirilmesi ile kompozit malzemeler elde edilmiştir [1-4]. Kompozit malzeme; birbirine karışmayan iki veya daha fazla malzemenin bir araya gelerek kendisini oluşturan bileşenlerden daha üstün özelliklere sahip olan malzemelerdir [5]. Kompozit malzemelerin; hafiflik, esneklik, değişik formlarda üretilebilir, yüksek yorulma kabiliyeti, yüksek darbe dayanımı, yüksek korozyon dayanımına sahip olmaları, rutubete karşı dirençli, kolay taşınabilir, uzun süre muhafaza edilebilir, geri dönüşümü kolaylığı gibi özellikleri onları diğer malzemelere göre avantajlı duruma getirmektedir [6]. Kompozit malzemeler başta savunma sanayi olmak üzere havacılık, otomotiv, tarım, inşaat sektörü ve şehir planlama gibi alanlarda yaygın olarak kullanılmaktadır [7-10].

Cam Takviyeli Polimer (CTP) kompozit malzemeler, üstün mekanik özelliklerinden dolayı mühendislik çalışmalarında kullanımı yaygınlaşan bir malzeme haline gelmiştir. CTP kompozit malzemeler havacılık, inşaat ve taşımacılık endüstrilerinde, enerji santrallerinde, içme suyu, sulama sistemlerinde, atık su hatlarında, yağmur suyu drenajları, hidroelektrik santrallerde, endüstriyel soğutma hatları gibi pek çok alanda tercih edilmektedirler. CTP kompozit borular, geleneksel olarak kullanılan beton ve çelik borulara kıyasla daha hafif ve aynı zamanda yüksek mukavemet sağlaması, korozyon direncinden dolayı toprak

altında daha uzun süre kalabilmesi ve servis süresinin uzun olması tercih sebeplerindendir [11,12]. Ayrıca CTP kompozit boruların taşınması, montajı, bağlantı ve onarım prosedürleri diğer geleneksel borulara göre çok daha kolaydır.

CTP kompozit boruların mekanik özelliklerinin belirlenmesi amacı ile birçok çalışma yapılmaktadır. Bu çalışmaların önde gelenleri; boruların mukavemetinin tespiti için patlama basınç test çalışmaları [13,14], iç basınç altında yorulma davranışları [15], basınçsız ve iç basınç altında düşük hızlı darbe cevabı [16-21], işlenebilirlik özellikleri [22] ve hibritasyonun genel mekanik özelliklere olan etkisi [23,24] gibi konular ele alınmıştır. CTP kompozit boruların kullanım alanına göre çeşitli deneylerle tabaka etkisinin incelenmesi yapılmıştır. Ancak bunlar arasında eksenel basma kuvveti üzerine yapılan çalışmalar yok denecek kadar azdır [25,26]. Bundan dolayı, bu çalışmada CTP boruların eksenel basma davranışlarında tabaka sayısının etkisi incelenmiştir.

2. MATERYAL VE YÖNTEM

CTP kompozit boruların üretimi ve kürlenmesi işlemleri, İzmir İzoreel Komp. Malz. San. ve Tic. Ltd. Şti.'de yapılmıştır. Filaman sarım yöntemi ile üretilen CTP borularının yapımında, elyaf malzemesi olarak Cam Elyaf San. A.Ş. 1200 teks (17 μm çapında) E camı, matris malzemesi olarak da Momentive, Bisphonel A, Epikote 828 reçine kullanılmıştır. Sertleştirici madde olarak Epikure 875 (Curing agent, Modified Carboxylic Acid Anhyride) kullanılmıştır.

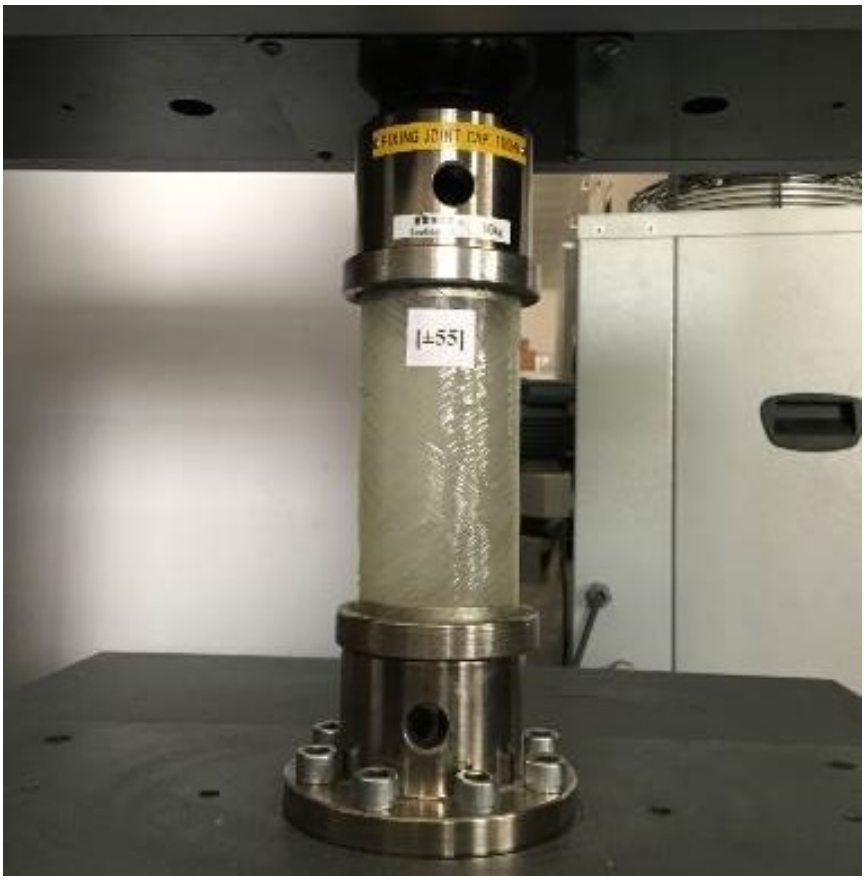
72 mm çapındaki malafalar üzerine yaş sarım yöntemi kullanılarak ±55° sarım açısıyla 2,4 ve 6 tabaka halinde cam elyaflar sarılmıştır. Filaman sarım işleminden sonra özel bir fırında 2 saat 135 °C ve 2 saat 150 °C'de reçine birikimini önlemek amacıyla sabit bir hızda dönen bir sistemle kürlenmeye bırakılmıştır. Kürlenme işleminin sonunda 1'er metrelik filaman sarım CTP borular kalıptan çıkarılarak üretimleri gerçekleştirilmiştir.

Üretimde kullanılan cam elyafların ve matrisin özellikleri Çizelge 1'de verilmektedir. Filaman sarım yöntemi ile üretilen CTP kompozit borular Şekil 1'de verilmiştir. Borulardan basma deneyi için 150 mm boyunda numuneler kesilmiştir ve deneye hazır hale getirilmiştir. Ø72 mm iç çapında 2,4 ve 6 tabakalı ±55° sarım açısına sahip CTP kompozit boru numunelerinin basma deneyleri 100 kN kapasiteli SHIMADZU deney cihazında yapılmıştır (Şekil 2). Deney ASTM D 3410 standardına uygun olarak gerçekleştirilmiş ve basma esnasında numuneler için özel olarak üretilmiş flanş başlıkları kullanılmıştır.

Çizelge 1. Kullanılan elyaf ve matrisin özellikleri

Malzemeler	E(GPa)	σ çek (MPa)	ρ (g/cm3)	ε kop (%)
Elyaf: E-camı	73	2400	2.6	1.5-2
Matris: Epoksi Reçine	3.4	50-60	1.2	4-6

Şekil 1. Üretilen 1'er metrelik CTP kompozit borular



Şekil 2. Basma deney cihazı

3. DENEY SONUÇLARI VE TARTIŞMA

Şekil 3'te, 4 mm/dak yükleme hızı ile gerçekleştirilen basma deneylerinde elde edilen veriler ile kuvvet-deplasman grafiği verilmiştir. Deney sırasında eksenel basma kuvvetinin numuneler üzerindeki hasar

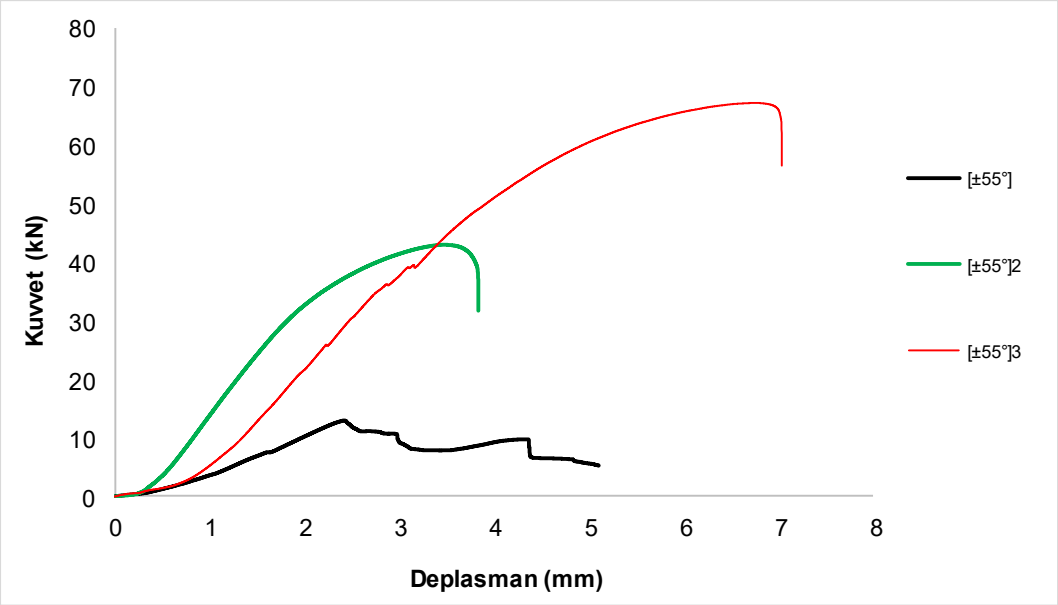
gelişimi incelenmiştir. Bu numunelerin basma deneyinden önceki ve sonraki fotoğrafları Şekil 4'te verilmiştir.

İki tabakalı CTP borularda eksenel basma kuvvetinin etkisiyle burkulmalardan kaynaklı hasarlar gözlenmiştir. Dört tabakalılarda burkulmanın etkisinin azaldığı, 6 tabakalı numunelerde ise tamamen ortadan kalktığı görülmüştür. Bu numunelerdeki hasarlar genel olarak elyaf sarım açısında yarılma şeklinde meydana gelmiştir.

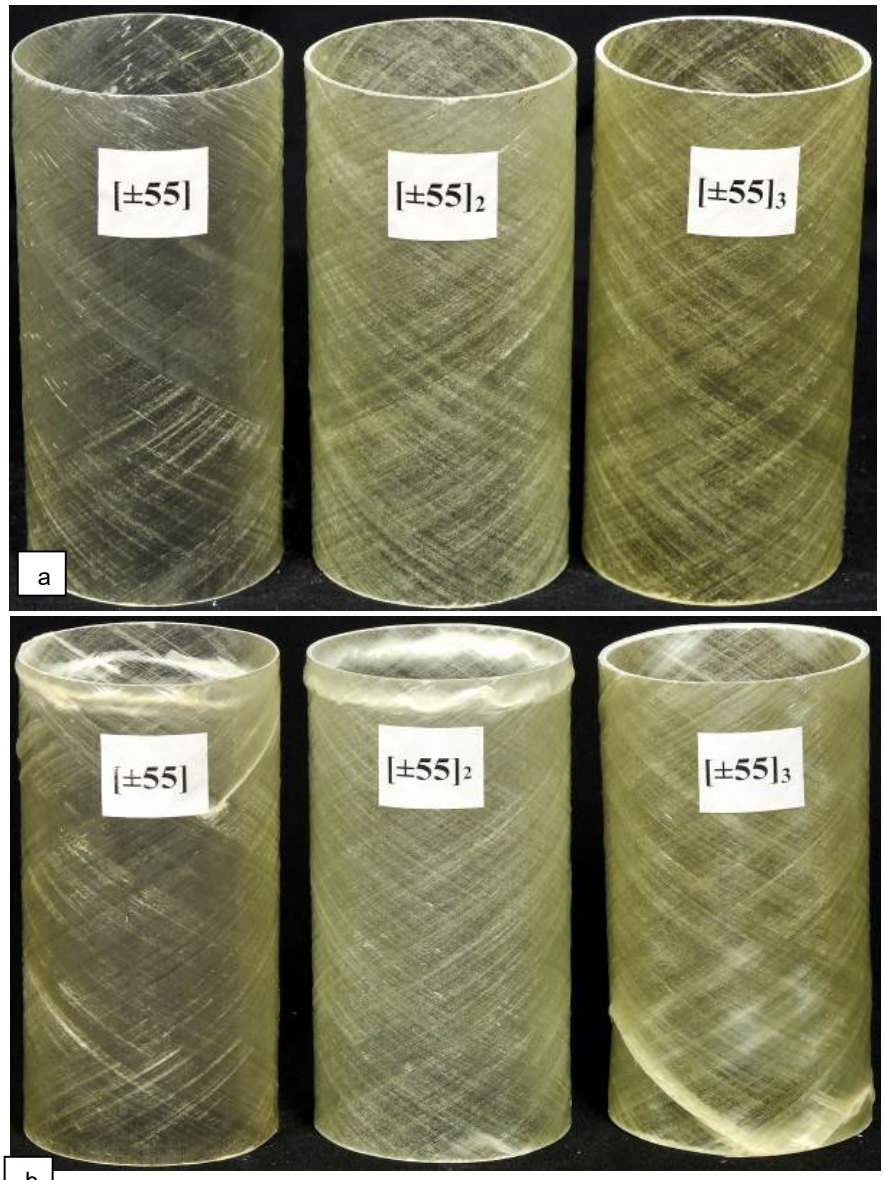
İki tabakalı numune yük almaya başladıktan sonra 7.566 kN yük 1.64 mm deplasman seviyesinde ilk burkulmadan kaynaklı matris çatlakları meydana gelmiştir. Yük almaya devam ettikçe burkulmaya da devam eden numunede 13.014 kN yük 2.42 mm deplasman seviyesinde burkulma hasarlarından başlık bölgesi yakınlarında beyazlaşmalar ve yarılmalar meydana gelmiştir.

Bu değerden sonra numunenin eksenel yük taşıma kapasitesinde artış gözlense bile 9.627 kN yük 4.36 mm deplasman seviyesinden sonra numunede ani bir düşüş gözlenmiştir. [±55°]2 sarım açısına sahip dört tabakalı numunede eksenel yükleme altında 43.017 kN yük 3.47 mm deplasman seviyesinde başlık kısmında burkulmadan meydana gelen hasar (elephant foot) ile sonuç hasarına ulaşmıştır.

Altı tabakalı numunede 39,537 kN yük 3,15 mm deplasman seviyesinde başlık bölgesinde başlayan ve numunenin genelinde beyazlaşma başlangıç hasarını oluştuğu görülmüştür. İlerleyen yük artışıyla beraber elyaf doğrultusunda yoğun beyazlaşma ve delaminasyon hasarlarının oluştuğu gözlenmiştir. Flanş bölgesinden başlamak üzere 67,251 kN yük 6,76 mm deplasman seviyesinde ±55° açı doğrultusunda kademeli olarak elyaf yarılma hasarı meydana gelmiştir. Deney sonrasında numune incelendiğinde numune genelinde lokal delaminasyon ve beyazlaşmalar görülmüştür [27].

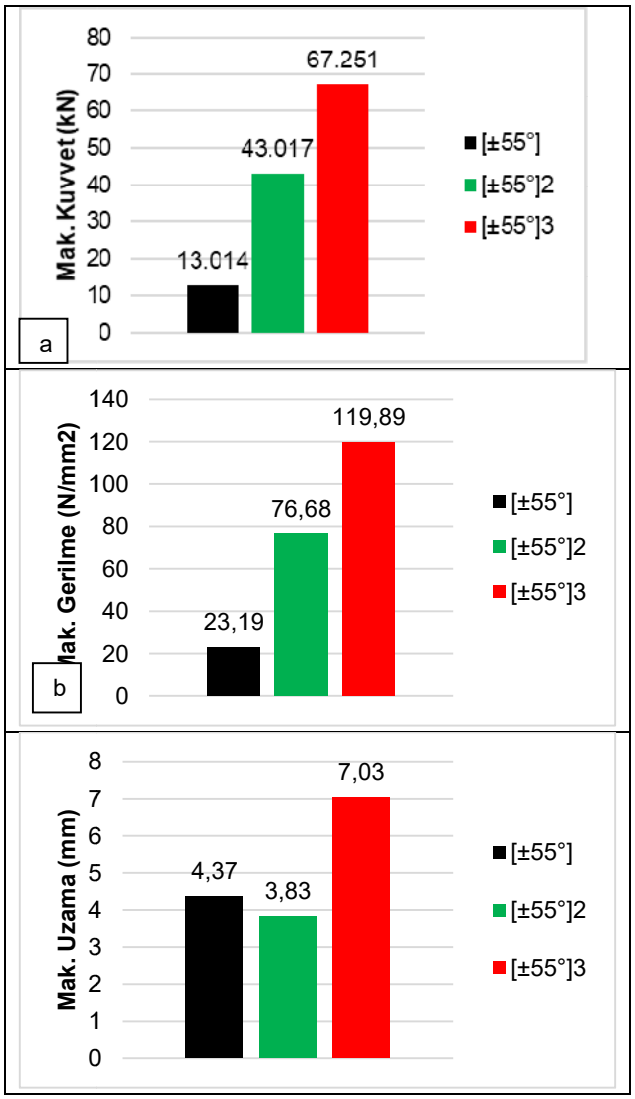


Şekil 3. 2, 4 ve 6 tabakalı ±55°numunelerinin kuvvet-deplasman grafiği



Şekil 4. CT boru numunelerinin a) basma deneyi öncesi ve b) basma deneyi sonrası görüntüleri

2 tabakalı numunenin maksimum kuvvet değerinin en küçük, 6 tabakalı numunenin maksimum kuvvet değerinin en büyük değere ulaştığı görülmektedir. 2, 4 ve 6 tabakalı ±55° elyaf açısına sahip numunelerin basma deneyi sonucu ulaştıkları maksimum kuvvet değerleri sırasıyla 13.014 kN, 43.017 kN ve 67.251 kN'dur (Şekil 5a). Elde edilen deney sonuç verilerine göre tabaka sayısındaki artış maksimum kuvvet değerini arttırmaktadır. Yani tabaka sayısı arttıkça numunenin yük taşıma kapasitesi artmaktadır. Basma deneyi sonucunda elde edilen maksimum kuvvet ve bu kuvvete karşılık gelen gerilme ve uzama değerleri Şekil 5'te verilmiştir.



Şekil 5. CTP boru numunelerinin a) mak. kuvvet değerleri, b) max. gerilme değerleri, c) uzama miktarları

4. SONUÇLAR

Deneysel çalışma neticesinde CTP kompozit borularda tabaka sayısının basma mukavemetini ve hasar gelişimini önemli derecede etkilediği anlaşılmıştır.

- 2,4 ve 6 tabakalı ±55° sarım açısına sahip CTP kompozit borularda tabaka sayısındaki artışın tepki kuvvetlerinde artış meydana getirdiği gözlenmiştir.
- Tabaka sayısının artışıyla birlikte burkulmanın etkisinin azaldığı tespit edilmiştir.
- Tabaka sayısındaki değişimin CTP kompozit boruların eksenel yük altındaki hasar mekanizmalarını da etkilediği gözlenmiştir. 2 tabakalı numunelerde burkulmanın etkisiyle hasar meydana gelirken 4 ve 6 tabakalı CTP borularda burkulma etkisi azalmış ve hasarın elyaf sarım açısı doğrultusuna doğru oluştuğu gözlenmiştir.

TEŞEKKÜR

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KAYNAKLAR

[1] Madenci, E., Kompozit kirişlerin karışık sonlu elemanlar yöntemi ile statik ve dinamik analizi, Yüksek Lisans Tezi, Selçuk Üniversitesi Fen Bilimleri Enstitüsü, Konya,2011.
[2] Madenci, E., Yüksek mertebe kayma deformasyon teorisine dayalı çapraz tabakalı kompozit plakların karışık sonlu eleman yöntemi ile analizi, Doktora Tezi, Selçuk Üniversitesi Fen Bilimleri Enstitüsü, Konya, 2016.
[3] Özütok, A., & Madenci, E., Static analysis of laminated composite beams based on higher-order shear deformation theory by using mixed-type finite element method. International Journal of Mechanical Sciences, 130, 234-243, 2017.
[4] Madenci, E., & Ozutok, A., Variational approximate for high order bending analysis of laminated composite plates. Structural Engineering and Mechanics, 73(1), 97-108, 2020.
[5] Aricasoy, O., Kompozit Sektörü Raporu, İstanbul Ticaret Odası, İstanbul, 2006.
[6] Arslan, N. ve Kaman, M. O., Alüminyum, Kağıt Ve Cam Elyaf Petek Yapılı Kompozitlerin Üretim Teknikleri Ve Mekanik Özelliklerinin Araştırılması, 2002.
[7] Akın, Y., Cam elyaf takviyeli kompozit boruların mekanik özelliklerine hidrotermal yaşlandırmanın etkisi, Yüksek Lisans Tezi, Necmettin Erbakan Üniversitesi Fen Bilimleri Enstitüsü, Konya, 77,2018.
[8] Madenci, E., Özkılıç, Y. O., & Gemi, L., Experimental and theoretical investigation on flexure performance of pultruded GFRP composite beams with damage analyses. Composite Structures, 242, 112162,2020.
[9] Madenci, E., Özkılıç, Y. O., & Gemi, L., Buckling and free vibration analyses of pultruded GFRP laminated composites: Experimental, numerical and analytical investigations. Composite Structures, 254, 112806, 2020.
[10] Madenci, E., Özkılıç, Y. O., & Gemi, L., G., Theoretical investigation on static analysis of pultruded GFRP composite beams. Akademik Platform Mühendislik ve Fen Bilimleri Dergisi, 8(3), 483-490, 2020.
[11] Kara, M., Düşük Hızlı Darbeye Maruz Tabakalı Kompozitlerin Dinamik Cevabı, Yüksek Lisan Tezi, Selçuk Üniversitesi Fen Bilimleri Enstitütüsü, Konya, 85s, 2006.
[12] American Water Works Association., Fiberglass pipe design (Vol. 45). Amer Water Works Assn,2005.
[13] Gemi, L., Tarakçioğlu, N., Akdemir, A., & Şahin, Ö. S., Progressive fatigue failure behavior of glass/epoxy (±75) 2 filament-wound pipes under pure internal pressure. Materials & Design, 30(10), 4293-4298, 2009.
[14] Gemi, L., Kara, M., & Avci, A., Low velocity impact response of prestressed functionally graded hybrid pipes. Composites Part B: Engineering, 106, 154-163, 2016.
[15] Tarakçioğlu, N., Gemi, L., & Yapici, A., Fatigue failure behavior of glass/epoxy±55 filament wound pipes under internal pressure. Composites science and technology, 65(3-4), 703-708, 2005.
[16] Gemi, L., Investigation of the effect of stacking sequence on low velocity impact response and damage formation in hybrid composite pipes under internal pressure. A comparative study. Composites Part B: Engineering, 153, 217-232, 2018.
[17] Gemi, L., Kayrıcı, M., Uludağ, M., Gemi, D. S., & Şahin, Ö. S., Experimental and statistical analysis of low velocity impact response of filament wound composite pipes. Composites Part B: Engineering, 149, 38-48,2018.
[18] Maziz, A., Tarfaoui, M., Rechak, S., Nachtane, M., & Gemi, L. (2021). Finite Element Analysis of Impact-Induced Damage in Pressurized Hybrid Composites Pipes. International Journal of Applied Mechanics. In-press, 2021,

[19] Gemi, DS., Şahin, ÖS., & Gemi, L. (2021). Experimental investigation of the effect of diameter upon low velocity impact response of glass fiber reinforced composite pipes. Composite Structures, 275, 114428, 2021.
[20] Maziz, A., Tarfaoui, M., Gemi, L., Rechak, S., & Nachtane, M. A progressive damage model for pressurized filament-wound hybrid composite pipe under low-velocity impact. Composite Structures, 276, 114520, 2021.
[21] Gemi, L., Morkavuk, S., Köklü, U., & Gemi, D. S., An experimental study on the effects of various drill types on drilling performance of GFRP composite pipes and damage formation. Composites Part B: Engineering, 172, 186-194, 2019.
[22] Azeem, M., Ya, HH., Kumar, M., Stabla, P., Smolnicki, M. Application of Filament Winding Technology in Composite Pressure Vessels and Challenges: A Review. In-Press, 2021.
[23] Gemi, L., Morkavuk, S., Köklü, U., & Yazman, Ş., The effects of stacking sequence on drilling machinability of filament wound hybrid composite pipes: Part-2 damage analysis and surface quality. Composite Structures, 235, 111737,2020.
[24] Gemi, L., Köklü, U., Yazman, Ş., & Morkavuk, S., The effects of stacking sequence on drilling machinability of filament wound hybrid composite pipes: Part-1 mechanical characterization and drilling tests. Composites Part B: Engineering, 186, 107787,2020.
[25] Gemi, DS. Filaman sarım CTP borularda darbe sonrası basma (CAI) davranışının incelenmesi. Konya Teknik Üniversitesi, Lisansüstü Eğitim Enstitüsü, Konya, 2019.
[26] Akın, Y., Cam elyaf takviyeli kompozit boruların mekanik özelliklerine hidrotermal yaşlandırmanın etkisi, Yüksek Lisans Tezi, Necmettin Erbakan Üniversitesi Fen Bilimleri Enstitüsü, Konya, 77,2018.
[27] Güven, Z,K., Gemi, L., Madenci, E., & Özkılıç, Y.O.
Basma kuvveti altındaki filaman sarım cam takviyeli polimer (CTP) borularda farklı sarım açılarının etkisinin incelenmesi. 2. International Science and Innovation Congress, Ankara, Turkey, s. 393-402, 2021.

STRUCTURAL ANALYSIS OF PARTICLE FRACTIONS RELEASED DURING FRICTION PHENOMENA

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ABSTRACT
Nano and micro plastics (NP/MPs) represent one of the most challenging classes of micro-pollutants, with occurrence across all ecosystems and size distributions ranging from the nanometre to the millimetre scale. Natural environments are receiving MPs in the form of anthropogenic direct release as well as disintegrated and loose products of lager plastics via biological activities, mechanical abrasion, and UV radiation. During the processing steps, the textile yarns are subjected to friction either by different driving organs or between themselves at the binding points. The magnitude of the friction forces is influenced by the nature of the yarns, the structure of the yarn, the type and the raw material from which the driving organs of the machines are made. There are still significant gaps in the quantitative analysis of MPs and the mechanisms associated with the toxic effects of inhaled MPs. The paper analyzes the distribution of polyester microparticle fractions that rise during the friction phenomena of textile materials during finishing or wearing.The friction phenomena are simulated at laboratory level and the polyester particles are collected and analyzed morphologically (SEM) and chemically (EDAX). The mathematical statistical analysis (average value, variance, coeficeient of variation, kurtosis, confidence level, skewness etc.) of the particle highlights fractional structure depending on the size (nanoparticles, microparticles, agglomerations and microfibrils) and shape of the particles (rectangular, spherıcal etc.). The correlation between the structure of yarns and textile materials with the level of statistical indicators but also the content of the most dangerous particles for helth, respectively under 0.1 μm, has been identified.

Keywords: particle, polyester, friction, statistics.

METAMORFİK ÇEKİRDEK KOMPLEKSLERDE DÜŞÜK-AÇILI NORMAL FAY BOYUNCA GELİŞEN MAGMATİK KAYAÇLARA BİR ÖRNEK, GÜNEYDOĞU TÜRKİYE: JEOLOJİK, TEKTONİK VE MİNERALOJİK ÇIKARIMLAR

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ÖZET

Güneydoğu Anadolu Orojenik Kuşağında yer alan inceleme alanı, Malatya-Yeşilyurt ile Adıyaman-Çelikhan bölgesini kapsar. Çalışma alanı ve yakın çevresinde ilk kez belirlenen magmatik kayalar, altın mineralizasyonlarıyla jenetik bir ilişkiye sahiptir. Bu kayalar, çoğunlukla sil ve dayk halinde olup, metamorfik çekirdek kompleks içerisindedir. Magmatik kayalar, Geç Triyas-Geç Kretase yaşlı Kayaköy ile Karaböğürtlen formasyonlarının arasında, KB-GD doğrultulu KD'ya eğimli düşük-açılı normal fay boyuncadır. Afanitikten porfiriye kadar değişen dokulara sahip yarı-derinlik (trakilatit/traki-andezit) ve derinlik (monzodiyorit, diyorit) kayaçlarıdır. Traki-latit/traki-andezitler feldispat, hornblend ve biyotitten oluşur. Feldispat fenokristalleri karbonatlaşma, serisitleşme ve opasitleşme gibi alterasyonlar ile biyotit ve hornblend varlığıyla kataklasit ve breşlerden ayırt edilir. Plajiyoklazlar küçük mikrolitler halinde olup, serisitleşme ve karbonatlaşma yaygındır. Hornblend mineralleri genellikle yarı-özşekilli veya özşekillidirler. Özşekilli kristallerde çift yönde dilinim belirgindir. Biyotit mineralleri genellikle opaklaşmış ince çubuksu kristaller halinde olup, yarı-özşekillidirler. Trakitlerde çoğunlukla mikrolitik doku gözlenirken, bazı örneklerde mikroporfirik doku izlenir. Diğer magmatik kaya topluğu diyorit ve monzodiyoritlerdir ve dayklar şeklinde metamorfik çekirdek kompleks içerisindedir. Feldispat, plajiyoklaz, amfibol, biyotit ve opak mineraller içerirler ve arenalaşma yaygındır. Bu kayalar düşük açılı normal fay düzlemini de keser konumludur ve traki-latit/traki-andezitlerden daha genç olduğu, altın cevherleşmesiyle ilişkili olmadığı düşünülmektedir.

Düşük-açılı normal fay, Paleojen-Neojen (?) döneminde genişlemeli bir tektonik ortamın etkin olarak rol oynamasıyla gelişmiş olmalıdır. Bu dönemde küçük-hacimli felsik magmalar sığ kabuk seviyelerine düşük-açılı normal fay boyunca yerleşmiştir. Buna benzer sin-tektonik magmatik kayalar dünyada farklı alanlarda da tanımlanmıştır.

Anahtar Kelimeler: Magmatik kayalar, düşük-açılı normal fay, altın mineralizasyonu

AN EXAMPLE OF MAGMATIC ROCKS THAT DEVELOPED ALONG THE LOW-ANGLE NORMAL FAULT IN METAMORPHIC CORE COMPLEXES, SOUTHEAST TURKEY: GEOLOGICAL, TECTONIC AND MINERALOGICAL IMPLICATIONS

ABSTRACT

The study area which is located in the Southeast Anatolian Orogenic Belt takes part in Malatya-Yeşilyurt and Adıyaman Çelikhan region. The magmatic rocks which are identified for the first time in the study area and its enviroment, have a relationship with gold mineralizations. These rocks are usually as sill and dykes in metamorphic core complex. Magmatic rocks are between the Late Triassic- Late Cretaceous Kayaköy and Karaböğürtlen formations, along the NW-SE striking and NE dipping low-angle normal fault. These are subplutonic (trachylatite/trachyandesite) and plutonic rocks(monzodiorite/diorite) which have textures changing aphanitic to porphyritic. Trachylatite/ trachyandesites are composed of feldspar, hornblende and biotite. Feldspar phenocrystals vary from cataclasite and breccia by the alterations like carbonation, sericitization, and opacitization with the presence of biotite and hornblende. Plagioclases are as little microlites and sericitization and carbonation are common. Hornblende minerals are generally euhedral or subhedral. Euhedral crystals have good cleavage in two directions. Biotite minerals are generally as opacificated thin rod-shaped subhedral crystals. Generally microlitic and sometimes porphyric texture is monitored in trachytes. Other magmatic rock assemblage is diorite and monzonites. These rocks are in metamorphic core complex as dykes. They are composed of feldspar, plagioclase, amphibole, biotite, and opaque minerals and arenization is common. These rocks cut the low-angle normal fault plane and it is thought that they are younger than trachylatite/trachyandesites and have no relation with gold mineralization.

The low-angle normal fault must be developed by effectively acting of extensional tectonic setting in Paleogene-Neogene (?) term. In this term, small volume felsic magmas settled in shallow crust levels along the low-angle normal fault. Syn-tectonic magmatic rocks like this are defined also in different areas in the world.

Keywords: Magmatic rocks, low-angle normal fault, gold mineralization

GLACIAL GEOMORPHOSITES - INVENTORY. STUDY CASE: CAPRA BASIN (FĂGĂRAȘ MTS.), ROMANIA

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ABSTRACT
The aim of this paper is to inventory and characterize the most important geomorphosites in the Capra Basin (Făgăraș Mountains), Romania. The Făgăraș have the highest peak (Moldoveanu, 2544m) in the Romanian Carpathian Mountains and present the most representative and complex forms of glacial relief (cirques, valleys, thresholds, plateaus, karlings and another). Geomorphosites are landforms that gaine value due to human perception (scientific, aesthetic, cultural, economic values). The inventory and characterization of geomorphosites was carried out in accordance with the inventory sheet used in the international literature (J.P. Pralong, 2005).

The most important geomorphosites identified in this area are:

- The Capra cirque, towered to the southwest by the Iezerul Caprei, to the north by the Văiuga peak and to the northeast by the Vânătoarea lui Buteanu peak, which shelters the Capra and Caprita tarns;
- The Fundul Caprei cirque lying at the headwaters of the Capra valley. To the southeast, they are towered by the Arpașu Mic peak, while to the north are closed by the main ridge of the Făgăraș Mts, more exactly the section developing between the Arpașel karling and the Dragon window.
- The Călțun - Căprioara cirque is bounded to the east by the Portița Negoiului saddle, to the south by the Lespezi ridge and the Lespezi peak, and to the north by the Laițel ridge, which separates it from the Laița glacial trough. The cirque is oriented on a west – east direction and is formed in micaschists, amphibolites and gneisses, the strata of which dip to the north and northeast, conferring it a subsequent character. The Calțun cirque is covered by scree which preserve interstitial ice all year.
- The Paltinu cirque lies on the headwater area, below the Paltinu peak. At present, both the Paltinul cirque and the valley are affected by intense mechanical weathering, gelifraction and erosion (along the avalanche corridors), processes intensified by the anthropogenic activities carried out in the area (the traffic along the Transfăgărașan road, overgrazing).
- the small corries of Paltinu and Călțun, towered to the west by the Lespezi, Lăița and Lăițel peaks and to the north by the Paltinu peak, which rises above the main ridge that separates the corries from the Balea cirque.
- The Fundul Caprei glacial valley develops on the headwaters of the Capra, being closed to the north by the Arpășel ridge, which is strongly affected by gelifraction.
- The Călțun valley preserves its U-shape, as low as 1300 m altitude, where the consequent trough ends abruptly above the Capra valley.
- The hanging cirques - on the left side of the Capra valley, at 1900 and 2200 m, there are nine hanging cirques of Pyrenean type placed one above the other, which are generally formed into the limestones bar of the Buda - Râiosu – Mușeteica ridge. These cirques are lying at the headwaters of the torrential basins that drain the left slope of the Capra valley

Some of the information was presented in article: Nedelea Alexandru, Comănescu Laura, (2012), *Types of glacial landforms on Capra Valley, (The Făgăraș Mountains-Romania)*, Pelagia Research Library, Advances in Applied Science Research, 3 (6): 3970-3980

Keywords: geomorphosites, inventory, glacial, Capra, Făgăraș, Romania

CONTRIBUTION OF ECOLOGICAL MODELING IN DEVELOPMENT OF SCIENTIFIC RESEARCH OF COUNTRIES: A CASE STUDY OF DROUGHT EARLY WARNING SYSTEM IN MOROCCAN RANGELANDS

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ABSTRACT
world is changing fastly, the ecosystems and biodiversity are the most affected by this change. Maintaining biodiversity of natural ecosystems is one of the most important problems and tasks for people in the 21st century. As well as researchers and scientists we need to understand the nature of the change and to make predictions about the way in which it might affect systems of interest; often we may also wish to understand what might be done to mitigate the predicted effects. In ecology, we usually make such predictions (or forecasts) by making use of mathematical models that describe the system and projecting them into the future, under changed conditions. New approaches of ecological modelling by using remote sensed software and new generation of statistical programme.

Keywords: Ecological modelling, Remote Sensing, Statistic & Scientific Research.

CONTINGENT VALUATION ON PROPOSED IMPROVEMENTS IN ENSURING SUSTAINABLEWATER, HYGIENE, AND SANITATION IN SDSSU BISLIG CAMPUS ON THIS NEW NORMAL BROUGHT BY COVID 19 PANDEMIC PROJECT

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ABSTRACT

Valuation of nonmarket features of a project is vital in the economic analysis for its implementation. This study aimed to determine Surigao del Sur State University – Bislig Campusstakeholders' willingness to pay on the nine proposed solutions to resolve water supply issues in the campus. This employed Contingent Valuation Method (CVM) survey administered both conventional and online to 228 respondents bootstrapped to 10,000 using Probit and Linear Regressions. Findings revealed that their willingness to pay was attributed to the importance of fire-fighting capability and clean water. Also, the amount they are willing to pay Php 17.1316 which was further influenced by age and the new environmental paradigm (NEP) belief with the proposedsolutions of building a reservoir at the 3rd-floor level to supply water at the 3rd floor, and providing a high capacity reservoir utilizing the combined BCWD supply and rainwater to have positive effects on the price.

REVERSE TRANSKİPTAZ-POLİMERAZ ZİNCİRİ REAKSİYONU VE REKOMBİNAZ POLİMERAZ AMPLİFİKASYONUNUN TESPİT LİMİTLERİ ÜZERİNE KARŞILAŞTIRMALI BİR ÇALIŞMA

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ÖZET
Revers transkripsiyon-polimeraz zincir reaksiyonu (RT-PCR), viral RNA tespiti ve kantitasyonu için ticari olarak kitleri piyasada mevcut kullanılan günümüzdeki en hassas yöntem olarak bilinmektedir. Rekombinaz polimeraz amplifikasyonu (RPA), polimeraz zincir reaksiyonuna (PCR) iyi bir alternatif olarak son yıllarda geliştirilen tek tüplü izotermal amplifikasyon yöntemidir. Ancak RPA yalnızca DNA tespiti için geliştirilmiştir. Bu çalışmada, viral RNA tespiti için RPA reaksiyonuna düşük sıcaklıkta çalışabilen reverz transkriptaz enzimi eklenerek RT-PCR ve RPA arasındaki tespit limitlerinin karşılaştırması amaçlanmıştır. Bu amaçla, tek iplikçikli RNA içeren bir virüs için hem RPA hem de RT-PCR testinde kullanılmak üzere 2'şer set primer ve prob tasarlanmıştır. RT-PCR ve RPA reaksiyonlarıyla gerçek zamanlı tespit cihazında yapılacak olan viral RNA'nın kantifikasyonu için standartlar pGEM-T easy vektör klonlama sistemi kullanılarak hazırlanmıştır. RT-PCR ve RPA kantifikasyon reaksiyonları, Biorad CFX Connect Real-Time PCR Detection System cihazında standartlar ve viral RNA kullanılarak gerçekleştirilmiştir. Kantifikasyon reaksiyonları sonucunda, her iki testin de tespit limitleri 100 viral kopya/µl olarak belirlenmiştir. Bu sonuçlar, bir RPA reaksiyonuna bir reverz transkriptaz enzimi eklenerek, tek aşamalı bir RT-RPA reaksiyonunda RT-PZR testi kadar viral RNA'yı da tespit edebileceğini ortaya koymuştur. Bununla birlikte RPA'nın ortalama 5 dakika sonra sonuç vermesi önemli bir avantajdır. Bu sonuçlar, RPA'yı RNA içeren virüslerin hızlı ve hassas tespitinde kullanılması için mükemmel bir aday yapmaktadır.

Anahtar Kelimeler: Tespit limiti, RT-PZR, RPA

A COMPARATIVE STUDY ON DETECTION LIMITS OF REVERSE TRANSCRIPTION-POLYMERASE CHAIN REACTION AND RECOMBINASE POLYMERASE AMPLIFICATION

ABSTRACT
Reverse transcription-polymerase chain reaction (RT-PCR) is known as the most sensitive technique for viral RNA detection and quantitation currently commercially available. Recombinase polymerase amplification (RPA) is a single tube, isothermal amplification method, which is a good alternative to the polymerase chain reaction (PCR). But RPA is only developed for DNA detection. This study aimed to compare the detection limits between RT-PCR and RPA, adding the low-temperature reverse transcriptase enzyme to RPA reaction for viral RNA detection. For this purpose, 2 set primers and probes for RPA and RT-PCR assays have been designed for a virus containing single-stranded RNA. The standards for the quantification of viral RNA to be performed on the real-time detection device by RT-PCR and RPA reactions were prepared using the pGEM-T easy vector cloning system. RT-PCR and RPA quantification reactions have been carried out using standards and viral RNA in the Biorad CFX Connect Real-Time PCR Detection System device. As a result of the quantification reactions, detection limits were determined that both assays could detect 100 viral copy/µl. These results revealed that by adding a reverse transcriptase enzyme to an RPA reaction, RPA could detect viral RNA as well as RT-PCR assay RT-RPA in a one-step reaction. However, it is a significant advantage that RPA gives results after an average of 5 minutes. These results make RPA an excellent candidate for use in the rapid and sensitive detection of RNA-containing viruses.

Keywords: Detection limit, RT-PCR, RPA

HAYVANCILIK İŞLETMELERİNDE VERİMİ ARTIRMAK İÇİN YALIN ALTI SİGMA METODOLOJİSİ İLE SÜRÜ YÖNETİMİ

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Özet
Besi ve süt sığırcılığı yapılan işletmelerde verim kayıplarına neden olan birçok faktör bulunmaktadır. Bu kayıpları en alt düzeye indirgemek, iyi bir sürü yönetimi ile mümkündür. Ancak ülkemizde ki işletmelerin çoğu küçük ve orta ölçekli geleneksel aile işletmeleri yapısında olup, modern ve teknolojik alt yapıya sahip olmadığı bilinmektedir. Bununla birlikte çiftçilerimizin eğitim düzeyinin düşük olması, bilinçsiz yapılan uygulamalar ile hayvancılık işletmelerinde kayıt tutulmaması verim kayıplarını artırmaktadır. Söz konusu verim kayıpları, uzman denetiminde uygulanacak yalın Altı Sigma metodolojisi ile giderilebile bilmektedir. Yalın Altı Sigma metodolojisi bir kısım istatistik araçları da kullanarak işletmelerde verim kaybına neden olan problemler üzerinde yoğunlaşmaktadır. Dünyada birçok işletme verimliliği ve kaliteyi sürekli artırmak için yalın Altı Sigma metodolojisini işletmelerine tatbik etmektedir. Verim kayıplarının çok yaşandığı ve her an birçok problemlerle karşı karşıya kalan hayvancılık işletmelerinde de bu metodolojiden faydalanılması verim kayıplarının önüne geçerek verim artışına katkı sağlayacaktır. Bu amaçla çalışma Erzincan Refahiye'de bulunan Zeybekler hayvancılık işletmesinin talebi üzerine, verim kaybına neden olabilecek faktörler Altı Sigma prosesi ile değerlendirilmiştir. Değerlendirmenin sonucunda verim kaybının ana nedeninin rasyon olduğu tahmin edilerek, rasyon içeriğinde yeniden yapılan düzenleme ile oldukça anlamlı ($p<0,01$) bir verim artışı sağlanmıştır. Besiye alınan Holstein sığırlarının günlük canlı ağırlık artışı 0,79 kg'dan 1,250 kg'a çıkarılmıştır. Elde edilen bulgular yalın Altı Sigma ile İSO 9001 kalite standartları karşılaştırılarak değerlendirilmiş ve Yalın Altı Sigma metodolojisinin uzman gözetiminde uygulanmasının hayvancılık işletmelerine önemli katkılar sağlayacağı ortaya konulmuştur.

Keywords: Yalın Altı Sigma, İso 9001, Rasyon, Holstein, Hayvansal üretim

HERD MANAGEMENT WITH LEAN SIX SIGMA METHODOLOGY TO INCREASE EFFICIENCY IN LIVESTOCK ENTERPRISES

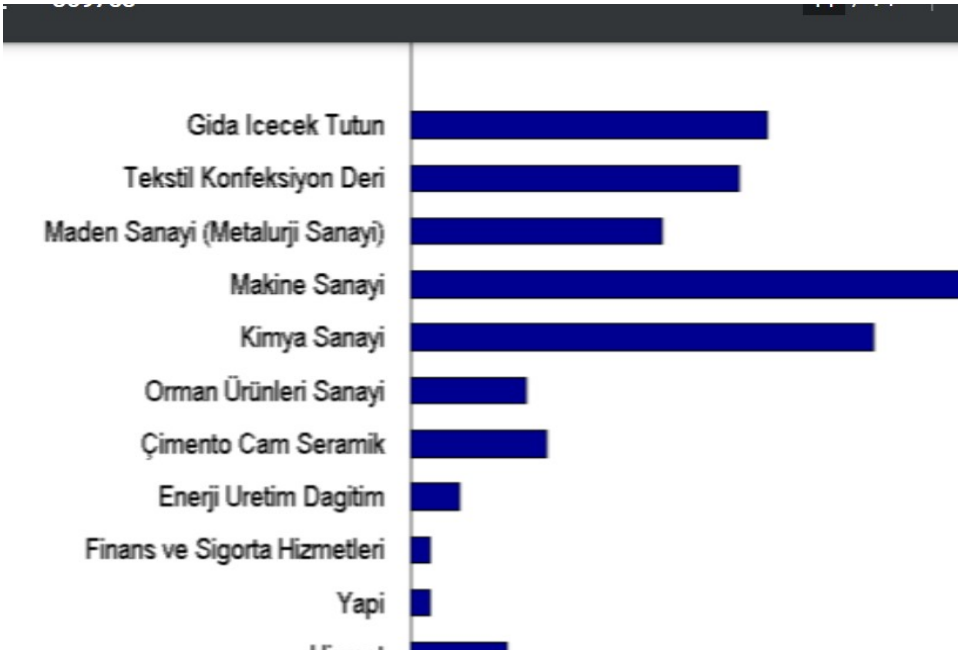
Abstract
There are many factors that cause yield losses in cattle and dairy farms. Minimizing these losses is possible with good herd management. However, most of the businesses are small and medium-sized traditional family businesses and they do not have a modern and technological infrastructure. In addition, farmers' low education level, application errors, and lack of records increase yield losses. These efficiency losses can be eliminated with the Lean Six Sigma methodology to be applied under the supervision of experts. Lean Six Sigma methodology focuses on problems that cause loss of efficiency in businesses by using some statistical tools. Many businesses in the world apply Lean Six Sigma methodology to increase efficiency and quality. The use of this methodology by livestock enterprises, which are constantly faced with problems, can prevent yield losses. For this purpose, in this study, the demand of Zeybekler livestock farm in Erzincan Refahiye and the factors that may cause yield loss were evaluated with the Six Sigma process. As a result of the evaluation, it was estimated that the main cause of yield loss was the ration, and a very significant ($p<0.01$) yield increase was achieved with the

rearrangement of the ration content. Daily live weight gain of fattening Holstein cattle was increased from 0,79 kg to 1,250 kg. The findings obtained were evaluated by comparing Lean Six Sigma with ISO 9001 quality standards and it was revealed that the application of Lean Six Sigma methodology under the supervision of experts would make significant contributions to livestock enterprises.

Keywords: Lean six sigma, ISO 9001, Ration, Holstein, Animal production

Giriş

Altı Sigma metodolojisi üretimde hata, kusur oranını minimize etmeyi; kalite, müşteri memnuniyeti ve verimi artırmayı hedefleyen bir metodoloji olarak ortaya çıkmıştır (Polat ve ark., 2005). İlk olarak endüstriyel üretimde ilgi görüp uygulanmış olmasına karşın, sonraki süreçlerde hizmet sektörü ile birçok alana yayılmıştır (Uluskan, 2017). Özellikle ilk başlarda büyük ve varlıklı şirketler Altı Sigma metodolojisine ilgi gösterirken, zamanla olumlu etkilerini gören bir kısım küçük ve orta ölçekli işletme ve hizmet sektörleri de Altı Sigma metodolojisine ilgi göstermeye başlamıştır (Çabuk ve Karayılmazlar, 2010). Türkiye de Altı Sigma uygulamalarının endüstriler arası dağılımı Şekil 1. de verilmiştir. Ülkemizde birçok endüstriyel ve hizmet alanına girmiş olan Altı Sigma uygulamaları tarım ve hayvancılık sektöründe pek görülememektedir. Ancak az da olsa Göksu (2019)'nun hayvancılık işletmeleri üzerinde yaptığı çalışmada olduğu gibi olumlu sonuçlar alındığı görülmektedir.



Şekil 1. Türkiye'de Altı Sigma uygulamalarının endüstriler arası dağılımı (Uluskan, 2017)

Günümüzde özellikle gelişmekte olan bölgeler teşvik kapsamına alınarak, burada faaliyet gösteren birçok sektör devlet tarafından desteklenmektedir (Takım ve Ersungur, 2018). Tarım sektörü ise neredeyse tüm dünyada ve ülkemizde sürekli desteklenmek durumunda kalmaktadır. Tarımsal üretimden elde edilen ürünlerin katma değerinin düşük olması ile girdi maliyetlerinin yüksek olması söz konusu desteklemeleri zorunlu kılmaktadır.

Tarım sektörünü işleten ve çalışan çiftçilerimizin eğitim düzeyinin düşük olması, tarımsal üretimde verim bakımından dünya ortalamasının altına düşmemize neden olmaktadır. Ayrıca aileden gelen geleneksel yapının da bu duruma olumsuz etkileri bulunmaktadır. Özellikle uzun yıllar ailece çiftçilik yapan köylülerimiz tarımı çok iyi bildiklerini zan ederek yeniliklere kapalı kalmaktadırlar. Ancak eğitimli aile işletmeleri dünyadaki yeniliklerden haberdar oldukları için söz konusu yeniliklere de açık olmaktadırlar (Kutlar ve ark., 2014).

Hayvancılık işletmelerinde hayvanlara optimum bakım ve refah koşulları sağlayarak, hayvan hastalıklarının ve hayvancılık işletmelerinde yönetime bağlı verim kayıpların önüne geçmenin etkili yollarından birisi sürü yönetimidir. Burada sürü yönetimi, yetiştiricilik için gerekli olan bilimsel ve teknik konular ile diğer işlerin sırasıyla ve belli bir disiplinle yapılmasını gerekli kılmaktadır (Özbeyaz ve Özbostancı, 2020).

Bugün Yalın Altı Sigma destekli tam teşekküllü sürü yönetim programları ancak bazı büyük modern hayvancılık işletmelerinde uygulanmaktadır. Buna karşılık kayıt tuttuğu halde, uzman destekli analiz ve değerlendirme yapmayan hayvancılık işletmeleri de bulunmaktadır. Geri kalan hayvancılık işletmelerinin çoğu geleneksel yöntemlerle kayıt tutmadan süreci götürmeye çalışmaktadır (Aydın ve Günlü, 2010). Bunun sonucunda birçok işletme ya iflas etmekte veya büyüyememektedir. Bu nedenle söz konusu işletmelere uzman desteği sağlanarak destek olmak gerekmektedir. Söz konusu işletmelere sadece kaliteli (İso 9001 sertifikalı) hammadde (Yem, ilaç, mineral…) ve hayvan temin etmek gerçekçi bir çözüm olmadığı uygulamalarda görülmektedir. Altı Sigma İso 9001 kalite standardizasyonun ötesinde kalite ve verim artışını sürekli hale getirmeyi hedeflemektedir (Ağın, 2020). Sürü yönetiminde tutulan kayıtların istatistiksel metotlarla analiz ve değerlendirilmesi yapılmadığı sürece bir yönü eksik kalacaktır. Bu nedenle hayvancılık işletmelerinde sürü yönetiminin Yalın Altı Sigma metodolojisi ile desteklenerek çiftçilerimizin bilgi ve becerilerinin artırılabileceğini, hem de sürekli zarar riski ile karşı karşıya olan bu işletmelerimize ait üretimlerinin, bir besi işletmesindeki örnek uygulama ile optimize edile bilebileceği ortaya konulmaya çalışıldı.

Materyal ve Metot

Materyal olarak Erzincan Refahiye ilçesinde bulunan Zeybek Tarım & Hayvancılık işletmesin deki Holstein besi sığırları ele alınmıştır. Tarım ve Kırsal Kalkınmayı Destekleme Kurumu (TKDK) Erzincan İl Koordinatörlüğü'nün desteklemeleri ile kurulan işletmede, besiye alınan hayvanlardan yeteri kadar canlı ağırlık artışı elde edilemediği konusundaki şikayetleri değerlendirilmeye alınmıştır. Bunun için satın alınan fabrika yemi ile hazırlanan rasyon incelenmiş. İşletmeden rastgele seçilen 50 tane Holstein sığırın küpe numaraları kayıt altına alınarak, besinin 3. ayında bir ay süre ile sığırlar (İso 9001 sertifikalı) eski fabrika yemi ile beslenerek canlı ağırlık artışlarına ait kayıtlar tutulmuştur. Besinin 4. ayında ise besiye alınan sığırlar Yalın Altı Sigma denetimleri sonunda hazırlanan ve Altı Sigma rasyonu olarak tanımladığımız yeni rasyonla beslenmiştir. Canlı ağırlıklar iki ay (60 gün) süresince kayıt altına alınmıştır. Haftalık ve günlük ortalama canlı ağırlık artışlarına ilişkin verilerin ortalama ve standart sapmalarının bir bölümü örnek olarak Tablo 1. de verilmiştir.

Tablo 1. Standart rasyon ile Altı Sigma rasyonlarına ait canlı ağırlık artışları

	Standard Rasyon (İso 9001)					**İyileştirilmiş Rasyon (Altı Sigma)**				
Sığır	$\bar{x} \pm s_x$	**Haftalık Canlı Ağırlık Kazancı**				$\bar{x} \pm s_x$	**Haftalık Canlı Ağırlık Kazancı**			
No	**(Kg/Gün)**	**1.Haf.**	**2.Haf.**	**3.Haf.**	**4.Haf.**	**(Kg/Gün)**	**1.Haf**	**2.Haf**	**3.Haf**	**4.Haf.**
1	0,4±0,114	0,30	0,40	0,56	0,34	0,65 ±0,068	0,56	0,64	0,68	0,72
2	0,7±0,039	0,65	0,74	0,69	0,72	0,9 ±0,037	0,86	0,88	0,92	0,94
3	0,35±0,043	0,24	0,32	0,30	0,34	0,7 ±0,052	0,64	0,68	0,72	0,76
4	0,8±0,080	0,71	0,77	0,82	0,90	1,24 ±0,032	1,20	1,23	1,26	1,27
5	0,75±0,054	0,68	0,76	0,81	0,75	1,1 ±0,161	0,96	0,98	1,16	1,3
6	0,9±0,052	0,84	0,88	0,96	0,92	1,3 ±0,052	1,24	1,28	1,32	1,36
7	0,65±0,045	0,59	0,64	0,68	0,69	1,2 ±0,032	1,17	1,18	1,21	1,24
8	0,55±0,073	0,47	0,52	0,57	0,64	1,05 ±0,063	0,98	1,03	1,06	1,13

9	0,5±0,070	0,41	0,48	0,56	0,55	1,1 ±0,117	0,97	1,06	1,12	1,25
10	0,8±0,037	0,78	0,76	0,84	0,82	1,5±0,067	1,42	1,48	1,52	1,58
11	1,2±0,032	1,17	1,21	1,18	1,24	1,6 ±0,059	1,54	1,56	1,64	1,66
12	0,9±0,039	0,88	0,86	0,91	0,95	1,19 ±0,032	1,15	1,18	1,22	1,21
13	0,92±0,095	0,84	0,86	0,93	1,05	1,36 ±0,063	1,29	1,34	1,37	1,44
14	…….	…….	…….	…….	…….	…….	……	……	….	……
50	0,78±0,026	0,75	0,77	0,81	0,79	1,41±0,047	1,36	1,39	1,42	1,47

Metot

Çalışmada incelenen canlı ağırlık artışlarına ilişkin veriler Minitab 20. paket programı ile Altı Sigma metodolojisinde kullanılan istatistiksel yöntemlerle değerlendirilmeye alınmıştır. Veriler her hayvandan iki farklı periyotta (Standart rasyon ile Altı sigma rasyonunun yedirildiği dönem) alındığından Eşleştirme (Paired-t) testi ile değerlendirilmiş.

$$t = \frac{\bar{x}_f - \mu_f}{s_{\bar{x}_f}} \qquad (1)$$

Ayrıca hafta faktörleri de rasyonlarla birlikte iki yönlü varyans analizi ile de değerlendirilmiştir. Elde edilen sonuçlar arasındaki grup üyelikleri Tukey testi ile belirlenmiştir. Bununla birlikte rasyon içeriğine ait hammaddelerin dağılımı pareto analizi ile ortaya konulmuştur.

Elde edilen veriler günlük olarak kayıt altına alınmış olup, 3. ve 4. ayın sonunda her iki aya ait canlı ağırlık artışlarına ilişkin veriler Minitab paket programı ile Altı Sigma metodolojisinde kullanılan istatistiksel yöntemlerle değerlendirilmeye alınmıştır.

Bulgular ve Tartışma

Yalın Altı Sigma metodolojisine ait prosesleri uygulayarak besiye alınan sığırların canlı ağırlık artışını etkileyebilecek tüm faktörler veteriner ve zootekni uzman gözetiminde değerlendirilmiş. Değerlendirme sonunda Yalın Altı Sigmanın ilk prosesi olan tanımlama aşamasında;

- Kaba yem kaynaklarının kalitesinde herhangi bir problem olmadığı,
- Hayvanlarda herhangi bir *hastalık problemine* rastlanmadığı
- Hayvanların bölgede *adaptasyon probleminin* yaşamadığı,
- Hayvanlarda *stres* belirtileri gözlenmediği.
- Besiye alınan Holstein *ırkının genetik kapasitesinin* besi için gayet yeterli olduğu. (Holstein sığırlarında yaklaşık 1,400 kg/gün kadar canlı ağırlık artışına ulaşılabilmektedir (Koç ve Akman (2003).
- Çevresel şartlarında kontrol altına olduğu belirlenmiştir.

Buna rağmen yeterli canlı ağırlık artışına ulaşılamamıştır. Besiyi etkileyebilecek tüm faktörler elemine edildikten sonra, canlı ağırlık artışını olumsuz etkileyebilecek ana neden olarak rasyon ve ilave kesif yemden kaynaklanmış olma olasılığı güçlendiğinden, rasyon içeriği inceleme altına alınmıştır.

Yalın Altı Sigma prosesinin 2. aşamasında probleme konu olan rasyonun (İso 9001 yemi) inceleme sonucunda;

1- Bazı hammaddelerin rasyonda bulunma oranının yemden yararlanmayı düşürebilecek sınırda olduğu,
2- Rasyonda bulunan bazı hammaddelerin toksik etki yapabilecek sınırda olduğu,
3- Kullanılan protein kaynaklarının kalitesinin tekrar düzenlenmesi gerektiği rasyon uzmanı tarafından belirlenmiştir.

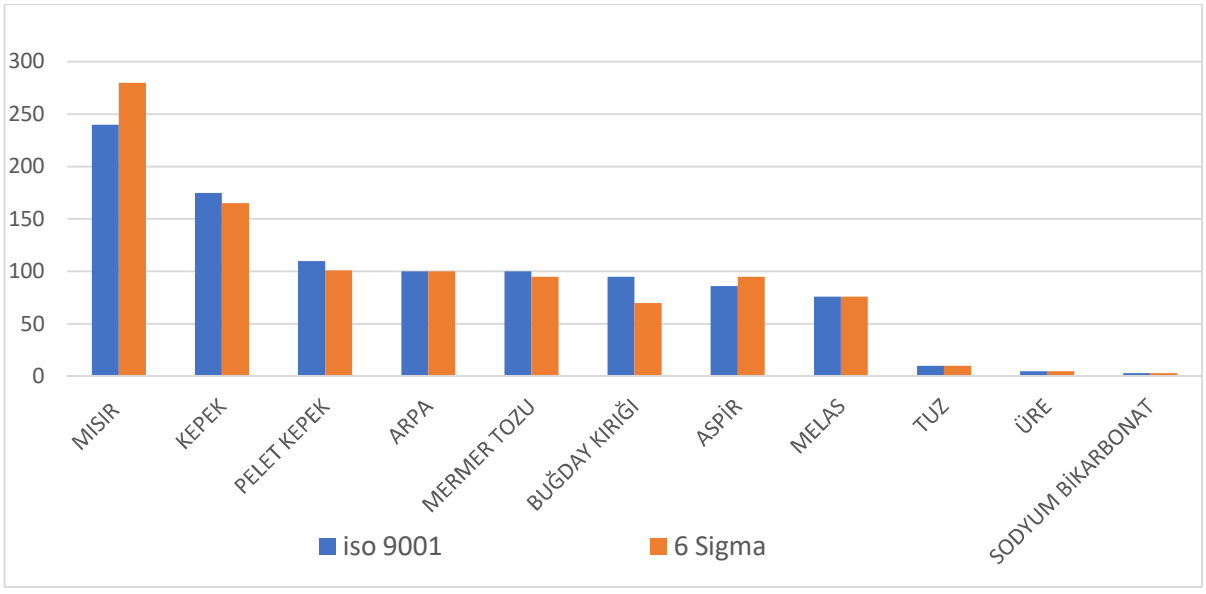
Yalın Altı Sigma prosesinin 3. aşamasında aynı protein oranına sahip; ancak hammadde oranları tekrar düzenlenmiş yeni bir rasyon (Altı Sigma besi yemi) hazırlanmıştır. Hazırlanan yeni rasyon ile önceki rasyon (İso 9001 yemi) işletmede 50’ şer sığıra bir ay süresince yedirilmek suretiyle haftalık

yapılan tartımların ortalama canlı ağırlık kazançları belirlenip değerlendirmeye alınmıştır. Eski (İso 9001) yemi ile rasyon uzmanının hazırladığı (Altı Sigma) rasyonun içeriği Tablo 2. de verilmiştir.

Tablo 2. (İso 9001) yemi ile rasyon uzmanının hazırladığı (Altı Sigma) rasyonun içeriği

Hammadde	İso 9001 yem karışım oranı (kg/1 Ton)	Altı Sigma özel üretim yem oranı (kg/1 Ton)
Mısır	240 kg/TON	280 kg/TON
Arpa	100 kg/TON	100 kg/TON
Buğday Kırığı	95 kg/TON	70 kg/TON
Aspir	86 kg/TON	95 kg/TON
Pelet Kepek	110 kg/TON	101 kg/TON
Mermer Tozu	100 kg/TON	95 kg/TON
Tuz	10 kg/TON	10 kg/TON
Sodyum Bikarbonat	3 kg/TON	3 kg/TON
Üre	5 kg/TON	5 kg/TON
Melas	76 kg/TON	76 kg/TON
Kepek	175 kg/TON	165 kg/TON

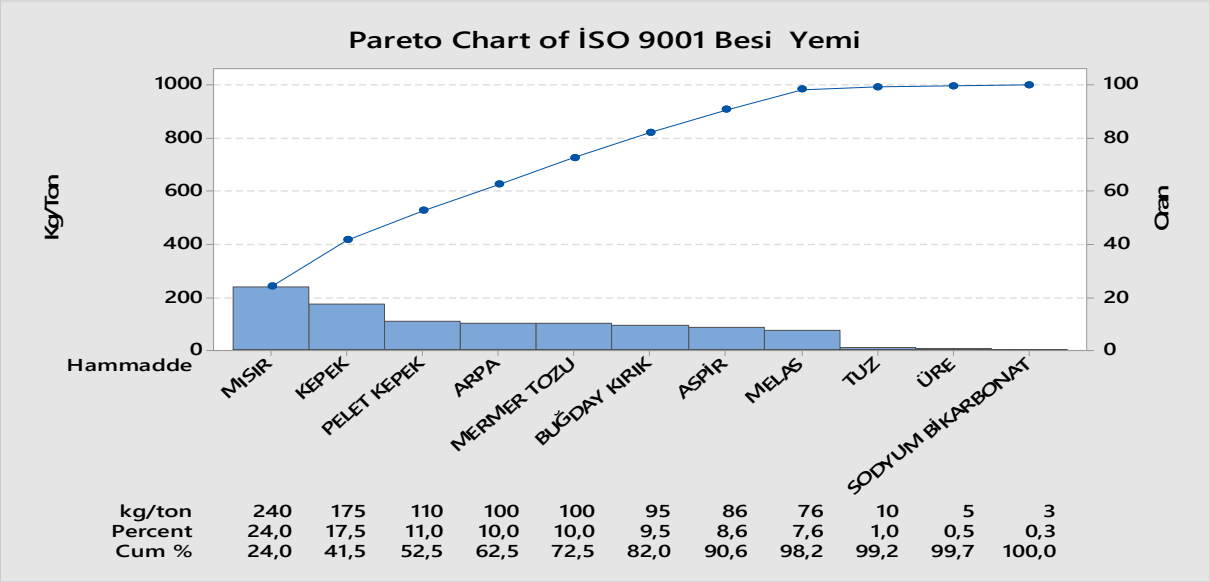
İso 9001 ile Altı Sigma rasyonlarının içeriklerine ait dağılım grafiği Şekil 2. de verilmiştir.



Şekil 2. İso 9001 ile Altı Sigma rasyonlarına ait yem içerinin dağılım grafiği

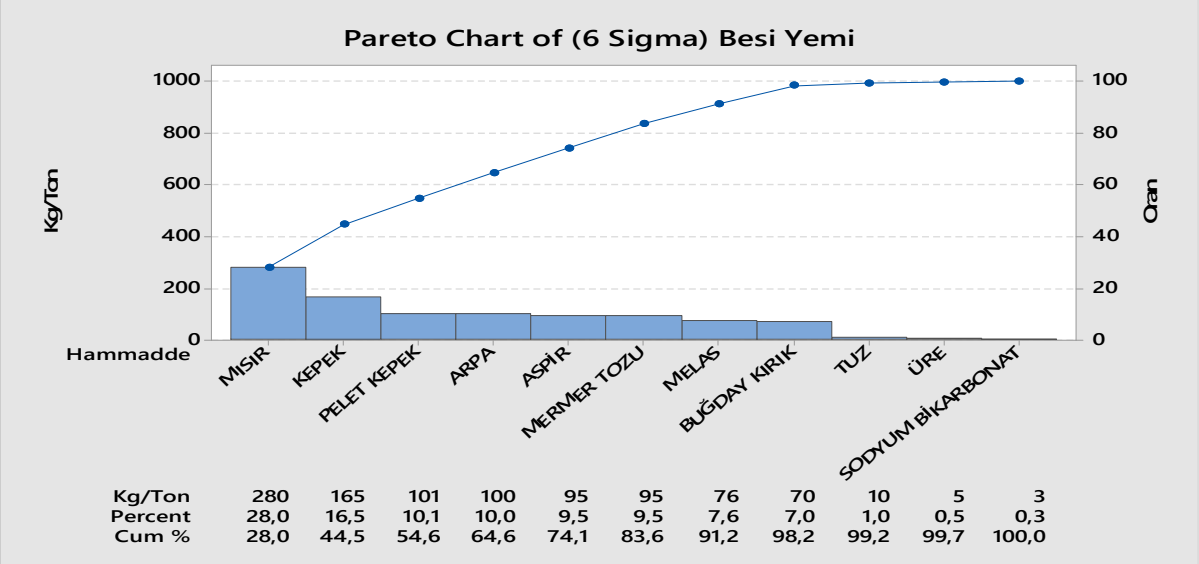
Yalın Altı Sigma proseslerinde sıkça başvurulan ve problemin önemli sebeplerini, nisbeten önemsiz sebeplerden ayıran Pareto analizi grafiği Şekil 3. de görülmektedir. Vilfredo Pareto 1897 tarafından formüle edilen ve sonraki yıllarda Dr. J.M. Juran tarafından ortaya atılan bu hipotez kalite kontrol alanında sıklıkla kullanılmaktadır (Akın ve Öztürk, 2005).

Pareto analizinde en önemli etkinin sırasıyla mısır (%24), kepek (%17,5) ve pelet kepek (%11), arpa (%10), mermer tozu (%10), buğday kırığı (%9,5), aspir (%8,6), melas (%7,6), tuz(%1), üre (%0,5) ve sodyum bicarbonat (%0,3) olduğu belirlenmiştir.



Şekil 3. Problemin önemli sebeplerini, nisbeten önemsiz sebeplerden ayıran Pareto analizi Grafiği

Bu hammaddelerin etkileri göz önüne alınarak yeni bir (Altı Sigma) rasyon hazırlanmış olup, ilgili rasyonun pareto analiz grafiği Şekil 4. de verilmiştir.



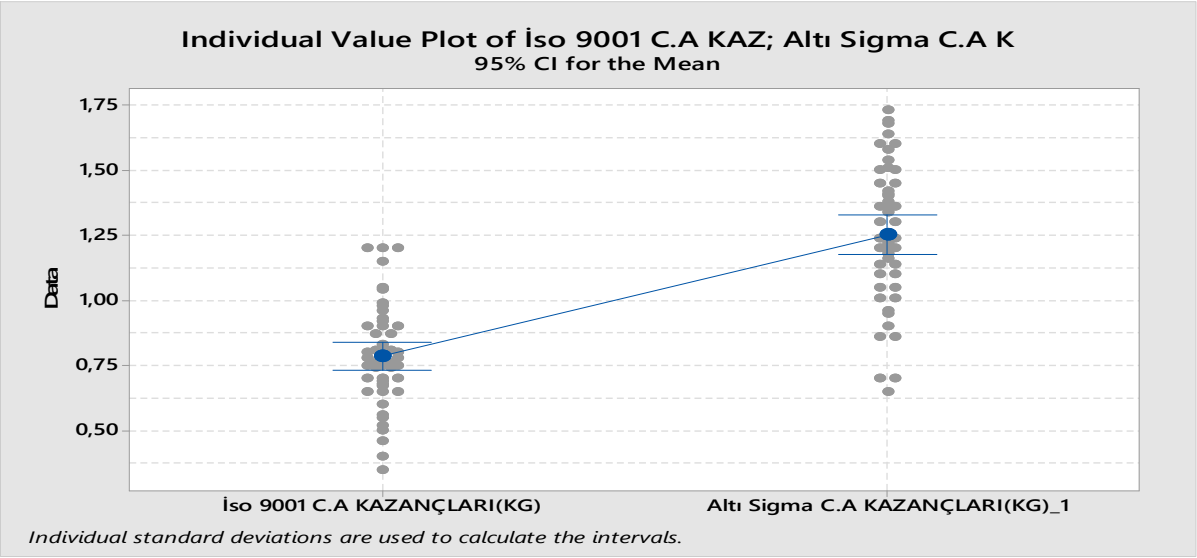
Şekil 4. Altı Sigma besi yemine ait Pareto grafiği

Zeybek hayvancılık işletmesinde besiye alınan Holstein (siyah alaca) sığırları için, %60 kaba yem ile %40 kesif yem oranıyla rasyon (TMR=Total mixed ration) hazırlanmıştır.

Her iki rasyonda da kullanılan besi yemlerinin proteinleri (%12) ve kullanılan besi yemlerinin TMR'e girme oranları aynı olup 10 kg olarak hazırlanan rasyon; 6 kg kaba yem (mısır silajı, yonca kuru otu, buğday silajı, pancar küspesi) ile 4 kg kesif yem (1kg arpa ezmesi, 0,5 kg tritikale, 0,5 kg buğday ezmesi ve 2 kg besi yemi) karışımından oluşmuştur.

Altı Sigma ve İso 9001 rasyonu ile beslenen sığırların ağırlık artışlarına ilişkin istatistikler Tablo 3. de verilmiştir. İso 9001 yemi ile beslenen sığırlarda yaklaşık 0,786 kg/gün canlı ağırlık artışı elde edilirken, Altı Sigma rasyonu ile 1,250 kg/gün canlı ağırlık artışı elde edilmiştir. Elde edilen sonuçlar Koç ve Akman (2003)'de yaptıkları çalışmada farklı yaşlardaki besi sığırlarının besiye alınması durumunda 800-1400 kg/gün arasında canlı ağırlık artışı elde edilebileceği bilgisi ile örtüşmektedir.

Her iki rasyondan elde edilen ortalama canlı ağırlıklarına ilişkin dağılım grafiği ile rasyonlar arasındaki verim artışı Şekil 5.' de verilmiştir.



Şekil 5. İso 9001 ile Altı Sigma Besi yemlerinden elde edilen canlı ağırlık artışlarına ait dağılım grafiği

Tablo 3. de İso 9001 ve Altı Sigma rasyonlarından elde edilen canlı ağırlık artışlarına ilişkin verim farkının 0,466 kg/gün olduğu görülmektedir. Elde edilen canlı ağırlık artışlarına ait verim farkının anlamlı olup olmadığı hem eşleştirme testi ile hem de iki yönlü varyans analizi ile değerlendirmek için araştırmaya ait örnek büyüklüğü ile verilerin dağılımının uygunluğu istatistik analizlerle test edilmiştir.

Tablo 3: İso 9001 ve Altı Sigma rasyonlarından elde edilen canlı ağırlık artışlarına ait istatistikler

Değişken	Ortalama	St. Hata	St. Sapma	Var. Katsayısı
İso 9001 Yemi	0,786	0,0275	0,1941	24,68
Altı Sigma Yemi	1,252	0,0376	0,2660	21,25
Fark	0,466	0,0249	0,1761	

Araştırmada örnek büyüklüğü n>30 büyük olup veriler normallik dağılım koşulunu sağladığından, ayrıca söz konusu iki grup birbirleri ile ilişkili olduğundan aritmetik ortalamaları arasındaki farkın anlamlılığını sınamak amacıyla Eşleştirme (Paired-t) testi uygulanmıştır. Test sonucunda Yalın Altı Sigma yapılandırması sonunda elde edilen rasyon ile standart İso 9001 rasyonundan elde edilen ortalama canlı ağırlık artışları arasında çok önemli ($p<0,01$) bir verim artışı sağlanmıştır.

Ayrıca rasyon ile hafta faktörleri birlikte iki yönlü varyans analizi ile test edildiğinde elde edilen varyans analiz sonuçlar Tablo 4. de verilmiştir.

Tablo 4. Canlı ağırlık artışına rasyon ve haftaların etkisine ait varyans analizi sonuçları

Source	DF	Adj SS	Adj MS	F-Value	P
Hafta	3	0,7520	0,2507	4,53	0,004
Rasyon	1	21,7442	21,7442	393,09	0,000
Hata	394	21,7945	0,0553		
Lack-of-Fit	3	0,0203	0,0068	0,12	0,947

Pure Error	391	21,7742	0,0557		
Genel	398	44,2799			

Rasyonlar ve haftalara ait canlı ağırlık artışlarında çok önemli (P<0,01) bir artış olduğu Tablo 4.'de verilen varyans analizi sonuçlarından görülmektedir. Ayrıca Lack-of-Fit değeri P>0,05 olup, modelin verilerle uyumlu olduğunu göstermektedir. Rasyonları Tukey testi ile gruplandırdığımızda Tablo 5. de görüldüğü gibi Altı Sigma rasyonu ile İso 9001 standart rasyonunun birbirinden farklı iki ayrı gruba ayrıştığı görülmektedir.

Tablo 5. Altı Sigma rasyonu ile İso 9001 standart rasyonuna ait Tukey çoklu karşılaştırma testi sonucu

Hafta*Rasyon	**N**	$\bar{x} \pm s_x$	**Gruplar**	
4 2 *(Altı Sigma)*	50	1,321±0,272	A	
3 2	50	1,272±0,269	A	
2 2	50	1,224±0,266	A	
1 2	50	1,188±0,265	A	
4 1 *(İso 9001)*	50	0,831±0,205		B
3 1	50	0,807±0,191		B
2 1	49	0,764±0,193		B
1 1	50	0,736±0,205		B

SONUÇ

Araştırma sonucunda, çiftçilerimizin karşılaştığı problemlerini ilgili uzmanlara danışmaları halinde gerekli çözümlerin üretilebileceği görülmektedir. Ayrıca sürü yönetiminin Yalın Altı Sigma metodolojisi ile desteklenerek gerekli teşhis, ölçüm ve analizlerin yapılması durumunda verimde ciddi artışlar elde edilebileceği ortaya konulmuştur. Yapılan ölçüm, analiz ve değerlendirmelerin çiftçilerle birlikte yapılması, çiftçilerimizin bilgi ve becerilerinin de bu süreçte artmasını sağlayacaktır.

Tavsiye

1-Hayvancılık işletmelerinde mümkünse tüm hayvanların kayıtlarını tutulması veya en azından bir kontrol grubunun bulundurulması gerekmektedir.

2- Seçilen grubun bazı kayıtları sürekli tutularak verimdeki mevcut durum denetlenmelidir.

3- Yapılan denetimlerle işletmedeki kayıplar belirlenmeli

4- Zootekni uzmanları ile Altı Sigma danışmanlarının kontrolünde ilgili parametreler tekrar değerlendirilerek verim artısının sürekliliği sağlanmalıdır.

Ayrıca tarım teşkilatındaki yetkililere tavsiyemiz çiftçilere doğrudan nakdi yardım yapmaktan ziyade, profesyonel uzman desteğinin sağlanması gerekmektedir. Böylece hem üretimde verimliliğin artışında süreklilik sağlanmış olacak, hem de ilgili yönlendirmelerle çiftçilerimizin bilgi ve tecrübesi artırılmış olacaktır.

Kaynaklar

1. AĞIN, K. (2020). Toplam Kalite Yönetimi Bağlamında Kaizen Felsefesinin Örgütlerin Maliyet, Verimlilik ve Kalite Düzeylerine Etkileri. Atatürk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 24 (3): 1191-1207.
2. Akın, B., Öztürk, E., (2005) "İstatistik Proses Kontrol Tekniklerinin Bilgisayar Ortamında Uygulanması" 5. Ekonometri Sempozyumu, İstanbul.

3. Aydın İ. ve Günlü A. (2010). Hayvancılık İşletmelerinde Teknik ve Finansal Verilerin Tutulmasına ve Değerlendirilmesine Yönelik bir Bilgisayar Yazılımı. Vet. Hekim Der. Derg. 80(4): 21-30.
4. Çabuk Y. ve Karayılmazlar S. (2010). Altı Sigma Yaklaşımı. Bartın Orman Fakültesi Dergisi, 12 (17): 93-99.
5. Göksu Y. (2019). Altı Sigma Metodolojisi İle Tarımsal İşletmelerde Verimliliğin Artırılması. Harran Üni. Fen Bilimleri Enstitüsü, Yük. Lisans Tezi.
6. Koç A. ve Akman N. (2003). Farklı Ağırlıkta Besiye Alınan İthal Edilmiş Siyah-Alaca Tosunların Besi Gücü ve Karkas Özellikleri. Ege Zootekni Derneği, Hayvansal Üretim Dergisi 44(1): 26-36.
7. Kutlar İ., Turhanoğulları Z. ve Kızılay H. (2014). Kırsal Alanda Kadınların Tarımsal Yayım Hizmetlerinden Yararlanma Olanakları: Burdur İli Örneği. Anadolu Tarım Bilim. Derg., 2014, 29(1): 46-53.
8. Özbeyaz C. ve Özbostancı S. (2020). İneklerde Beden Dili ve Sürü Yönetimi. Journal of Bahri Dagdas Animal Research, 9 (2): 148-161.
9. Polat, A., B. Cömert, T., Arıtürk, (2005). Altı Sigma nedir?, 2. baskı S.P.A.C. Altı Sigma Danışmanlık ltd. şti. yayınları, Ankara,
10. Takım A. ve Ersungur Ş.M., (2018). Türkiye'de Teşvik Sisteminin Yapısı, Sorunları ve Etkinliği Üzerine bir Politika Önerisi: Tek bir Uygulamacı Kuruluş Sorunları Çözer mi? Atatürk Üni. İktisadi ve İdari Bilimler Dergisi, 32(3): 725-744.
11. Uluskan M. (2017). Türkiye'nin Altı Sigma Uygulama Haritası. Çukurova University Journal of the Faculty of Engineering and Architecture, 32(3): 131-143.

FISH HEALTH MANAGEMENT IN THE FISH PONDS OF RAJBARI DISTRICT, CENTRAL BANGLADESH

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ABSTRACT
It is critical to conduct research on regional culture practices in order to pinpoint the source of fish health issues. The purpose of this study was to investigate the present fish culture systems and health management techniques in selected aquafarms in Rajbari District, Bangladesh. From October 2019 to February 2020, data was collected from 50 fish farmers by questionnaire interview, focus group discussion, and cross-check interview. The majority of the aqua farmers had 11 to 15 years of expertise in fish farming and owned their own ponds, according to the findings. More than 32% farmer cultured fish in their own pond and near 40% shared pond with others; while 30% used to take ledge for fish cultivation. Seventy-six percent respondents used to apply commercial fish feed in their culture pond. Several stages were employed to prepare ponds for stocking, including pond drying, bottom mud removal, dike building, liming, fertilizer application, and lastly stocking. Only 20% of fish farmers stocked single fish species such as pangas and tilapia, while the rest stocked two to eight different fish species. The majority of fish farmers sell their collected fish in local or municipal markets. Infectious and non-infectious disorders caused by bacteria, virus, fungus, parasites, poor water quality, and malnutrition were major fish health issues in the research region. Moreover, more than 15% fish farmers practiced integrated fish farming with poultry and duck farming while 86% fish farmers practiced horticulture at the dyke. The vast majority of farmers (94%) lacked water quality monitoring equipment. On the other hand, farmers ranked the major health problems of fish on the basis of critical condition, with fish disease, poor water quality, fish killing as a result of enmity, entrance of wild animals, and hindrance due to fish-eating birds ranked first, second, third, fourth, and fifth, respectively. Government and non-government groups provided instruction on various aquaculture techniques to 44% and 20% of respondents, respectively. In the research area, the fish producers were unaware of basic aquaculture practices for maintaining biosecurity. The present study revealed that there is a lack of scientific knowledge of the fish farmers in the studied area which demands further improvements of the existing condition.

Keywords: Aquaculture; biosecurity; constraints; commercial feed; water quality

GROWTH PERFORMANCE OF TILAPIA FED WITH MORINGA LEAF POWDER MIXED FEED

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ABSTRACT

One of the most important aspects in aquaculture is fish health management, and many plant components are being employed to improve fish health and reduce the detrimental effects of synthetic aqua medicines. The potentiality of moringa (*Moringa oleifera*; Lamarck, 1785) leaf as a nutritional source for tilapia (*Oreochromis niloticus*; Linnaeus, 1758) fish was investigated in this experiment, which lasted two months from September to November, 2020. The moringa leaves were brought in, cleaned, dried, and then powdered. Three experimental diets were created by mixing processed moringa leaf powder at a rate of 0% (T1), 10% (T2), and 20% (T3) with rice bran, wheat bran, mustard oil cake, fish meal, soya oil, and vitamin-mineral premix. Each tank was stocked with 90 L water and fifteen tilapia fingerlings with an average initial length of 10.88±0.11 cm and an initial weight of 29.06±0.50 g. Three replications of each treatment were used in a sixty-day feeding trial. The fish were fed formulated meals at a rate of 3% of their body mass twice a day, at 9 am and 4 pm. Fish samples and water quality values were collected every twelve days. Furthermore, the blood glucose and cholesterol levels of tilapia were monitored on a monthly basis. The treatments differed considerably in terms of final length, final weight, weight increase, percent weight gain, feed conversion ratio (FCR), specific growth rate (SGR), and tilapia production. T3 and T2 percent had the greatest FCR (3.17±0.25) and SGR (1.33±0.12 %) values, respectively. The maximum and the lowest tilapia production in the experiment were 9.21±0.39 kg m^{-3} in T2 and 7.39±0.35 kg m^{-3} in T3, respectively. The blood glucose levels were considerably different amongst the treatments ($p< 0.05$), with T1 (48.00±2.00 mg dl^{-1}) having the highest value. Furthermore, T1 (177.67±2.52 mg dl^{-1}) and T3 (148.33±1.53 mg dl^{-1}) had the greatest and lowest blood cholesterol levels, respectively, despite the fact that the values were extremely significantly different among the treatments ($p\leq 0.01$). The water quality parameters were statistically similar between treatments ($p> 0.05$), and the values were within permissible limits for tilapia culture. The present study revealed that, using moringa leaf powder nutrient rich feed can be formulated for fish by optimizing the amount on the basis of culture species boosting up the fish yield.

Keywords: Moringa; formulated feed; water quality; fish growth; glucose; cholesterol

INVESTIGATION OF STRESS CORROSION CRACKING IN TITANIUM ALLOY (TI6AL4V) WITH AND WITHOUT CADMIUM COATING

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ABSTRACT
Stress corrosion cracking (SCC) is a dangerous and complex form of cracking which is defined as the propagation of cracks due to the joint effect of tensile stress and a reactive environment. In the present article, Investigation of stress corrosion cracking phenomenon has been studied out on Ti-6Al-4V, which is a renowned grade of Titanium alloys and used widely in aerospace industry and marine environments. In the current study, Titanium Alloy (Ti6Al4V) is employed to investigate the tensile strength, microstructure, of non coated and coated specimens in the corrosive environment. For applying SCC conditions, a test fixture is developed. The static force of 1000 N is applied for both specimens with an environment having 3.5 % NaCl solution for time intervals of 468 hours. The scanning electron microscope (SEM) is used to investigate the microstructure of non coated and coated specimens. Both specimens had been tensile tested and stress-strain curves were analyzed. Surface of both specimens was analyzed by SEM and metallography to study the effects of aforesaid conditions in internal structure of both specimens. It is observed that due to the corrosive environment grains are damaged visibly in different areas of the specimen. Moreover, dimples, inter and transgranular cracks are found in the fractographic examination. It is concluded an that 31.72 % increase in tensile strength and 41.58% increase in elongation of coated specimen as compared to non coated specimen. It is observed that due to the corrosive environment grains are damaged visibly in different areas of the not coated specimen while coated specimen also show small pits and grain damage.

Introduction
Stress corrosion cracking (SCC) which is disaster due to combine effect of stress and susceptible environment. Corrosion which are very critical in metals. Many types of corrosion present the form which we are concern here is that which occur with combine effect of corrosive environment and tensile load. The failure of this type is called stress corrosion cracking. The alloy of titanium Ti-6Al-4V which are extensively used in many engineering. Its surface oxide film can shield the substrate from collaboration with a great deal of destructive conditions. Tragically, this surface layer can be harmed under mechanical and compound activities with a subsequent decrease in erosion obstruction [1].The SCC phenomena is created through the break nucleation and its progressive spread under the collaborating activity of the applied pressure and of the erosion interaction [2].Inside the nucleated breaks a variety of the centralization of antagonistic specialists happens and this prompts a steady spread

of the breaks with a speed remembered for the scope of10^{-2}-10^{-5} mm/s. [3, 4]. The surface modification technology is an efficient way to improve the corrosion resistance of titanium and titanium alloys. Frequently, utilized surface treatment techniques include Nitriding/carburizing, metallic cementation, vapor deposition, ion implantation, laser deposit, enamel coating and so on [5]. It is plausible that the substance of the vaporous species can think twice about the SCC exhibitions of titanium combinations, in which the break instable proliferation can for the most part be advanced by the anodic disintegration of the break tip or by the hydrogen arrangement inside the alloy [6].Another way to reduce corrosion cracks in ocean vessels is to reduce stress, either by bending or yielding the hull or by leaving residue through welds and rivets. If the ship is not completely decommissioned, bending stress cannot be removed. Residual stress reduction is a method currently being studied in detail [7-9]. The residual stress around the weld seam is intrinsically tense. By improving basic welding methods, including preparation of the structure and edges, residual stresses in the welding area can be reduced. As the most efficient method for welding sensitive materials, various welding technologies such as friction stir welding (FSW) have recently been developed [10, 11]. FSW is a process that does not melt the materials in the joining process [12]. The tensile stress acting on the prone alloys is the most significant factor leading to the occurrence of SCC [13]. The level of tensile stress influences the degree of SCC significantly, regardless of the sources. The increase in tensile stress reduces the time of fracture [14]. The welding system was considered destructive to the consumption conduct of welded titanium alloys. Karimzadeh and Heidarbeigy discovered that the combination zone of Ti-6Al-4V gas tungsten circular segment welding composite showed lower erosion obstruction contrasted with the base metal in Ringer arrangement, demonstrated by more bad consumption potential and higher current consumption densities [15]. Thomas et al. detailed that after heat treatment, the stage piece of the combination zone in the welded test when the temperature of the hotness treatment was at moderately low level like 540C, comprising of martensite stages [16]. Because of their remarkable explicit properties like light weight, low thickness, erosion affectability with relatively great mechanical properties, Titanium and its compounds are generally utilized in modern applications [17]. In this research work, effects of SCC are investigated on a widely used industrial material Ti-6Al-4V in an aggressive environment after surface treatment. SEM, metallography and tensile testing are conducted for investigation of Ti-6Al-4V before and after surface treatment.

System description and measurement procedure

Material Selection

The workpiece was prepared from a sheet of the Alloy of titanium Ti-6Al-4V measuring 150 x 60 x 6 mm. A sample of the material was tested on Spectro lab M8 the material composition is given in Table 1.

Table 1: Material Composition

Component	Value (%)	Component	Value (%)
Ti	89.5	N	0.007
Al	6.135		
Fe	0.15		
C	0.018		
V	4.075		
O	0.18		

Experimental setup

Experimentation related to stress corrosion cracking done on SCC rig apparatus Fracture mechanics lab and for FSW using milling machine in machine tool laboratory at University of Engineering and Technology, Taxila.

Stress corrosion cracking rig apparatus

Stress corrosion cracking (SCC) rig apparatus consist of a base, lower clamp bath, hanger, arm, magnetic stand, dial indicator, upper clamp support plate, and, pin as shown in Figure 1.

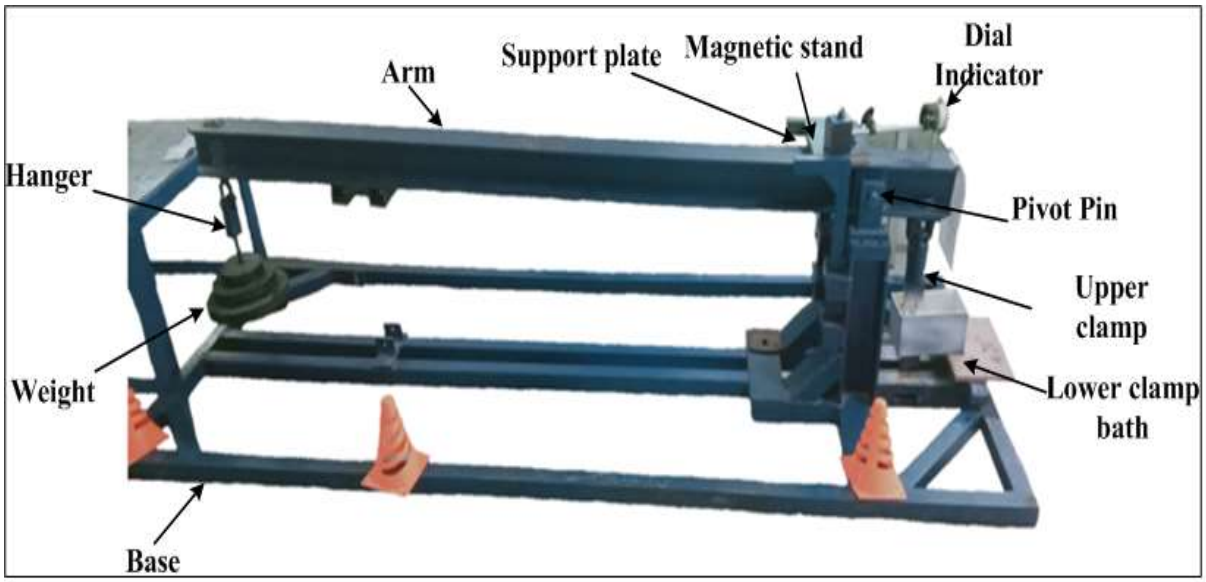


Figure 1: Stress corrosion cracking rig apparatus

Workpiece preparation

The length of plate is of 140 mm and width of 50 mm was cut down by specimen cutting machine using disk cutter placed in UET Taxila. The size of the Workpiece material is 140 mm x 50 mm x 6mm that are cut from the plate. The edge of the workpiece is accurately cut down, so the joining of the plate is precise. Theses welded plates are put on CNC milling machine to prepare samples for testing. After preparation of samples were cadmium coated from private lab

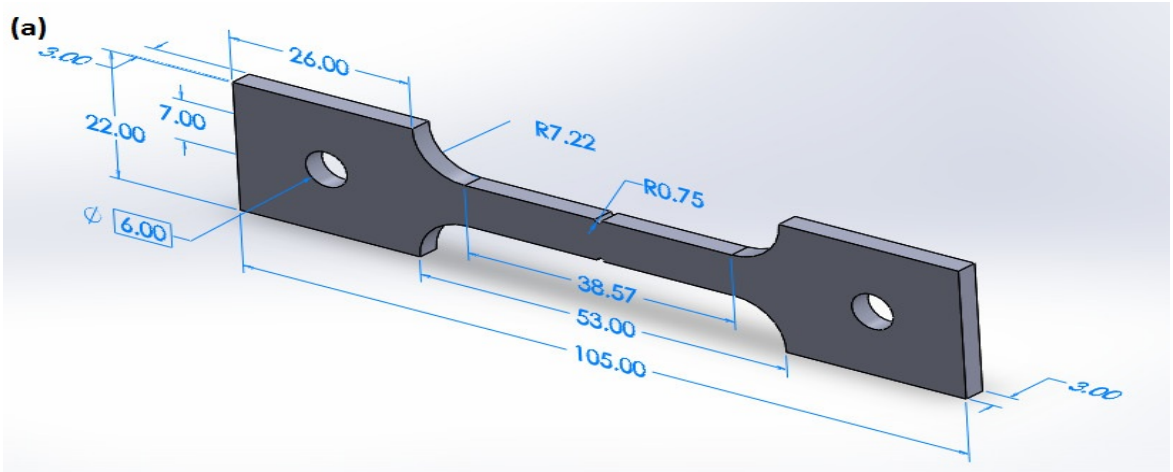


Figure 2: Tensile test specimens

The prepared specimens of material including coated and non coated are examined by considering different conditions given in Table 2.

Table 2: Test conditions

Parameter	Coated Specimen	Non Coated Specimen
Load	1000N	1000N
Environment	3.5% NaCl Solution	3.5% NaCl Solution
Time	468 hours	468 hours

Results and discussion

Stress-strain evaluation

The relation between stress and strain for coated and non-coated specimens is analyzed in Figure 3 (a) and (b) respectively. Ultimate tensile strength (UTS) value of coated specimen is greater than non-coated one which depicts better mechanical properties of coated specimen.

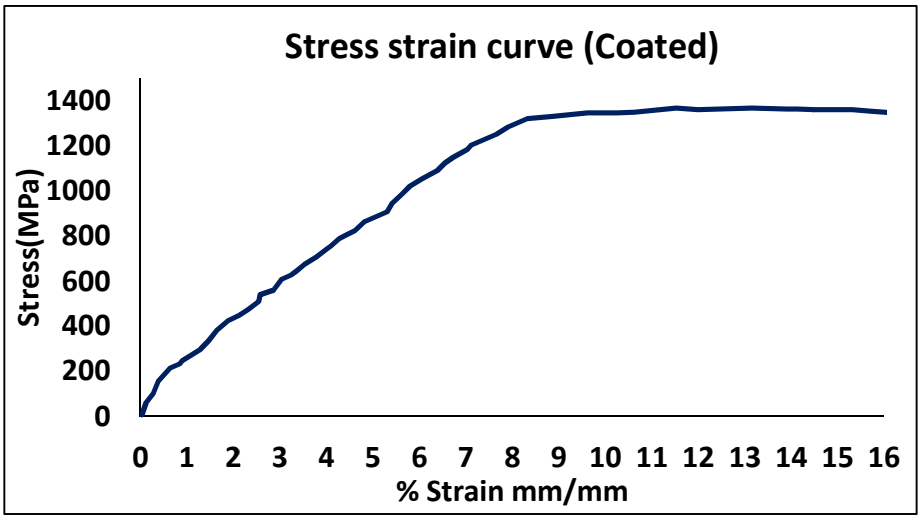


Figure 3: Stress-strain curve (a) Coated

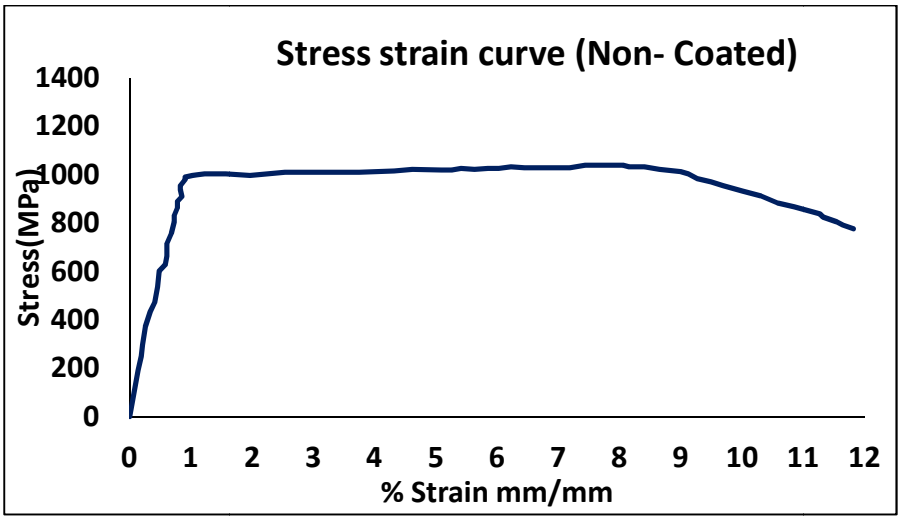
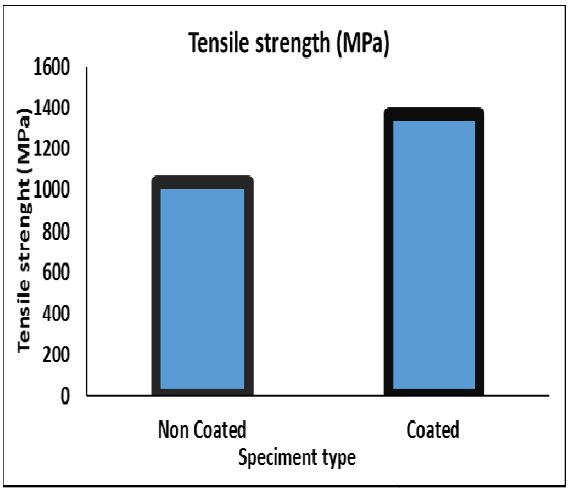


Figure 3: Stress-strain curve (b) non coated

Tensile strength and elongation evaluation 15.73

The tensile strength and elongation of coated and non coated specimens are tested and it is found that 31.72 % increase in tensile strength and 41.58% increase in elongation is observed as shown in Figure 4 (a) and(b) respectively.



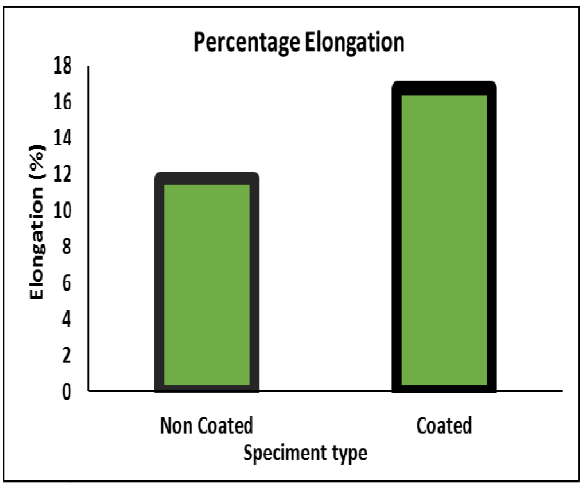


Figure 4: (a) Tensile strength, (b) Percentage elongation

Scanning electron microscope evaluation

The coated and coated specimen's strength is affected due to the intensity of force applied under the application. In the current work, the stability of the coated joint is evaluated under SCC conditions. The coated and non coated specimens are investigated for microstructure at given conditions. The cracks are produced on non coated specimen more compare to coated specimen. However, the specimen's coated and non coated microstructures are examined for 1000 N load and 3.5% NaCl solution.

Microstructure of specimens

Scanning electron microscope (SEM) allows fracture surface to be studied with incredible detail. Many fractographic features such as fatigue striations, intergranular cracking, micro void coalescence, trans granular cleavage, and secondary cracking can be identified with SEM. The resolution and depth of field, SEM is much greater than optical microscopes that topographical characteristics of fracture surface.

SEM analysis of Ti–6Al–4V samples, tested at static loading condition of 1000N in environments such as 3.5% NaCl solution, performed at Scanning electron microscope (JSM-6490LA) to obtain more information about stress corrosion cracking mechanism.

Figure no. 5 and 6 illustrations the SEM micrographs of tensile cross section of non-coated and coated Ti–6Al–4V when subjected to static load of 1000N with loading time of 468 hours in NaCl solution at different magnification. SEM micrographs clearly depict intergranular grain boundary corrosion of non-coated sample which causes deep pitting and voids on sample. It is observed that most of the specimen without coating is with deep dimples, large deformation. Due to the application of 1000 N force, the tensile strength of non coated material compromised and deep dimples and cracks on the surface are observed while specimen with coating can resist deformation, resist intergranular cracking while small pitting is observed due to high static load.

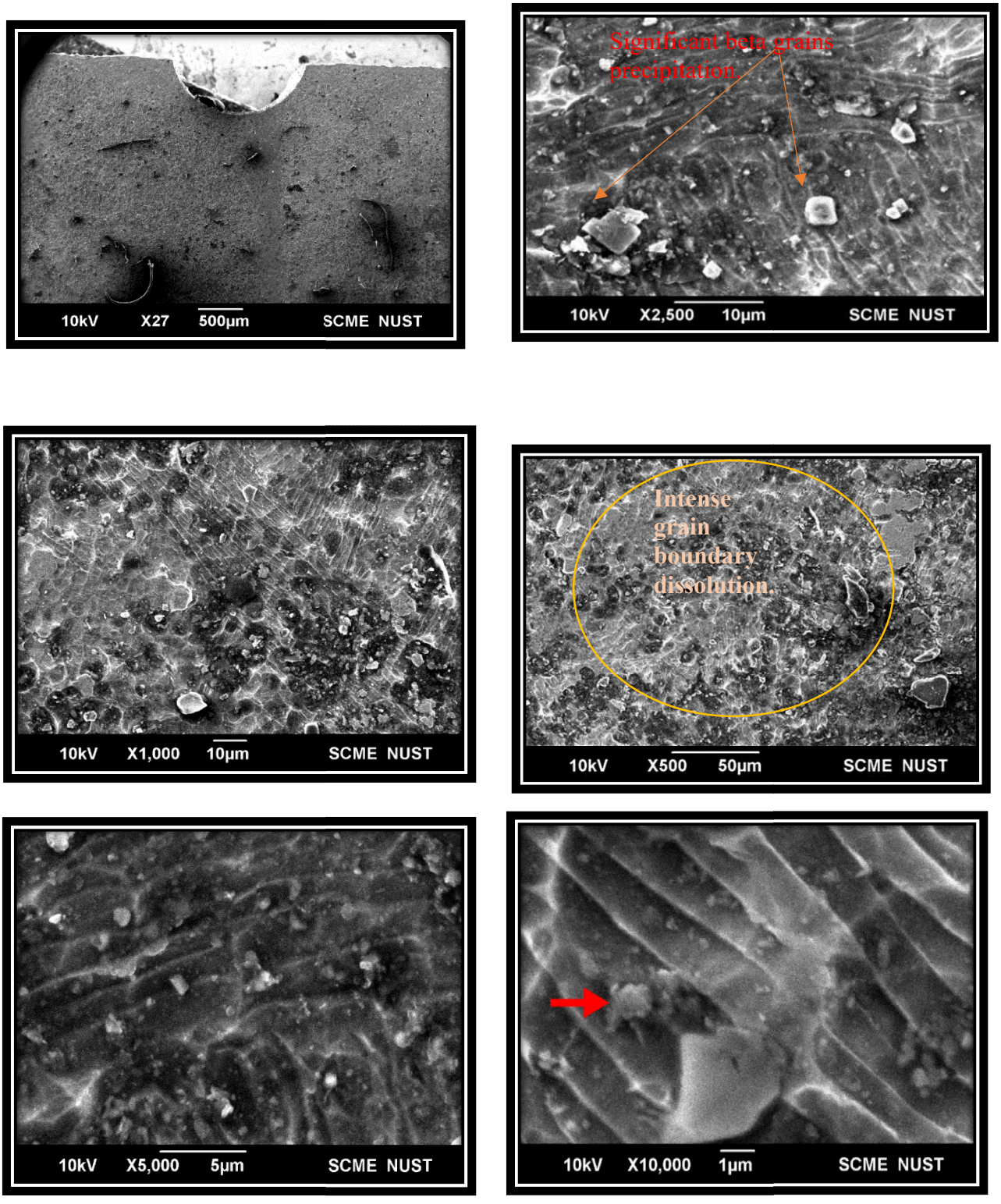


Figure 5: Non-coated Ti–6Al–4V sample

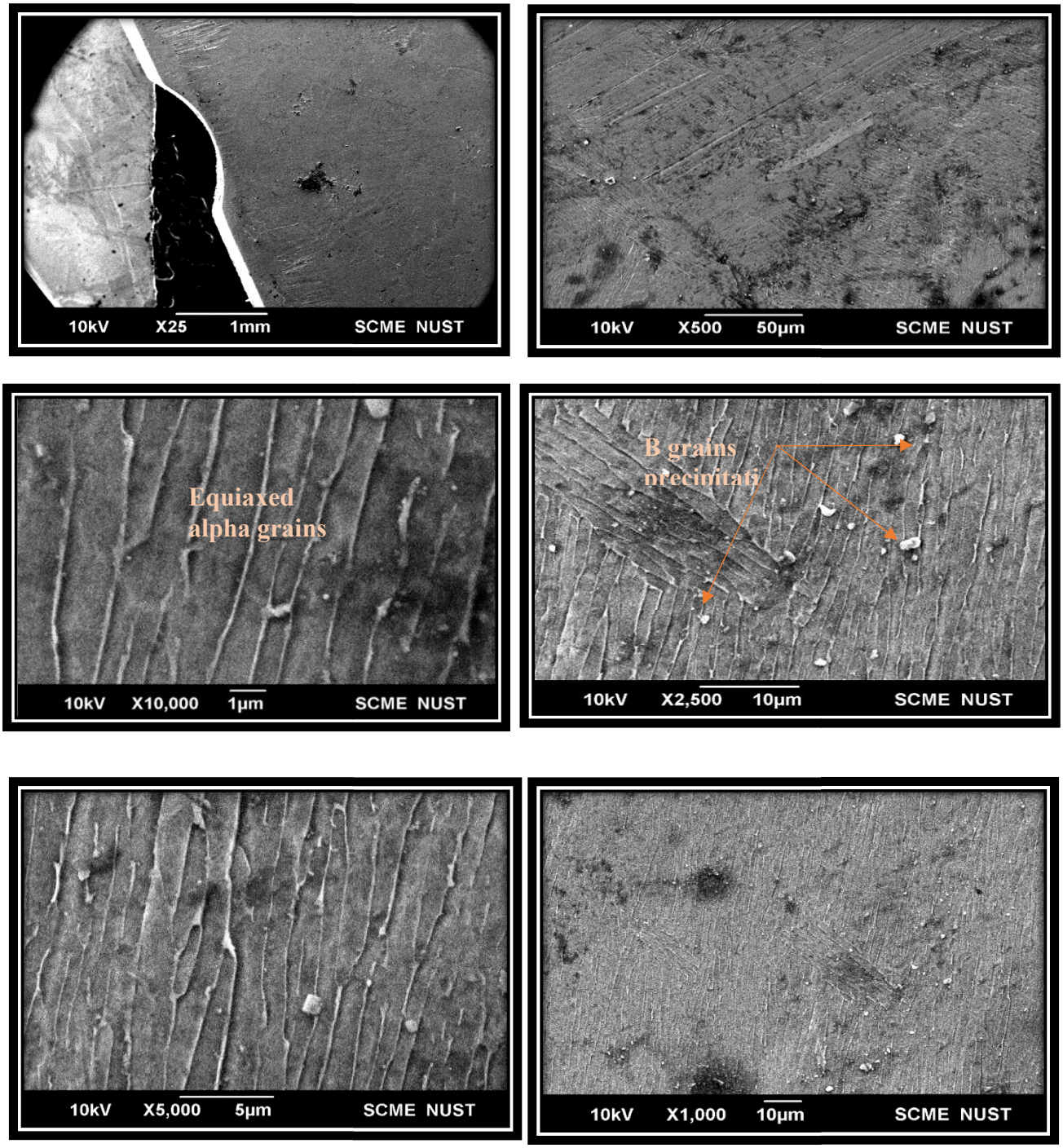


Figure 6: Non-coated Ti–6Al–4V sample.

Conclusion

In the current study, the alloy of titanium Ti–6Al–4V is investigated through stress corrosion cracking under high load and aggressive environment. It is concluded that the intensity of load applied directly affects the strength of the specimen. The tensile strength and elongation of coated specimens are found around 31.72 % and 41.58% increase respectively as compared to non coated sample. Overall, an increase in load increases the crack propagation and depth in both samples. Microstructure for non-coated specimen depict preferential grain boundary attack and crack propagation/initiation site. Some regions demonstrate clearly that grain boundaries are affected by the elemental depletion or weakening from oxidation, chemical attack, or embrittlement. Intergranular corrosion results from weakening of grain boundaries due to chemical attack in the corrosive environment. Precipitates and grain boundaries

in the present alloy can serve a crack initiation due to hydrogen diffusion. Cadmium coating proved to be most suitable cost-effective alternative for commercial Ti-6Al-4V alloy.

References

[1] Baragetti S, Arcieri EV. Corrosion fatigue behavior of Ti-6Al-4V: chemical and mechanical driving forces. Int J Fatigue 2018; 112: 301–307

[2] "Product Developments and applications in conventional Titanium alloys", Titanium '95: Science and Technology, (1995) vol I, pp. 1- 20

[3] "Proceedings of Conference - Fundamental aspects on Stress Corrosion Cracking", sept. 11-15, 1967, Ohio, USA, ed. NACE 1969, per gentile concessione del Dott. G. Rondelli, CNR di Milano.

[4] M. J. Blackburn, J. A. Feeney, T. R. Beck, "Stress-Corrosion Cracking of Titanium Alloys", pp. 67-292 in Advances in Corrosion Science and Technology, Vol. 3, Plenum Press, New York (1973).

[5] Zhou, H., Li, C., Yang, H., Luo, X., Yang, G., Li, W., ... & Li, C. (2019). Pores structure change induced by heat treatment in cold-sprayed Ti6Al4V coating. Journal of Thermal Spray Technology, 28(6), 1199-1211.

[6] Aly OF. Modeling of Primary Water Stress Corrosion Cracking At Control Rod Drive Mechanism Nozzles of Pressurized Water Reactors. São Paulo: IPEN/CNEN-USP 2006. (D. Sc. Thesis in Portuguese). Access on May 2012: http://www.teses.usp.br/ teses/disponiveis/85/85134/tde-22032012-154040/pt-br.php

[7] Hertzberg, RW. Deformation and fracture mechanics of engineering materials, New York, N.Y.: John Wiley & Sons, 1989.

[8] Loto, C. A. (2017). Stress corrosion cracking: characteristics, mechanisms and experimental study. The International Journal of Advanced Manufacturing Technology, 93(9), 3567-3582.

[9] Sheinker, A. A., & Wood, J. D. (1972). Stress corrosion cracking of a high strength steel. In Stress Corrosion Cracking of Metals—A State of the Art. ASTM International.

[10] Thompson, D. H. (1972). Stress Corrosion Cracking of Copper Metals. In Stress Corrosion Cracking of Metals—A State of the Art. ASTM International.

[11] Parkins, R. N. (1981). Environment sensitive fracture of metals, Metallic corrosion. Proc. 8th Int. Cong. On Metallic corr.(8th ICMC), 3, 2180-2200.

[12] Scully, J. C. (1966). The characteristics of transgranular stress-corrosion cracking. British Corrosion Journal, 1(9), 355-359.

[13] Parkins RN (1981) Environment sensitive fracture of metals, Metallic corrosion, Proc. 8th Int. Cong. On Metallic corr. (8^{th} ICMC), Vol. III, p 2180–2200.

[14] Copson, H. (1959). Physical metallurgy of stress corrosion fracture. Interscience, 256.

[15] Liu, S., & Shin, Y. C. (2019). Additive manufacturing of Ti6Al4V alloy: A review. Materials & Design, 164, 107552.

[16] Zhou, H., Li, C., Yang, H., Luo, X., Yang, G., Li, W., ... & Li, C. (2019). Pores structure change induced by heat treatment in cold-sprayed Ti6Al4V coating. Journal of Thermal Spray Technology, 28(6), 1199-1211.

[17] J. C. Park and S. J. Kim, "Electrochemical properties in a seawater environment of 5456-H116 Titanium alloy subjected to optimal friction stir processing," Physica Scripta, vol. T139, p. 5, 2010.

BINDING OF DNA AND CYTOTOXICITY OF TWO CU(II) COMPLEXES WITH CO-LIGANDS

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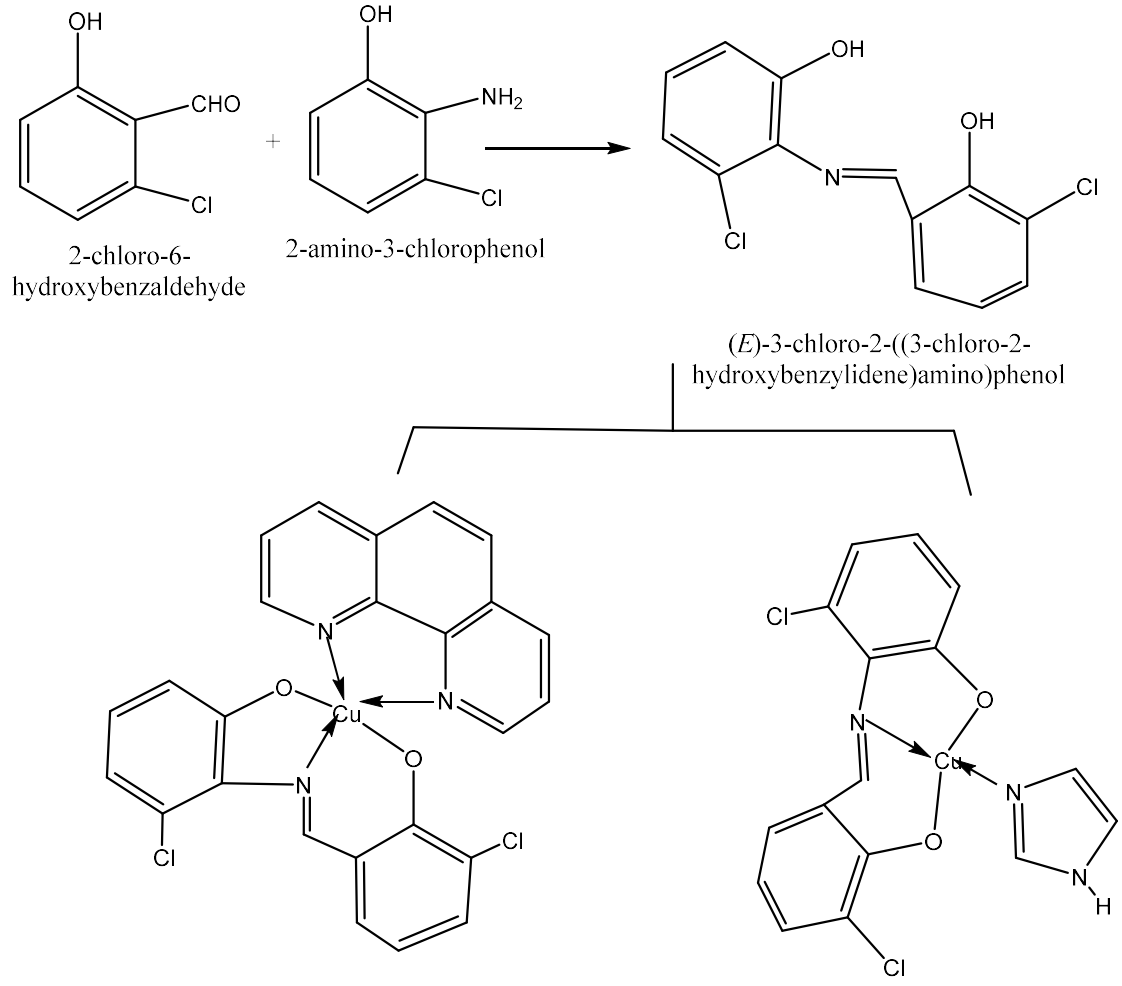
ABSTRACT
The compounds [CuL(phen)] and [CuL(Imz)] are synthesized, characterized, and tested for biological activity (H2L= 3-chloro-2-((3-chloro-2-hydroxybenzylidene) amino)phenol, Imz = imidazole , phen = 1,10-phenanthroline, and). Intercalative DNA binding has been found to be cytotoxic and anticancer in a biological investigation. IC50 values of 1 and 2 are shown to be extremely promising for the human lung cancer A549 cell line (0.67 and 0.59 M, respectively) and the breast cancer MCF7 cell line (6.30 and 8.88 M, respectively). Complexes C1 and C2 appear to be more effective than several anticancer medicines evaluated for the human lung cancer A549 cell line. Most importantly, C1 and C2 are substantially less hazardous to the normal cell line L132, as indicated by cell viability in the presence of these two compounds.



Scheme 1. The Schiff base and complexes are synthesized.

Keywords: UV-VIS spectra; A549 cell line; MCF7 cell line; DNA binding; Cu(II) complex;

1. Introduction

In the last few decades, there has been a surge in activities to find or construct complexes with binding to DNA [1], cutting action of DNA and cytotoxicity to examine the potential of producing novel anticancer metallodrugs[2]. The ligand in metallodrugs is critical for the metal complex's binding to DNA[3]. That targets anticancer drugs. In addition[4], the ion of metal may also function in the metal complex's efficacy as a medication[5]. Cu(II), for example, as a metal ion with redox activity, can stimulate protein or DNA modification via an oxidative mechanism[6]. These complexes were found to be more potent than various anticancer medications evaluated in human lung cancer A549[7] and breast cancer MCF7 cell lines[8], according to their IC50 values[9]. In our constant search for complexes with acceptable ligands as donor with extra heterocycles, we have synthesized two Cu(II) complexes, one six-coordinate and the other four-coordinate. Biological activities include DNA binding, cytotoxicity, and anticancer action.

4. Experimental

4.1. Chemicals

Aldrich provided 2-amino-3-chlorophenol, 2-chloro-6-hydroxybenzaldehyde, and imidazole. Sigma-Aldrich (USA) provided calf thymus DNA. In contrast, Merck provided Cu(OAc)2 H2O (GR),1,10-phenanthroline monohydrate ,(DMF, GR), methanol, ethanol (GR), , and DMSO

4.2. Preparation of Schiff base (H2L). 2-amino-3-chlorophenol and 2-chloro-6-hydroxybenzaldehyd was made using the method described. Yield 71%. Anal Calc. for 282.12 $C_{13}H_9Cl_2NO_2$: C, 54.87; H, 3.54; N, 5.12. Found: C, 55.35;H, 3.22; N, 4.96%.

4.3. Complexes preparation

4.3.1 [CuL(ph)]

During 30 minutes of stirring at room temperature, then, over 30 minutes at room temperature, this reaction mixture was gently added with stirring to a (0.001mol) solution of H2L in (10mL, 25 ˚C) methanol. The solution was separated by a dark-colored substance. The result was purified, rinsed completely with methanol, then with water, and finally dried in vacuum. At room temperature, this chemical was recrystallized from (1:1) CH_3CN: CH_3OH to obtain good single crystals. It is worth noting that after prolonged exposure (or in vacuum), these crystals become amorphous after losing their water of crystallization .Anal. Calc. for $C_{16}H_{11}Cl_2CuN_3O_2$: C, 46.68; H,2.69; N, 10.21; Cl,17.22; Cu,15.43 .Found: C, 45.78; H,3.15; N, 10.65; Cl,17.08; Cu,14.87 %. ESI-MS in CH_3CN: m/z 411.73 [M]+.

4.3.2. [CuL(z)] (**2**)

A dark color solution was generated by gently adding (0.001 mol) imidazole in (15 mL) methanol to a (0.002 mol) solution of $Cu(OAc)_2.H_2O$ in (20 mL, 5 ˚C) methanol in methanol (20 mL, 5˚C) for 20 minutes with stirring at ambient temperature (23˚C). This solution was then progressively added to a solution of H2L (0.002 mol) in methanol (30 mL, 25 ˚C) for 30 minutes at room temperature with stirring. A substance separated the solution. The solid was filtered, thoroughly washed with methanol, and dried in a vacuum. This compound was recrystallized at RT from (1:1) CH_3CN :CH_3OH while suitable single crystals were obtained. X-ray crystallography was also used to characterize this molecule. Anal. Calc. for $C_{25}H_{15}Cl_2CuN_3O_2$: C,57.32; H, 2.89; Cl,13.53 ;N, 8.02 ,Cu,12.13. Found: C,57.11; H, 3.12; Cl,13.09 ;N, 8.43 ,Cu,12.07%. ESI-MS in CH_3CN: m/z 523.86 [M]+.

4.4. Physical measurements Flexer SQ 300 MS Mass Spectrometer from Perkin Elmer collected mass spectra in mode of ESI. An elemental analyzer Perkin-Elmer 24 ˚C was used to perform the microanalyses (C, H, and N). In addition, a quartz dewer was used to record frozen glass spectra in liquid nitrogen. Electrochemical measurements were performed using at 298K with a bioanalytical system CV-27 electrochemical analyzer and a BAS type X-Y recorder under dinitrogen . In addition, A Shimadzu IR Affinity - 1 FT-IR spectrometer and a KBr pellet were used to collect infrared spectra. Furthermore, a pair of matching quartz cells with a route length of 1 cm was used to a Jasco V-570 UV/VIS/NIR spectrophotometer, record electronic absorption spectra. Finally, the cell was constructed using the platinum working electrode, an Ag/AgCl reference electrode, and a platinum auxiliary electrode are used in the typical three-electrode setup. As a supporting electrolyte, ([N(n-Bu)4]ClO4) was employed.

4.6. Methods for biological activity

4.6.1. DNA binding studies

To determine the binding constant for compounds 1 and 2, the electronic spectra of these compounds were recorded using a Jasco V-570 UV/VIS/NIR spectrophotometer with incremental amounts of (CT-DNA). The titration tests were carried out in a 10 mM Tris–HCl buffer with the complex concentration constant. The CT-DNA concentration varied between 0 and 40 M. (pH 7.6).

4.6.2. Cytotoxicity studies

4.6.2.1. Cell culture and treatment

Human lung cancer A549 cells, human breast cancer MCF7 cells, normal human keratinocyte HaCaT cells, and human lung embryonic L132 cells were donated by NCCS Pune. In T-25 mm NUNC cell culture flasks, these cell lines were grown in DMEM high glucose medium with 10% Fetal Bovine Serum Penicillin (100 units/ml), streptomycin (100 g/ml), gentamycin 50 g/mL. In addition, Amphotericin B (2.5 g/ml) was added in a CO2 incubator at 37 ˚C (5 % CO2 and 95 % O2). As a result, they reached 70-80 % confluence, and these cells were trypsinized and sub-cultured for several experiments.

Results and discussion

We investigated Schiff base reaction with $Cu(OAc)_2.H_2O$ in methanol in the presence of either imidazole or 1,10-phenanthroline as a co-ligand to form complexes[10]. The ν(C=N) band appears at 1625 cm^{-1} in the IR spectra of the free Schiff base ligand. This changes to 1603 cm^{-1} and 1607 cm^{-1} in the IR spectra of both complexes. They suggest N-azomethine chelation, deprotonation, and O-phenolate coordination to the metal ion. These are only moderately soluble in acetonitrile and methanol. However, they are quite soluble in DMF and DMSO[11].

In the visible region, the UV spectra of these two molecules are remarkably similar. However, the bands' intensities are discovered to stand out.

At roughly 676 nm (= 14,792 cm^{-1}), compound C1 displays a weak broad d-d band. In contrast, compound C2 exhibits a weak ligand field band at approximately 634 nm (λ= 15,772 cm^{-1})[12]. Compound C1 has a large LMCT in the visible area, except for the slight ligand field transition. The charge transfer band at 467 nm (λ= 21,413 cm^{-1}) for C1 with 1,10-phenanthroline as the ligand is significantly stronger than 2 with imidazole as the coligand at 474 nm (λ = 21,097cm^{-1}). Moreover, the overall intensity of C1 is much larger than that of C2, showing that their electrical architectures are different[13].

DNA binding studies

DNA linking studies were completed utilizing spectroscopy of UV Vis. UV absorbance titration tests were performed using incremental quantities of (CT-DNA) in a 10 mM Tris–HCl buffer (pH 7.5)[14]. At the same time, they are maintaining a constant concentration of 2x 10^{-4} M in the single complex. Figure 4 shows the absorption spectrum of complexes in the presence and absence of CT-DNA. On CT-DNA addition, both complexes appear to lower molar absorptivity of the absorption band of * (hypochromism of 47.5 % for C1 and 82.5 % for C2), indicating robust DNA-complex binding. These modifications occur in complexes that intercalate with DNA via an intensive stacking contact between DNA base pairs and aromatic chromophores. To calculate the quantity rapprochement of DNA linking capacity. We calculated Kb of the complexes for linking with CT-DNA by utilizing the next Eq. (1).

$$\frac{[DNA]}{(\varepsilon_a - \varepsilon_f)} = \frac{[DNA]}{(\varepsilon_b - \varepsilon_f)} + \frac{1}{K_b(\varepsilon_b - \varepsilon_f)}$$

Where [DNA] denotes the CT-DNA concentration employed, and a, f, and b denote the apparent extinction coefficients of the complex, i.e., Abs/[complex] in DNA existence, non-attendance, and DNA Completely bound, respectively.The plot of [DNA] versus [DNA]/(εa − εf) results in slope = 1/(εb − εf), and crossover = 1/Kb(εb − εf), respectively. Kb is determined from the proportion between the intercept and the slope. The data of Kb are 1.89 10^5 M^{-1} for compound C1 (R2 = 0.99654 for 14 points) and 3.67 10^5 M^{-1} for compound 2 (R2 = 0.99786 for 10 points), respectively. These data are similar to that of a traditional intercalator like EB in a 20 mM buffer of Tris- HCl (pH 7.33) (Kb = 1.75 × 10^5 M^{-1}). The more proportion of hypochromism(82.5%) and a more Kb data of compound C2 compared to compoundC1 elucidates its more tendency to ligation that arises attributed to the planar structure with 4 chalets of 2[15]. They allowed the intercalated ligand to be inserted into the DNA base pair effectively;

enhanced stacking interaction increases binding ability. Table-3 shows a comparison of Kb values of compounds

Table 1. Values of DNA linking constant for compounds.

Compounds	K_b (M^{-1})
H2L	1.75×10^5
[CuL(ph)]	$1.89\ 10^5$
[CuL(z)]	$3.67\ 10^5$

Viscosity measurements

Both compounds' spectroscopic examinations of DNA intercalation provide additional proof. The concentration of added complex was changed to assess the viscosity of CT-DNA. When CT-DNA solution interacts with substrates that bind in the intercalative mode, the relative viscosity of the solution usually increases. Because the metal complex is inserted between DNA base pairs, the base pairs split, increasing the overall length of DNA and thus increasing the DNA viscosity. The effect of increasing the amount of complex 1 and 2 on the relative viscosity, as shown in Fig. 1, indicates a constant rise in the viscosity of the DNA, indicating that the complexes attach to DNA in an intercalative way. It's also worth noting that the viscosity rise is more pronounced in 2. The results support the spectral studies, which suggest that complex 2 binds more strongly to CT-DNA. [Complex]/[DNA]

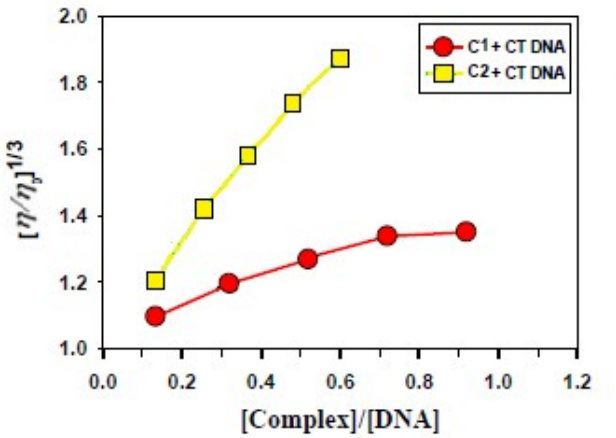


Fig.1. At room temperature in 10 mM Tris.HCl buffer, increasing the number of complexes affect the relative viscosity of CT-DNA (100 M)

2.5.1. Cytotoxicity

The MTT assay was used to evaluate the cytotoxicity of compounds C1 and C2 on lung cancer A549, breast cancer MCF7, human lung L132, embryonic normal, and human keratinocyte HaCaT standard cell lines. In addition, the vitality of the cells was assessed by converting yellow MTT into purple formazan product in living cells using mitochondrial dehydrogenase enzyme activity. Both malignant (MCF7 and A549) and conventional cell lines (MCF7 and A549) showed a concentration-dependent influence on cell viability (HaCaT, L132).

The results show that even at a low concentration of 0.30 M, the compounds are toxic to A549 cells, evidenced by their respective cell viability of 84% and 70 %, respectively. At the same time, toxicity is much less in normal HaCaT cells at the same dose (cell viability is 93% for C1 and 89 % for C2. Almost no toxicity was observed for L132 lung cells. Cells of A549 treated with 0.6 M of C1 and C2 have a viability of 65% and 50 %, respectively. That compared to 90 % for L132 cells treated with the same dose of compounds. In addition, compoundC1 exhibits similar results in normal HaCaT cells, with 95 % cell viability at 0.6 M dosage. Similar results were seen when A549 cells were given a 1.25 M dosage of compounds; cell viability was reduced to 40% for both compounds.

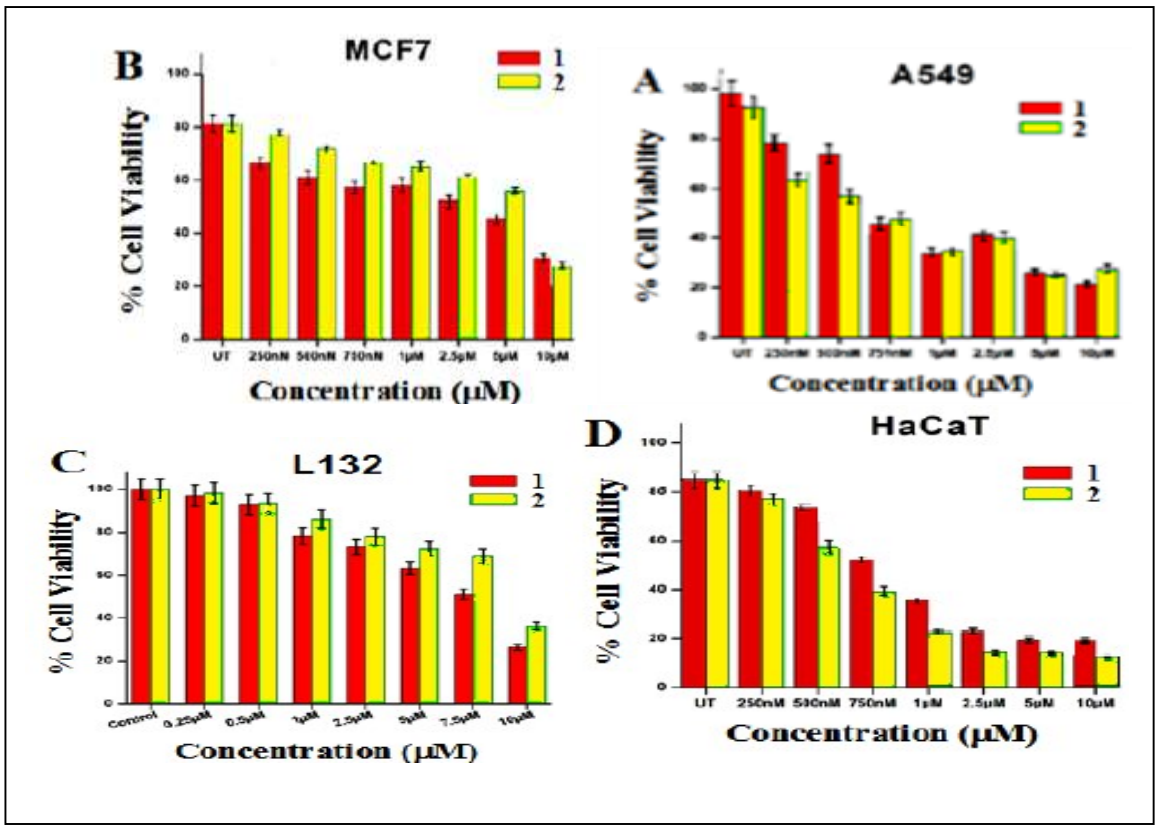


Fig. 2. MTT assay for 1 and 2. A549 cell line, MCF7 cell line, L132 cell line, and HaCaT cell line.

On the other hand, the compounds appear to be substantially less harmful to L132 normal cells, with cell viability of 78 and 86 percent, respectively, after treatment with 1 M doses of compounds. Compound C2 was found to be highly toxic to HaCaT cells at the same 1 M dose. However, cell survival appears to be moderate (50%) when normal HaCaT cells are treated with it. When the effect of 2.5, 5, and 10 M doses of compounds on lung cancer A549 cell lines versus L132 lung normal cells are evaluated, the dramatic difference in cell viability is observed once more. Compound C1 is more harmful than C2 in the MCF7 cell line over the whole concentration range examined but substantially less toxic in A549 cells. Again, a substantial difference in cell viability is seen when the effect of 2.5, 5, and 10 M doses of compounds on lung cancer A549 cell lines versus L132 lung normal cells is evaluated. Compound C1 is more harmful than compound C2 in the MCF7 cell line over the whole concentration range examined but substantially less toxic in A549 cells. However, both compounds are exceedingly toxic at concentrations of 2.5 M and above towards cells of HaCaT .However, at 1.0 M, compound C1 is discovered to be notably less hazardous than C2, as evidenced by their cell viabilities of 51 % and 20 %, respectively. Table 2 shows the IC50 values for compounds calculated from this plot for both the cancer cell lines A549 and MCF7 and the two standard cell lines.

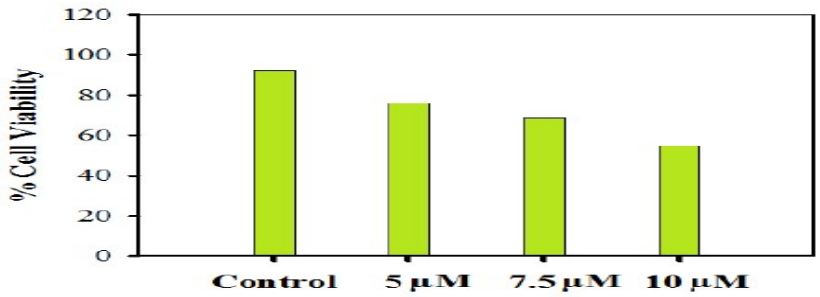


Fig. 3. Cell viability of human lung cancer cells with 5 M, 7.5 M, and 10 M free Schiff base ligand N-salicylidene-o-aminophenol The A549 cell line after 24 hours.

It should be noted that the IC50 values for A549 cells are higher than the IC50 value for cisplatin (4.5 M for A549). The IC50 values for compounds for the MCF7 cell line are somewhat higher than those reported for cisplatin (3.1M for MCF7) and significantly lower than those reported for carboplatin (35.88 M for MCF7). We recently reported a few Cu(II)/Zn(II) complexes with a carbohydrate ligand and 1,10-phenanthroline as a co-ligand. They were found to be up-and-coming anticancer agents tested for the breast cancer MCF7 cell line and the human lung cancer A549 cell line based on their IC50 values. However, these Cu (II) compounds were hazardous to the normal L132 and HaCaT cell lines. The two compounds investigated in this work, on the other hand, were shown to be substantially less hazardous to regular L132 cell lines. According to the findings, they may be helpful as anticancer therapy for the human lung cancer A549 cell line.
In contrast, the two chemicals investigated in this study were determined to be significantly less dangerous to conventional L132 cell lines, emphasizing their utility as anticancer medications specifically for human lung cancer A549 cell lines.
To assess the relevance of our findings, we compared the IC50 and Kb values of compounds to those of several recently published copper (II) complexes for A549 and MCF7 cell lines. According to the comparison (as indicated by lower IC values), the compounds exhibit a higher Kb intrinsic binding constant and a more cytotoxic effect in the A549 cell line. According to the comparison (as indicated by lower IC values) than most Cu(II) complexes. However, no cytotoxic effect on any standard cell line has been found. In this work, complexes were tested in both carcinogenic and noncancerous cell lines, and they showed a substantial difference in cytotoxicity in lung cancer A549 versus human lung normal cell line L132, showing their potential to operate as anticancer therapeutic agents. The therapeutic index (TI) of compounds was calculated by comparing the IC50 values of the complexes in normal and cancer cells to determine their respective antiproliferative effects on malignant vs. normal cells.

Table 2. The IC50 values for compounds were obtained using the MTT assay's plot of cell viability vs. concentration

Cell line	IC50 (μM) for	
	CompoundC1	CompoundC2
A549	0.73	0.64
MCF 7	7.11	9.21
L132	8.32	10.23
HaCaT	1.34	0.97

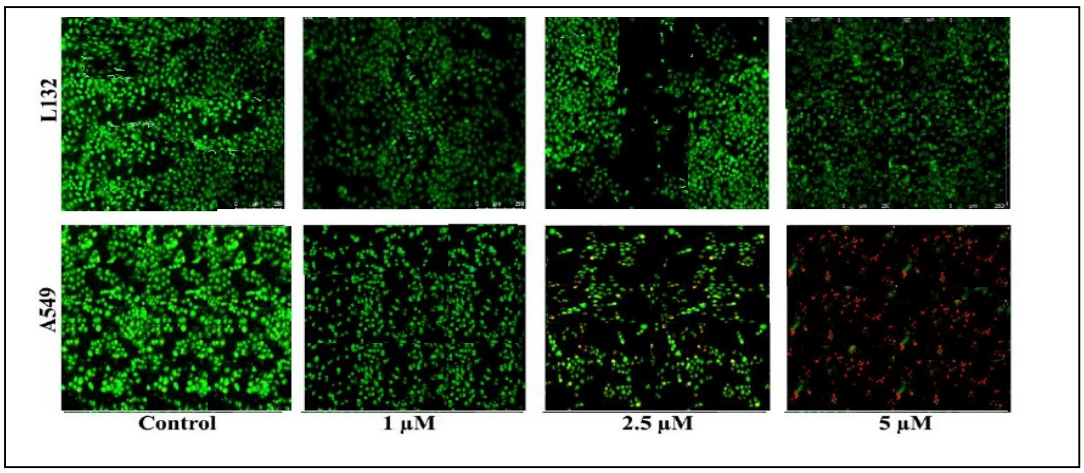


Fig. 4. AO/PI staining results for compound C2 using A549 and L132 cell lines. Scale bar: 250 m

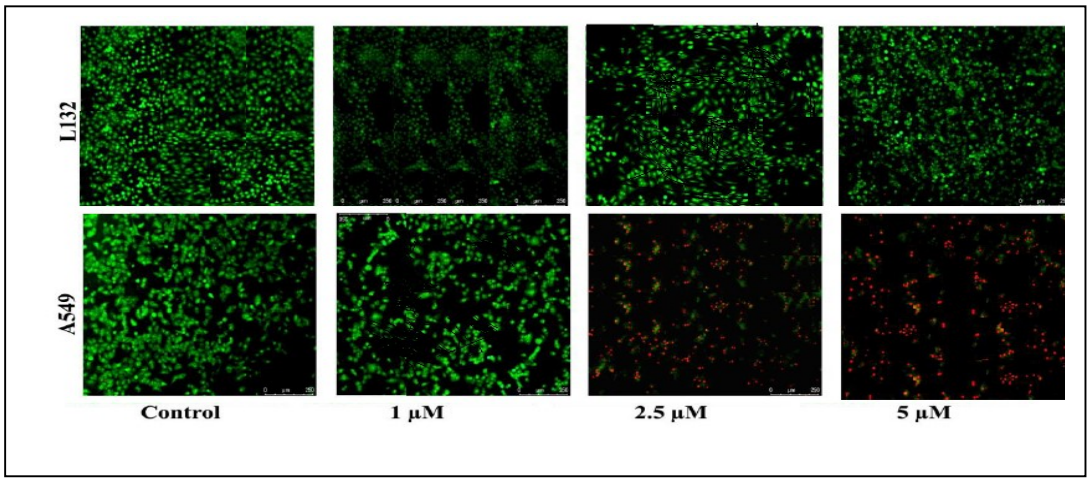


Fig. 5. AO/PI staining findings for compound 2 using A549 and L132 cell lines. Scale bar: 250 m

2.5.2. Dual-Fluorescence Viability: A549 and L132 Cells AO/PI Dual Staining Assay

This fluorescence microscopy-based dual staining experiment is used to investigate the induction of cell apoptosis in the presence of complexes. Nucleic acid-binding dyes acridine orange (AO) and propidium iodide (PI) were used. AO is permeable to both live and dead cells, and it produces green fluorescence in all nucleated cells. On the other hand, PI only enters dead, dying, and necrotic nucleated cells with damaged membranes, staining and creating red fluorescence in all of them. Due to Förster resonance energy transfer, when cells are stained with both AO and PI. All dead nucleated cells glow red, and all live nucleated cells fluoresce green (FRET). (a)The following morphological alterations were detected in the treated cells using this staining approach. (b) Early apoptotic cells with nuclear condensation produce orange-green fluorescence in the treatment with 2.5 and 5 M concentrations of the respective drugs. Early apoptotic cells with nuclear condensation produce orange-green fluorescence in the treatment with 2.5 and 5 M concentrations of the respective drugs. (c) Late apoptotic cells with severely compacted or fragmented chromatin and orange to red fluorescence were detected in the treatment with 2.5 and 5 M doses of the various drugs. (d) In the case of A549 cells treated with 5 M of each of the complexes, necrotic cells fluoresce red with no evidence of chromatin fragmentation. While no such red fluorescence is seen in L132 cells with 1-5 M concentrations for compounds, implying that no or very little DNA damage occurs at these doses. The cell viability reported in their MTT assay is consistent with these findings, indicating the significant disparities in cell death in A549 and L132 cells treated with complexes. Both complexes may have caused cell death by apoptosis and necrosis, based on these morphological alterations. It should be noted that in vitro DNA binding tests revealed that the two chemicals under investigation are capable of DNA intercalation. This does not rule out the possibility that the observed cell death is caused by this intercalation, as the structural stability of these complexes once they enter the cell membrane will be crucial. Though this possibility cannot be ruled out entirely at this time, other possibilities include them being reduced to Cu(I) in the reducing environment after entering the cell membrane.

Following ligand dissociation (as evidenced by their electrochemical activity). They may either interact with the proteasome [2d] to cause apoptosis or mix with dioxygen to produce reactive oxygen species (ROS). Thus, cancer cells have (ROS) levels than normal cells, leading to oxidative breakage of DNA polynucleotide chains and apoptosis. At the same time, cancer cells do contain higher quantities of reactive oxygen species (ROS) than normal cells. However, compared to normal cells, cancer cells contain higher quantities of reactive oxygen species (ROS). With the current experimental evidence, this is the most plausible answer we can offer.

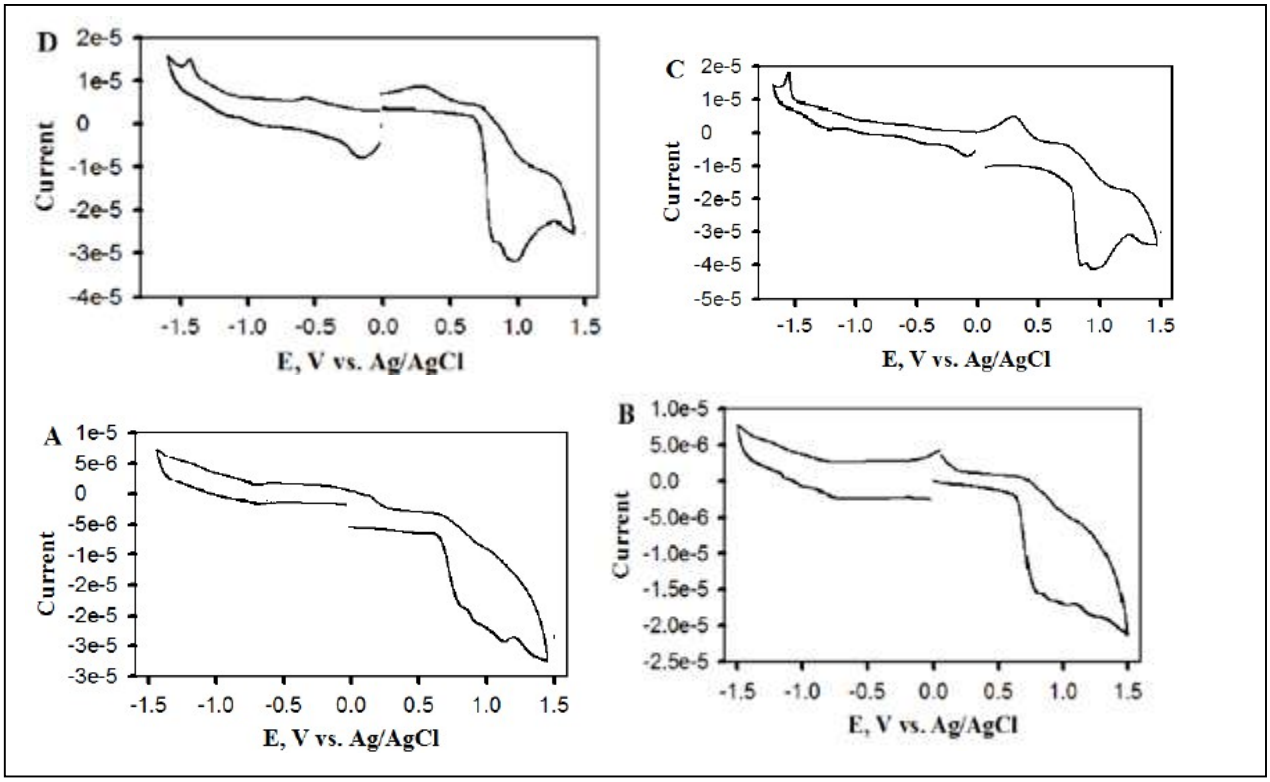
It should be noted that the cytotoxicity of the free Schiff base ligand was also studied for 24 hours in the human lung cancer A549 cell line at various dosages (2.5 M, 5 M, 7.5 M, and 10 M). With a 2.5 M concentration of the free ligand, no cell death was detected. However, with 5 M, 95.5 M, and 91 percent of the free ligand, cell viability was determined to be roughly 96.5 %t, 95.5 %, and 91 %, respectively. Thus, the free ligand can induce 9-10% cell death in the presence of a 10 M concentration of free ligand.

That meaning that the free ligand can induce 9-10% cell death if the compounds undergo ligand dissociation after penetrating the cell membrane. Thus, the toxicity was seen in compounds (e.g., at dosages of 5 M and 10 M, respectively) could be attributed to the free Schiff base ligand. Otherwise, the complex as a whole should be responsible for the reported toxicity.

2.6. The outcomes of electrochemistry

A platinum working electrode was used to study the electrochemical behavior of compounds 1 and 2 in DMF containing 0.1 M $[N(n\text{-}Bu)_4]ClO_4$. Both compounds' cyclic voltammetric behavior is independent of scan directions, yielding oxidation and reduction peaks at nearly identical positions regardless of scan direction. (Fig.5, panels A, B for C1, and panels C, D for C 2, respectively. Compound 1 exhibits a large reduction wave near 1.25 V; reversing this scan results in three consecutive oxidation waves at 0.78, +0.839, and +1.17 V, respectively. When scanned within -1.5 - +1.5 V, reversing the scan generates reduction waves at +0.78and +0.10. On scan reversal, Compound C2 exhibits a large reduction wave of about 1.55 V (against Ag/AgCl), a small oxidation peak at 1.25 V**,** and another oxidation peak near 0.0915 V. A positive scan shows an oxidation wave near +0.88 V,

Fig. 6. The compounds (1.25 103 mol L-1) in DMF with 0.1 M [N(n-Bu)4]ClO4 at 100 mVs C1. A, B for 1, C, D for C2, respectively. followed by three reduction waves at +1.31, +0.789, and +0.3234 V, respectively. The reduction peak at 0.0865 V is connected to the oxidation wave at +0.3235 V, showing a partially reversible redox process. Hence, the absence of any reversible or almost reversible Cu(II)/Cu(I) redox pair in these complexes' cyclic voltammograms indicates that they undergo irreversible oxidation



and reduction involving both the metalcore and the ligand center. Since the redox potentials of Cu(II)/Cu(I) complexes are dependent on the thermodynamic stability of the two oxidation states in a given ligand environment. As a result, none of them preserve the same shape in both oxidation states.

3. Conclusions

Their DNA binding studies with calf thymus DNA demonstrated that both compounds readily intercalate with binding constants of **1.89 10^5** M^{-1} and **3.67 10^5**M^{-1}. Compounds 1 and 2 are cytotoxic to human breast cancer MCF7 cells and human lung cancer A549 cells in vitro. Their IC50 values suggest that they are quite potent for the A549 cell line in particular. They are also discovered to be substantially less harmful to the L132 human lung embryonic normal cell line. The AO/PI dual-labeling data strongly

suggest that these complexes exert anticancer action by activating both apoptotic and necrotic cell death pathways.

References

1) Mini, S.; Sadasivan, V.; Meena, S.S. and Pramod Bhatt., (2015), Synthesis and Spectral Studies of Metal Complexes of a Schiff Base Derived from (2-amino-5-chlorophenyl) Phenyl Methanone, Spectro. Chim.Acta. , vol (15), 598-604
2) Rajesh K. Singh, Sonia Devi, Prasad, D.N.,(2011), Synthesis physicochemical and biological evaluation of 2-amino-5-chloro benzophenone derivatives as potent skeletal muscle relaxants, Arab. J. Chem.,
3) Mini, S.; Meena, S.S.; Pramod Bhatt, Sadasivan, V., and Vidya, V.G.,(2013), Synthesis and characterization of Fe(III) complex of an azo dye derived from (2-amino-5-chlorophenyl) phenyl methanone, AIP Conf.Proc.,1536, 1011-1012.
4) Rajendra K. Jain; Anand. P. Mishra, (2012), Microwave synthesis, spectral, thermal, 3D Molecular modeling analysis and antimicrobial activities of some transition metal complexes of Schiff bases derived from 5-brmo salicylaldehyde, J.Seb.Chem. Soc., 77, 1013-1029.
5) Chohan, Z.H.; Iqbal, M.S.; Aftab, S.K.,(2010), Design, synthesis, characterization and antibacterial properties of copper(II) complexes with chromone derived compounds, Appl. Organomet. Chem., 24, 47-56.
6) Khansari, A., Enhessari, M., Salavati-Niasari, M.: Synthesis and characterization of nickel oxide nanoparticles from Ni(salen) as a precursor. J. Clust. Sci. 24, 289–297 (2013)
7) Khalaji, A.D.: Preparation and characterization of NiO nanoparticles via solid-state thermal decomposition of Ni(II) complex. J. Clust. Sci. 24, 189–195 (2013)
8) Farhadi, S., Kazem, M., Siadatnasab, F.: NiO nanoparticles prepared via thermal decomposition of the bis(dimethylglyoximato) nickel(II) complex: a novel reusable heterogeneous catalyst for fast and efficient microwave-assisted reduction of nitroarenes with ethanol. Polyhedron 30, 606–613 (2011)
9) Farhadi, S., Roostaei-Zaniyani, Z.: Preparation and characterization of NiO nanoparticles from thermal decomposition of the[Ni(en)3](NO3)2 complex: a facile and low-temperature route. Polyhedron 30, 971–975 (2011)
10) 26. Elif Eda Şengül, Tolga Göktürk, Cansu Gökçe Topkaya, Ramazan Gup , Synthesis, Charactrization and Interaction of CU(II) Complexes With Hydrazone –Schiff Base Ligands Bearing Alkyl Quaternary Amonium Salts J. Chil. Chem. Soc., 65, N°2 (2020) 4754-
11) , Abdul Khader; Gowthaman, N.S.K.; and Kesavan, Mookkandi Palsamy (2020) "Synthesis, Characterisation and Biological Evaluation of Tyramine derived Schiff base Ligand and Its Transition Metal(II) Complexes," Karbala International Journal of Modern Science: Vol. 6 : Iss. 2 , Article 15. Available at: https://doi.org/10.33640/2405-609X.1637
12) Faeza Haseen Ghanim and Zuhair A. Shafiq Rehab Khadem Al- shemary, Preparation, Characterisation and Biological Activity Studies for Some Mixed Ligands Complexes of 1, 10-Phenanthroline and Schiff Base Ligand with Metal Ions, Diyala Journal for sciences,2017,13,3, 150-161
13) Al-Shemary, R.K. (2016)Microwave Preparation, Spectral Studies and Antimicrobial Activities Evaluation of $Mn^{(II)}$, $Ni^{(II)}$, $Hg^{(II)}$, $Co^{(II)}$ and $Cu^{(II)}$ Complexes with Schiff Base Ligand, Ibn Al-Haitham Journal; 30(3):72-85.
14) H. Rajak, C. K. Behera, R. S. Pawar, P. K. Singour, and M. D. Kharya, "A novel series of 2,5-disubstituted 1,3,4-thiadiazoles as a potential anticonvulsant agent," Chin. Chem. Lett., vol. 21, pp. 1149-1152, Oct. 2010.
15) Michael, D.; Thi, T. H. N.; Jochen L.; "Investigations into the mechanism of lactamization of lactones yielding in a novel route to biologically active tryptamine derivatives", J. Tetrahedron, 60(21), 4567-4578, 2004.

16) Mohamed, F. K.; "Synthesis, reactions and antimicrobial activity on some novel phthalazinones derivatives", Egypt. J. Chem. 53(5), 645-660, 2010.
17) Karam, N. H.; Tomma J. H.; Al-Dujaili, A. H.; "Synthesis and characterisation of heterocyclic compounds derived from 4-hydroxy and 4-amino acetophenone", Ibn Al-Haitham J. for Pure and Appl. Sci., 26(3), 296-312, 2013.
18) H. Rajak, R. Deshmukh, R. Veerasamy, A. K. Sharma, P. Mishra, and M. D. Kharya, "Novel semicarbazones based 2,5-disubstituted-1,3,4-oxadiazoles: one more step towards establishing four binding sites pharmacophoric model hypothesis for anticonvulsant activity," Bioorg. Med. Chem. Lett., vol. 20, pp. 4168-4172, July 2010.
19) Ahankar, H.; Ramazani, A.; Ślepokura, K.; Lis, T.; Joo S. W.; "Synthesis of pyrrolidinone derivatives from aniline, an aldehyde and diethyl acetylenedicarboxylate in an ethanolic citric acid solution under ultrasound irradiation", J. Green Chem., 18(12), 3582-3593, 2016.
20) Rehab. K. Al- shemary, Basima Abdul Hussin Zaidan and Nibras A. Al-marsomy Synthesis, Characterization and Antibacterial Activities of Mixed Ligand Complexes of Schiff Base Derived from Benzidine and 2-Benzoyl benzoic acid, Diyala journal of pure sciences, Vol: 13 No:3, July 2017 21 DOI : http://dx.doi.org/10.24237/djps.1303.189C
21) Mahdi, F. R.; Synthesis of new compounds derived from N-amino quinolone -2-one MSc. thesis, college of science/chemistry department/Mustansiriayh University, (2010).
22) Mohamed, F. K.; "Synthesis, reactions and antimicrobial activity on some novel phthalazinones derivatives", Egypt. J. Chem. 53(5), 645-660, 2010.
23) Navin, B. P.; Sarvil, D. P.; "Synthesis and in vitro antimicrobial studies of 4-thiazolidinedione incorporated 1, 3, 4-oxadiazoles"; Chem. & Bio. Interface; 2(3), 183-198, 2012.
24) Karam, N. H.; Tomma J. H.; Al-Dujaili, A. H.; "Synthesis and characterisation of heterocyclic compounds derived from 4-hydroxy and 4-amino acetophenone", Ibn Al-Haitham J. for Pure and Appl. Sci., 26(3), 296-312, 2013.
25) Hasan, S. M.; Samir, A. H.; Majeed, I. Y.; "Synthesis and characterisation of novel Schiff bases of imide moiety", Ibn Al-Haitham J. for Pure and Appl. Sci., 27(3), 407-420,2014.
26) Abdul-Wahid, J. H.; Ayad, S. H.; Aveen, K. M.; "Synthesis characterisation of some new heterocyclic compounds containing 1, 3-oxazepine ring", Kirkuk Univ. J./Sci. Stu. (KUJSS), 11(3), 237-247, 2016.
27) Ahamed, L. S.; "Synthesis and characterisation of new N-substituted quinoline-2-one derivatives and evaluation of their biological activity", Ph.D. thesis, chemistry dep., college of science, Mustansiriyah Univ., Iraq, 2016.
28) Farhadi, A.; Takassi, M. A.; Hejazi, L.; "One-pot synthesis of 2-oxo-1,2,3,4-tetrahydro pyrimidines using homogeneous catalyst under solvent-free conditions", Iran. Chem. Commun., 5(1), 35-41, 2016.
29) Rehab Khadem Al shemary, Faeza Haseen Ghanim, and Zuhair A. Shafiq, Preparation, Characterisation and Biological Activity Studies for Some Mixed Ligands Complexes of 1, 10 – Phenanthroline and Schiff Base Ligand with Metal Ions, Diyala Journal for Pure Science July 13, 2, 2017, DOI: 10.24237/djps.1303.226C
30) Rehab. K.Al-Shemary Synthesis, Spectroscopic Characterization and Biological Studies for New Binuclear Schiff Base with Some Transition Metal Chemistry and Materials Research Vol.7 No.5, 2015
31) C. R. Prakash, S. Raja, and G. Saravanan, "Synthesis, characterization and anticonvulsant activity of novel Schiff base of isatin derivatives," Int. J. Pharm. Pharm. Sci., vol. 2, pp. 177-181, Oct. 2010.
32) Hiyam Hadi Alkam, Wasan Mohammed Alwan, Rehab Kadhim Raheem Al Shemary, Complexes of Co(II), Cu(II), Ni(II), Pt(II) And Pd(II) with N3O-Chelating Ligand Incorporating Azo and Schiff Base Moieties: Synthesis, Spectroscopic, Thermal Decomposition, Theoretical Studies, and thermodynamic parameters, International Journal of Pharmaceutical Research | Jan - Mar 2021 | Vol 13 | Issue 1

33) Noor M. Majeed, Suha Sahab Abd, Rehab Kadhim Raheem Al Shemary, Eco-friendly and Efficient Composition, Diagnosis, Theoretical, kinetic studies, Antibacterial and Anticancer Activities of Mixed Some Metal Complexes of Tridentate Schiff base Ligand, International Journal of Pharmaceutical Research, 2021 (1)
34) Aeshah Muhana Mohammed, Rehab Kadhim Raheem Al Shemary, Metal complexes with heteroscorpionate ligand founded on the pyridinamine group: cyclin-dependent kinase 2 inhibitor antimicrobial, antioxidant, and in vitro cytotoxicity, notional studies, International Journal of Pharmaceutical Research | Jan - Mar 2021 | Vol 13 | Issue 1

EVALUATION OF APHRODISIAC POTENTIAL OF SOME FUNCTIONAL FOODS AND A MARKETED POLYHERBAL FORMULATION IN MALE RATS

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ABSTRACT

Functional foods and traditional herbal remedies are often used as aphrodisiacs in different parts of the world, depending upon their availability and use in that region. Zingiber officinale *(Zingiber officinale*) rhizomes, Caviar (fish-eggs of *Beluga sturgeon*), Rocket salad (*Eruca sativa*) leaves, and a polyherbal formulation named "Power Man" were investigated for their copulatory behaviour on sexually normal male albino rats.

Suspension of aqueous extracts of *Zingiber officinale* and of *Eruca sativa* and suspensions of Caviar and Power Man were administered orally at doses of 200 and 400 mg/kg to different groups of male rats (n = 6) once a day for seven days. The female albino rats involved in mating were made receptive by hormonal treatment. The parameters of copulatory behaviour studied included mounting frequency, intromission frequency, mounting latency, intromission latency, and ejaculation latency. The results are compared with standard drug sildenafil citrate.

Oral administration of four substances significantly increased the mounting frequency, intromission frequency, and ejaculation latency, as well as producing a significant reduction in mounting latency and intromission latency.

The most prominent effect was seen with the 400 mg/kg aqueous extract of *Zingiber officinale*.

Keywords: Zingiber officinale, *Eruca sativa*, Caviar, Power Man, copulatory behaviour, aphrodisiac.

ESTIMATION OF POPULATION PARAMETERS FOR A DATA DEFICIENT *Rasbora rasbora* (HAMILTON, 1822) STOCK FROM THE PAYRA RIVER, SOUTHERN BANGLADESH

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ABSTRACT

The near threatened *Rasbora rasbora* (Hamilton, 1822) known as Gangetic scissortail rasbora is a freshwater indigenous fish species in Bangladesh. This study offers first comprehensive explanation on population parameters of *R. rasbora* specifically; length-frequency distribution (*LFD*), length-weight relationships (*LWRs*), asymptotic length (L_α), asymptotic weight (W_α), form factor ($a_{3.0}$), size at maturity (L_m), age at maturity (t_m), Fulton's condition factor (K_F), prey-predator status through relative weight (W_R), natural mortality (M_w) and optimum catchable length (L_{opt}) using multi-model indices from the Payra River in southern Bangladesh. Total 215 individuals of *R. rasbora* were hardly sampled (ranging between 2.6 to 12.5 cm total length (TL), and 0.22 to 10.65 g whole body weight (BW)) through different fishing gears during July to December 2019. For each specimen, standard length (SL), total length (TL), and whole body weight (BW) were measured nearest to 0.01 cm and 0.01 g precision, respectively. The maximum number (41.86%) of its population stands at 4.00 to 4.99 cm TL size group. Exponential (b) of *LWRs* exhibits negative allometric growth pattern ($b< 3.0$), representing the fish becomes more slender as the length increases in the Payra River. The calculated L_α and W_α values obtained were 13.29 cm, 16.36 g, respectively for this species and the $a_{3.0}$ was 0.007 signifying the fish is elongated in shape. Based on the empirical model, L_m and t_m for combined sexes of *R. rasbora* were estimated as 7.96 (~8.00) cm TL and 0.92 year, respectively. The K_F with regard to length class displayed a noticeable decrease after 9.0 cm for combined sexes, which may specify the start of sexual maturation and therefore L_m could be around 8.0 cm TL for *R. rasbora*. Wilcoxon signed rank test confirms that W_R revealed very significant divergence from 100 ($p< 0.0001$), suggesting that the habitat was imbalanced with higher predators. Moreover, the estimated M_w and L_{opt}

were 1.88 year^{-1} and 8.86 cm TL for *R. rasbora* in the Payra River. The natural mortality value was conspicuous very high with comparing to the smaller sizes. Therefore, the research knowledge will be very useful in planning the sustainable and appropriate management of this fish species in the Payra River and adjacent water-bodies.

Keywords: *Rasbora rasbora*; growth; condition; maturity; mortality; Payra River.

COMPARATIVE STUDY BETWEEN TWO POLYETHYLENE RING AND THICK-WALLED DISC PROSTHESES ON THE DISTRIBUTION OF VON MISES STRESSES AND STRAINS IN THE SPINE: CALCULATED BY THE CODE OF ANSYS WORKBENCH 16.2.

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ABSTRACT

The intervertebral disc plays an important role in resisting and transmitting load across a motion segment while maintaining disc height and stability. The disc commonly degenerates over time due to natural aging which can be related to lower back pain [1]. In the event that conservative treatment fails, surgical intervention may be indicated. There are two common surgical treatments for degenerative disc disease (DDD): arthrodesis (fusion) and arthroplasty (disc replacement). On the other hand, total disc replacement (TDR) used as an alternative surgical treatment for DDD is believed to be capable of preserving motion and restoring the normal kinematics of the spine. The two prosthetic discs (polyethylene ring and thick-walled) were implanted to minimize stresses and elastic strains at the stage of disc D2 between the two lumbar segments in a three-dimensional nonlinear finite element model (FEM) verified from Th1 to S1 (L5-L4). In other words, at the level of the lumbar pedicle, we implanted a posterior attachment system (6 screws + 2 rods) to preserve the spine's continuity and avoid slippage (S1-L5, L5 -L4). Each implanted model was subjected to a total of 134 N of compression load P1 and two bending moments (P2, P3). ANSYS WORKBENCHE version 16.2 was used to perform mesh and geometry analysis on both the intact and implanted models. The numerical results show that the two disc prostheses (polyethylene ring and thick-walled) showed lower levels of Von Mises stresses at the level of the D2 intervertebral disc, the cortical and spongy bone of the vertebra (L5, L4) as determined with the model intact. The current finite element model could be valuable for engineers and surgeons seeking to optimize TDR designs.

Keywords: Spine; Von Mises Stress-Strain; Total disc replacement; cortical bone; spongy; finite element method.

COMPARATIVE STUDY BETWEEN PATCH REPAIR AND RIVETING IN DAMAGED STRUCTURE CALCULATED BY THE FINITE ELEMENT METHOD

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ABSTRACT
Repairing damaged structures through the use of composite patch bonding is an efficient and economical process for preserving structures and increasing their lifespan. Much work is currently being done to improve this technique. In this work a non-linear 3-D finite element numerical simulation (ANSYS Workbench16.2) was carried out to analyze the behavior of the crack front and determine the evolution of the Von Mises stress and stress intensity factor. KI and J-integral for a 2024-T3 aluminum alloy plate containing a horizontal crack, completely repaired with a composite (Boron / epoxy) and metal patch reinforced with rivets. The results of this work show that the horizontal position of a semi elliptical crack of (0 °) it gives maximum values of stress of Von Mises, stress intensity factor KI and J-integral by contribution the other orientations, this justified that the crack angle plays a very important role in increasing stresses in metal plates without repaired. On the other hand, the repair by single patch and doubled in (Boron / epoxy) decreased the Von Mises stress and stress intensity factor KI and the rate of energy release. The different shapes of patches (circular, hexagonal, elliptical, rhombus, rectangular), have played an important role in reducing the stresses of Von Mises, KI and Jintegral and increasing the life of the structure. The calculation by the finite element method indicates that the repair of the damaged structure by aluminum patch 2024 plus rivets play a very important role in the absorption of Von Mises stresses and stress intensity factor KI and Jintegral.

Keywords: crack; Von Mises Stress-Strain; patch; aluminum 2024; spongy; stress intensity factor KI

SİKLON AYIRICILARDA PARTİKÜL BOYUTUNUN SİKLON PERFORMANSINA ETKİSİNİN ANALİZİ

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ÖZET

Bu çalışmada, siklon tasarımı yapılarak farklı boyutlardaki partiküllerin siklona etkisi analiz edilmiştir. Siklon ayırıcılar, iç kısmında bulunan katı parçacıkların gaz akımı ile girdaba dönüştürülmesi sonucu oluşan merkezkaç kuvvetin etkisiyle katının gazdan ayrılma işleminde kullanılan toz tutuculardır. Endüstriyel alanlarda yaygın olarak kullanılan sabit parçalı cihazlardır. Siklonlar genellikle girdap oluşturmak için teğetsel konumlandırılan bir giriş, eksenel bir temiz gaz çıkışı ve toz boşaltma açıklığından oluşmaktadır. Yüksek sıcaklık ve basınç gibi ağır şartlar altında çalışabilmesi ayrıca basit yapılı olması siklonları önemli bir avantaj haline getirmektedir. Gaz içerisinde bulunan 5µm'den küçük olan partiküllerin oranı siklonda verimi etkilediğinden, yüksek oranda olması bir dezavantajdır. Ekonomik olmalarından ziyade hareketli parça içermemeleri bu cihazları dayanaklı ve verimli kılmaktadır. Siklonların performansını etkileyen parametreler içerisinde en önemlileri Toz toplama verimliliği ve basınç kaybıdır. Siklonda basınç kaybını etkileyen faktörler; siklona giriş kesiti, siklon iç duvarındaki sürtünme ve çıkış dalma borusudur. Siklon dizaynında tasarım kriterleri, kullanım amacına göre yüksek verimli ve yüksek kapasiteli olabilir. Bu çalışmada standart siklon geometrik yapısı Solidworks programında modellenmiştir. Siklona giren gazın 10 m/s hız, 0.125 m³/sn debi ve 120°C sıcaklık parametreleri belirlenerek siklon tasarımı oluşturulmuştur. Performansa etki eden toz toplama verimliliğini belirlemek için boyutları 15 ve 25 mikron olan partikülleri siklona ayrı ayrı gönderimi sağlanmış ve akış analizi incelenmiştir. Yapılan çalışmada analiz sonuçlarından istatiksel veriler oluşturularak, siklonun optimum verimi ve basıncı belirlenmeye çalışılmıştır. (MIM-TM-2020-06 Proje kapsamında MİMSAN Endüstri Kazanları A.Ş. destekli olarak katılmıştır.)

Anahtar Kelimeler: Akış Simülasyonu, Toz Tutma Verimi, Siklon

ANALYSIS OF THE EFFECT OF PARTY SIZE ON CYLON PERFORMANCE IN CYLON SEPARATIONS

ABSTRACT

In this study, the effect of particles of different sizes on the cyclone was analyzed by designing the cyclone. Cyclone separators are dust holders used in the process of separating the solid from the gas due to the centrifugal force formed by converting solid particles in the inner part into vortexes with gas flow. They are fixed-part devices widely used in industrial areas. Cyclones usually consist of a tangentially positioned inlet to form a vortex, an axial clean gas outlet and a dust discharge clearance. The fact that it can operate under harsh conditions such as high temperature and pressure, as well as its simple structure, makes cyclones an important advantage. Since the ratio of particles smaller than 5µm in gas affects the efficiency of the cyclone, it is a disadvantage to have a high rate. The fact that they do not contain moving parts rather than being economical makes these devices resilient and efficient. Among the parameters affecting the performance of cyclones, the most important are dust collection efficiency and pressure loss. Factors affecting pressure loss in the cyclone; the section of entry into the

cyclone, the friction on the inner wall of the cyclone and exit plunge pipe. In cyclone design, design criteria can be highly efficient and high capacity according to the purpose of use. In this study, the standard cyclone geometric structure was modeled in the Solidworks program. Cyclone design was created by determining the parameters of 10 m/s speed, 0.125 m³/s flow rate and 120°C temperature of the gas entering the cyclone. In order to determine the performance-influencing dust collection efficiency, particles with dimensions of 15 and 25 microns were sent separately to the cyclone and flow analysis was examined. In the study, statistical data were created from the results of the analysis and the optimum efficiency and pressure of the cyclone was tried to be determined. (MIM-TM-2020-06 Within the scope of the project, MIMSAN Industry Boilers participated with the support of INC.).

Keywords: Flow Simulation, Dust Retention Efficiency, Cyclone

1.GİRİŞ

Siklonlar genellikle endüstriyel alanlarda kullanılan gaz-katı ayırıcılardır. Siklonlar hem kava kirliliği hem de endüstriyel proses işlemlerinde 5µm'den büyük partiküllerin uzaklaştırılmasında kullanılır. Merkezkaç kuvvetinin etkisi ile siklonlar gazdan partikülleri ayırma işleminde en çok kullanılan sabit parçalı cihazlardır. Siklonları diğer cihazlardan ayıran önemli özelliklerinden birisi ağır çalışma şartlarında kullanımının sağlanmasıdır. Uygulama alanlarında teğetsel ve eksenel girişli siklon modelleri bulunmaktadır. Gaz temizleme işlemi için en çok kullanılan teğetsel girişli siklonlardır. Tozlu havanın teğetsel girişten girerek, siklon içerisinde vorteks hareketi oluşturur. Siklona giren partikül, merkezkaç kuvveti etkisinden dolayı iç duvarda sürtünme oluşturur ve partikül girdap hareketi ile aşağıya ilerleyerek siklon alt haznesinde birikir. Siklon tasarımına göre büyük partiküller alt biriktirme haznesine geçerken, kalan küçük partikül ve hava karışımı siklonun üst dalma borusundan sistemi terk eder. Siklon performansına etki eden parametreler içerisinde en önemli olanları partikül tutma verimi ve basınç kaybıdır. Siklon maliyetine etki eden en önemli parametre basınç kaybıdır. Sebebi fan gücünün basınç kaybını etkilemesidir.

Karakaş (2020), yaptığı çalışmada stairmand tipi yüksek verimli siklonlarda gövde çapının azaltılması sonucunda ayırma veriminin etkisini incelemiştir. Mini siklon tiplerinin beş farklı büyüklükteki hali imal edilmiştir. Mini siklonların basınç kayıpları ve ayırma verimlerinin deneysel incelemesi yapılmıştır. Çalışma sonucunda siklon gövdesinin azalması ile verim artarken daha küçük çaplarda verimde azalma meydana gelmiştir. Çapların sürekli azalması sonucunda basınç kayıpları da daimî olarak azalmıştır. Deney sonucunda hesaplar ile elde edilen sonuçların uyumlu olduğu gözlemlenmiştir. Tan F. (2016), konvansiyonel bir siklon ve değiştirilebilir girdap durdurucu tasarımını yapmıştır. Deney sonucunda siklonun boy uzunluğunun arttırılması ile basınç kaybında azalmaların oluştuğu gözlemlenmiştir. Basınç kaybı ve toz tutma verim değerleri incelenmiş ve klasik siklonun sonuçları ile karşılaştırılmıştır. Uygur (2020), yaptığı çalışmada yüksek verimli standart siklon geometrisi yapısı Solidworks programı ile modellemiştir. Siklon performansını belirleyen basınç düşüşü ve kesme çapının siklona karşı etkisi incelemiştir. Çalışma da akış analizi yapılmış ve analiz sonuçları istatiksel öğrenme yöntemleri kullanılarak kesme çapları belirlenmiştir.

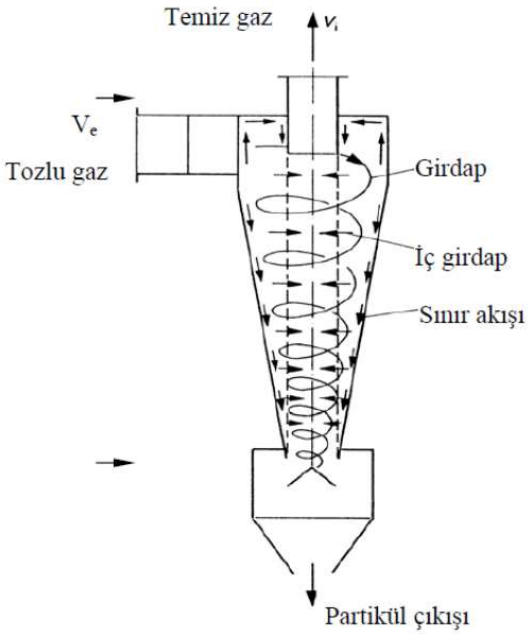
Bu çalışma kapsamında siklona giren iki farklı parçacık boyutuna sahip gaz akımlarının siklon performansına etkisi incelenmiştir. Siklona giren gaz akımının giriş hızı, gaz sıcaklığı, debisi, partikül konsantrasyonu parametre olarak seçilerek partikül tutma verimi ve siklonda meydana gelen basınç kaybı üzerinde etkileri analiz ile irdelenmiştir.

2.SİKLON AYIRICILAR

2.1. Akış Modeli

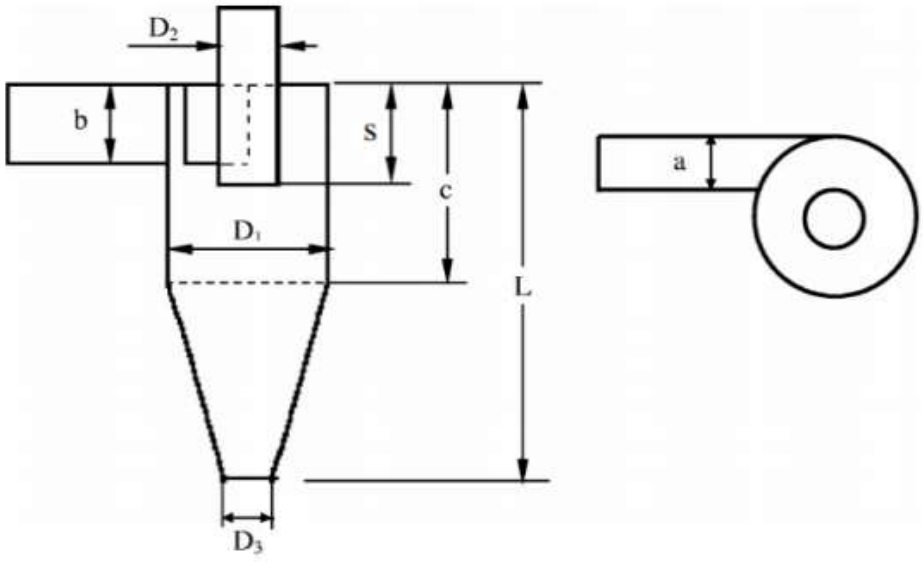
Siklon ayırıcıların performansına etki eden en önemli parametreler toz toplama verimliliği ve basınç kaybıdır. Performansa karşı etkide bulunan faktörlerin belirlenmesi için akış modeli anlaşılır olmalıdır.

Siklon içerisinde etki eden hareketler teğetsel, radyal ve dikey hız bileşenleri olarak belirtilmektedir. Siklona teğetsel olarak giren akışkan Şekil 1.'de görülmektedir. Temiz gazın eksenel olarak çıkışı dalma borusu tarafından yapılırken gövde duvarında girdap hareketi oluşturulmaktadır. Girdap akımı sonucunda aşağıya doğru toz çıkışı yapılır ve koninin alt kısımdaki haznede toplanır. Siklonun merkezinde gaz akımı eksenel olarak ters yönde yukarıya doğru hareket eder ve ince tutulamayan partiküllü temiz gazlar dalma boru çapından siklonu terk eder. Santrifüj kuvveti sayesinde ağır partiküller gazlardan ayrılır. Santrifüj kuvveti ile partiküller siklonun iç duvarına çarpar ve ağır partiküller duvara yakın şekilde hareket eder ve siklonun alt kısmında toplanır.



Şekil 1. Siklon Akış Modeli

Siklon ayırıcılarda geometri özelliklerine göre en önemli parametrelerinden birincisi giriş ve çıkış kesiti olup ikinci olarak da siklon boyu, koni ucu çapı ve diğer büyüklükler sıralanabilir. Diğer önemli parametre özellikleri de yüzey pürüzlülüğü, siklon büyüklüğü, akışkan özellikleri dağılımı ve şekli olarak sıralanmaktadır. Siklon geometri özelliklerine göre axb siklona giriş kesitini, D_1 siklon dış çapını, D_2 siklon dalma boru çapını, D_3 siklon koni ucu çapını, S dalma boru çapının siklon içerisindeki uzunluğunu, c siklonun dairesel boy uzunluğunu ve L siklon toplam boy uzunluğu olarak Şekil 2.' de gösterilmiştir.



Şekil 2. Stairmand Tipi Yüksek Verimli Siklon Filtrenin Karakteristik Boyutları

2.2.Siklonda Toplama Verimliliği

Siklonun toplama verimliliği "η", partikül boyutu olarak belirlenmektedir. Siklona verilen her boyuttaki partiküllerin tutulan kesirleri olarak ifade edilmektedir. Kesirsel (fraksiyonel) verimlilik eğrisine göre belirli bir boyuttaki partiküllerin verimini belirtilmiş olsa da, sadece toplam verim için tahminde bulunulmasına yeterli olmaz. Partiküllerin boyut dağılımına göre pratik uygulamalarda sahip olunan toplam verimlilik öncelik olarak yer almaktadır.

$$\text{Toplama verimi } (\eta) = \frac{toz\ kutusunda\ biriken\ toz}{deney\ esnasında\ sisteme\ verilen\ toz}$$

Siklona giren parçacık kütlesi(m_g) ve siklonda tutulan parçacık kütlesi(m_b) biliniyor ise ayırma verimi (η),

$$\eta = \frac{m_b}{m_g}$$

ya da giren toz konsantrasyonu (C_g) ve çıkan toz konsantrasyonu (C_{ck}) biliniyor ise,

$$\eta = 1 - \frac{C_{ck}}{C_g}$$

olarak elde edilmektedir. Bu değerler parçacık çapı (d_i) için elde edilmek istenirse fraksiyonel verim (η_i) elde edilmiş olur. Fraksiyonel verimler biliniyor ise genel verim (η),

$$\eta = \frac{1}{m} \sum \eta_i \, m_i$$

şeklinde elde edilmektedir. Fraksiyonel verim eğrisi ve giriş toz analizi biliniyor ise verim tahmin edilebilir.

Siklon geometrisi ve çalışma şartına bağlı olarak siklonlarda verim hesabı için en çok kullanılan yaklaşım kritik çap hesabıdır. Analitik 10 hes η abına yönelik bağıntılar çok bulunmaktadır. Çalışmada incelemek için çalışma parametresine uygun bağıntı olarak Avcı ve Karagöz (2003) modeli seçilmiştir. Düzenlenmiş hali,

$$d_k = 0{,}4.\sqrt{\frac{\mu.\, a_d.\, D_S.\, D_0.\, D_1.\, a_h\sqrt{D_{3m}}}{(\rho_p - \rho_h).\, C_c.\, L_b.\, V_0}}.\, x^{c_s}$$

Bulunmaktadır. Verilen parametrelerin tanımı sırasıyla aşağıda verilmiştir;

Ortalama siklon çapı;

$$D_0 = \frac{C}{L} + (1 - \frac{C}{L})\frac{D_1 + D_3}{2D_1}$$

Sürtünme yüzey ortalama çapı;

$$D_S = D_0 + \frac{2SD_2 + D_S^2 + D_3^2}{LD_1}$$

Ortalama çıkış çapı;

$$D_{3m} = \frac{2D_2 + D_3}{3D_1}$$

Düzeltilen boyutsuz akış genişliği;

$$a_d = 0{,}5 + \frac{4ab}{(D_1 + D_2)(D_0 + a + b + s)}$$

Boyutsuz hidrolik çap;

$$a_{h1} = \frac{\sqrt{ab}}{D_1}$$

Cunningham düzeltme faktörü;

$$C_c = 1 + \frac{0{,}165}{d_k}$$

Giriş ve çıkış çaplar oranı;

$$\mathrm{x} = \frac{10\mathrm{a_h}}{\mathrm{D_{3m}}}$$

Boyutsuz siklon uzunluğu;

$$L_b = \frac{L}{D_1}$$

Reynolds sayısı;

$$Re = \frac{D_0 V_0 a_h}{v}$$

Ortalama sürtünme katsayısı;

$$f_0 = f(Re)$$

Laminer Akış için; Re<2100

$$f_0 = \frac{64}{Re}$$

$$f_0(2100) = 0{,}0305$$

Türbülanaslı akış için pürüzsüz (Re≥ 3000);

$$f_0 = \frac{0{,}316}{Re^{1/4}}$$

Boyutsuz parametre;

$$C_s = 0{,}75\frac{a_d D_s}{D_0}\frac{L_b f_0}{a_h - 0{,}1D_{3m}}$$

Bağıntı sayesinde kritik çap hesaplanarak kullanılan ve tutulması düşünülen tozların dağılımı ile bu tozların parçacık dağılımından parçacık grupları ve grup ortalama çapı ve parçacık yüzdesi bulunur.

2.3. Siklonda Basınç Kaybı

Siklon performansına etki eden bir diğer önemli parametre de basınç kaybıdır. Verim parametrede kullanılan Avcı ve Karagöze (2005) Siklonlarda basınç kaybı;

$$\Delta P = K\rho\frac{V^2}{2}$$

Şeklindedir. V (m/s) giriş hızı olup, Q (m³/s) hacimsel debi olarak;

$$V = \frac{Q}{a.b}$$

Olarak hesaplanır. Basınç kaybı K ve yoğunluğu ρ (kg/m³) olarak alınır. K katsayısı siklon geometrisine göre hesaplanmaktadır. Bu parametrenin hesabı Avcı ve Karagöz (2005) modeline göre;

$$K = \frac{cs}{cs-1}(x^{2(1-cs)} - 1)$$

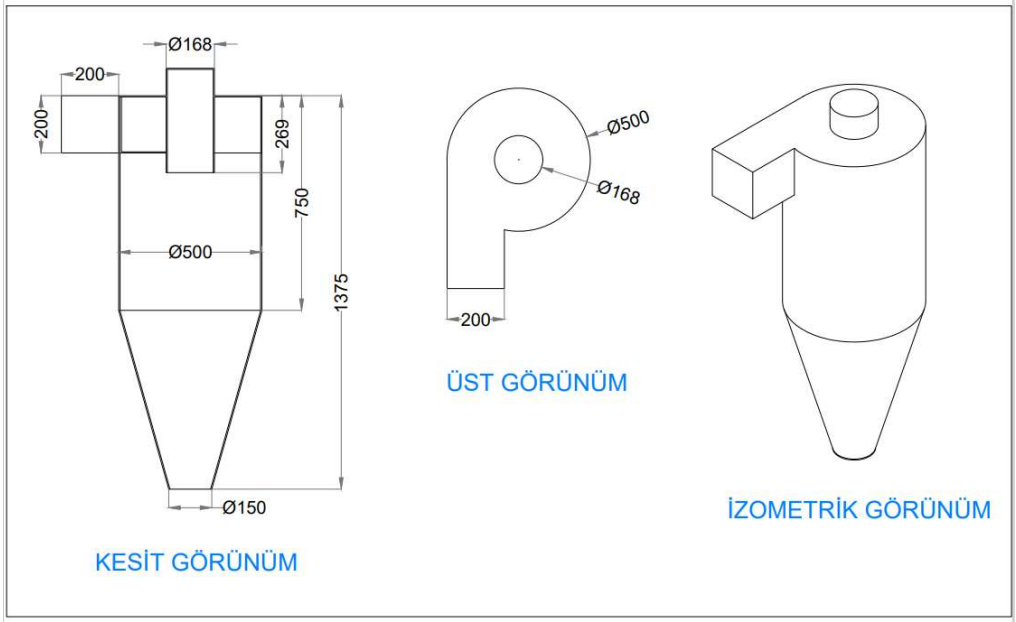
Şeklindedir. Statik basınç farkına göre;

$$K = \frac{2\Delta P}{\rho V^2}$$

Hesaplanır. Siklon gövdesinin boyutu basınç kaybına ve toplama verimine etki etmektedir.

3.SİKLON TASARIMI

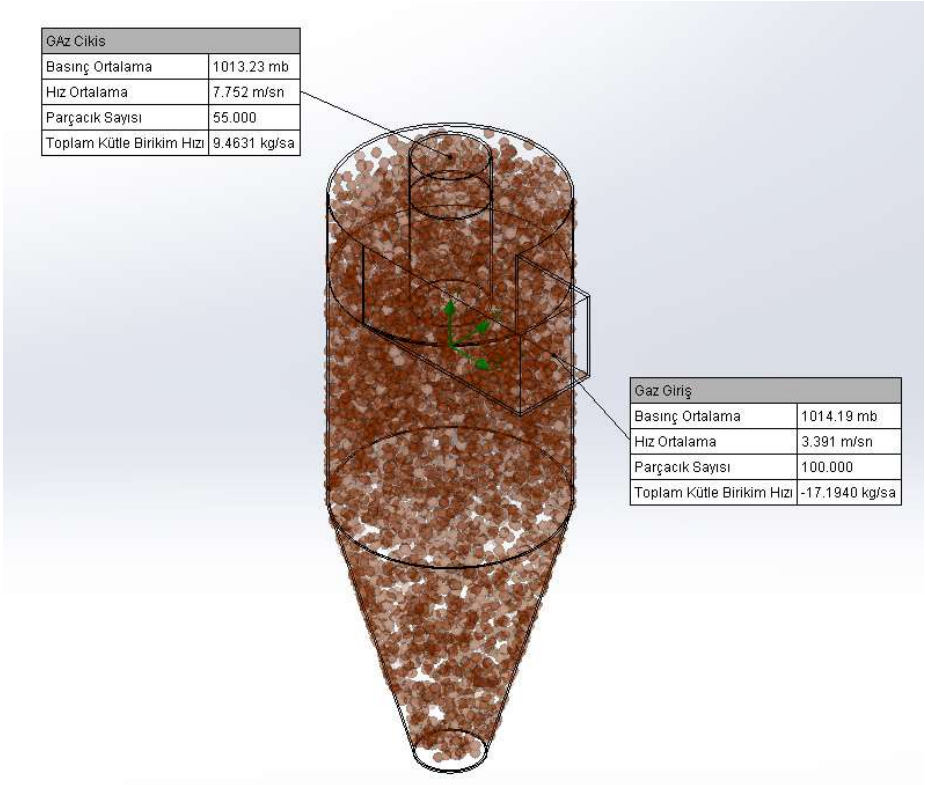
Siklonlarda performansına etki eden birçok parametreler mevcut olup en önemli parametre de siklon büyüklüğüdür. Ana gövde çapı Ø500 mm olan Stairmand tipi yüksek verimli siklon imal edilmiştir. Siklon dalma boru çapı Ø168.3 mm, siklon koni ucu Ø150 mm çapında tasarlanmıştır. Siklona gaz akımı fan çıkış hızı 10 m/s, 0.125 m³/sn debi ve 120°C sıcaklıkta sabit parametreler ile gönderim yapılmıştır. Değişkenlik gösteren parametreler 15 ve 25 mikron partikül miktarları olmuştur.



Şekil 3. Siklon Boyutsal Tasarımı

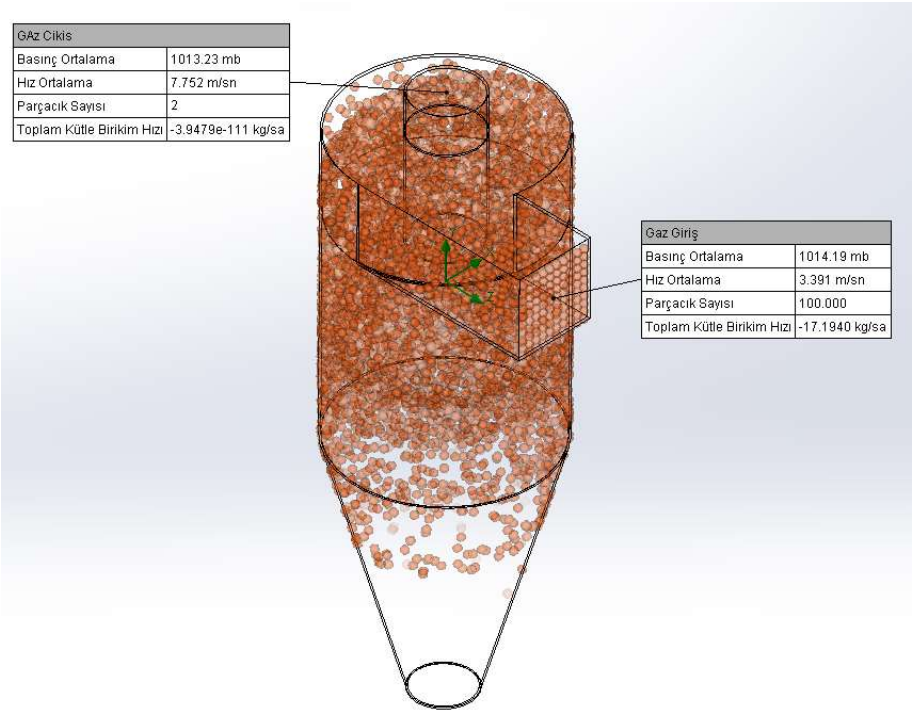
4. BULGULAR VE TARTIŞMA

1.375 metre uzunluğundaki siklonun çapı Ø500 mm olup 0.125 m³/sn debi ve 15 µm ile analizi Şekil 5.' de verilmiştir.



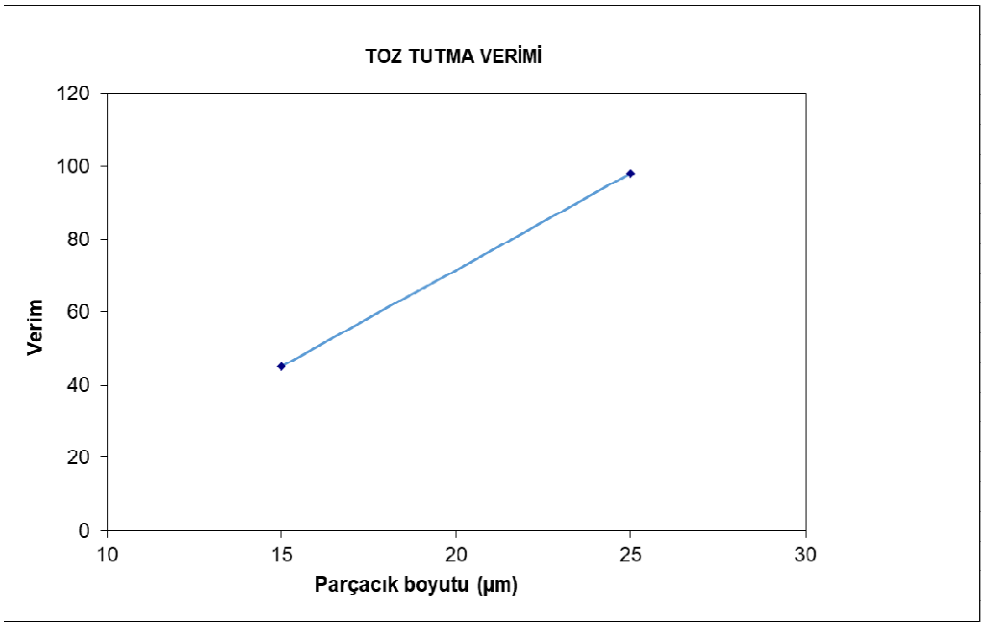
Şekil 5. 15 µm (mikron) gaz partikül akımı

1.375 metre uzunluğundaki siklonun çapı Ø500 mm olup 0.125 m³/sn debi ve 25 µm ile analizi Şekil 6.' da verilmiştir.



Şekil 6. 25 µm (mikron) gaz partikül akımı

Yapılan teorik analiz çalışma sonucunda toz tutma verim grafiği **Şekil 7.**'de verilmiştir.



Şekil 7. Toz Tutma Verimi

Yapılan çalışma sonucunda;

- Parçacık özelliklerine göre yoğunluğu 400 kg/m³, 15 mikron da partiküle ait siklona giriş hızı 3.391 m/sn ve giriş nokta sayısı da 100 olarak belirlenmiştir. Parçacığın siklon dalma boru çapından çıkış hızı 7.752 m/sn, çıkış nokta sayısı da 55 olarak analiz edilmiştir. Siklon performansına etki eden parametrelerde teorik olarak basınç kaybı 1.0149 bar ve toz tutma verimi %45 sağlanmıştır.
- Parçacık özelliklerine göre yoğunluğu 400 kg/m³, 25 mikron da partiküle ait siklona giriş hızı 3.391 m/sn ve giriş nokta sayısı da 100 olarak belirlenmiştir. Parçacığın siklon dalma boru çapından çıkış hızı 7.752 m/sn, çıkış nokta sayısı da 0 olarak analiz edilmiştir. Siklon performansına etki eden parametrelerde teorik olarak basınç kaybı 1.0149 bar ve toz tutma verimi %100 sağlanmıştır.

4.SONUÇLAR

Bu çalışmada klasik siklon modeline iki farklı partikül parçacıklarının gönderilmesi sonucu siklon toplam verimi ve basınç kaybının analizi incelenmiştir. Toz tutma verimliliği çalışmalarında genellikle pürüzlülük miktarı arttıkça verimde azalmanın olduğu gözlenmiştir. Katı gövde yüksekliği için pürüzsüz yüzeylerde girdap durdurucu mesafenin artmasıyla verimde artış gözlenmiş ve bu değerden sonra da azalma eğilimi göstermiştir. Girdabın durdurucuya ulaşmadığı pürüzlü yüzeylerde ise verimde azalma meydana gelmiştir. Buna bağlı olarak yapılan çalışmada siklona gönderilen 15 ve 25 mikron partiküllerin toz toplama verimliliği ve basınç kaybına etkisi incelenmiştir. Siklona 15 mikron partikül de gönderimi sağlanan 100 parçacık sayısında 55 parçacık sayısının dalma boru çapından çıkışı gözlemlenmiştir. Aynı şekilde siklona 25 mikron partikül de gönderimi sağlanan 100 parçacık sayısında 2 parçacık sayısının dalma boru çapından çıkışı gözlemlenmiştir. Bu duruma göre teorik verilerde 15 mikron da gaz çıkışının 55 parçacık sayısı çıkışı sonucu siklonda toz tutma veriminin %45 ve 25 mikronda gaz çıkışının 2 parçacık sayısı sonucunda siklonda toz tutma verimi %98 olarak elde edilmiştir. Siklona giren partiküllerin toz toplama verimine etkisi sonucunda %98 verim sağlayan 25 mikron kullanımı önerilmektedir.

5.KAYNAKLAR

1) Caliskan, M.E., Karagoz, I., Avci, A., Surmen, A. (2019). An experimental investigation into the particle classification capability of a novel cyclone separator. Separation and Purification Technology, 209: 908-913.

2) Fıçıcı F., Arı V., Aras Ö. (2008) Önısıtıcılı Siklonlarda Dalma Borusu Çap Değişiminin Toz Toplama Verimliliğine Etkisinin Deneysel Olarak İncelenmesi. Celal Bayar University Journal of Science, 4(2), 229-240.
3) Fıçıcı, F., & Ari, V. (2008). Teğetsel Girişli Ters Akışlı Siklonlarda Dalma Borusu Çap Değişiminin Basınç Kaybına Etkisinin Deneysel Olarak İncelenmesi. Pamukkale University Journal of Engineering Sciences, 14(2).
4) Kalafatoğlu, E., Örs, N., & Erencek, E. Siklon Tasarımı ve Simülasyonu.
5) Karagoz I, Avci A. (2005). Modelling of the pressure drop in tangential inlet cyclone separators. Aerosol Science and Technology, 39 (9): 857-865.
6) Karakaş, C. (2020). Yüksek verimli farklı geometrideki mini siklonların performansının deneysel olarak incelenmesi. Yüksek Lisans Tezi, Fen Bilimleri Enstitüsü, Uludağ Üniversitesi, Bursa.
7) Tan, F. (2016). Siklonlarda iki fazlı ve girdaplı akışların parametrik incelenmesi ve siklon ayırıcıların geliştirilmesi. Yüksek Lisans Tezi, Fen Bilimleri Enstitüsü, Uludağ Üniversitesi, Bursa.
8) Uygur, N. (2020). Yüksek Verimli Standart Siklon Performansının Sayısal Yöntemlerle Belirlenmesi. Çukurova Üniversitesi Mühendislik-Mimarlık Fakültesi Dergisi, 35 (3), 711-720.

MHD MIXED CONVECTIVE HEAT TRANSFER IN A SQUARE ENCLOSURE FILLED WITH COPPER-WATER NANOFLUID

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Abstract
In this paper, we present a numerical study of mixed convection in a square lid-driven cavity heated from top and filled with water-Cu nanofluid and subjected to a magnetic field oriented at an angle α with respect to the x axis. The transport equations are solved with finite volume method using the SIMPLE algorithm. Comparisons with previously published works are performed and found to be in good agreement. The influence of Grashof and Hartmann numbers as well as the volume fraction of nanoparticles on the hydrodynamic and thermal characteristics of the nanofluid is illustrated and discussed in terms of streamlines, isotherms and mean Nusselt number. Two orientations of the magnetic field (α = 0° and 90°) were considered to control the flow. The results obtained show that the heat transfer rate is greater in the case where the magnetic field is applied in the vertical direction (α = 90°) compared to the horizontal direction (α = 0°), whatever the Hartmann number and for all the Grashof numbers. It is also found that, for all the values of Hartmann number, the mean Nusselt number increases with the volume fraction of the nanoparticles.

Keywords: Mixed convection, Heat transfer, Magnetic field, Water-Cu nanofluid

GAZ YAKITLI KAZANLARDA FARKLI TİPTE TÜRBÜLATÖRLERİN KULLANIMI VE ANALİZ

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ÖZET
Gelişen teknoloji, sürekli artan nüfus ve artan şehirleşme gibi etmenlerle birlikte enerji ihtiyacı da sürekli olarak artmaya devam etmektedir. Artan enerji ihtiyacı ve enerji kaynaklarının yoğun kullanımı ile birlikte enerji kaynaklarında giderek azalmalar meydana gelmektedir. Enerji kaynaklarının tükenme ihtimalinden dolayı bilim insanları enerjiyi aktif ve etkin kullanma yollarını araştırmaktadırlar. Buna bağlı olarak günümüzde alternatif enerji kaynakları ortaya çıkarılıp kullanılmaktadırlar. Ayrıca enerji kayıplarını en az seviyeye indirmek, bilim insanlarının oldukça dikkatini çekmektedir. Isı enerjisi kayıplarını en aza indirmek ısı transferi çalışmalarında önemli bir yer tutmaktadır. Kullanım alanı oldukça geniş olan ısı değiştiricilerinde de enerjiyi verimli kullanabilmek için bilim insanları çok sayıda çalışmalar yapmaktadırlar. Yapılan çalışmalarda türbülatör kullanımı oldukça önemli yer kaplamaktadır. Türbülatörlerin kullanılmasıyla enerjide tasarruf sağlandığı gözlemlenmektedir. Farklı modellerde türbülatörler tasarlanmış ve hangi modelin sisteme daha fazla verim artışı sağladığı tespit edilmiştir. Farklı modellerde tasarlanan türbülatörlerin endüstriyel tip kazanlarda ve kalorifer kazanlarında kullanımı oldukça fazladır. Türbülatörler sayesinde ısı transferi katsayısı artmakta ve ısı transferi miktarında artışlar olmaktadır. Kazanlarda kullanılan türbülatörler baca gazı sıcaklığında düşüş meydana getirirken, baca gazı kayıplarını en aza indirmektedirler.

Bu çalışmada iki farklı kanatçık açısına sahip türbülatörler, gaz yakıtlı kazanda kullanılmak üzere tasarlanmıştır. Türbülatörler çapı Ø42.4 mm olan bir boru içerisine yerleştirilmiştir. Farklı kanatçık açısına sahip türbülatörlerin analizi Solidworks Flow Simulation programı ile yapılmıştır. Yapılan analiz ile kanatçık açısında değişimin ısı transferine etkisi araştırılmıştır. Yapılan analiz sonuçlarına göre 15° kanatçık açısının ısı transferi miktarını maksimum seviyede artırdığı tespit edilmiştir. (Proje kapsamında MİMSAN Endüstriyel A.Ş. Kazanları destekli olarak katılmıştır.)

Anahtar Kelimeler: Isı Değiştiricileri, Türbülatör, Isı Transferi, Kanat Açısı

USAGE AND ANALYSIS OF DIFFERENT TYPES OF TURBULATORS IN GAS BOILER

ABSTRACT
With factors such as developing technology, ever-increasing population and increasing urbanization, the energy need continues to increase steadily. With the increasing energy need and intensive use of energy sources, there are gradual reductions in energy sources. Due to the possibility of depletion of energy sources, scientists are exploring ways to use energy actively and effectively. Because of that, alternative energy sources are created and used today. In addition, minimizing energy losses attracts a lot of attention from scientists. Minimizing heat energy losses plays an important role in heat transfer studies. Scientists are working hard to use energy efficiently in heat exchangers, which have a wide range of uses. The use of turbulators takes up a very important place in the studies. It is observed that energy savings are achieved by using turbulators. Turbulators were designed in different models and it was determined which model provided more efficiency increase to the system. Turbulators designed in different models are very used in industrial boilers and heating boilers. Thanks to turbulentators, the coefficient of heat transfer increases and the amount of heat transfer increases. Turbulators used in boilers cause a decrease in flue gas temperature, while minimizing flue gas losses.

In this study, turbulators with two different fin angles created with configuration are designed for use in gas-fired boiler. Turbulators are placed in a pipe with a diameter of Ø42.4 mm. Analysis of turbulators with different fin angles was carried out with Solidworks Flow Simulation program. With the analysis, the effect of the change in fin angle on heat transfer was investigated. According to the results of the analysis, it was determined that the 15° fin angle increased the amount of heat transfer to the maximum level. (Within the scope of the project, MIMSAN Industrial Inc. participated with the support of Boilers)

Keywords: Heat Exchangers, Turbulator, Heat Transfer, Fin Angle

1.GİRİŞ

Enerji, cismin iş yapabilme yeteneğidir. Enerji yenilenebilen enerji ve yenilenemeyen enerji şeklinde ikiye ayrılır.Yenilenebilen enerji kaynakları doğal çevreden elde edilir.Yenilenebilen enerji kaynaklarına güneş, rüzgar, biyokütle, jeotermal, hidrojen, dalga vb. örnekler verilebilir. Sürekli kaynağı olmayan ve tükenebilen enerji kaynaklarına ise yenilenemeyen enerji kaynakları denmektedir. Yenilenemeyen enerji kaynaklarına petrol, doğalgaz, madenler, yeraltı kaynakları, metaller vb. örnekler verilebilir. Türkiye'nin de gelişen teknoloji, sürekli artan nüfus gibi etmenlerle birlikte enerji ihtiyacı sürekli artmaktadır. Bu sebepten dolayı enerji kullanımında tasarruf yapılmaya başlanmış olup alternatif enerji kaynaklarıda kullanılmaya başlanmıştır.

Bademci (2017), bu çalışmada plaka tipi türbülatörler kullanılmıştır. Plaka tipi türbülatörlerin üzerine farklı kanatçık açıları ve farklı adımlar oluşturularak sayısal çalışma yapmıştır. Türbülatörler dairesel kesitli borunun içine yerleştirilmiştir. Çalışmada basınç kayıpları, ısı transfer özellikleri ve sürtünme karakteristikleri incelenmiştir. Sayısal analizler sonucunda türbülatör kullanılmasıyla boş boruya göre %208 oranlarında ısı transferinde iyileşme olduğunu gözlemlemiştir. Deviren (2019), yaptığı çalışmada türbülatör kullanımının verimliliği nasıl etkilediğini araştırmıştır. Sabit yüzey sıcaklığına sahip ısı değiştiricisinde türbülatör sayısının ve diziliminin ısıl verim, basınç kaybı gibi değerlere etkisini incelemiştir. Yapmış olduğu deney sonuçlarına göre türbülatör sayısının artmasıyla ısıl verim, basınç kaybı ve sürtünme faktöründe artışlar gözlemlenmiştir. Ertan (2019), çalışmasında türbülatörleri farklı konfigürasyonlarda iç içe borulu ısı değiştiricilerinde kullanmıştır. Reynolds sayısını 5000 ile 30000 aralığında almış olup 6 farklı Reynolds sayısı için deneyler yapmıştır. Deneyler sonucunda Re=3000 için türbülatörün 4.5 cm adımda, beş adet ve giriş kısmında olduğu zaman ısı transferi ve basınç kaybının maksimum olduğunu belirtmiştir. Pusat (2016), yaptığı çalışmada bükümlü plaka tipi türbülatörü çift borulu eş eksenli bir ısı değiştiricisinin içine yerleştirilmiştir. Bu deneysel çalışmada türbülatörün ısı transferine, basınç kaybına, ekserji kaybı, entropi atım oranı ve NTU değişimi incelenmiştir. Yapılan deneyler sonucunda, plaka kalınlığının artmasının entropi oranını artırmış olduğunu, etkinlik üzerinde bir etkisi olmadığını, ekserji kaybının arttığını belirtmiştir. Karagöz (2019), çalışmasında boru içerisine üç farklı kanatçıklar arası mesafe ve üç farklı kanatçık açısına sahip türbülatörler yerleştirmiştir. Yapılan deneysel çalışma sonucunda farklı açılı ve farklı kanatçık mesafeli türbülatör kullanıldığı zaman boş boruya göre sürtünme katsayısında belirli bir artış olduğunu belirtmişlerdir.

Bu çalışmada iki farklı kanatçık açısına sahip türbülatörler gaz yakıtlı kazanda kullanılmak üzere tasarlanmış olup türbülatörler çapı Ø42.4 mm olan bir boru içerisine yerleştirilmiştir. Farklı kanatçık açısına sahip türbülatörlerin analizi Solidworks Flow Simulation programı ile yapılmış ve kanatçık açısında değişimin ısı transferine etkisi araştırılmıştır.

2. GAZ YAKITLI KAZANLAR

Doğal gazın kimyasal yapısının büyük bir kısmını metan (CH_4) olmak üzere etan(C_2H_6), propan (C_3H_8), bütan (C_4H_{10}) ve karbondioksitten (CO_2) oluşan yanıcı bir gazdır. Doğal gaz rengi ve kokusu olmayan bir gaz çeşididir. Diğer fosil yakıtlar ile kıyaslandığı zaman kirletici emisyonlar açısından daha temizdir.

Kazan, içerisinde yanan yakıtın yanma enerjisini sistemde çalışan akışkana iletmek için kullanılan ekipmandır. Kazanlar yanma sonucu meydana gelen ısının tamamını akışkana aktaramazlar. Isının bir kısmı kazan yüzeyinde kalırken diğer bir kısmıda baca gazı ile atmosfere gönderilmektedir. Gaz

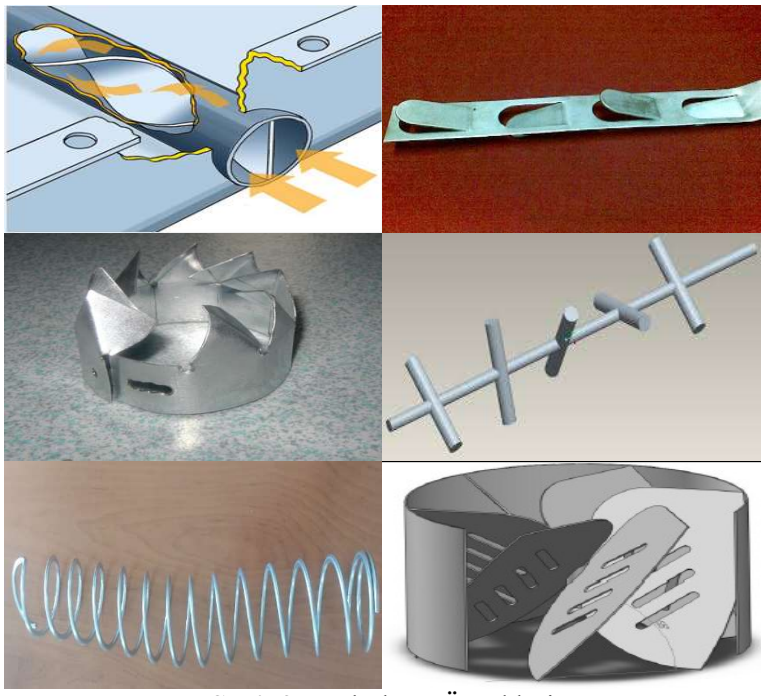
yakıtlı kazanlardaki ocak sıcaklığı katı ve sıvı yakıtlı ocaklardakine göre daha yüksek olmaktadır. Çevresel ve biyolojik nedenlerden dolayı son zamanlarda kazanlarda doğalgaz kullanımı artmıştır. Şekil 1'de farklı tipteki gaz yakıtlı kazanlar görülmektedir.

Şekil 1. Gaz Yakıtlı Kazan Örnekleri

3. TÜRBÜLATÖRLER

Isı değiştiriciler farklı sıcaklıklarda olan ve birbirine karışamayan akışkanlar arasındaki ısı transferini sağlayan cihazlardır. Isı değiştiricileri birçok alanda kullanılmaktadır. Bunlara örnek olarak; termik santraller, ısıtma, ilaç endüstrisi, taşıtlarda, demir çelik endüstrisi, soğutma tesisatları vb. verilebilir. Isı değiştiricileri kullanım yerlerine göre değişik tiplerde imalatları yapılabilmektedir. Isı değiştiricisi seçiminde akışkan sayısı, akışkanın yapısal özellikleri, akışkanların faz değişimleri, akışkanın akış şekli, ısı transfer mekanizması gibi özellikler dikkate alınmaktadır.

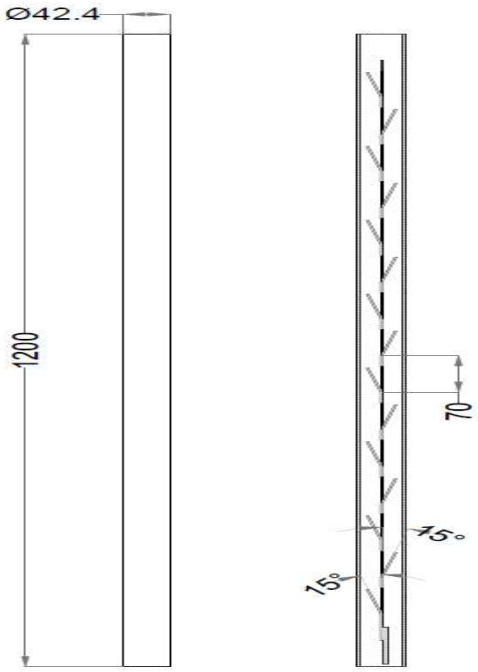
Isı değiştiricilerinde ısı transferini artırmak için birçok yöntem geliştirmiştir. Bunlardan biride türbülatör kullanımı olmuştur. Türbülatörler ısı transferini artırmak için kullanılan ekipmandır. Türbülatörler ısı transfer yüzeyini alanını ve türbülans değerlerini artırarak ısı transferini artırmakta olup baca gazı sıcaklığını düşürürler ve baca gazı kayıplarını azaltırlar. Türbülatörler enerji verimliliği sağladığı için kullanım alanı geniştir. Özellikle bina ısıtmalarında yoğun şekilde kullanılmaktadırlar. Değişik tiplerde türbülatörler üretilebilmektedir. Şekil 2'de türbülatör örnekleri verilmiştir.



Şekil 2. Türbülatör Örnekleri

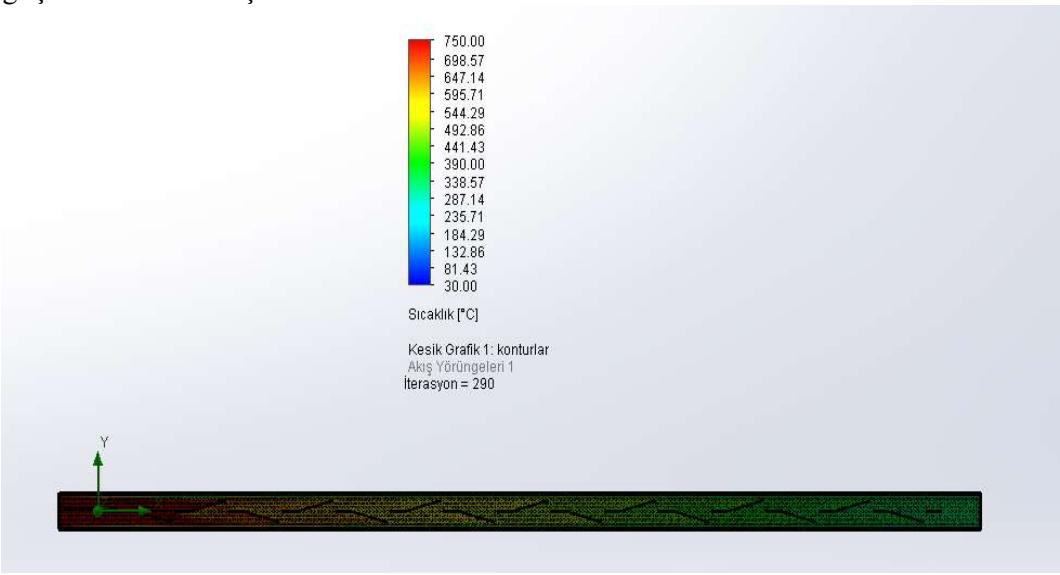
4. YAPILAN ÇALIŞMA

Bu çalışmada dogalgaz yakıtlı bir kazanda çapı Ø42.4 mm olan ve boru boyu 1200 mm olan demir bir boru kullanılmıştır. Borunun içerisine kanatçık açısı 15° ve 25° olan türbülatörler yerleştirilmiştir. Borunun iç kısmından gaz geçerken dış kısmından da su geçmektedir. Böylelikle gazın sıcaklığı suya aktarılır ve çevreye ısı verilir. Borunun içinden geçen gazın sıcaklığı 750°C ve borunun dışından geçen suyun sıcaklığına 30°C olarak verilmiştir. Şekil 3'de kanat açısı 15° olan türbülatörün tasarım parametreleri verilmiştir.



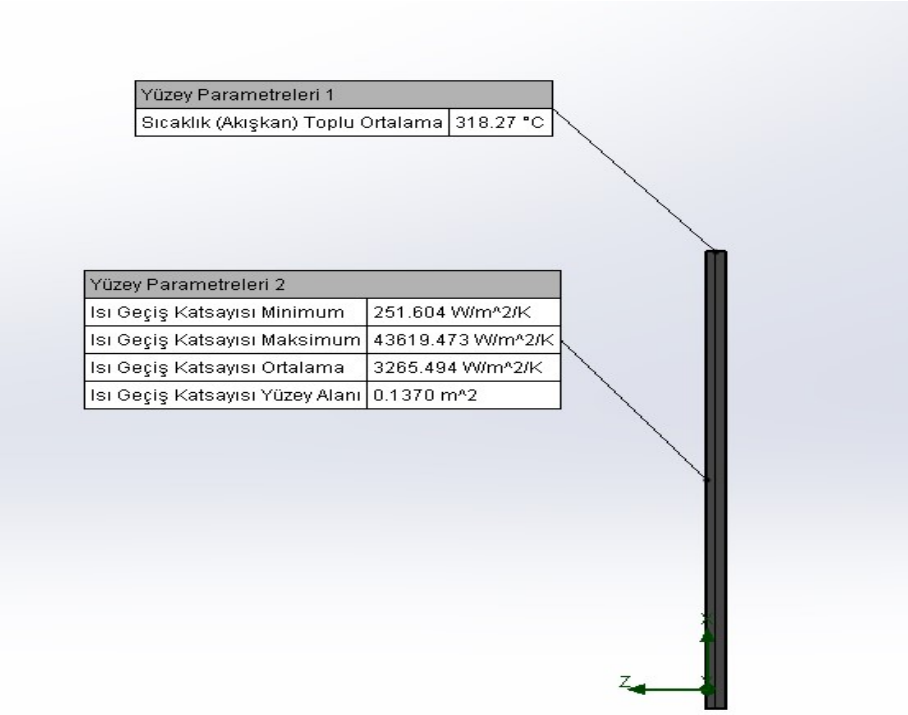
Şekil 3. 15°'lik Açıya Sahip Türbülatör

1200 milimetre uzunluğundaki borunun çapı Ø42.4 mm, kanat açısı 15° olan gaz giriş ve çıkış sıcaklığı Şekil 4'de verilmiştir.



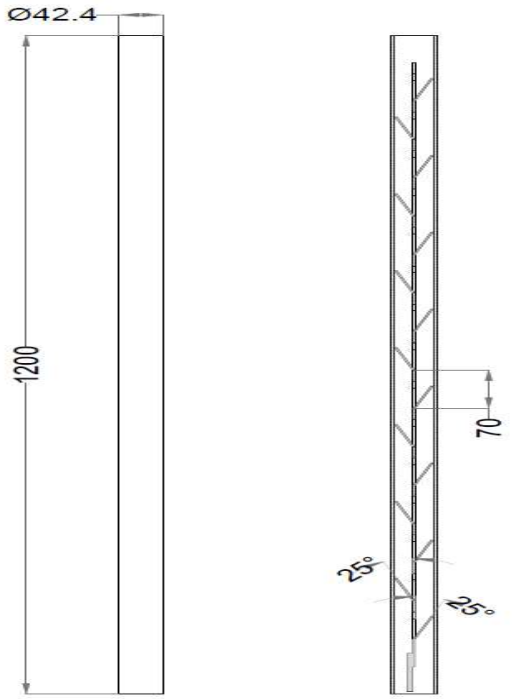
Şekil 4. 15°'lik Açıya Sahip Türbülatörün Sıcaklık Analiz Değerleri

Şekil 5'de kanat açısı 15° olan türbülatörün ısı transfer değerleri verilmiştir.



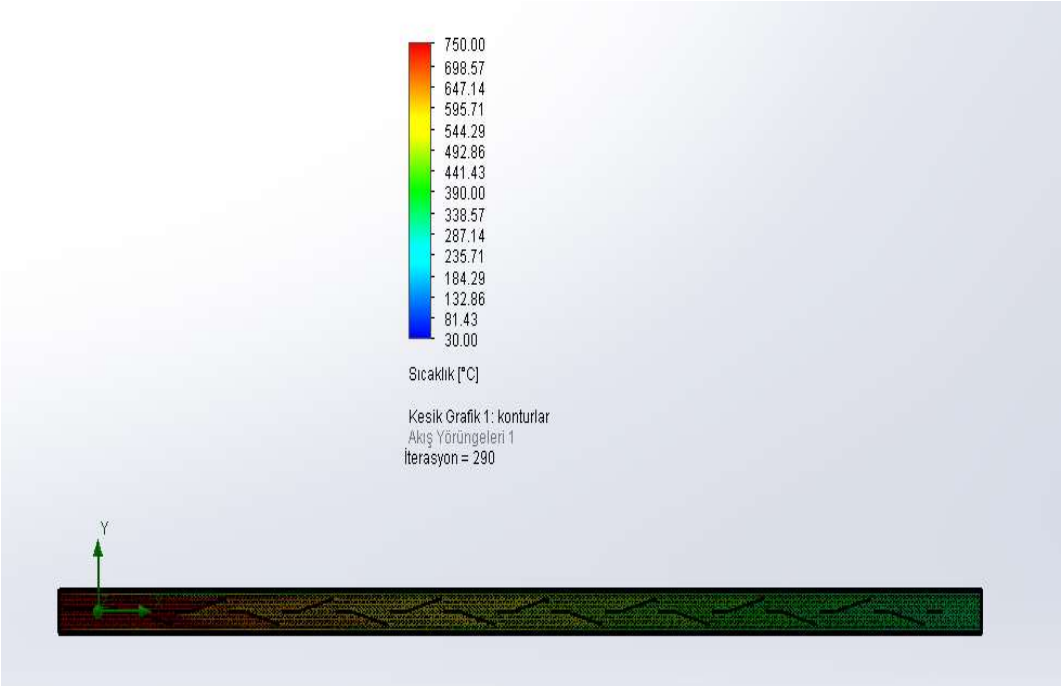
Şekil 5. 15°'lik Açıya Sahip Türbülatörün Isı Transfer Değerleri

Şekil 6'da kanat açısı 25° olan türbülatörün tasarım parametreleri görülmektedir.



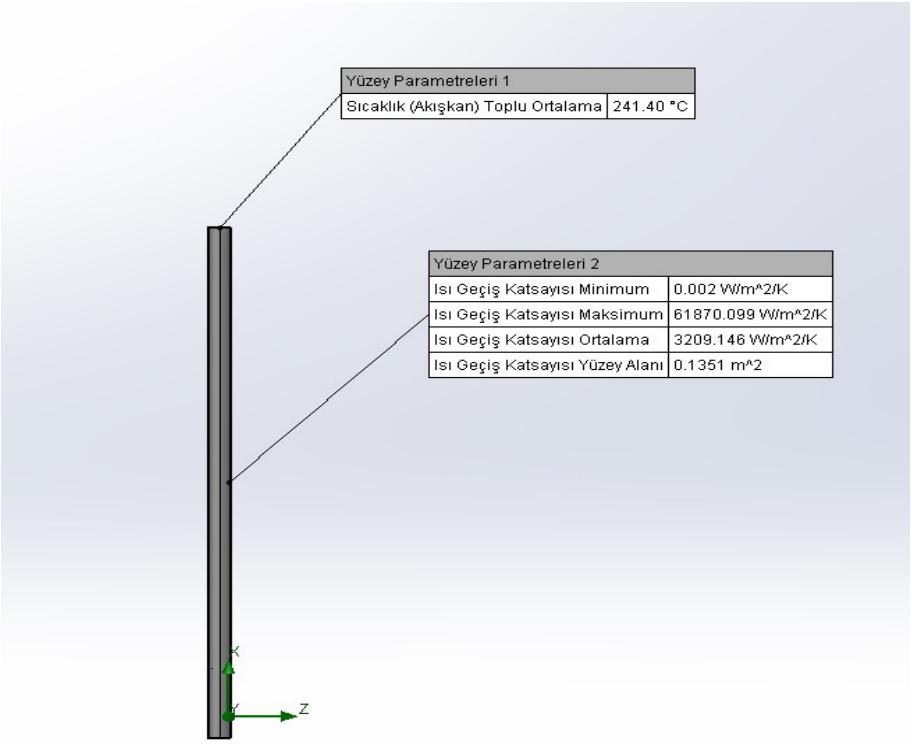
Şekil 6. 25°'lik Açıya Sahip Türbülatör

1200 milimetre uzunluğundaki borunun çapı Ø42.4 mm, kanat açısı 25° gaz giriş ve çıkış sıcaklığı Şekil 7'de verilmiştir.



Şekil 7. 25°'lik Açıya Sahip Türbülatörün Sıcaklık Analiz Değerleri

Şekil 8'de kanat açısı 25° olan türbülatörün ısı transfer değerleri görülmektedir.



Şekil 8. 25°'lik Açıya Sahip Türbülatörün Isı Transfer Değerleri

Yapılan Solidworks Flow Simulation analizi sonucunda;

- Ortalama gaz çıkış sıcaklığının en düşük değerine kanatçık açısının 25° olduğu türbülatör ile yapılan çalışmada ulaşılmıştır. Kanatçık açısı 15° olan türbülatörde ortalama gaz çıkış sıcaklığı 318.27°C iken kanatçık açısı 25° olan türbülatörde ortalama gaz çıkış sıcaklığı 241.40°C olmuştur. Bu durum 25° kanatçık açısına sahip türbülatörün daha fazla ısı transferine sebep olduğunu göstermektedir.

- Ortalama ısı geçiş katsayısının en fazla olduğu değer 15° olduğu çalışmada elde edilmiştir. Ortalama ısı geçiş katsayısı kanatçık açısı 15° olan türbülatörde 3265.494W/m^2K iken kanatçık açısı 25° olan türbülatörde ise 3209.099 W/m^2K'dir.

Elde edilen bu değerler sonucunda 25° kanatçık açısına sahip türbülatörlerde ısı transfer miktarının daha fazla olduğu görülmektedir.

5. SONUÇ

Bu çalışmanın amacı gaz yakıtlı bir kazanda kullanılan türbülatörlerde kanatçık açısının değişimi ile ısı transferindeki değişimi analiz etmektir. Isı transferi iyileştirmelerinde ısı değiştiricilerinde türbülatör kullanımı oldukça önemlidir. Farklı tip türbülatörler kullanılması ısı transferini oldukça etkilemektedir. Bu çalışmada boru içerisine düz plakalar yerleştirilerek üzerlerine farklı kanat açılarında kanatçıklar yerleştirilmiştir. Oluşturulan türbülatör yardımıyla ısı transferi artırılmıştır. Yapılan Solidworks Flow Simulation analizi sonucunda elde edilen verilere göre kanatçık açısı artınca ısı transferininde arttığı gözlemlenmiştir. Kanatçık açısı 25° olan türbülatörün kullanıldığında ısı yayınımı daha fazla olmuştur. Isı transferindeki artış miktarına en iyi sağlayan türbülatör tipinin 25° kanatçık açısına sahip türbülatör olduğu tespit edilmiştir.

KAYNAKLAR

1) Bademci, N. (2017), ''Boru içine yerleştirilen türbülatörlerin ısı transferi ve akış karakteristiklerinin sayısal olarak incelenmesi '', Yüksek Lisans Tezi, Fen Bilimleri Enstitüsü, Batman Üniversitesi, Batman.
2) Deviren, H. (2019), ''Yeni geliştirilen türbülatörlerin ısı değiştiricilerinde ısıl verim ve basınç kaybı üzerindeki etkisinin deneysel olarak araştırılması '' Yüksek Lisans Tezi, Fen Bilimleri Enstitüsü, Batman Üniversitesi, Batman.
3) Ertan, U. (2019), '' Isı değiştiricilerinde yeni geliştirilen türbülatörlerin ısı transferi ve basınç kaybına etkisi'' Yüksek Lisans Tezi, Fen Bilimleri Enstitüsü, Batman Üniversitesi, Batman.
4) İşyarlar, B., & Kırbaş, İ. (2015), ''Doğal Gaz Yakıtlı Bir Yanma Odasında Hava ve Yakıt Hızlarının Sıcaklık, Entalpi ve Entropi Üzerindeki Etkisinin İncelenmesi. 'Gümüşhane Üniversitesi Fen Bilimleri Enstitüsü Dergisi, 5(2), 60-66.
5) Kahraman, N., Sekmen, U., Çeper, B., Akansu, S. O. (2008), ''Boru içi akışlarda türbülatörlerin ısı transferine olan etkisinin sayısal incelenmesi.'' Isi Bilimi ve Tekniği Dergisi, 28(2), 51-59.
6) Karahan, F. (2010), '' Duman borulu kazanlarda yeni geliştirilen türbülatörler kullanarak ısı transferi ve basınç kaybının araştırılması", Yüksek Lisans Tezi, Fen Bilimleri Enstitüsü, Fırat Üniversitesi, Elazığ.
7) Karagöz, Ş., Çiltaş, S., Yıldırım, O., & Erdoğan, S. (2019), '' Yatay Borularda Türbülatörlerin Isı Transferine Olan Etkisinin Deneysel Araştırılması.'' Erzincan Üniversitesi Fen Bilimleri Enstitüsü Dergisi, 12(1), 306-316.
8) Pusat, G. (2016), '' Isı değiştirgeçlerinde bükümlü plaka tipi türbülatörün ısı transferine ve basınç kaybına etkisi", Yüksek Lisans Tezi, Fen Bilimleri Enstitüsü, Fırat Üniversitesi, Elazığ.
9) Terhan, M. (2014), '' Doğalgaz Yakıtlı Bir Kazanda Baca Gazından Enerji Geri Kazanımı Ve Yoğuşma Olayının Enerji, Ekserji Ve Ekonomik Yönden İncelenmesi '', Doktora Tezi, Fen Bilimleri Enstitüsü, Atatürk Üniversitesi, Erzurum.
10) Tucer, S., Onat, K., Böke, E. (2011), '' Katı yüzey ışınımı ile gaz yakıtlı ocaklarda ısı geçişinin arttırılması.'' İtüdergisi, *5*(3), 243-254.
11) Uğurluoğlu, E., Erhan, B. Ö. K. E., & AYDIN, Ö. (2017), '' Doğal Gaz Yakıtlı Bir Kazanda Katı Yüzey İlavesinin NOx Emisyonlarına Etkisi.'' Isı Bilimi ve Tekniği Dergisi, *37*(2), 13-18.

IDENTIFICATION AND RANKING OF INDUSTRIAL CLEANING PERFORMANCE INDICES IN SIRJAN STEEL COMPLEX (PELLETIZING) BASED ON MCDM METHODS

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ABSTRACT
Sirjan Iranian Steel Company was established in November 2009 and is one of the companies of MIDHCO Holding. Sirjan Iranian Steel Company is one of the exploitable projects of this holding. The purpose of building this complex is iron ore extraction, production of granulated iron ore, iron ore concentrate and pellets in Sirjan city, production of sponge iron and steel ingots in Bardsir city. Be. Sirjan complex consists of different units, the main of which are mine No. 4, concentrating unit, re-crushing unit, and iron ore pelletizing unit. In any large production organization such as this complex, especially in the Sirjan complex, there is a lot of environmental pollution. This pollution mainly includes iron ore dust and airborne concentrate, which causes damage to staff health, environmental damage, and damage. Are imported to production, so different companies are responsible for performing such industrial cleaning of complexes using ancillary contracts. The contractor uses the deployment of his forces inside the complex and prepares the monthly status of the industrial cleaning of the site or pays fines as well as the contractor's monthly balance sheet. This study was conducted in the period of November 1st, 2019 to December 1st, 2019 that the indicators were extracted using the opinions of experts and after analysis and review, the quality of the contractor's work is expressed numerically and the status report is paid on this basis. It was also examined that regional ranking could be done to make more use of this method Based on the results, 5 main criteria and 12 locations were used for ranking. The main criteria were: cleanliness of sub-conveyors, cleanliness of lubricating waste, cleanliness of raw material charging area, cleanliness of human waste, and cleanliness of waste from repairs, respectively by weight. The final 0.1, 0.036, 0.318, 0.22, 0.326 had an effect on the experiment, which was analyzed using the opinions of experts, the average value of each index in each area. Also, using the experiment design technique - the closest case to the future option, rank Area classification was also done to present to the management of the complex. The present study showed that the average value of the indicators expressed in the mentioned month is 0.076, 0.04, 0.081, 0.028, and 0.031, respectively. These results were presented to the management of the complex for analysis and review, as well as the ranking of industrial cleaning of the steel pelletizing site. Sirjan Iranian were selected using DOE-TOPSIS technique, using the extracted data, HPGR re-crushing as the first rank and LVCC and LVSS office rooms as the last rank in terms of industrial cleaning.

Keywords: Steel production, Industrial cleaning, Multi criteria decision making, Prioritizing.

APPLICATION OF CFD THEORY IN WORKING CYCLE SIMULATION OF THE YANMAR 4CHE DIESEL ENGINE

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ABSTRACT

The modern diesel engines are equipped with a sensor system, to measure working parameters. Thereby determining the engine's combustion characteristics, helping users to adjust operating parameters appropriately, to ensure the safety of the engine. However, in engines that are not equipped with sensors, it is very difficult to determine working parameters. So a tool for simulation is required. The theory of CFD uses numerical methods, combined with computer simulation technology, to solve problems related to moving factors and physicochemical properties of fluid flows in the environment. Such as simulating the combustion process of an internal combustion engine, which is currently being developed and widely applied in science and technology to serve social life. In order to evaluate the working process of the diesel engine, when changing operating conditions (load conditions), thereby determining the appropriate operating mode, to improve reliability during use. The paper presents the use of CFD software KIVA-3V, to simulate the working cycle of the Yanmar 4che diesel engine. The results show that the pressure and combustion temperature changes in the engine at 40% load, 60% load, and 80% load are suitable with theory and practical use. The research results are the basis for adjusting the engine, to achieve the highest efficiency when working in different modes.

Keywords: Diesel engine, combustion pressure, combustion temperature, cfd, kiva-3v.

1. Introduction

The theory of CFD (Computational Fluid Dynamics) solves problems related to the motion and physicochemical properties of fluid flow in the environment, all mathematical models describing the above processes are usually expressed in the form of the differential equation. Finding the solutions to these equations is very complex, so it is not usually possible to use analytical methods. Instead, using numerical methods to find approximate solutions, the numerical methods used are the Finite Difference Method (FDM), Finite Element Method (FEM), Finite Volume Method (FVM) [14]. These methods are collectively known as the method of discretizing differential equations in space and time, on the basis of subdividing the computational domain into a grid consisting of mutually bound elements on the grid according to the following principles identified.

Numerical methods to solve problems of unstable and turbulent fluid flows, problems with multi-dimensional flows are always solved based on a system of differential equations of the equations of conservation of mass, energy, and momentum. In the engine combustion chamber, the fluid flow has two phases: The gas-phase always has many components and changes due to participation in chemical reactions; the liquid phase is the breakup fuel drops, which participate in the chemical reactions of many substances and have complicated processes. Therefore, when calculating these processes, the equations of conservation of mass, momentum, and energy need to add "source" terms when considering energy conversion, changes in the concentration of substances, and gas-liquid phase interaction [9]. Therefore, applying CFD theory with the help of computers through Kiva-3v software, to calculate and simulate the processes that take place in the engine combustion chamber is necessary. The advantage of this method is that it gives reliable results, reduces time and costs, so it is widely applied in research works of many scientific fields [4].

Besides, improving internal combustion engine performance better is a complex task, that can only be achieved by a combination of experiments and simulations at the same time. Although simulation parameters may not be as accurate as experimental ones, this method still has advantages that are useful for engine development. Currently, at major research centers around the world, especially when

conducting studies on changing working parameters and changing engine structure, we often use the pre-simulation method, which has brought us great results with very high efficiency and can be studied on many different engine models [2], [12].
The main advantages of the simulation method are:
- Can easily change all the parameters to be studied.
- Initial conditions can be imposed over a wide range.
- It is possible to study separately each sub-process in the overall combustion process.
- Can extract relevant information in detail at any time.
- High efficiency in time and cost.
Currently, there are a lot of Computational Fluid Dynamics - CFD software on the market such as Ansys fluent, Kiva, Avl-fire, Star-cd, ... This software has calculated the combustion process inside the engine giving results consistent with experimental data. Among them, Kiva -3v simulation software has been widely used in the world [1].

2. Materials and methods

- Diesel engine:
The Yanmar 4che diesel engine is made in Japan, used as the main engine in fishing boats and waterway vehicles. Engine parameters are given in Table 1, the fuel used for the engine is shown in Table 2.

Table 1. Engine and simulation parameters

Type	**4CHE, unified combustion chamber**
Number of cylinders	4
Cylinder diameter x piston stroke (mm)	105x125
Power (Hp/rpm)	70/2300
Compression ratio	16.4
Engine speed of simulation	1800 rpm
Number of nozzle holes x diameter x spray direction	4 x 0.32 x 140^0
Injection timing ^{0}BTDC	18^0 BTDC
Injection pressure (bar)	210
Rod length	215 mm
IVC, EVO	
IVO	16^0 BTDC
IVC	52^0 BTDC
EVO	52^0 BTDC
EVC	16^0 BTDC

Table 2. Properties of fuel

Parameters	Value	ASTM D6751 Standard
Calorific value, MJ/kg	45.69	45.70
Density at 15^0C (g/cm^3)	0.830	DO – clean
Cetane number (CN)	52.1	Min 46
Flash point, ^{0}C	57	Min 55
Viscosity at 40^0c 40^0C, mm/s^2	2.419	2.0 – 4.5
Carbon residue of 10% of distillate residue	0.17	0.3 max
Ash content % mass	<0.001	Max 0.01
Water content, mg/kg	85	Max 200
Lubricity	380	Max 460

- Kiva-3v software

- Kiva-3v simulation software, developed over the years at Los Alamos National Laboratory (LANL), USA, and used by many research centers around the world is the CFD software that simulates 2D and 3D turbulent fluid flows, such as fuel injection, and has chemical reactions such as simulation of combustion of an internal combustion engine. The structure of the Kiva - 3v program consists of 3 parts, calculated in the following order [1]:

- "Preprocessor": k3prep_ program used to create the mesh for the model.
- "Mainprocessor": kiva3v_main processor program.
- "Postprocessor": Origin + Tecplot_ program to create graphs and images.

Kiva-3v software calculates based on the structure as shown in Figure 1.

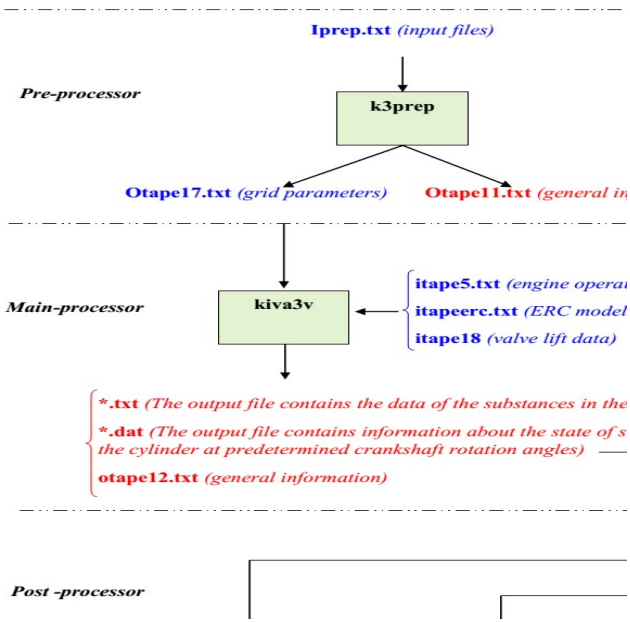


Figure 1. Structure diagram of calculation program of Kiva-3v

Kiva -3v uses the equations of conservation of mass, momentum, and energy, besides using the fuel spray breakup the model of Kelvin - Helmholtz and Rayleigh-Taylor (KH - RT) [3], the calculation model of the combustion process (Shell model) of Kong and Reitz [9],[11], [13], 8-step soot emission calculation model of Kazakov and Foster [8], [10]. For NO_x emissions, Kiva uses a calculation model based on the Y.B. Zeldovich mechanism [5-6].

Conservation of mass:

$$\frac{\partial \rho_m}{\partial t} + \frac{\partial (\rho_m u_i)}{\partial x_i} = \frac{\partial}{\partial x_i}\left(\rho D \frac{\partial (\rho_m / \rho)}{\partial x_i} \right) + \dot{\rho}_m^s + \dot{\rho}_m^c \quad (1)$$

Momentum equation:

$$\frac{\partial (\rho u_j)}{\partial t} + \frac{\partial}{\partial x_i}\left(\rho u_i u_j - \tau_{ij}\right) = -\frac{1}{\alpha^2}\frac{\partial p}{\partial x_j} + \rho F_j^s + \rho g_j - A_0 \frac{2}{3}\frac{\partial (\rho k)}{\partial x_i} \quad , \quad j = 1,2,3 \quad (2)$$

Conservation of energy:

$$\rho c_p \left(\frac{\partial T}{\partial t} + \frac{\partial T}{\partial x_i} \right) = k \frac{\partial^2 T}{\partial x_i^2} + \frac{\partial}{\partial x_i}\left(\rho D \sum_m h_m \frac{\partial (\rho_m / \rho)}{\partial x_i} \right) + A_0 \rho \varepsilon + \dot{Q}^s + \dot{Q}^c \quad (3)$$

In the above equations: F^s is the rate of momentum gain per unit volume due to the spray (kg·m/s); t: time (s); x_i: coordinates (m); p: pressure (N/m^2); $\rho = \sum_m \rho_m$: ρ_m is the mass-density of species m, ρ is the total mass-density (kg/m^3); $\dot{\rho}^s = \sum_m \dot{\rho}_m^s$: source terms of spray; $\dot{\rho}^c = \sum_m \dot{\rho}_m^c$: source terms of chemistry ; u_i, u_j: the fluid velocity (m/s); T: is the fluid temperature (K); h_m the specific enthalpy of species m (J/kg); D: diffusion coefficient; Q^c , Q^s: The source terms due to chemical heat release and spray interactions; k, ε: the turbulent kinetic energy and its dissipation rate; A_0 and $1/\alpha^2$: parameter improves computational performance for flows with small Mach numbers (the quantity Ao is zero in laminar calculations and unity when one of the turbulence models is used ($A_o = 1$)).

The RNG k-ε turbulent model (RNG k- ε) is used by Kiva because it describes the phenomena occurring in the engine combustion chamber in more detail than the k- ε standard turbulent model, especially the combustion chamber type unified [7], [12]. The k- ε RNG model was developed by Han and Reitz [1], [9]:

$$\frac{\partial \rho k}{\partial t} + \nabla \bullet \left(\rho u k\right) = -\frac{2}{3}\rho k \nabla \bullet u + \tau : \nabla u + \nabla \bullet \left(\alpha_k \mu \nabla k\right) - \rho\varepsilon + \dot{W}^s \quad (4)$$

$$\frac{\partial \rho \varepsilon}{\partial t} + \nabla \bullet \left(\rho u \varepsilon\right) = -\left[\frac{2}{3}C_1 - C_3 + \frac{2}{3}C_\mu C_\eta \frac{k}{\varepsilon}\nabla \bullet u\right]\rho\varepsilon \nabla \bullet u + \nabla \bullet \left(\alpha_\varepsilon \mu \nabla \varepsilon\right) + \frac{\varepsilon}{k}\left[\left(C_1 - C_\eta\right)\tau : \nabla u - C_2 \rho\varepsilon + C_s W^s\right] \quad (5)$$

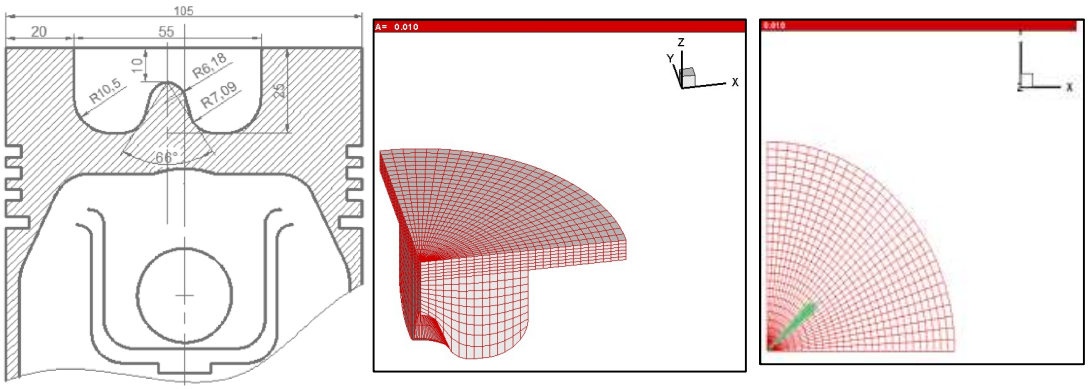
Additional coefficients: $C_3 = \dfrac{-1 + 2C_1 - 3m(n-1) + (-1)^8 \sqrt{6} C_\mu C_\eta \eta}{3}$ (6)

$$C_\eta = \frac{\eta\left(1 - \eta/\eta_0\right)}{1 + \beta\eta^3}, \eta = S\frac{k}{\varepsilon}, \; S = (2S_{ij}S_{ij})^{1/2}, \; S_{ij} = \frac{1}{2}\left(\frac{\partial u_i}{\partial x_j} + \frac{\partial u_j}{\partial x_i}\right) \quad (7)$$

In the above equations, ρ, u, τ and μ are density, velocity, stress, viscosity; η: is the dependence ratio S; S: is the magnitude of the strain; model constants: m = 0.5, n = 1.4, Cs = 1.5 (Amsden, 1999); C_μ = 0.0845, C1 = 1.42, C2 = 1.68, $\alpha_k = \alpha_\varepsilon$ = 1.39, η_0 = 4.38 and β = 0.012 (Yakhot et al., 1986).

3. Research results and discussion

The model of the Yanmar 4che engine combustion chamber grid is built based on the parameters according to Table 1 and the technical drawing of the engine's combustion chamber in Figure 2a. Because of the symmetry of the combustion chamber and the nozzle with 4 holes, the simulation content is performed on the model of 1/4 of the combustion chamber (90^o) instead of the whole combustion chamber to reduce the calculation time (Figure 2b,c).



a) Dimensional drawing of the combustion chamber *b) Grid model simulating of the combustion chamber* *c) Grid model simulating the fuel injection process*

Figure 2. Calculation grid of the Yanmar 4che engine combustion chamber

The image of the simulation results of the combustion process as shown in Figure 3, the pressure and temperature in the combustion chamber at 40% load, 1800 rpm is shown in the range of 1200 crank angle rotation (-60÷60)0 as shown in Figure 4. The comparison results of pressure, temperature, and exhaust emissions are shown in Figures 5 and 6. In which, in low load mode, the pressure and combustion temperature are small and increase with increasing load (Figure 5). Besides, soot and NOx emissions are also different. At high load mode, soot emission is also larger, because the amount of soot formed is large, so the amount of soot emission is also large (soot emissions is the difference between the amount of soot formed and the amount of soot oxidized) as shown in Figure 6a. The same is true for NOx emissions, the larger the load, the higher the combustion temperature, the greater the NOx emissions, because NOx is formed at high temperature because nitrogen combines with oxygen (Figure 6b).

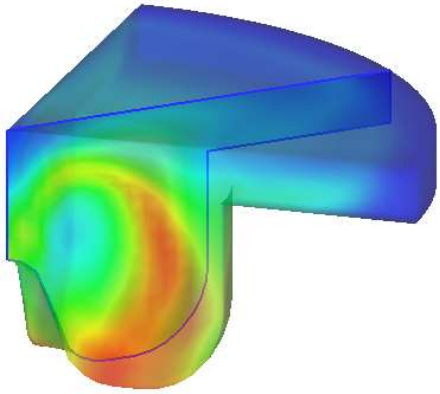
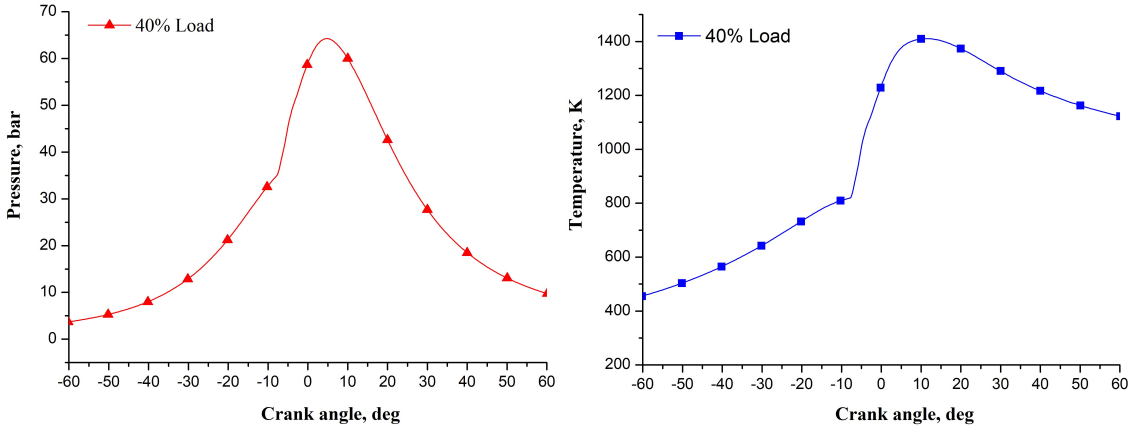
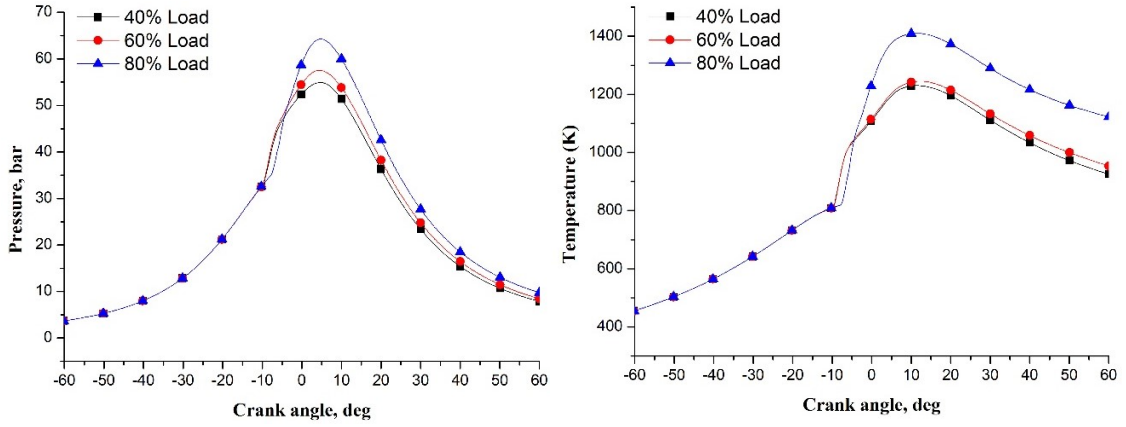


Figure 3. Simulation of the combustion process in the engine combustion chamber



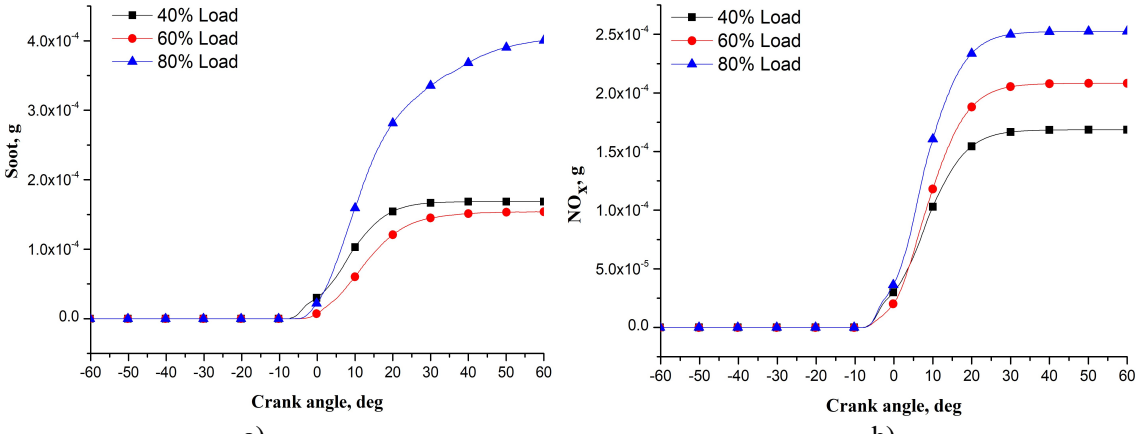
a) b)

Figure 4. Chart of pressure and temperature evolution in the engine combustion chamber at 40% load



a) b)

Figure 5. Comparison of pressure and temperature changes in the engine combustion chamber at different load modes



a) b)

Figure 6. Comparison of engine exhaust emissions under different load modes

4. Conclusion

Applying CFD theory through Kiva-3v software has simulated the working cycle of Yanmar 4che diesel engine, giving results consistent with diesel engine theory, this is the necessary basis for research evaluation the combustion process of the engine in different working modes. Thereby, it is possible to adjust the operating mode appropriately, increasing efficiency and reducing harmful exhaust emissions (mainly soot), as well as improving the reliability of the diesel engine during use.

Reference

[1]. Anthony A. Amsden, T-3, 1999, Kiva - 3v, Release 2, Improvements to Kiva-3v, Los Alamos National Laboratory.

[2]. Bernard Challen, Rodica Baranescu, 1999, Diesel Engine Reference Book, Oxford OX2 8DP.

[3]. Carsten Baumgarten, 2006, Mixture Formation in Internal Combustion Engines, Springer - Verlag Berlin Heidelberg.

[4]. G. Stiesch, 2003, Modeling Engine Spray and Combustion Processes, Springer, Berlin.

[5]. G.P. Merker, C. Schwarz, G. Stiesch, F. Otto, 2006, Simulating Combustion, Springer - Verlag Berlin Heidelberg.

[6]. Gunnar Stiesch, 2003, Modeling Engine Spray and Combustion Processes, Springer - Verlag Berlin Heidelberg.

[7]. Han, Z. and R.D. Reitz, 1995, Turbulence Modelling of Internal Combustion Engine Using RNG k-e Models. Comb. Sci. Tech.

[8]. Kazakov, A., and D.E.Foster, 1998, Modeling of Soot Formation During DI Diesel Combustion Using a Multi - Step Phenomenological Model, SAE paper No. 98246.

[9]. Kong, S, Z.Han, R.D.Reitz, 1994, The Development and Application of a Diesel Ignition and Combustion Model for Multidimensional Engine Simulation. SAE paper 950278.

[10]. Kamran Poorghasemi, Fathollah Ommi, 2012, An Investigation on Effect of High Pressure Post Injection on Soot and NO Emissions in a DI Diesel Engine, Journal of Mechanical Science and Technology 26 (1)269~281.

[11]. K. Mollenhauer, H. Tschoeke, 2010, Handbook of Diesel Engines, DOI 10.1007/978-3-540-89083-6, Springer - Verlag Berlin Heidelberg.

[12]. P.A.Lakshminarayanan, Yogesh V. Aghav, 2010, Modelling Diesel Combustion, Springer Science Business Media B.V.

[13]. Siebers DL, 1998, Liquid-Phase Fuel Penetration in Diesel Sprays, SAE Paper 980809.

[14]. T. J. Chung, 2002, Computational Fluid Dynamics, Cambridge, England.

FAS'IN DOĞU BÖLGESİNDE BİR GÜNEŞ TERMODİNAMİK MİKRO ENERJİ SANTRALİNİN İNŞASI: GÜDÜLER VE NEDENLER

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ÖZET

Fas, muazzam güneş potansiyeli ile tanınıyor ve 2009'da başlatılan ulusal sürdürülebilir kalkınma stratejisinin bir parçası olarak Fas, yenilenebilir enerji üreterek olay güneş ışınımından yararlanmak için Ouarzazate NooR Projesi'ni kurdu. Projemiz, bu fikir üzerinde çalışarak ve Fas'ın doğu bölgesindeki birincil enerji kaynaklarının tüketimini dikkate alarak, çevreyi korumak ve ulusal kalkınma stratejisi ilkelerine ulaşmak için doğuluların yaşam alanlarını yenilenebilir kaynakları kullanmaya başlatmayı amaçlamaktadır.

Anahtar Kelimeler: mikro enerji santrali - Ulusal kalkınma stratejisi

THE CONSTRUCTION OF A SOLAR THERMODYNAMIC MICRO POWER PLANT IN THE ORIENTAL REGION OF MOROCCO: MOTIVES AND REASONS

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ABSTRACT

Morocco is known for its enormous solar potential and as part of National Sustainable Developement Strategy launched in in 2009, Morocco built the NooR Project in Ouarzazate to take advantage of the incident solar irradiance by producing renewbale energy. Working on this idea and taking into account the consumption of primary energy sources in the eastern region of Morocco, our project aims to initiate the eastern habitats to use renewable sources to protect the environment and achieve the principles of the National Developement Strategy.

Keywords: micro power plant – National Developpement Strategy.

NUMERICAL ANALYSIS OF UNDEREXPANDED SONIC JET USING VANED NOZZLE FOR JET CONTROL

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ABSTRACT
The jet mixing characteristics of an underexpanded vane nozzle was analysed numerically and compared with the results of a base circular nozzle for NPR (Nozzle Pressure Ratio) value of 4. The usage of vane nozzle is a subject of interest because it enhances the mixing characteristics of underexpanded jets with minimum thrust loss. This study will help in understanding the effect of flow through vane nozzle. This method has relatively less thrust loss as the vanes placed at the exit of the nozzle are designed in such a way that they deflect the flow stream near the wall rather than obstructing it since the vanes are placed parallel to the flow when compared to other vortex generators that are placed normal to the flow. The simulation was carried out by solving the Navier Stokes equation utilizing the k-ε realizable two equation turbulence model in ANSYS Fluent software. The centreline pressure decay of the base circular nozzle and the vane nozzle was compared from the analysis to determine the effectiveness produced by the usage of vanes in the nozzle. From the obtained results it is observed that the vanes creates vortex in the flow and therefore increases the mixing characteristics and thereby reduces the potential core region. The radial pressure decay at various x/d locations is also calculated for both nozzles and compared.

Keywords: Jet mixing, Jet control, Vanes, Turbulent flows, Curvature effect

EFFECT OF CABERGOLINE ON PSEUDOPREGNANCY TREATMENT PROTOCOLS IN CANINE

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ABSTRACT
Pseudopregnancy, also known as *pseudocyesis* is where an entire or spayed bitch shows clinical signs typical of the peri and post-partum period of pregnancy, despite the bitch not being pregnant. Pseudopregnancy can be further classified as overt, which is the clinical condition and covert, which is the normal physiological condition. Nonetheless, pseudopregnancy may be under-recognised in bitches and may account for a proportion of behavioural cases seen in veterinary practices including aggression. Ninety-seven percent of vets had seen aggression in pseudopregnant bitches. Ninety-six percent of veterinary surgeons reported seeing pseudopregnant bitches showing behavioural changes without any physical changes. Behavioural changes commonly appear between six to eight weeks after oestrous. Behavioural signs consist of, but are not limited to, maternal behaviours including aggression in defence of resources, increased or reduced activity, nesting behaviour, and collecting or mothering objects [1]. Of those behavioural changes, collecting and mothering objects was the most frequently reported behavioural sign. The most commonly reported physical sign was enlarged mammary glands and/or milk production, weight gain, vomiting, and appetite loss. The precise aetiology of clinical pseudopregnancy is still poorly understood, but is reported to be linked with the exposure and decline of plasma progesterone, high plasma prolactin concentrations, an increased tissue sensitivity to prolactin, or the existence of molecular variants of prolactin with varying bioactivities [2]. Treatment options varied (surgical, medical or none) and depended on duration and severity of physical and behavioural signs, owners' preference, cost, concurrent disease, drug availability and previous history. Cabergoline may be useful for inducing estrus, treatment of primary or secondary anestrus, pseudopregnancy, and pregnancy termination in the second half of pregnancy. Also cabergoline has a high affinity for dopamine2 (D2) receptors and has a long duration of action. It exerts a direct inhibitory effect on the secretion of prolactin from the pituitary. When compared to bromocriptine it has greater D2 specificity, a longer duration of ac- tion, and less tendency to cause vomiting. 5 mcg/kg once a day PO for 5–10 days can be effective for treatment of pseudopregnancy.

Keywords: Pseudopregnancy, Cabergoline, Canine

References:

[1] England GC, Heimendahl AV. BSAVA manual of canine and feline reproduction and neonatology 2nd edition. Cheltenham: British Small Animal Veterinary Association; 2010.
[2] Gobello C, Concannon PW, Verstegen J: Canine pseudopregnancy: A Review. Recent advances in Small animal reproduction. Edited by: Concannon PW, England G, Verstegen J. 2011, Ithaca, New York USA Retrieved: International Veterinary Information Services, (www.ivis.org).

INDUCTION AND SYNCHRONIZATION OF ESTRUS IN CANINE

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ABSTRACT
Indications for estrus induction in the bitch include missed breeding opportunities or conception failure, the treatment of primary or secondary anestrus and synchronization of ovulation for embryo transfer programs. Exogenous gonadotropin regimens that combine sequential treatment with eCG and hCG are frequently used in domestic and non-domestic felids as one component of AI protocols. To date, it has been demonstrated that oestrus of bitches can be induced by the administration of a variety of hormones, including porcine FSH, equine chorionic gonadotropin and GnRH analogues [1]. These methods vary widely in efficacy of inducing estrus, in the pregnancy rates following the induced estrus, and in success in maintaining ongoing pregnancies. Furthermore, some protocols are too expensive or labor-intensive to be suitable for clinical veterinary practice, or hormones are not available in all countries. Of these, equine chorionic gonadotropin (eCG or PMSG) has been most frequently used as a gonadotropin for the induction of oestrus because of the ready availability of eCG in most countries. In addition, the combination of eCG and human chorionic gonadotropin (hCG) has been used to induce oestrus in bitches [2]. Nevertheless, the use of high doses of eCG for estrus induction can be associated with hyperestrogenism. Also the use of hCG to induce ovulation in estrus induction protocols in bitches is quite controversial because they are spontaneous ovulators. Furthermore, hyperestrogenism and thrombocytopenia were reported in 29% of bitches treated with 20 IU/kg of eCG for 10 days. In conclusion, 50 IU/kg of eCG combined 7 days later with 500 IU of hCG induced normal and fertile estrus in bitches at 164 days post estrus with an 80% pregnancy rate, with no side effects, and with a reduction of 48 days of the interestrus interval.

Keywords: Induction of estrus, Equine chorionic gonadotropin, Human chorionic gonadotropin

References
[1] Kutzler MA. Effect of estrus induction on pregnancy rates in domestic bitches and queens. Clin Theriogenol 2010;2:191–207.
[2] Tsuda T, Nakao S, Nakao T. The induction of superovulation in the bitch with pregnancy mare serum gonadotropin and human chorionic gonadotropin. J Reprod Dev 1995;41:189 –95.

COVİD-19 SÜRECİNDE EĞİTİM VE ÖĞRETİM SİSTEMİNE YÖNELİK SORUNLAR VE ÇÖZÜM ÖNERİLER

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ÖZET
Bu çalışmada, Covid-19 sürecinde uzaktan eğitim ve öğretim sistemine yönelik sorun ve çözüm önerilerinin tartışılması hedeflenmiştir. Uzaktan eğitim süreçinin yüz yüzeden daha etkin olmadığı aşikardır. Öğretmenler ve öğrenciler Covid-19 pandemi sürecinde en çok internet erişimi problemi nedeniyle sorunlar yaşamışlardır. Bu sorunlarla beraber uygulamalı derslerde deney yapmanın sıkıntılı olacağı ve gerekli malzeme ve tekniksel alt yapının sağlanamayacağı düşünülmektedir. Dolaysıyla bu süreçte velilerle işbirliği ve eğitim disiplini önem kazanmaktadır. Özellikle kırsal kesimde yaşayanlar için internet alt yapısı ve internet erişimi sağlanmalıdır. Uygulamalı dersler için deneysel model önerileri yapılmalıdır. Öğretmen adaylarına uygulamalı derslere yönelik gerekli mesleki eğitimler verilmeli ve daha basit düzeyde deneylerle öğrenci adayları öğrenmeye teşvik edilebilir. Fırsat eşitliği tanınması açısından imkanı kısıtlı öğrencilere amaca yönelik merkezler açılabilir. Böylece imkanları kısıtlı öğrencilere hizmet edilebilir. Sunulan önerilerin etkili olabileceği düşünülmektedir.

Anahtar Kelimeler: Covid-19, Uzaktan eğitim, Çözüm Önerileri.

PROBLEMS AND SOLUTION SUGGESTIONS FOR THE EDUCATION AND TRAINING SYSTEM IN THE COVID-19 PROCESS

ABSTRACT
In this study, it is aimed to discuss the problems and solutions for the distance education and training system in the Covid-19 process. It is obvious that the distance education process is not more effective than face-to-face. Teachers and students have experienced problems mostly due to internet access problems during the Covid-19 pandemic. Along with these problems, it is thought that it will be difficult to experiment in applied courses and the necessary material and technical infrastructure will not be provided. Therefore, cooperation with parents and educational discipline gain importance in this process. Especially for those living in rural areas, internet infrastructure and internet access should be provided. Experimental model suggestions should be made for applied courses. Necessary vocational training should be given to prospective teachers for applied courses, and prospective students can be encouraged to learn with simpler experiments. In order to provide equal opportunities, purpose-oriented centers can be opened for students with limited opportunities. Thus, students with limited opportunities can be served. It is thought that the suggestions presented can be effective.

Keywords: Covid-19, Distance education, Solution Proposals.

HEMŞİRELİK ÖĞRENCİLERİNİN PANDEMİ SÜRECİNDEKİ DENEYİMLERİ, COVID-19 KORKULARI VE MANEVİ YÖNELİMLERİ: KESİTSEL BİR ÇALIŞMA

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ÖZET
Tüm dünyayı etkisi altına alan COVID-19 pandemi süreci şüphesiz ki hemşirelik öğrencilerini de pek çok açıdan etkilemiştir. Bu süreçte öğrencilerin ruh sağlıklarını korumak ve uygun girişimlerde bulunabilmek için deneyimlerinin, duygu ve düşüncelerinin ve olumsuz duygularla baş edebilmek için nelere yöneldiklerinin belirlenmesi önemli hale gelmiştir. Araştırma, hemşirelik öğrencilerinin COVID-19 pandemi sürecindeki deneyimlerini ve yaşadığı korku ile manevi yönelim arasındaki ilişkiyi değerlendirmek amacıyla yürütülmüştür. Kesitsel tipteki araştırmaya Türkiye'deki üniversitelerde öğrenim gören 524 hemşirelik öğrencisi katılmıştır. Çalışmanın yürütülebilmesi için etik kurul izni (26 Nisan 2021 tarihi, 07 numaralı toplantı ve 73 karar numarası ile) ve Türkiye Cumhuriyeti Sağlık Bakanlığı'ndan izin alınmıştır (2021-02-12T02_50_37). Veriler online anket formu ile toplanmıştır. Veriler, hemşirelik öğrencilerinin tanımlayıcı özelliklerine ilişkin soru formu, Manevi Yönelim Ölçeği ve COVID-19 Korkusu Ölçeği ile toplanmıştır. Veri analizi SPSS 21.0 kullanılarak yapılmıştır. Araştırmaya katılan öğrencilerin Manevi Yönelim Ölçeği puan ortalamasının 86.56 ± 13.24, COVID-19 Korkusu puan ortalamasının ise 19.26 ± 5.01 olduğu belirlendi. Araştırmaya katılan öğrencilerin manevi yönelim puanları ve COVID-19 korkusu puanları arasında pozitif yönde orta düzeyde ilişki olduğu saptandı (r=0,411, p=0,0001). Araştırma sonucunda hemşirelik öğrencilerinin pandemi sürecinde psikososyal açıdan olumsuz değişimlere maruz kaldığı ve korku yaşadıkları belirlenmiştir. Öğrencilerin korkularının kontrol altına alınmasına yönelik girişimlerde bulunulması, korku ile baş etmede uygun manevi yaklaşımların geliştirilmesi ve öğrencilere psikolojik danışmanlık hizmetleri verilmesi önerilebilir.

Anahtar Kelimeler: COVID-19, hemşirelik öğrencileri, korku, manevi yönelim, pandemi.

THE EXPERIENCE OF NURSING STUDENTS DURING THE PANDEMIC PROCESS AND THEIR FEAR OF COVID-19 AND SPIRITUAL ORIENTATION: A CROSS-SECTIONAL STUDY

ABSTRACT
The COVID-19 pandemic process, which has affected the whole world, has undoubtedly affected nursing students in many ways. In this process, it has become important to determine the experiences, feelings and thoughts of the students in order to protect their mental health and to take appropriate initiatives, and what they turn to in order to cope with negative emotions. This study aimed to investigate the experiences of nursing students during the COVID-19 pandemic and the relationship between the fear and spiritual orientation they experienced. This study used a cross-sectional research design and consisted of a total of

524 nursing students studying at universities in Turkey. The study was approved by an ethics committee (dated: April 26, 2021, with the Meeting Number of 07, and Decision Number of 73). The permission of the Republic of Turkey Ministry of Health was obtained to conduct the study (2021-02-12T02_50_37). The data were collected using an online questionnaire. The online questionnaire included a personal information form, which aimed to collect descriptive data about nursing students, the Spiritual Orientation Scale, and the Fear of COVID-19 Scale. Data analysis was performed using SPSS 21.0. The mean score of the nursing students participating in the study from the Spiritual Orientation Scale was 86.56 ± 13.24, and their mean score from the Fear of COVID-19 Scale was 19.26 ± 5.01. A moderate positive correlation was found between spiritual orientation and fear of COVID-19 scores of the students ($r = 0.411$, $p = 0.0001$). As a result of the study, it was determined that nursing students were exposed to psychosocial negative changes during the pandemic and experienced fear. It may be recommended that initiatives should be carried out to control nursing students' fear, appropriate spiritual approaches should be developed to cope with fear, and that nursing students should be provided with psychological counseling services.

Keywords: COVID-19, fear, nursing students, pandemic, spiritual orientation.

TÜRKİYE'DEKİ HEMŞİRELERİN PANDEMİ SÜRECİNDEKİ DENEYİMLERİ, COVID-19 KORKULARI VE ÖLÜM KAYGISI: KESİTSEL BİR ÇALIŞMA

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ÖZET
Hemşireler, tüm dünyayı etkisi altına alan COVID-19'u önleme ve müdahale çabalarının merkezinde yer almaktadır. Bu süreçte hastalığın kontrol altına alınamayan ölümcül doğası ve birçok olumsuz faktöre maruziyet nedeniyle hemşirelerin ruh sağlıklarının olumsuz etkileneceği düşünülmektedir. Araştırma, hemşirelerin COVID-19 pandemi sürecindeki deneyimlerini ve yaşadığı korku ile ölüm kaygısı arasındaki ilişkiyi değerlendirmek amacıyla yürütülmüştür. Kesitsel tipteki araştırmaya Türkiye'de sağlık kuruluşlarında çalışmakta olan 250 hemşire katılmıştır. Çalışmanın yürütülebilmesi için etik kurul izni (56786525-050.04.04/7287) ve Türkiye Cumhuriyeti Sağlık Bakanlığı'ndan izin alınmıştır (2020-09-01T09_28_15). Veriler online anket formu ile toplanmıştır. Veriler, hemşirelerin tanımlayıcı özelliklerine ilişkin soru formu, Thorson-Powell Ölüm Kaygısı Ölçeği ve COVID-19 Korkusu Ölçeği ile toplanmıştır. Veri analizi SPSS 21.0 kullanılarak yapılmıştır. Araştırmaya katılan hemşirelerin Thorson-Powell Ölüm Kaygısı Ölçeği puan ortalamasının 54,50±15,51, COVID-19 Korkusu puan ortalamasının ise 19,79±6,20 olduğu belirlendi. Araştırmaya katılan hemşirelerin ölüm kaygısı puanları ve COVID-19 korkusu puanları arasında pozitif yönde orta düzeyde ilişki olduğu saptandı (r=0,451, p=0,0001). Araştırma sonucunda hemşirelerin pandemi sürecinde psikososyal açıdan olumsuz pek çok değişime maruz kaldığı, korku ve ölüm kaygısı yaşadıkları belirlenmiştir. Hemşirelerin korku ve ölüm kaygılarının kontrol altına alınmasına yönelik girişimlerde bulunulması, makul bir vardiya takvimi oluşturulması ve hemşirelere psikolojik danışmanlık hizmetleri verilmesi önerilebilir.

Anahtar Kelimeler: COVID-19, hemşirelik, korku, ölüm kaygısı, pandemi.

THE EXPERIENCE OF NURSES IN TURKEY DURING THE PANDEMIC PROCESS AND THEIR FEAR OF COVID-19 AND DEATH ANXIETY: A CROSS-SECTIONAL STUDY

ABSTRACT
Nurses are at the center of the prevention and intervention efforts for COVID-19, which has affected the whole world. During this process, it is thought that the mental health of nurses will be negatively affected due to the fatal nature of the disease that cannot be controlled and exposure to many undesirable factors. This study aimed to investigate the experiences of nurses during the COVID-19 pandemic and the relationship between the fear and death anxiety they experienced. This study used a cross-sectional research design and consisted of a total of 250 nurses working in health institutions in Turkey. The study was approved by an ethics committee (56786525-050.04.04/7287). The permission of the Republic of Turkey Ministry of Health was obtained to conduct the study (2020-09-01T09_28_15). The data were collected using an online questionnaire. The online questionnaire included a personal information form, which aimed to collect descriptive data about nurses, the

Thorson-Powell Death Anxiety Scale, and the Fear of COVID-19 Scale. Data analysis was performed using SPSS 21.0. The mean score of the nurses participating in the study from the Thorson-Powell Death Anxiety Scale was 54.50 ± 15.51, and their mean score from the Fear of COVID-19 Scale was 19.79 ± 6.20. A moderate positive correlation was found between death anxiety and fear of COVID-19 scores of the nurses ($r = 0.451$, $p = 0.0001$). As a result of the study, it was determined that nurses were exposed to many psychosocial negative changes during the pandemic and experienced fear and death anxiety. It is recommend that initiatives should be carried out to control nurses' fear and death anxiety, a reasonable shift schedule should be established, and that nurses should be provided with psychological counseling services.

Keywords: COVID-19, fear, death anxiety, nursing, pandemic.

İNSAN KALÇA EKLEMİ İÇİN SIKMA FİLMİ ANALİTİK ÖZELLİKLERİ

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ÖZET

Bu tezde sunulan çalışmanın temel amacı, analitik (basınç filmi için belirtiler, günlük aktivite sırasında sinovyal kalça ekleminin yük taşıma kapasitesi, sürtünme katsayısı ve sinovyal azalmanın azalması) elde etmek için insan kalça eklemini modelleyerek sıkma film özelliklerini belirlemektir. sabit yürüme sırasında femurun asetabuluma yaklaşma süresi ile film kalınlığı) . Her iki cinsiyet için de günlük aktivite sırasında insan kalça eklemine uygulanan kuvveti hesaplamak için adım uzunluğu ve adım uzunluğunu inceliyoruz ve bunun için adım uzunluğu ve adım uzunluğunu belirlemek için birçok deney yapıyoruz. Bu çalışmada gösterdiğimiz gibi, kalça eklemine uygulanan farklı yağlama türleri ve filmin kalınlığını ve bunun yürüme döngüsüyle ilişkisini belirledik. Matematiksel model, insan kalçasını ilk detaylandıran temsil edildi, yüzeye yakın bir top olarak tasarlandı, membran basınç özellikleri, üç durumda bir çift stres ile sıvı ile modifiye edilmiş Reynolds denklemi kullanıldı: ilk olarak, hareket sırasında eklem üzerine uygulanan yükler.

Anahtar Kelimeler: insan kalça eklemi, matematiksel model, yürüyüş döngüsü

SQUEEZE FILM ANALYTICAL CHARACTERISTICS FOR THE HUMAN HIP JOINT

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ABSTRACT

The main aim of study presented in this thesis is to determine of squeeze film characteristics by modeling the human hip joint to obtain analytical manifestations for the pressure film, load carrying capacity of synovial hip joint during daily activity, coefficient of friction and reduction of synovial film thickness with time of approach femur to acetabulum during steady walking . To calculate the force that apply on human hip joint during daily activity for both genders, we study step length and stride length, and for this we do many experiment to determine step length and stride length. As we have shown through this study the different types of lubrication to the hip joint and determined the thickness of the film and its relationship to the gait cycle. Mathematical model the first to detail the human hip was represented engineered a ball close to the surface have been studied membrane pressure characteristics use Reynolds equation modified with fluid with a couple stress in three cases: first, the loads applied to the joint during movement.

Keywords: human hip joint, mathematical model, gait cycle.

THE ROLE OF OBJECT-ORIENTED PROGRAMMING IN THE SYSTEM OF PROFESSIONAL TRAINING FOR A BACHELOR'S DEGREE IN COMPUTER SCIENCE

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ABSTRACT

The pace of scientific and technological progress as well as the introduction of modern information technologies in various spheres of human life and professional activity lead to the urging necessity to improve the system of training of the specialists in the field of information systems and corresponding technologies. In Ukraine, such training at the level of higher education is carried out in groups of specialties and directions "Information technology", in particular in the specialty "Computer science" (CS).

According to existing standards, a bachelor of the specialty "Computer Science" must possess fundamental knowledge, professional skills and corresponding qualification, experience in creative and research activities as well as in solving professional problems. These tasks, in particular, include the following: the development of projects for the automation and informatization of applied processes, including creation of appropriate information systems. The project activity of the bachelor of the specialty "Computer Science" involves the development, implementation and adaptation of applied software, programming applications in the development of information systems (IS). Thus, it attracts attention to the need to improve the training of CS bachelors in the field of programming, creation of applications and software using modern approaches and professional instrumental environments.

In order to identify the elements of professional competence of CS bachelors related to the tasks of development, implementation and adaptation of applied software, programming applications in the development of ISs, we must describe the components of above-mentioned competence while analyzing the standard of the specialty, as well as verifying the use of modern ideas of the competence-based approach, implying understanding of the need for the formation of knowledge, skills and particular personal qualities of students at a bachelor's degree associated with the most advanced modern technologies and means of designing and developing applied computer software.

In the standard of higher education of Ukraine of the first (bachelor's) level, sphere of knowledge 12 “Information technologies”, specialty "Computer Sciences", there is a number of competencies that can be formed in the process of studying object-oriented programming:

• **general competences**:
- the ability to perform abstract thinking, conduct analysis and synthesis;
- the ability to use knowledge in practical situations;
- possession of knowledge and understanding of the subject area and professional activities;
- the ability to learn and master modern knowledge;
- the ability to generate new ideas (creativity).

• **special competencies**:
- the ability to think logically, build logical conclusions;
- the ability to use formal languages and models of algorithmic computations;
- ability to design, develop and analyze algorithms, assess their effectiveness and complexity;
- ability to identify decidability or undecidability of algorithmic problems for adequate modeling of subject areas and the creation of software and information systems.
- the ability to design and develop software using various programming paradigms: generalized, object-oriented, functional, logical, with appropriate models, methods and algorithms of calculations, data structures and control mechanisms.

After conducting the analysis of modern approaches to the development of computer software, we consider it necessary to exploit the object-oriented programming. This direction is the most

popular and promising in the practice of programming, for it allows to design and create software at a high level of abstraction and contributes to the formation of the object-oriented style of algorithmic thinking, which is identified as a a programming methodology that enables the professional to represent formalized solutions due to the conceptual unity of the terminological base and a small number of basic constructs. At the same time, teaching object-oriented programming requires the development of special techniques, since it combines the need to master a special methodology, as well as modern languages and development tools that ensure the implementation of an object-oriented approach.

Summing up all the results presented in the article, we can conclude that the competence of a CS bachelor in the field of object-oriented programming presupposes a high level of generalized professional knowledge, a willingness to develop computer applications in the process of solving professional problems. This competence is an integral part of the core of the professional competence of a bachelor's degree in Computer Science, which allows a university graduate to be modern and competitive in the labor market. The formation of this competence is effectively carried out on the basis of the implementation of two interrelated disciplines focused on the formation of theoretical knowledge and cognitive activity necessary for the study of object-oriented programming, as well as on the further study of a specific programming language and corresponding instrumental environments.

Keywords: Education, Competences**,** Information techno

ЧИСЛЕННОСТИ ВРАНОВЫХ ПТИЦ В РЕКЕ ТУУЛ НА ТЕРРИТОРИИ УЛААНБААТАР

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В Целом Монголии встречаются 14 видов из 9 родов, из них 8 (кукша, сойка, голубая сорока, сорока, кедровка, клушица, черная ворона, ворон) гнездящиеся оседлые, 5 (альпийская галка, галка, даурская галка, грач, серая ворона) гнездящиеся перелетный вид, 1 вид (монгольская саксаульная сойка) редкий вид.

В чаще реки Туул встречаются 7 видов врановых. Из них 5 вида (голубая сорока, сорока, клушица, черная ворона, ворон) зимуют и 2 вида (даурская галка, грач) гнездящиеся перелетная.

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Распределение врановых птиц р. Туул фауно-генетическая структура (Штегман, 1938) выглядит следующим образом: Европейские по происхождению птицы представлены – 4 вида (голубая сорока, грач, черная ворона, ворон), Сибирского – 1 (сорока), Монгольского – 1 (клушица) и Китайского – 1 (даурская галка).

По абсолютным количественным значениям врановых птиц многочисленна 2,22 ос/км^2 чаща реки Туул. Показатели индекса видового разнообразия H '= 1,58; индекса видового богатства Dmg = 1,11.

ALTERNATIVE MANAGEMENT OF DEGRADED SEED PRODUCTION SAINFOIN STANDS

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ABSTRACT

Forage legumes are of importance in agriculture. Through the symbiotic association with *Rhizobium* spp. they can convert atmospheric nitrogen and enrich the nitrogen content of soil. Thus forage legumes can make a substantial contribution to sustainable agriculture. Sainfoin (*Onobrychis viciifolia* Scop.) is a legume forage crop which is adapted to a wide range of climatic conditions. Sainfoinís crude protein content ranges from 17-25%, depending on growth stages. Its non-bloating characteristics make it a potentially valuable forage crop. The lack of longevity is considered as a disadvantage of that crop. The possibility degraded sainfoin seed production stands be undersowed with subterranean clover and thereafter used for forage was tested in field experiment. The work was done in the Institute of Forage Crops, Pleven, Bulgaria during seven consequence years (2007-2013). Sainfoin was used and cultivated according to the technology accepted for seed production. Three subterranean clover subspecies were used for the undersowing vz. *Trifolium subterraneum ssp. brachycalicinum* (cv. "Antas"), *Trifolium subterraneum ssp. yaninicum* (cv. "Trikkala") and *Trifolium subterraneum ssp. subterraneum* (cv. "Denmark"). The under sowing with subclovers was performed during the autumn of the fourth year (2010) of using of sainfoin stands with 400 germinated seeds/m^2. The interrow spacing was 12 cm. Three years after sowing the crops were harvested for forage. Six cuts (two annually) were received. The subterranean clover was considered to improve the botanical composition of the stands. As self-seeding legume it occupied free spaces and significant decreased the weed infestation in the first cut. The dry mass yield was found increased also. It was concluded the undersowing of degraded sainfoin stands with subterranean clover is possible agrotechnical measurement. That allowed the stands be used for forage production. In addition the longevity of the stands was extended. This measure is contribution to overcoming the lack of longevity of that crop.

Keywords: degraded swards, undersowing, sainfoin, subterranean clover.

INCREASING HOUSE-HOLD DEMAND FOR WOOD FUEL: A THREAT TO FORESTRY DEVELOPMENT IN NIGERIA

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ABSTRACT
Over exploitation of forest based products had been a serious issue and a great threat to forestry development in Nigeria. Among these forest products are the fuel woods. This comes as a result of deforestation without reforestation. Due to the increasing population of Nigeria, the available fossil fuels which serve as sources of cooking energy for most urban and rural dwellers have become inadequate, unaffordable and most times unavailable for the population. Fuel wood such as firewood and charcoal which is being used by 90% of rural households now becomes the highly demanded cooking fuel for households despite the health risks or environmental challenges that emanates from its use. This paper therefore evaluates the increasing rate in household demand for wood fuel which is a great threat to forestry development in Nigeria. It specifically describes firewood and charcoal as the common types of wood fuels; kerosene and cooking gas as the most use fossil fuels in Nigeria. It also establishes that the increase in the price of fossil fuel leads to increase in the demand for wood fuels in Nigeria. The recent hike in wood fuel demand brought about new technological inventions in equipment usage. The drivers of deforestation such as land use changes, use of wood fuel, urbanization, among others were also explained. The effect of deforestation on forestry development in Nigeria was also emphasized. These effects are; land degradation, climate change, biodiversity loss, desertification flooding and erosion. The paper therefore recommended that there should be increase the subsidy on fossil fuels, development of alternative cooking fuel, use of agricultural and industrial wastes.

Keywords: Fossil fuel; Wood fuel; Forestry development.

UNDERSTANDING OF SOIL EROSION BASED ON WADIES MORPHOMETRIC PARAMETER INCONSISTENCIES

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Abstract
Morphometric parameters are parameter that can used to investigate watershed delineation and other geomorphological studies such as understand the of soil erosion problem. Extract basin parameters was done to evaluate the inconsistencies of morphometric parameters from 2 basins which adjacents to each other, Yalamlam basin and Al-Lith basin in the southeastern part of KSA. Basin delineation with ASTER GDEM 30 m spatial resolution in this study processed by ArcGIS, the NDVI value obtain from remote sensing technique using Landsat-8, and the RUSLE method was chosen as a soil erosion estimation method since it has proven to have better accuracy. The soil erosion predict from natural factor such as errosivity factor, erodibility factor, also C, LS and P factor. In this study, the rainfall data taken on November 24, 2018 which on flood condition. The result from comparation of morphometric parameters shows that Al-Lith basin have high drainage densities, high elongation ratio, more circular basin, and low relief than Yalamlam basin. It indicates that Al-Lith basin has a high susceptibility to erosion than Yalamlam. Based on soil erosion result, both basins have soil erosion dominantly on a low value with less than 4 ton/ha/year. The maximum soil erosion is range between 23 to 52 ton/ha/year. As land use and landcover references, the landcover for Al-Lith basin has 2% of alluvium, 73% of Rock, and 25% of vegetation while the landcover of Yalamlam basin is 41% of alluvium, 54% of rock, and 4% of vegetation. Based on these data, Yalamlam basin is more eroded than Al-Lith basin. This study regarding soil erosion estimation through the morphometric parameters analysis can provides useful information about geomorphological studies and hydrologycal behaviour. It also can help land decision makers for sustainable water resource management and evaluate risk assessment of the basin.

Keywords: Soil erosion, morphometric parameters, GIS and remote sensing

ENVIRONMENTAL ANALYSIS OF AROMATIC HYDROCARBON TOXICITY: A CASE STUDY

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ABSTRACT
Aromatic hydrocarbons are organic compounds containing two or more benzene cycles fused into their structure. However, they are very stable and unrestricted due to their hydrophobic nature and low solubility in water. They are CMR (toxic, mutagenic and carcinogenic) in nature and are considered as pollutants to be treated in priority. Plants absorb a large number of aromatic hydrocarbons from the soil and enter our food chain, causing serious health problems. In this work, using a literature review, the hazards of these materials in the environment were discusses and analysed, using the Mads Mosar method, in addition to the Aloha simulation software. As a case study, two aromatic substances were considered: benzene and toluene. They are stored in a tank at the Sidi Rzine refinery complex, Baraki, Algiers. The study's preliminary results show that both substances pollute on several levels: air pollution, water pollution and soil pollution. In addition to these findings, this pollution leads to other scenarios. In terms of the pollution value, it was found that benzene pollution exceeds toluene pollution in equal quantity. However, in the adverse weather conditions, red zone, the study shows that the death of all personnel present in a surrounding area of 367 m and 172 m respectively for benzene and toluene. It was also found that in the least toxic zone, the orange zone, with a surrounding area of 856 m and 559 m respectively, these substances cause permanent damage. In the yellow zone, which is the least harmful, benzene was found to cause permanent damage at a distance of 4 km and toluene at a distance of 1.9 km. As a result, it is possible to determine the safest and most dangerous zones, and even to determine the perimeter that allows the population and agricultural distribution around the refinery to evolve.

Keywords: Aromatic hydrocarbons, industrial pollution, Risk analysis, Aloha, Mads Mosar method , and safety.

Introducion

The introduction of many chemicals into the environment since the industrial revolution has been associated with a dynamic increase in energy consumption; where this energy can be estimated according to its source, such as nuclear energy, gas, oil ... etc. The last two sources of energy belong to the same family, which is hydrocarbon. While these hydrocarbons are divided into three main families: Aliphatic hydrocarbons, Naphthenic hydrocarbons, and Aromatic hydrocarbons[1]. In general, aromatics are hydrocarbons which have properties associated with the benzene nucleus or ring, the general formula of which is CnH2n-6; its presence in crude oil varies from 10 to 30% of the total hydrocarbons [2]**.** The BTEX (benzene, toluene, ethylbenzene, and xylenes) are generally used in perfumes, dyes and pharmaceutical industries. This family is considered very stable and unrestricted due to its hydrophobic nature and low water solubility.

BTEX are considered one of the most important volatile organic compounds (VOCs)[3], as its emission represents an important class of pollutants as they are associated with many health effects [4]. Even at low concentrations, it can cause many health effects, including nausea, irritation, asthma attacks, fatigue, headaches, dizziness, agitation, …[5], the indirect effect on health is the consumption of the contaminated product (meat and vegetables) which destroys internal organs, such as the kidneys, liver and lungs [6]. In addition, these materials are CMR (toxic, mutagenic and carcinogenic) in nature; In particular, both benzene and ethylbenzene increase the risk of leukemia and hematopoietic cancers [7].

In addition, the BTEX release is an major accident wich have a serious impact on the environment in terms of marine, terrestrial and air, where environmental pollution is leading to contamination and death of flora and fauna directly [8] due to their poisoning or due to the hypothermia of birds and mammals by destroying their buffer capacity; meanwhile, leading to an imbalance in the food chain [9].

Therefore, monitoring, measuring and controlling the levels of these pollutants has a significant impact on the environment and human health. One effective way to monitor and control the level of pollutants is to model the dispersal of pollutants in the atmosphere. For that many study used serval softwars and methods [8].

This work aims to assess the risks due to the release of BTEX into the atmosphere. Where it seeks to provide a combination of risk analysis using both the literature, MADS MOSAR method, and the ALOHA software to model the phenomenon, and determine its effects on the study environment. The benzene and toluene stored on sidi r'cine raffinery, Algers (Algeria) were considered as a case study.

Material and methods

A three-step methodology was adopted for the case study, illustrated in Figure 1. The first step was to discuss the multi-level impact of the BTEX environmental release using a literature review.

While the second step was to estimate and analyze the scenarios resulting from such leaks, using the the systemic approach Mads Mosar (table1). This type of risk modeling, called "Source-Flow-Target (SFT)", after dividing the system into sub-systems and defining the hazard domain that affects them and the source and thus the hazard flo; From there, black boxes and expected scenarios can be formed [10]–[12].

Table1. Demenstration of MADS MOSAR

Types of systems **Sources of danger**	**Life phases**	**Initiating events**		**Initial events**		**Main events**
		External (active environment)	**Internal**	**Linked to container**	**Linked to the content**	

The last step was to determine hazard zones of two cases study : A tank filled once with benzene and once with toluene, under the climatic conditions mentioned in table 2; The representation of the modelling was showed in figure 1, the software that used to this step was aloha (Areal Location of Hazardous Atmospheres)[13], [14]

Table2. Parameters used in modeling

Location	Algiers 36° 46′ 34″ Nord, 3° 03′ 36″ East
Temperature	20 C
Humidity	43 %
Wend Velocity	3 m/s
Wend Direction	NW
Product	Benzene
	Toluene
Tank Dimensions	60*15 m

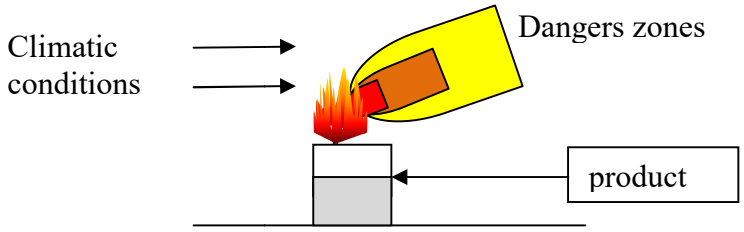
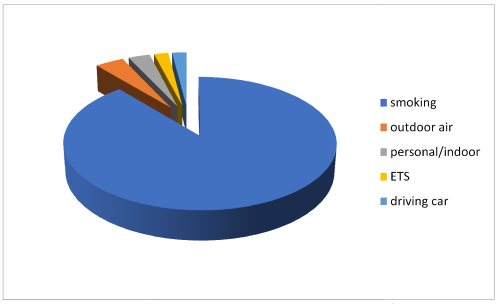


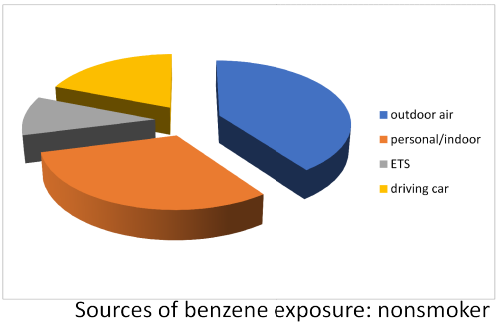
Figure. 1: Schematic representation of the modelling and their environment [14]

BETX sources emission

There is a wide sources range of aromatic hydrocarbons dispersed in the air nowadays[15] where it has been revealed that BTEX concentrations are much higher in urban areas compared to rural areas [16]. As for their sources in the atmosphere, they are multiple (figure2).



Sources of benzene exposure: smoker



Sources of benzene exposure: nonsmoker

Figure2. benzene sources[17]

Natural source

The main natural sources of BTEX emissions and their derivatives in the atmosphere are associated with specific processes that occur in the environment such as forest fires, volcanic eruptions, or biomass burning[18].

Outdoor source

The main sources of emissions of BTEX compounds into outdoor air are:

- Transportation in which a petroleum product is used;

- smelting industries;
- Petroleum industries in all its forms and stages, such as refining and storage;
- Paints and solvent industries.

Indoor air source

There is a wide range of BTEX sources in homes. We mention for example:

- Building materials such as paints, paint Remover, and floor coverings;
- Furniture and home appliances;
- Heaters and gas stoves;
- Cleaning materials;
- Cosmetics such as nail polish remover;
- Laser Printed Paper & Photocopier;
- Smoking [19], [20].

Risk for the human

Solvents have more or less marked common characteristics depending on the substance and at the same time toxicological properties specific to each product, so the BTEX effect on the human can be ranging from the discomfort to death:

Table 3. Health Effects of Ambient Exposure to BTEX

		Benzene	Toluene	Ethylbenzene	Xylene
Development	Low birth weight	✓	✓	✓	✓
	Preterm birth	✓			
	Spina bifida	✓			
İmmune function	Atopy	✓	✓	✓	
	Eczema	✓	✓		
	Sensitization to pollen	✓			
	Senstitzation to egg		✓		
	Whitesensitization to milk		✓	✓	✓
	Eye symptoms				✓
Metabolic function	İnsulin resistance)	✓			
Reproductive function	Asthenospermic	✓			
	Normospermic	✓			
Respiratory function	Asthma	✓	✓	✓	✓
	Bronchitis	✓			
	Cough	✓			
	Wheeze	✓	✓	✓	✓
	Pulmonary infections	✓			

- neurological symptoms : such as headaches, dizziness, nausea, fatigue, agitation, and confusion[21] ;
- damage lung: As inhalation is the main route of administration for BTEX, the lungs are the primary target for injury [22];
- Acute toxicity: That related to poor working conditions, accidents, or misuse and abuse of CMR;

- Chronic toxicity : Which are represented in occupational diseases [23];
- Mutagenic: BTEX provoke a genetic damage by causing chromosomal aberrations;
- Carcinogenic: Aromatic hydrocarbons (particularly the benzene) are known Group 1 human carcinogen per a World Health Organization working group [24].

The below table (Table 3) summarize the mutual diseases between the BTEX that was found in the literature [21].

Risk for the environment

Aromatic hydrocarbons, like all petroleum solvents, are all volatile organic compounds (VOCs).

- **Air:** Their vaporization in the atmosphere contributes to the production of ozone in the troposphere by photochemical reaction;
- **Soil:** they are strongly adsorbed to soil organic matter and make them less available for degradation. CMRs are very resilient and can last a long time and pose a significant threat to humanity and the environment;
- **Water:** If released into an aquatic environment, a small part will dissolve in water, the remainder supernatant on the surface. Their biodegradability is poor and aromatic hydrocarbons are toxic to aquatic organisms.

Other risks

- ***Risk of fire and explosion:*** These solvents are flammable and tend to accumulate electrostatic charges, which is one of the significant technological risks associated with their use. At room temperature, in the presence of an open flame, spark or significant heat source, they will ignite instantly. Aromatic hydrocarbon vapors can form explosive mixtures with air.
- ***Reactivity:*** Under normal conditions of use, these are stable products. They can, however, react violently with strong oxidizing agents such as sulfochromic mixtures. They do not corrode common metals but attack certain rubbers and plastics such as polyethylene, natural rubber, etc. [23]

Mads mosar application:

The systemic decomposition proposed below is based mainly on a topological division, the studied system is composed of the following subsystems (Figure3):

Ss1: storage tank

Ss 2: storage tank safety system

Ss 3: environment

Ss 4: operators

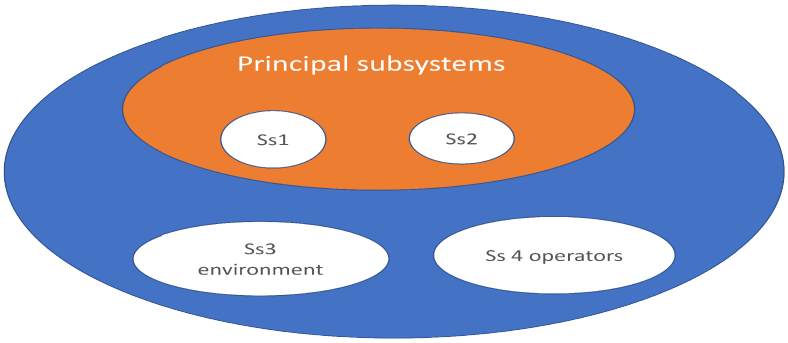


Figure3. The decomposition of the study case into subsystems

The Identification of dangers sources of each subsystem, by searching line by line which are the initiating events that may be at the origin of these initial events and which are the main events that these initial events will generate. Each subsystem will be modeled in the form of a black box with the initiating events as input and the main events as output.

Table4. Danger processes establishment of subsystem 1 Storage Tank

Systems Types Danger Sources	**Initiating Events**		**Initial Events**		**Main Events**
	External (Active Environment)	**Internal**	**Related To The Container**	**Related To The Content**	
Subsystem1 Storage Tank	Shock Corrosion Heat Flux Deformation	Corrosion Overpressure	Rupture Crack	Overpressure Product Overheated Product Unconfined	Product Leakage Fire Explosion Pollution Flaming leak
Roof	Corrosion	Under Pressure Corrosion	Deformation	Product Unconfined	Product Leakage Air pollution
Wall	Corrosion Fatigue	Degradation Corrosion Aging	Deformation Crack	Deverssed Product Incontroled	Product Leakage Fire Explosion pollution
Base	Settlement Degradation	Corrosion	Deformation	Product Overheated	Tank Deformation

Table5. Danger processes establishment of subsystem 2 Storage tank safety system

Systems types Danger sources	**Initiating events**		**Initial events**		**Main events**
	External (active environment)	**Internal**	**Related to the container**	**Related to the content**	
Subsystem 2 Storage tank safety system	Shock Corrosion Heat flux Deformation	Corrosion Overpressure	Rupture Crack	Overpressure	Product leakage Fire Explosion deformation
valves	Shock Corrosion		Deformation	Product uncontrolled	Product leakage
Retention bin	Vibrations shock	Degradation Aging Fatigue		Spilled Product uncontrolled	Product leakage Pool fire pollution
Detection system	Climatic conditions	Electrical failure	Deformation	Product overheated	Fire explosion
Cooling system	Corrosion Wear	Lack of water	Deformation	Product overheated	Fire explosion
Extinction system	Wear	Lack of water Lack of foam	Deformation	lack of foam	Fire explosion

Electrical installations	Poor insulation	Bad grounding		spark	Fire Explosion Static electricity

Table6. Danger processes establishment of subsystem 3 Environment

Systems types Danger sources	**Initiating events**		**Initial events**		**Main events**
	External (active environment)	**Internal**	**Related to the container**	**Related to the content**	
Subsystem 3 Environment			Deformation	Overpressure Overheat	Product leakage Fire Explosion pollution
wind			Deformation	Instable product	Domino effect Air pollution
temperature		Over heat	Deformation	Auto inflammation temperature	Fire
Nearby roads	Shock vibrations		Deformation	Instable product	Product leakage Fire
Nearby installations	Corrosion Wear Shock Vibrations		Deformation	Instable product	Product leakage Fire

Table7. Danger processes establishment of subsystem 4 Human factor

Systems types Danger sources	**Initiating events**		**Initial events**		**Main events**
	External (active environment)	**Internal**	**Related to the container**	**Related to the content**	
Subsystem 4 Human factor	Noise vibrations	Stress Fatigue negligence	Deformation	Instable product	Injuries irradiation electrocution poisoning

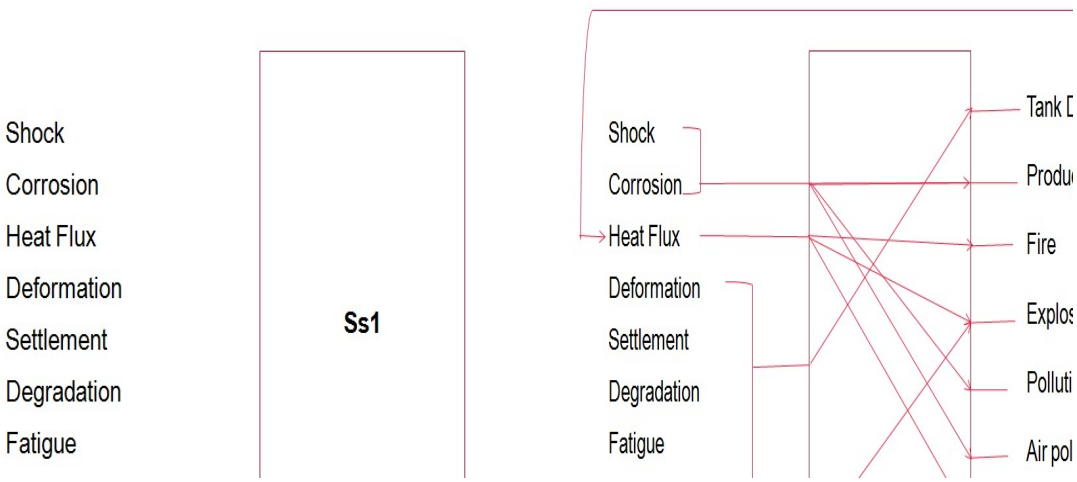


Figure4. Black box of Subsystem1 Storage Tank and proposal scenarios

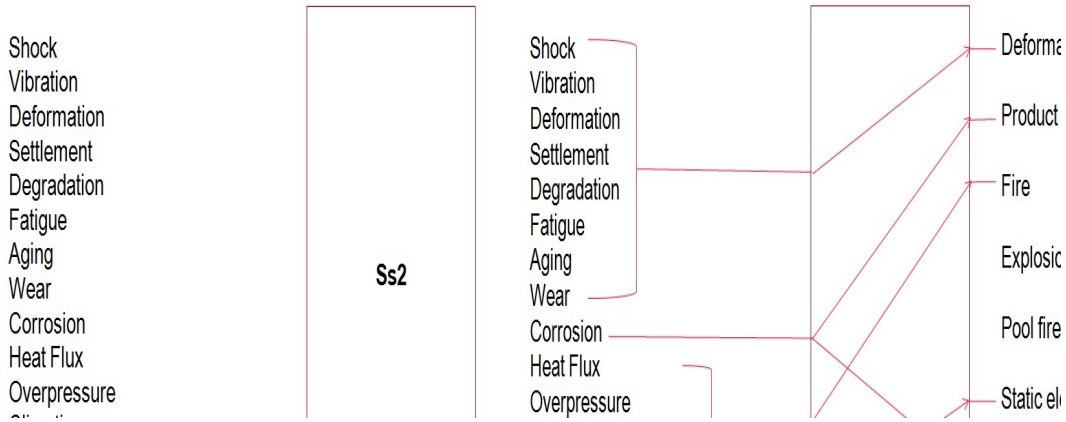


Figure5. Black box of Subsystem 2 Storage tank safety system and proposal scenarios

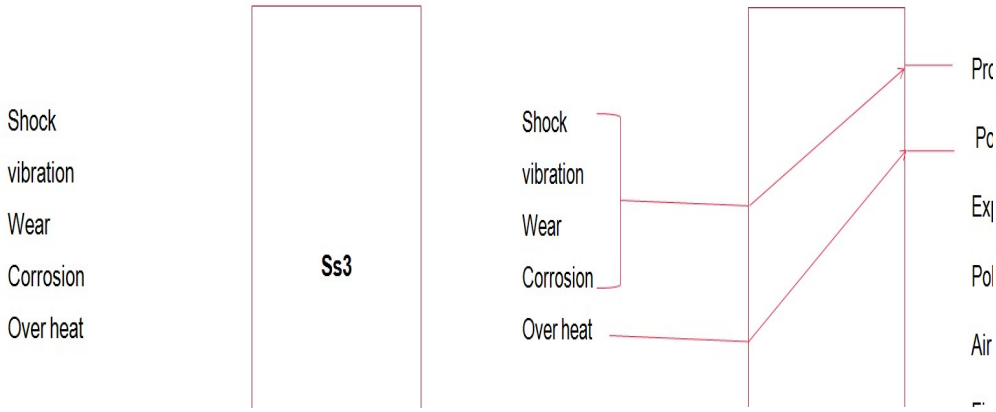


Figure6. Black box of Subsystem 3 Environment and proposal scenarios

From these results, we find that this method allows for a macroscopic study of the system, which includes various stages: selection of 4 subsystems, identification of sources of danger, identification of different scenarios of undesirable events. Major scenarios expose operators to risk of injury, electrocution, poisoning, pollution, fire, and explosion.

Accident modeling by ALOHA

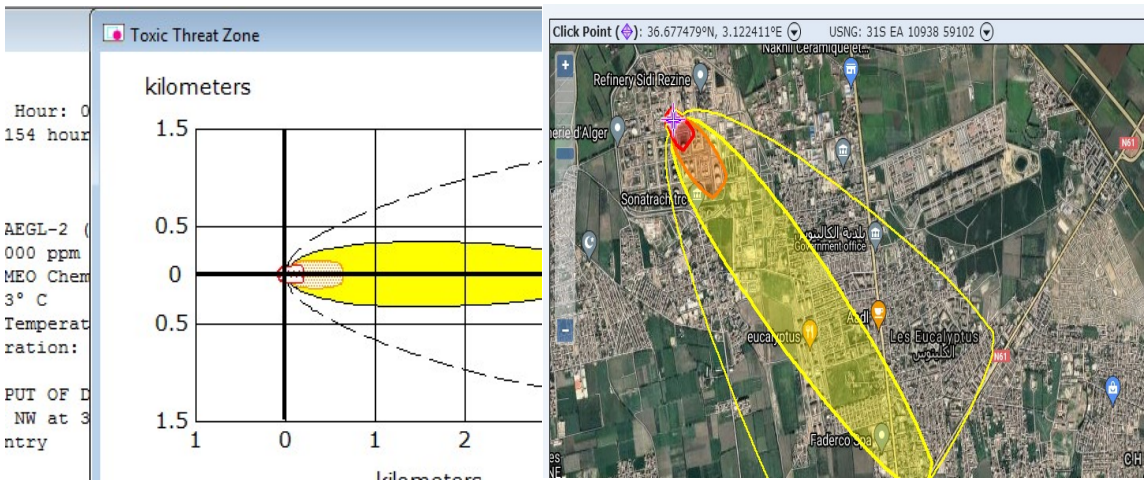


Figure7. Benzene release

Where:

Red : 211 meters --- (4000 ppm = AEGL-3 [60 min])
Orange: 649 meters --- (800 ppm = AEGL-2 [60 min])
Yellow: 3.5 kilometers --- (52 ppm = AEGL-1 [60 min])

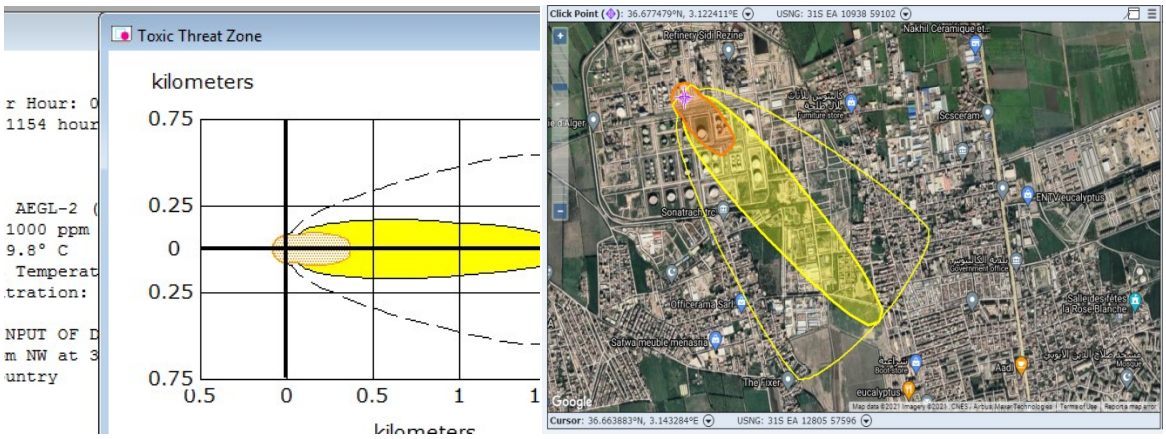


Figure8. Toluene release

Where:

Red : LOC was never exceeded --- (3700 ppm = AEGL-3 [60 min])
Orange: 370 meters --- (560 ppm = AEGL-2 [60 min])
Yellow: 1.6 kilometers --- (67 ppm = AEGL-1 [60 min])

İt was found that benzene pollution exceeds toluene pollution in equal quantity. Where we observed the toxicity effect is fatal for the refinery workers in the event of a benzene leak; It was also noted that the effect of the leakage of these materials goes beyond the industrial area to reach the residents of the Eucalyptus city and the neighboring agricultural lands, Which will directly and indirectly affect the human health.

Conclusion

Our work aims to analyze risks associated with BTEX that threaten hydrocarbon storage areas, the environment, and humans. Where we found that the emissions of these materials have several sources so that the industry is not the only one responsible.

When an accident scenario analysis was carried out using the MODS MOSAR method, we described in detail each of the possible scenarios causing a possible accident.

At the end of this study, we evaluated the hazards of the dispersal phenomenon for two products: benzene and toluene, as toxic risk areas were observed for hydrocarbon discharges affecting areas adjacent to the reservoirs. It was also noted that the prevalence and danger of benzene was greater than that of toluene, through the ALOHA modeling program.

This research is considered as a complementary study to previous studies in this field, the methodology used can be used to study other phenomena.

Bibliography

[1] A. Hammouya, “Contribution à l’amélioration des barrières de sécurité dans un système industriel,” badji mokhtar annaba university, 2021.
[2] M. Soltani, “Distribution lipidique et voies métaboliques chez quatre bactéries Gram-négatives hydrocarbonoclastes . Variation en fonction de la source de carbone .,” L’UNIVERSITE PARIS

6, 2004.
[3] E. Ilgen *et al.*, “Aromatic hydrocarbons in the atmospheric environment: Part I. Indoor versus outdoor sources, the influence of traffic,” *Atmospheric Environment*, vol. 35, no. 7, pp. 1235–1252, Jan. 2001, doi: 10.1016/S1352-2310(00)00388-5.
[4] S. Garte, E. Taioli, T. Popov, C. Bolognesi, P. Farmer, and F. Merlo, “Genetic Susceptibility to Benzene Toxicity in Humans,” *Journal of Toxicology and Environmental Health, Part A*, vol. 71, no. 22, pp. 1482–1489, Oct. 2008, doi: 10.1080/15287390802349974.
[5] C. W. F. Yu and Jeong Tai Kim, “Building Pathology, Investigation of Sick Buildings — VOC Emissions,” *Indoor and Built Environment*, vol. 19, no. 1, pp. 30–39, Feb. 2010, doi: 10.1177/1420326X09358799.
[6] J.-Y. Ko and J. W. Day, “A review of ecological impacts of oil and gas development on coastal ecosystems in the Mississippi Delta,” *Ocean & Coastal Management*, vol. 47, no. 11–12, pp. 597–623, 2004.
[7] T. T. N. Lan and N. T. T. Binh, “Daily roadside BTEX concentrations in East Asia measured by the Lanwatsu, Radiello and Ultra I SKS passive samplers,” *Science of The Total Environment*, vol. 441, pp. 248–257, Dec. 2012, doi: 10.1016/j.scitotenv.2012.08.086.
[8] A. Hammouya and D. Hammouya, “ÉVALUATION DES RISQUES LIÉS AU REJET D’HYDROCARBURES DANS L’AIR,” *International Journal of Human Settlements*, vol. 5, no. 2, pp. 500–509, 2021.
[9] J. Xue, Y. Yu, Y. Bai, L. Wang, and Y. Wu, “Marine Oil-Degrading Microorganisms and Biodegradation Process of Petroleum Hydrocarbon in Marine Environments: A Review,” *Current Microbiology*, vol. 71, no. 2, pp. 220–228, Aug. 2015, doi: 10.1007/s00284-015-0825-7.
[10] M. Smaiah, M. Djebabra, and L. Bahmed, “Contribution to the Improvement of the MADS–MOSAR Method for the Modeling of Domino Effects,” *Journal of Failure Analysis and Prevention*, vol. 17, no. 3, pp. 440–449, Jun. 2017, doi: 10.1007/S11668-017-0258-7/FIGURES/8.
[11] P. Thivel, Y. Bultel, and F. Delpech, “Diagnostic sécurité d’un procédé de traitement des gaz par photocatalyse : application de la méthode MOSAR,” *Déchets, sciences et techniques*, vol. 45, no. 45, pp. 4–12, 2007, doi: 10.4267/dechets-sciences-techniques.1554.
[12] F. Hamzaoui *et al.*, “Management des risques dans les projets de construction par le couplage du modèle agent SMACC avec la méthode MADS MOSAR – Application au projet de barrage TAHT à Mascara en Algérie,” *Academic Journal of Civil Engineering*, vol. 34, no. 1, pp. 1069–1076, 2016, doi: 10.26168/ajce.34.1.131.
[13] K. Rajeev, S. Soman, V. R. Renjith, and P. George, “Human vulnerability mapping of chemical accidents in major industrial units in Kerala, India for better disaster mitigation,” *International Journal of Disaster Risk Reduction*, vol. 39, p. 101247, Oct. 2019, doi: 10.1016/j.ijdrr.2019.101247.
[14] A. Hammouya, A. Kabouche, and R. Chaib, “Study of Drain Barrier Effect on Hydrocarbons Hazards,” *Journal of Failure Analysis and Prevention*, vol. 19, no. 5, 2019, doi: 10.1007/s11668-019-00748-1.
[15] R. Duarte-Davidson, C. Courage, L. Rushton, and L. Levy, “Benzene in the environment: an assessment of the potential risks to the health of the population,” *Occupational and environmental medicine*, vol. 58, no. 1, pp. 2–13, 2001.
[16] A. Masih, A. S. Lall, A. Taneja, and R. Singhvi, “Exposure levels and health risk assessment of ambient BTX at urban and rural environments of a terai region of northern India,” *Environmental Pollution*, vol. 242, pp. 1678–1683, Nov. 2018, doi: 10.1016/j.envpol.2018.07.107.
[17] L. Wallace, “Environmental exposure to benzene: an update.,” *Environmental health perspectives*, vol. 104, no. suppl 6, pp. 1129–1136, 1996.
[18] M. Słomińska, P. Konieczka, and J. Namieśnik, “The fate of BTEX compounds in ambient air,” *Critical Reviews in Environmental Science and Technology*, vol. 44, no. 5, pp. 455–472, 2014, doi: 10.1080/10643389.2012.728808.
[19] G. A. Ayoko and H. Wang, “Volatile Organic Compounds in Indoor Environments,” 2014, pp. 69–107.
[20] C. Yu and D. Crump, “A review of the emission of VOCs from polymeric materials used in buildings,” *Building and Environment*, vol. 33, no. 6, pp. 357–374, Nov. 1998, doi: 10.1016/S0360-1323(97)00055-3.

[21] A. L. Bolden, C. F. Kwiatkowski, and T. Colborn, “New Look at BTEX: Are Ambient Levels a Problem?,” *Environmental Science & Technology*, vol. 49, no. 9, pp. 5261–5276, May 2015, doi: 10.1021/es505316f.
[22] C. J. Davidson, J. H. Hannigan, and S. E. Bowen, “Effects of inhaled combined Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX): Toward an environmental exposure model,” *Environmental Toxicology and Pharmacology*, vol. 81, no. December 2020, 2021, doi: 10.1016/j.etap.2020.103518.
[23] C. Boust, “Fiche Solvant Les hydrocarbures aromatiques ED 4226,” *Inrs DÉPARTEMENT EXPERTISE ET CONSEIL TECHNIQUE*, pp. 1–8, 2005.
[24] IARC, “IARC Monographs: on the evaluation of carcinogenic risks to humans. Volume 120: Benzene,” 2018. .

КРАЕВОЙ ЗАДАЧЕ ДЛЯ ОПЕРАТОРНО – ДИФФЕРЕНЦИАЛЬНЫХ УРАВНЕНИЙ ВТОРОГО ПОРЯДКА

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АННАТАЦИЯ

В работе найдёны условия разрешимости в абстрактных пространствах гладких вектор-функий для некоторых начально – краевых задач для уравнения второго порядка с операторными коэффииентами.

Все эти условия выражены свойствами коэффииентов операторно- дифферениального уравнения.

Ключевые слова:Гилбертово пространство ,ореаторно-дифференцифлъных уравнений,гладких решений.

BOUNDARY VALUE PROBLEM FOR SECOND ORDER OPERATOR-DIFFERENTIAL EQUATIONS

ABSTARCT

In the paper the solvability conditions in abstract space of smooth vector-functions for some initial-boundary value problems for a second order equation with operator coefficients are found.All these condtions are expressed by the features of coefficients of an operator-differential equation.

1.ВВЕДЕНИЕ

Пусть H - сепарабельное гильбертово пространства, A - положительно определённый самосопряженный оператор в H, а $H_\gamma(\gamma \geq 0)$ шкала гильбертовых пространств порожденный оператором A т.е

$$H_\gamma = D\left(A^\gamma\right), (x,y)_\gamma = \left(A^\gamma x,\ A^\gamma y\right),\quad x,y \in H_\gamma$$

Пусть $L_2(R_+;H)$ есть гильбертово пространство вектор – функций $f(t)$ определённых почти всюду в R_+, со значениями в H, для которых

$$\|f\|_{L_2(R_+;H)} = \left(\int_0^\infty \|f(t)\|^2\, dt\right)^{1/2}$$

Следуя монографию [1] определим следующие пространство при натуральных $m \geq 1$:

$$W_2^m(R_+ : H) = \left\{u(t) : u^{(m)}(t) \in L_2(R_+;H),\ A^m u(t) \in L_2(R_+;H)\right\}$$

с нормой

$$\|u\|_{W_2^m(R_+;H)} = \left(\left\|u^{(m)}\right\|^2_{L_2(R_+;H)} + \left\|A^m u\right\|^2_{L_2(R_+;H)}\right)^{1/2}.$$

При $m=3$ вудем выводт подпространства в $W_2^3(R_+;H)$

$$\overset{0}{W}{}_2^3(R_+;H)=\left\{u/u\in W_2^3(R_+:H),u(0)=u'(0)=0\right\}$$

Аналогично определяются пространства $L_2(R:H)$ и $W_2^m(R;H)$ при $R=(-\infty;\infty)$.

Пусть $L(X,Y)$ пространство линейных ограниченных действующих из X в Y.

Рассмотрим в H следующую краевую задачу

$$\frac{d^2u}{dt^2}+(pA+A_1)\frac{du}{dt}+(A^2+A_2)u(t)=f(t),\quad t\in R_+ \tag{1}$$

$$u(0)=u'(0)=0 \tag{2}$$

где $f(t),u(t)\in H$ при $t\in R_+$ почти всюду, а операторные коэффициенты удовлетворяют следующим условиям:

1) $p>0$,
2) A - положительно определённый сомосопряжённый оператор;
3) Операторы $A_1\in L(H_1,H)\text{I}\ L(H_2,H_1),\quad A_2\in L(H_2,H)\text{I}\ L(H_3,H_1)$.

Определение 1. Если при $f(t)\in W_2^1(R_+;H)$ сушествует вектор-функция $u(t)\in W_2^3(R_+;H)$ которая удовлетворяет уравнению (1) тождественно в $R_+=(0,\infty)$, то $u(t)$ будем называть гладким решение уравнения (1) из $W_2^3(R_+;H)$.

Определение 2. Если при любом $f(t)\in W_2^1(R_+;H)$ существует гладкое решение $u(t)$ уравнение (1) из $W_2^3(R_+;H)$ которая удовлетворяет оценку

$$\|u\|_{W_2^3(R_+;H)}\le const\|f\|_{W_2^1(R_+;H)},$$

то задача (1), (2) называется регулярно разрешимой в пространстве $W_2^3(R_+;H)$.

В данной работе мы найдем условие на коэффициенты уравнения (1), которые обеспечивают регулярно разрешимость задачи в пространстве $W_2^3(R_+;H)$. Отметим, что для эллиптических уравнения такие задачи исследованы в работах $[2,3,4]$.

2. ОСНОВНОЙ РЕЗУЛЬТАТ

Обозначим через

$$P_0u=P_0(d/dt)u=u''+pAu'+A^2u,u\in\overset{0}{W}{}_2^3(R_+;H)$$

$$P_1(d/dt)=A_1\frac{du}{dt}+A_2u,\qquad u\in\overset{0}{W}{}_2^3(R_+;H)$$

$$Pu=P_0u+P_1u\qquad u\in\overset{0}{W}{}_2^3(R_+;H).$$

Легко видет что при выполнения условия 1) пучок

$$P_0(\lambda)=\lambda^2+pA\lambda+A^2$$

имеет вид $P_0(\lambda)=(\lambda-\omega_1 A)(\lambda-\omega_2 A)$, где $Re\,\omega_1<0,\ \ Re\,\omega_2<0.$

Поэтому уравнения (1) относится к параболическому типу. При $f\in L_2(R_+;H),\ u\in W_2^3(R_+;H)$ это задача изучена в работе $[5]$.

Сперва рассмотрим следующую уравнению.

$$P_0u=f,\ u\in \overset{0}{W}{}_2^3(R_+;H),\quad f\in W_2^1(R_+;H)$$

Имеет место следующая.

Теорема 1. Пусть выполняются условия 1) и 2). Тогда оператор P_0 изоморфно отоброжает пространство $W_2^3(R_+;H)$ на $L_2(R_+;H).$

Доказательство. Покажем, что ядро оператора P_0 совподает с $L_2(R_+;H)$.

Так как общее решение уравнения $P_0(d/dt)u(t)=0$ из пространство $W_2^3(R_+;H)$ имеет вид:

$$u_0(t)=e^{\omega_1 tA}\varphi_0+e^{\omega_2 t A}\varphi_1$$

при $\omega_1\neq\omega_2$ или

$$u_0(t)=e^{\omega_1 t A}\varphi_0+t\,Ae^{\omega_2 t A}\varphi_1$$

при $\omega_1=\omega_2$, где $\varphi_0,\varphi_1\in H_{5/2}$ а ω_1 и ω_2 есть корни многочлена

$$P_0(\lambda)=\lambda^2+p\lambda+1.$$

В первом случае $(\omega_1\neq\omega_2)$ из краевых условий (2) следует, что $\varphi_0+\varphi_1=0$ и $\omega_1A\varphi_0+\omega_2A\varphi_1=0$ или $\varphi_1=-\varphi_0$ и $(\omega_1-\omega_2)A\varphi_0=0$. Отсюда следует, что $A\varphi_0=0,$ т.е. $\varphi_0=0.$ Следовательно $\varphi_1=0,$ т.е $u_0(t)=0.$ Во втором случае $(\omega_1=\omega_2)$ из условия (2) следует что $\varphi_0=0$ и $\varphi_1=0,$ т.е $u_0(t)=0$. Таким образом $Ker\,P_0=\{0\}.$

Теперь покажем, что образ оператора P_0 совпадает с $u\in\overset{0}{W}{}_2^3(R_+;H)$. Так как $f\in W_2^1(R_+;H)$ то его можно продолжит в отрицательном ось таким образом $[1]$ чтобы предолжение $f_1(t)\in W_2^1(R_+;H)$ и

$$\|f_1\|_{W_2^1(R_+;H)}\le const\|f\|_{L_2(R_+;H)}.$$

Тогда из уравнения $P_0(d/dt)u(t)=f_1(t),$ после преоброзование Фурье получаем, что вектор – функция

$$u_1(t)=\frac{1}{\sqrt{2\pi}}\int_{-\infty}^{\infty}\left(\xi^2E+\xi\,pA+A^2\right)^{-1}\hat{f}_1(\xi),\ \ t\in R$$

удовлетворяет уравнению $P_0(d/dt)=f(t)$ в R_+. Покажем, что $u_1(t)\in W_2^3(R;H)$. Из теоремы Планшареля следует, что достоточно доказать $A^3\hat{u}_1(\xi)\in L_2(R;H)$ и $\xi^3A\hat{u}_1(\xi)\in W_2^3(R;H)$. Очевидно, что

$$\left\|A^3\hat{u}_1(\xi)\right\|_{L_2(R;H)}=\left\|A^3\left(\xi^2E+\xi\,p\,A+A^2\right)^{-1}\hat{f}(\xi)\right\|_{L_2(R_+;H)}\le$$

$$\le\sup_{\xi\in A}\left\|A^2\left(\xi^2E+\xi\,p\,A+A^2\right)^{-1}\right\|\cdot\left\|\hat{f}(\xi)\right\|_{L_2(R_+;H)}\le$$

$$\le const\sup_{\xi\in A}\left\|A^2\left(\xi^2E+\xi\,p\,A+A^2\right)^{-1}\right\|\cdot\left\|f\right\|_{L_2(R_+;H)} \qquad (3)$$

С другой стороны при любом $\xi\in R$

$$\left\|A^2\left(\xi^2E+\xi\,p\,A+A^2\right)^{-1}\right\|=\sup_{\mu\in\sigma(A)}\left|\mu^2\left(\xi^2+\xi p\mu+\mu^2\right)^{-1}\right|\le$$

$$\le\sup_{\mu\ge\mu_0}\left|\left(\xi^2/\mu^2+p\xi/\mu+1\right)^{-1}\right|\le\sup_{\tau>0}\left|\tau^2+p\tau+1\right|\le\beta_0^{-1/2},$$

где

$$\beta_0^{-1/2}=\begin{cases}\dfrac{2}{p\left(4-p^2\right)^{1/2}}, & \dfrac{p^2}{2}\le 1,\\[2ex] 1, & \dfrac{p^2}{2}\ge 1.\end{cases}$$

Из (3) следует, что $A^3u_1(\xi)\in L_2(R_+;H)$. Аналогично доказывается что $\xi^3u_1(\xi)\in L_2(R_+;H)$. Теперь обозначим через $\xi_1(t)=u_1(t)/_{[0,\infty)}$, т.е $\xi_1(t)$ есть сужение вектор функции $u_1(t)$ на $[0,\infty)$. Тогда $\xi_1(t)\in W_2^3(R_+;H)$ и $\xi_1(0)\in H_{5/2}$, $\xi_1'(0)\in H_{3/2}$. Теперь будам искать решение уравнение $P_0u=f$ в виде

$$u(t)=\xi_1(t)+e^{\omega_1tA}\varphi_0+e^{\omega_2tA}\varphi_1,\qquad \varphi_0,\varphi_1\in H_{5/2}\ \text{ при }\ \omega_1\ne\omega_2.$$

Отсюда используя краевые условия (2) получаем:

$$\varphi_0+\varphi_1=\xi_1(0)\ \text{ и }\ \omega_1A\varphi_1+\omega_2A\varphi_2=-\xi_1'(0)$$

Так как $\xi_1(0)\in H_{5/2}$ и $\xi_1'(0)\in H_{3/2}$, то $\varphi_0=-\dfrac{1}{\omega_1-\omega_2}A^{-1}\xi_1'(0)\in H_{5/2}$ и $\varphi_1=-\varphi_0\in H_{5/2}$. Следовательно $u(t)\in\overset{0}{W}{}_2^3(R_+;H)$, т.е образ оператора P_0 совподает с пространством $L_2(R_+:H)$. С другой стороны при $u\in W_2^3(R_+;H)$

$$\left\|P_0u\right\|^2_{W_2^1(R_+;H)}=\left\|A\cdot P_0u\right\|^2_{L(R_+;H)}+\left\|\frac{d}{dt}P_0u\right\|^2_{L_2(R_+;H)}=$$

$$=\left\|Au''+p\,A^2u'+A^3u\right\|^2_{L_2(R_+;H)}+\left\|u'''+pAu''+A^2u'\right\|^2_{L_2(R_+;H)}$$

Используя теорему о промежуточных производных получаем, что

$$\left\|P_0u\right\|_{W_2^1(R_+;H)}\le const\left\|u\right\|_{W_2^3(R_+;H)}$$

Наконец, применяя теорему Банаха об обратном операторе мы получаем утверждению теоремы.

Рассмотрим в пространстве H_6 следующие операторные пучки щестого порядка

$$R_0(\lambda;\beta;A)=\left((i\lambda)^4E+\left(p^2-2\right)(i\lambda)^2A^2+A^4-\beta A^4\right)\left(\lambda^2E+A^2\right) \qquad (4)$$

и

$$R_1(\lambda;\gamma;A)=\left((i\lambda)^4E+\left(p^2-2\right)(i\lambda)^2A^2+A^4-\gamma(i\lambda)^2A^2\right)\left(\lambda^2E+A^2\right) \quad (5)$$

где p - вещественные числа, β и γ из вещественные параметры.

Имеет место следующая.

Теорема 2. Пусть $p>0$. Тогда при $\beta\in[0,\beta_0)$, а при $\gamma\in[0,\gamma_0)$ операторные пучки (4) и (5) не имеет спектра на мнимой оси, где

$$\beta_0=\begin{cases}1, & \dfrac{p^2}{2}>0\\ \dfrac{p^2\left(4-p^2\right)}{4}, & \dfrac{p^2}{2}\le 1;\end{cases} \qquad \gamma_0=p^2, \quad (6)$$

причем они представляются в виде

$$R_0(\lambda;\beta;A)=F_0(\lambda;\beta;A)F_0(-\lambda;\beta;A), \quad (7)$$

$$R_1(\lambda;\gamma;A)=F_1(\lambda;\gamma;A)F_0(-\lambda;\gamma;A) \quad (8)$$

где

$$F_0(\lambda;\beta;A)=\prod_{j=1}^{3}\left(\lambda E-\omega_{j,0}(\beta)A\right)=\lambda^3E+c_{2,0}(\beta)\lambda^2A+c_{1,0}(\beta)\lambda A^2+c_{0,0}(\beta)A^3 \quad (9)$$

$$F_1(\lambda;\gamma;A)=\prod_{j=1}^{3}\left(\lambda E-\omega_{j,1}(\beta)A\right)=\lambda^3E+a_{1,0}(\gamma)\lambda^2A+a_{2,0}(\gamma)\lambda A^2+a_{0,0}(\gamma)A^3 \quad (10)$$

Здесь $\omega_{j,0}(\beta)=\omega_{j,0}(\alpha)=-1,\quad \operatorname{Re}\omega_{j,0}(\beta)<0,\ \omega_{j,1}(\gamma)<0,$ при $\beta\in[0,\beta_0)$ и $\gamma\in[0,\ \gamma_0)$

а числа

$$c_{2,0}=1+2\sqrt{\sqrt{1-\beta}+p^2-1},\quad c_{1,0}=\sqrt{2\sqrt{1-\beta}+p^2-1}+\sqrt{1-\beta}$$
$$c_{0,0}(\beta)=\sqrt{1-\beta}, \quad (11)$$

$$a_{2,1}(\gamma)=1+\sqrt{p^2-\gamma},\quad a_{1,1}=\sqrt{p^2-\gamma}+1,\ a_{1,0}(\gamma)=1 \quad (12)$$

Доказательство. Утверждению докажем для пучка $R_1(\lambda;\gamma;A)$, так как оно доказывается для $R_0(\lambda;\beta;A)$ аналогично.

Пусть $\mu\in\sigma(A)\quad(\mu\ge\mu_0>0)$. Тогда при $\lambda=i\xi,\ \xi\in R$

$$R_1(i\xi;\gamma;\mu)=\left(\xi^2+\mu^2\right)\left(\xi^4+\left(p^2-2\right)\xi^2\mu^2+\mu^4-\gamma\xi^2\mu^2\right)=$$

$$=\left(\xi^2+\mu^2\right)\left(1-\gamma\frac{\xi^2\mu^2}{\xi^4+\left(p^2-2\right)\xi^2\mu^2+\mu^4}\right)\left(\xi^4+\left(p^2-2\right)\xi^2\mu^2+\mu^4\right)=$$

$$=\left(\xi^2+\mu^2\right)\mu^4\left(\frac{\xi^4}{\mu^4}+\frac{\left(p^2-2\right)\xi^2}{\mu^2}+1\right)\left(1-\gamma\frac{\xi^2/\mu^2}{(\xi/\mu)^4+\left(p^2-2\right)(\xi/\mu)^2+1}\right)\ge$$

$$\ge\left(\xi^2+\mu^2\right)\mu^4\left(\tau^4+\left(p^2-2\right)\tau^2+1\right)\left(1-\gamma\sup_{\tau\ge0}\frac{\tau^2}{\tau^4+\left(p^2-2\right)\tau^2+1}\right)$$

Так как, $\tau^4+\left(p^2-2\right)\tau^2+1>0,$ то

$$R_1(i\xi;\gamma;\mu)\geq\left(\xi^2+\mu^2\right)\mu^4\left(1-\gamma\frac{1}{p^2}\right)>0$$

Таким образом при $\gamma\in[0,\gamma_0)\left(\gamma_0=p^{-2}\right)$ полином $R_1(\lambda;\gamma;\mu)$ не имеет корней на мнимой оси. Тогда его корни симметричны относительно вещественной оси и начало координат. Поэтому

$$R_1(\lambda;\gamma;\mu)=F_1(\lambda;\gamma;\mu)\cdot F_1(-\lambda;\gamma;\mu) \tag{13}$$

где

$$F_1(\lambda;\gamma;\mu)=(\lambda+\mu)\cdot(\lambda-\omega_{1,1}(\gamma)\mu)(\lambda-\omega_{1,2}(\gamma)\mu), \tag{14}$$

где

$$\operatorname{Re}\omega_{1,1}(\gamma)<0,\quad \operatorname{Re}\omega_{1,2}(\gamma)<0$$

Далее полагая

$$F_1(\lambda;\gamma;\mu)=\lambda^3+a_{2,1}(\gamma)\lambda^2\mu+a_{1,1}(\gamma)\lambda\mu+a_{1,0}(\gamma)\mu^3$$

Сравнивая коэффициенты в равенстве (13) мы найдем коэффициенты $a_{21}(\gamma),\ a_{1,1}(\gamma),\ a_{1,0}(\gamma).$

Далее, для завершение теоремы равенству (13) применим спектральную разложению оператора A. Теорема доказана.

Лемма 1. Пусть $u\in W_2^3(R_+;H)$. Тогда

$$\|P_0u\|^2_{W_2^1(R_+;H)}=\left\|\frac{d^3u}{dt^3}\right\|^2_{L_2(R_+;H)}+\left(p^2-1\right)\left\|A\frac{d^2u}{dt^2}\right\|^2_{L_2(R_+;H)}+$$

$$+\left(p^2-1\right)\left\|A\frac{du}{dt}\right\|^2_{L_2(R_+;H)}+\left\|A^3u\right\|^2_{L_2(R_+;H)}-p\|\varphi\|^2,$$

где $\varphi=A^{1/2}u''(0).$

Доказательство. Очевидно, что

$$\|P_0u\|^2_{W_2^1(R_+;H)}=\left\|\frac{d^3u}{dt^3}+pA\frac{d^2u}{dt^2}+A^2\frac{du}{dt}\right\|^2_{L_2(R_+;H)}+\left\|A\frac{d^2u}{dt^2}+pA^2\frac{du}{dt}+A^3u\right\|^2_{L_2(R_+;H)}=$$

$$=\left\|\frac{d^3u}{dt^3}\right\|^2_{L_2(R_+;H)}+p^2\left\|A\frac{d^2u}{dt^2}\right\|^2_{L_2(R_+;H)}+\left\|A^2\frac{du}{dt}\right\|^2_{L_2(R_+;H)}+$$

$$+2p\operatorname{Re}\left(\frac{d^3u}{dt^3},A\frac{d^2u}{dt^2}\right)_{L_2(R_+;H)}+\operatorname{Re}\left(\frac{d^3u}{dt^3},A^2\frac{du}{dt}\right)_{L_2(R_+;H)}+$$

$$+2p\operatorname{Re}\left(A\frac{d^2u}{dt^2},A^2\frac{du}{dt}\right)_{L_2(R_+;H)}+\left\|A\frac{d^2u}{dt^2}\right\|^2_{L_2(R_+;H)}+$$

$$+p^2\left\|A^2\frac{du}{dt}\right\|^2_{L_2(R_+;H)}+\left\|A^3u\right\|^2_{L_2(R_+;H)}+2p\operatorname{Re}\left(A\frac{d^2u}{dt^2},A^2\frac{du}{dt}\right)_{L_2(R_+;H)}+$$

$$+2\operatorname{Re}\left(A\frac{d^2u}{dt^2},A^3u\right)_{L_2(R_+;H)}+2\operatorname{Re}\left(A^2\frac{du}{dt},A^3u\right)_{L_2(R_+;H)} \tag{15}$$

При $u \in \overset{0}{W}{}_2^3(R_+;H)\,(u(0)=u'(0)=0)$

$$\left(\frac{d^3u}{dt^3}, A\frac{d^2u}{dt^2}\right)_{L_2(R_+;H)} = -\left(A^{1/2}u''(0),\ A^{1/2}u'(0)\right) - \left(A\frac{d^2u}{dt^2}, \frac{d^3u}{dt^3}\right)_{L_2(R_+;H)}$$

т.е

$$2\,\mathrm{Re}\left(\frac{d^3u}{dt^3},\ A\frac{d^2u}{dt^2}\right) = -\left\|u''(0)\right\|_{1/2}^2 = -\left\|\varphi_2\right\|_{1/2} \tag{16}$$

Аналогично имеем

$$\left(\frac{d^3u}{dt^3}, A^2\frac{du}{dt}\right)_{L_2(R_+;H)} = \left(A^{1/2}u''(0),\ A^{3/2}u'(0)\right) - \left\|A\frac{d^2u}{dt^2}\right\|_{L_2(R_+;H)}^2 \tag{17}$$

и

$$\left(A\frac{d^2u}{dt^2}, A^2\frac{du}{dt}\right)_{L_2(R_+;H)} = -\left(A^{3/2}u'(0), A^{3/2}u'(0)\right) - \left(A^2\frac{du}{dt}, A\frac{d^2u}{dt^2}\right)_{L_2(R_+;H)}$$

т.е

$$2\,\mathrm{Re}\left(A\frac{d^2u}{dt^2}, A^2\frac{du}{dt}\right)_{L_2(R_+;H)} = 0 \tag{18}$$

При $u \in \overset{0}{W}{}_2^3(R_+;H)$ аналогично доказываются равенствао.

$$\mathrm{Re}\left(A\frac{d^2u}{dt^2}, A^3u\right) = -\left\|A^2\frac{du}{dt^2}\right\|_{L_2(R_+;H)} \tag{19}$$

$$2\,\mathrm{Re}\left(A\frac{du}{dt}, A^3u\right) = 0 \tag{20}$$

Учитывая равенство (16)-(20) в (15) получаем:

$$\left\|P_0u\right\|_{W_2^1(R_+;H)}^2 = \left\|\frac{d^3u}{dt^3}\right\|_{L_2(R_+;H)}^2 + \left(p^2-1\right)\left\|A\frac{d^2u}{dt^2}\right\| + \left(p^2-1\right)\left\|A\frac{du}{dt}\right\|_{L_2(R_+;H)}^2 +$$

$$+\left\|A^3u\right\|^2 - p\|\varphi\|^2$$

Лемма доказана.

Лемма 2. При $u \in \overset{0}{W}{}_2^3(R_+;H)$ имеет место равенство

$$\left\|F_1(d/dt;\gamma;A)u\right\|_{L_2(R_+;H)}^2 + \left(\alpha_{21}(\gamma) - p\right) = \left\|P_0u\right\|_{W_2^1(R_+;H)}^2 - \gamma\left(\left\|A\frac{du}{dt}\right\|_{W_2^1(R_+;H)}^2\right) \tag{21}$$

Доказательство. При $u \in \overset{0}{W}{}_2^3(R_+;H)$ имеет место следующие равенство:

$$\left\|F_1\left(d/dt;\gamma;A\right)u\right\|^2_{L_2(R_+;H)}=\left\|\frac{d^3u}{dt^3}+a_{2,1}(\gamma)A\frac{d^2u}{dt^2}+a_{1,1}(\gamma)A^2\frac{du}{dt}+a_{0,1}(\gamma)A^3u\right\|^2_{L_2(R_+;H)}=$$

$$=\left\|\frac{d^3u}{dt^3}\right\|^2_{L_2(R_+;H)}+a^2_{2,1}(\gamma)\left\|A\frac{d^2u}{dt^2}\right\|_{L_2(R_+;H)}+a^2_{1,1}\left\|A^2\frac{du}{dt}\right\|^2_{L_2(R_+;H)}+a^2_{0,1}\left\|A^3u\right\|^2_{L_2(R_+;H)}+$$

$$+2\operatorname{Re}a_{2,1}(\gamma)\left(\frac{d^3u}{dt^3},A\frac{d^2u}{dt^2}\right)_{L_2(R_+;H)}+2\operatorname{Re}a_{1,1}(\gamma)\left(\frac{d^3u}{dt^3},A^2\frac{du}{dt}\right)_{L_2(R_+;H)}+$$

$$+2\operatorname{Re}a_{0,1}(\gamma)\left(\frac{d^3u}{dt^3},A^3u\right)_{L_2(R_+;H)}+2a_{2,1}(\gamma)a_{1,1}(\gamma)\left(A\frac{d^2u}{dt^2},A^2\frac{du}{dt}\right)_{L_2(R_+;H)}+$$

$$+2a_{2,1}(\gamma)a_{0,1}(\gamma)\left(A\frac{d^2u}{dt^2},A^3u\right)_{L_2(R_+;H)}+2a_{1,1}(\gamma)\cdot a_{0,1}(\gamma)\left(A^2\frac{du}{dt},A^3u\right)_{L_2(R_+;H)}.$$

Учитывая что $u(0)=u'(0)$ и равенство (16)-(20) имеем:

$$\left\|F_1\left(d/dt;\gamma;A\right)u\right\|^2_{L_2(R_+;H)}=\left\|\frac{d^3u}{dt^3}\right\|^2_{L_2(R;H)}+a^2_{21}(\gamma)\left\|A\frac{d^2u}{dt^2}\right\|^2_{L_2(R_+;H)}+$$

$$+a^2_{1,1}(\gamma)\left\|A^2\frac{du}{dt}\right\|^2_{L_2(R_+;H)}+a^2_{0,1}\left\|A^3u\right\|^2_{L_2(R_+;H)}-a_{2,1}(\gamma)\left\|\varphi_2\right\|^2-$$

$$-2a_{1,1}(\gamma)\left\|A\frac{d^2u}{dt^2}\right\|_{L_2(R_+;H)}-2a_{2,1}(\gamma)a_{0,1}(\gamma)\left\|A^2\frac{du}{dt}\right\|^2_{L_2(R_+;H)}=$$

$$=\left\|\frac{d^3u}{dt^3}\right\|^2_{L_2(R_+;H)}+\left(a_{2,1}(\gamma)-2a_{1,1}(\gamma)\right)\left\|A\frac{d^2u}{dt^2}\right\|^2_{L_2(R_+;H)}+$$

$$+\left(a^2_{11}(\gamma)-2a_{21}(\gamma)a_{1,0}(\gamma)\right)\left\|A^2\frac{du}{dt}\right\|_{L_2(R_+;H)}-a_{2,1}(\gamma)\left\|\varphi\right\|^2_{1/2}$$

Учитывая что $a_{2,1}(\gamma)=1+\sqrt{p^2-\gamma}\quad a_{1,1}(\gamma)=\sqrt{p^2-\gamma}+1$, $a_{1,0}(\gamma)=1$ получаем:

$$\left\|F_1\left(d/dt;\gamma;A\right)u\right\|^2_{L_2(R_+;H)}=\left\|\frac{d^3u}{dt^3}\right\|^2_{L_2(R_+;H)}+\left(p^2-1\right)\left\|A\frac{d^2u}{dt^2}\right\|^2_{L_2(R_+;H)}+$$

$$+\left(p^2-1\right)\left\|A\frac{du}{dt}\right\|^2_{L_2(R_+;H)}+a_{2,1}(\gamma)\left\|\varphi\right\|^2_{1/2}-\gamma\left(\left\|A\frac{d^2u}{dt^2}\right\|^2_{L_2(R_+;H)}+\left\|A^2\frac{du}{dt}\right\|^2_{L_2(R_+;H)}\right)$$ Так как

$\left\|\frac{d^2u}{dt^2}\right\|^2_{L_2(R_+;H)}+\left\|A^2\frac{du}{dt}\right\|^2_{L_2(R_+;H)}=\left\|A\frac{du}{dt}\right\|^2_{W_2^1(R_+;H)}$, то учитывая лемму в последном равенстве получаем:

$$\left\|F_1\left(d/dt;\gamma;A\right)u\right\|^2_{L_2(R_+;H)}+\left(a_{2,1}\left(\gamma\right)-p\right)\left\|\varphi\right\|^2_{1/2}=\left\|P_0u\right\|^2_{W_2^1(R_+;H)}-\gamma\left\|A\frac{du}{dt}\right\|^2_{W_2^1(R_+;H)}$$

Аналогично доказывается

Лемма 3. При $u\in\overset{0}{W}{}_2^3\left(R_+;H\right)$ имеет место равенство

$$\left\|F_0\left(d/dt;\beta;A\right)u\right\|^2_{L_2(R_+;H)}+\left(c_{2,1}\left(\beta\right)-\beta\right)\left\|\varphi\right\|^2_{1/2}=\left\|P_0u\right\|^2_{W_2^1(R_+;H)}-\beta\left\|A^2u\right\|^2_{W_2^1(R_+;H)} \quad (22)$$

Отметим что из теоремы 1 следует, что в пространстве $\overset{0}{W}{}_2^3\left(R_+;H\right)$ нормы $\left\|P_0u\right\|_{W_2^1(R_+;H)}$ и $\left\|u\right\|_{W_2^3(R_+;H)}$ эквивалентны, поэтому конечны следующие нормы

$$N_1=\sup_{0\neq u\in\overset{0}{W}{}_2^3(R_+;H)}\left\|A\frac{du}{dt}\right\|_{W_2^1(R_+;H)}\cdot\left\|P_0u\right\|^{-1}_{W_2^1(R_+;H)} \quad (23)$$

и

$$N_0=\sup_{0\neq u\in\overset{0}{W}{}_2^3(R_+;H)}\left\|A^2u\right\|_{W_2^1(R_+;H)}\cdot\left\|P_0u\right\|^{-1}_{W_2^1(R_+;H)} \quad (24)$$

В дальнейшем, при получения условия разрешимости задачи (1), (2) очень ваэнную роль играют нормы N_1 и N_0.

Теорема 3. Норма

$$N_1=\begin{cases}\dfrac{1}{p}, & 0<p\le 1\\ \left(\dfrac{1}{2p-1}\right)^{1/2}, & p>1\end{cases}$$

Доказательство. Проведя аналогичные рассуждения работы $[6]$ получаем, что если уравнение $\left(a_{2,1}\left(\gamma\right)-p\right)=0$ (см. формулу (21)) не имеет решение из интервала $\left(0,\gamma_0\right)\left(\gamma_0=p^2\right)$, то $N_1=\gamma_0^{-1/2}=\dfrac{1}{p}$. Если уравнение $\left(a_{2,1}\left(\gamma\right)-p\right)=0$ имеет решение из интервала $\left(0,\gamma_0\right)$, то N_1 есть обратный квадратного корня наименьшего этих решений. Поэтому, мы должна решать уравнению $a_{2,1}\left(\gamma\right)-p=0.$ Следовательно, получаем

$$1+\sqrt{p^2-\gamma}-p=0 \quad (25)$$

или

$$\sqrt{p^2-\gamma}=p-1$$

Очевидно, что при $p \le 1$ это уравнение не имеет решение из интервало $(0, p)$. Поэтому $N_1 = \frac{1}{p}$, при $0 < p \le 1$. А при $p > 1$ уравнение (25) имеет решение $\gamma_1 = \frac{1}{2p-1} \in (0, p)$. Поэтому $N_1 = \left(\frac{1}{2p-1}\right)^{1/2}$, при $p > 1$. Теорема доказана.

Аналогично доказывается.

Теорема 4. Норма

$$N_0 = \begin{cases} \beta_0^{-1/2}, p \le 1; \quad p \ge 1{,}5 \\ \left(1-(3-2p)^2\right)^{-\frac{1}{2}}, 1\pi\ p\ \pi\ 1{,}5. \end{cases}$$

Доказательство. Чтобы найти число N_0 мы должны решать уравнению $c_{11}(\beta) - p = 0$ (см. формулу (22)). Тогда

$$1 + \sqrt{2\sqrt{1-\beta} + p^2 - 2} = p$$

т.е

$$\sqrt{2\sqrt{1-\beta} + p^2 - 2} = p - 1 \qquad (26)$$

Тогда $p \le 1,$ уравнение $c_{1,1}(\beta) - p = 0$ не имеет решение из интервали $(0, \beta).$ Поэтому при $p \le 1,$ $N_0 = \beta_0^{-1/2}$. Пуст $p > 1.$ Тогда

$$2\sqrt{1-\beta} + p^2 - 2 = (p-1)^2, \quad 2\sqrt{1-\beta} = 3 - 2p$$

Очевидно, что при $p \ge 1.5$ уравнение (26) не имеет решение из интервале $(0, \beta).$ Поэтому $N_0 = \beta_0^{-1}$. Если $p\ \pi\ 1.5$ то при $\frac{p^2}{2} \ge 1,$ уравнение (25) имеет решение $\beta_1 = (2p-2) \in (0, \beta_0).$

Поэтому $N_0 = \beta_1^{-1/2},$ A при $q \ge p^2$, получаем $p - \frac{1}{2} \le q \le p^2$.

Отсюда имеем, что $(p-1)^2 < 0.$ А это невозможно.

Поэтому в этом случае, также $N_0 = \beta_0^{-1/2}$. Теорема доказана.

Теперь докажем основную теорему.

Теорема 5. Пусть выполняются условия 1)-3) и $q = N_1 \max\left(\|A_1\|_{H_1 \to H}, \|A_1\|_{H_2 \to H_1}\right) + N_0 \max\left(\|A_2\|_{H_2 \to H}, \|A_2\|_{H_3 \to H_1}\right) < 1$ где числа N_1 и N_0 определены из теоремы 3 и 4 соответственно. Тогда задача (1) и (2) регулярно разрешимо в $W_2^3(R_+; H).$

Доказательство. По теорема 1 оператор P_0 изоморфно отоброжает пространство $\overset{0}{W}{}_2^3(R_+; H)$ на $W_2^1(R_+; H).$ Тогда при любом $\omega \in W_2^1(R_+; H)$ существует $u \in \overset{0}{W}{}_2^3(R_+; H),$ такое, что $P_0^{-1}\omega = u.$ Теперь напишем задача (1), (2) в виде уравнение

$$Pu \equiv P_0 u + P_1 u = f,\ u \in \overset{0}{W}{}_2^3(R_+;H), \quad f \in W_2^1(R_+;H).$$

После замены $u = P_0^{-1}\omega$ получаем уравнению $\left(E + P_1 P_0^{-1}\right)\omega = f$ в $W_2^1(R_+;H)$.

Так как при любом $\omega \in W_2^1(R_+;H)$

$$\left\|P_1 P_0^{-1}\omega\right\|_{W_2^1(R_+;H)} = \left\|P_1 u\right\|_{W_2^1(R_+;H)} = \left\|A_1 \frac{du}{dt} + A_2 u\right\|_{W_2^1(R_+;H)} \le \left\|A_1 \frac{du}{dt}\right\|_{W_2^1(R_+;H)} +$$

$$+ \left\|A_2 u\right\|_{W_2^1(R_+;H)} = \left(\left\|A_1 \frac{d^2u}{dt^2}\right\|_{L_2(R_+;H)} + \left\|AA_1 \frac{du}{dt}\right\|_{L_2(R_+;H)}^2\right)^{1/2} +$$

$$+ \left(\left\|A_2 \frac{du}{dt}\right\|_{L_2(R_+;H)}^2 + \left\|AA_2 u\right\|_{L_2(R_+;H)}^2\right)^{1/2} \le \left(\left\|A_1 A^{-1}\right\|_{H\to H}^2 \left\|A \frac{d^2u}{dt^2}\right\|_{L_2(R_+;H)} +\right.$$

$$\left. + \left\|AA_1 A^{-2}\right\|_{H\to H}^2 \left\|A^2 \frac{du}{dt}\right\|_{L_2(R_+;H)}^2\right)^{1/2} + \left(\left\|A_2 A^{-2}\right\|_{H\to H}^2 \cdot \left\|A^2 u\right\|_{L_2(R_+;H)}^2 +\right.$$

$$\left. + \left\|AA_2 A^{-3}\right\|^2 \left\|A^3 u\right\|_{L_2(R_+;H)}^2\right)^{1/2} \le max\left(\left\|A_1 A^{-1}\right\|_{H\to H}, \left\|AA_1 A^{-2}\right\|_{H\to H}\right) \times$$

$$\times \left(\left\|A \frac{d^2u}{dt^2}\right\|_{L_2(R_+;H)}^2 + \left\|A^2 \frac{du}{dt}\right\|_{L_2(R_+;H)}^2\right)^{1/2} + max\left(\left\|A_2 A^{-2}\right\|_{H\to H}, \left\|AA_2 A^{-3}\right\|_{H\to H}\right) \cdot$$

$$\left(\left\|A^2 \frac{d^2u}{dt^2}\right\|_{L_2(R_+;H)}^2 + \left\|A^3 u\right\|_{L_2(R_+;H)}^2\right)^{1/2} = max\left(\left\|A_1\right\|_{H_1\to H}, \left\|A_1\right\|_{H_2\to H_1}\right) \times$$

$$\times \left\|A \frac{du}{dt}\right\|_{W_2^1(R_+;H)} + max\left(\left\|A_2\right\|_{H\to H_2}, \left\|A_2\right\|_{H_3\to H_1}\right) \cdot \left\|A^2 u\right\|_{W_2^1(R_+;H)}.$$

Далее прameняя теоремы 3 и 4 получаем:

$$\left\|PP_0^{-1}u\right\|_{W_2^1(R_+;H)} \le \left(N_1 max\left(\left\|A_1\right\|_{H_1\to H}, \left\|A_1\right\|_{H_2\to H_1}\right) + N_0\left(max\left(\left\|A_2\right\|_{H_2\to H}, \left\|A_2\right\|_{H_3\to H_1}\right)\right)\right) \times$$

$$\times \left\|P_0 u\right\|_{W_2^1(R_+;H)} = q\left\|P_0 u\right\|_{W_2^1(R_+;H)} = q\left\|\omega\right\|_{W_2^1(R_+;H)}.$$

Так как, по условию теоремы $q < 1$, то оператор $E + P_1 P_0^{-1}$ обратим в $W_2^1(R_+;H)$.

Тогда $\omega = \left(E + P_1 P_0^{-1}\right)^{-1} f$, а $u = P_0^{-1}\left(E + P_1 P_0^{-1}\right)^{-1} f$. Отсюда следует, что

$$\left\|u\right\|_{W_2^3(R_+;H)} \le const\left\|f\right\|_{W_2^1(R_+;H)}$$

Теорема доказана.

Литература.

1. Лионс Ж.Л, Мадженес Э. Неоднородные краевые задачи и их приложения, Москва, «Мир», 1971, 371 с.
2. Мирзоев С.С., ГамидовЭ.Г. О нормах операторов процежуточных производных в пространстве гладких вектор- функций и их приложения. Доклада НАН Азербайджана 2011, №3, TL XVII.
3. Гамидов Э.Г. Оценки промежуточных производных в пространствах типа Соболева и их применения. Автореф. Диссер. на соиск. Канд. физ. мат. наук. Баку, 2006, 16 с.
4. Гамидов Э.Г. О розрешимости операторно – дифференциальных уравнений второго порядка в пространстве гладких вектор- функций. Вестник Университета, серия физика – математических наук, №2. 2007, с. 67-74
5. Mirzoev S.S. On the norms of operators of intermediate derivatives / Trahsactions of NAS Azerbaijan,, rer. of phis. techn, math. sciences, 2003, v. XXIII, № 1, p. 93-102.
6. S.S.Mirzoev,E.G.Gamidov.On Smooth Solutions of Operator- Differential Equation in Hilbert Space Applied Matematical Sciences, Vol. 8,2014. no. 63,3109-3115

R PROGRAMMING LANGUAGE AS THE MAIN TEACHING TOOL OF TEACHING STATISTICS TO FUTURE IT SPECIALISTS AND COMPUTER SCIENCE TEACHERS

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ABSTRACT

The paper analyzes methods of teaching statistics and the software tools for statistical analysis of data by future IT specialists and computer science teachers. Universal statistical packages are analyzed and proposed to use R programming language as the main method of teaching statistics. It is suggested to use software packages MS Excel and Statistica as auxiliary teaching tools.

Keywords: programming language, IT-specialists, statistics.

The main tasks of teaching statistics are the following: to teach students methods of constructing statistical and probabilistic mathematical models, methods of their research and solving problems, in particular with the use of computer mathematics systems; to develop students' ability to analyze different ways of solving problems, to compare the obtained results, to formulate formal and meaningful conclusions; to form skills of statistical analysis of data including with use of various types of modern software.

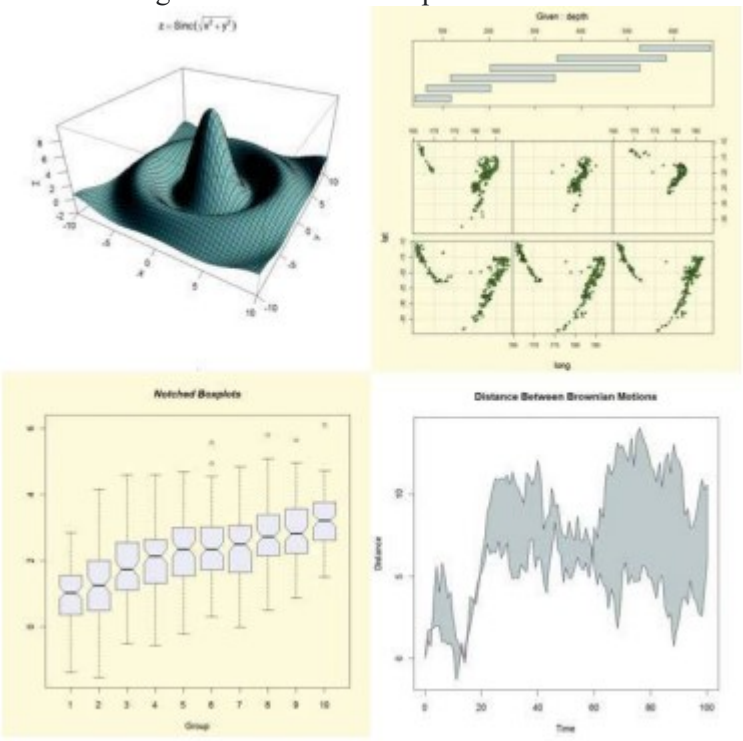
Future IT-specialists have to know the theoretical foundations as well as be able to apply tools to automate statistical analysis. Such tools include specialized statistical software packages and programming languages. There are many common programs for statistical and graphical data processing. Specialized packages (BioStat, Datastream, Datascope, etc.) allow analysis using a limited number of specialized statistical methods or are used in a specialized subject area. Professional statistical packages (SAS, BMDP) allow working with extremely large amounts of data and use highly specialized methods of analysis, but they should not be used in the educational process.

Universal statistical packages (Statistica, SPSS, Statgraphics, STATA, Stadia, SYSTAT, MS Excel) are not focused on a specific subject area and can be used to analyze data from different industries. The vast majority of existing universal packages have many common functionalities and are similar in the composition of the built-in statistical procedures. We analyzed such as Microsoft Excel, SPSS, GRAN1, Statistica. The criteria of the analysis were: prevalence and accessibility, the level of use in practice, ease of use, the capabilities of the software in the formation of a high level of knowledge and competencies. After conducting their practical testing, we selected those that, in our opinion, best meet the above criteria. These are MS Excel and Statistica.

However, from the practice of using the MS Excel software, it can be concluded that this tool is suitable for solving educational problems in which the data are pre-grouped and presented in a form convenient for analysis. However, for large samples its use becomes problematic (or impossible). Some difficulties also arise when visualizing data. That is why we have concluded and propose to use the R language and programming environment.

```
> Age <- c (1,3,5,2,11,9,3,9,12,3)
> Weight <- c (4.4,5.3,7.2,5.2,8.5,7.3,6.0,10.4,10.2,6.1)
> Mean (weight)
[1] 7.06
> Sd (weight)
[1] 2.077498
> Cor (age, weight)
[1] 0.9075655
> Plot (age, weight)
> Q ()
```

Program code 1. An example of a session in R



Picture 1. Graphics capabilities of R

R is a programming language and environment for statistical computation and graphical analysis, similar to language S, originally developed by Bell Labs. It is an open source data analysis program supported by a large and active research community around the world.

R has many features that allow to recommend this program. This programming language is modern, popular and effective in solving problems of statistics. Involving it in the study of statistics will allow students to gain theoretical knowledge and practical skills in using modern mathematical methods, open source libraries and theories of machine learning in solving specific problems that arise in professional and everyday activities.

The study revealed that the teaching of statistics should be based on real data obtained from statistical research, which is more relevant for students compared to synthetic examples. Therefore, the development of practical and laboratory work for future IT spacialists should include tasks that will contain real data.

The main method of teaching statistics is the method of practical training based on programming. Therefore, we propose to use the R language and programming environment as the main teaching tool. MS Excel and Statistica software packages should be used as auxiliary teaching tools.

References

1. Khomyak M. Analysıs of data on the organızatıon of dıstance learnıng // Mıddle East Internatıonal conference on contemporary scıentıfic studıes-V, March 27-28, 2021, Ankara, Turkey. Vol.II, -P. 384-386.
2. Tishkovskaya S., Lancaster G. A. Statistical education in the 21st century: A review of challenges, teaching innovations and strategies for reform. Journal of Statistics Education, 20(2). 56 p. DOI: 10.1080/10691898.2012.11889641.
3. Zieffler A., Garfield J., Alt S., Dupuis D., Holleque K., Chang B. What Does Research Suggest about the Teaching and Learning of Introductory Statistics at the College Level? A Review of the Literature, Journal of Statistics Education, 2008.16(2). http://www.amstat.org/publications/jse/v16n2/zieffler.html.

PLANNING A FAST MOVEMENTS FOR TWO-LINK PLANAR ROBOT ARM USING SEQUENTIAL QUADRATIC PROGRAMMING

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ABSTRACT
We propose in this work a method, to solve a problem of trajectory planning for two-link planar robot arm which execute repetitive operations. The objective function represents the execution time, will be minimized by using a powerful optimization technique namely sequential quadratic programming (SQP), while not exceeding a maximum pre-defined torque (dynamic constraints). The trajectories that connect initial, two intermediates, and final point in joint-space are constructed using cubic spline functions. The dynamical model of the robot is derived using Euler-Lagrange's equations and the inertia terms of the actuators are not neglected. The results obtained are compared with others from the scientific literature to test the performance and effectiveness of our method.

Keywords: Trajectory generation, Execution time, two-link Planar robot, SQP.

SODYUM KATKI ORANININ FONKSİYONU OLARAK ZNS İNCE FİLMLERİNİN YAPISAL VE OPTİKSEL ÖZELLİKLERİ

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ÖZET

Bu çalışmada, Na katkılı ZnS ince filmleri çözelti tabanlı sol-jel daldırma yöntemiyle cam altlıklar üstüne hazırlandı. Hazırlanan ince filmlerin yapısal ve optiksel özelliklerine Na katkı oranın etkisini incelemek için x-ışını kırınım diffiraksiyonu (XRD), taramalı elektron mikroskobu (SEM), enerji dağıtıcı x-ışını (EDX), x-ışını fotoelektron spektroskopisi (XPS) ve ultra-viyole görünür spektrofotometresi (UV-Vis) kullanıldı. Yapısal ve yüzeysel ölçüm sonuçları, filmlerin polikristal doğaya ve (111) yansıma düzlemi yönünde baskın kübik kristal yapıya sahip olduğunu gösterdi. Bununla beraber film kristallenme derecesinin Na katkı oranına göre değiştiği gözlemlendi. Film yüzeylerinin homojen ve yoğun olduğu ve tanelerin yöneliminin ve büyüklüğünün Na katkı düzeyine göre değiştiği anlaşıldı. Buna ek olarak filmlerin Zn, S, Na içerdiği de teyit edildi.

Optik ölçüm sonuçları, optiksel geçirgenliğin, Na katkı oranıyla birlikte, katkısız ZnS'e göre önce arttığı sonra tekrar azaldığını gösterdi. Benzer şekilde, soğurma spektrumlarınında Na katkı oranına sıkıca bağlı olduğu ve şiddetinin, katkısız ZnS'e göre Na katkı oranıyla önce arttığı sonra azaldığı gözlemlendi. Na katkı oranıyla birlikte soğrulma band kenarının, katkısız ZnS'e göre önce düşük dalga boylarına daha sonra yüksek dalga boylarına kaydığı da gözlemlendi. Bu kayma optik band gap enerjisinin önce arttığını ve sonra tekrar azaldığını yansıtmaktadır.

Anahtar Kelimeler: Sol-jel, ZnS, Na Katkılı ZnS, İnce Film, Geçirgenlik, Yasak bant aralığı.

STRUCTURAL AND OPTICAL PROPERTİES OF ZNS THIN FILMS AS A FUNCTION OF NA SUBSTITUTION RATIO

ABSTRACT

In this study, Na doped ZnS thin films were prepared on glass substrates by solution-based sol-gel dipping method. X-ray diffraction diffraction (XRD), scanning electron microscopy (SEM), energy dispersive x-ray (EDX), x-ray photoelectron spectroscopy (XPS) and Uv-Vis spectroscopy were used to examine the effect of Na contribution on the structural and optical properties of the prepared thin films. The structural and surface measurement results showed that the films have a polycrystalline nature and a dominant cubic crystal structure in the (111) reflection plane direction. However, it was observed that the film crystallization degree changed according to the Na doping ratio. It was understood that the film surfaces were homogeneous and dense, and the orientation and size of the grains changed according to the Na contribution level. In addition, it was confirmed that the films contained Zn, S, Na.

Optical measurement results showed that the optical transmittance first increased and then decreased again compared to undoped ZnS with the variation of Na doping ratio. Similarly, it was observed that the absorption spectra were tightly dependent on the Na doping ratio, and the intensity first increased and then decreased with the Na doping ratio compared to undoped ZnS. It was also observed that with the Na doping ratio, the absorption band edge shifted first to the lower wavelengths and then to the higher wavelengths compared to the undoped ZnS. This shift reflects that the optical band gap energy first increases and then decreases again.

Keywords: Sol-gel, ZnS, Na Doped ZnO, Thin films, Transmittance, Band gap.

1. GİRİŞ

Yarı iletken ve elektronik devre elemanları teknolojisinde boyutsal olarak küçülmeler ve gelişmiş fonksiyonlara sahip nanoparçaçık ve ince filmlere ihtiyaç giderek artmaktadır. ZnS diğer temel yarıiletkenler içerisinde bu temel ihtiyaçları karşılayanbilen önemli yarıiletkenlerden birisidir. Onların

nanoparçacık ve ince film formunda üretilebilinmeleri söz konusu alanda daha da önemli duruma getirmektedir. İstenilen amaca yönelik olarak kullanılan katkı elementlerinin türü ve katkı oranı, ZnS temel yarıiletkenin yapısal, optik, elektriksel ve manyetik davranışlarını pozitif yönde geliştirebilir. Bu gelişim, ZnS yarıiletken bileşiğinin geniş yasak enerji bant aralığına (3.7 eV) ve yüksek eksiton bağlanma enerjisinden kaynaklanmaktadır [1-2]. Ek olarak, ZnS önemli bir lüminesans yarıiletkeni olup, spin-LED, hareketli göstergelerde, sensor, fotokatalizör ve güneş hücresi yapımında etkin bir rol oynayabilir.

Na katkılı ZnS ince film nanoyapıların yapısal ve optiksel özellikleri ile ilgili literatürde çok nadir çalışmalar yer almaktadır. Sol-jel metodu ile nanoyapılı ince film veya nanopartikül üretmek bayağı artmıştır. Diğer geleneksel metotlarla karşılaştırıldığında: ucuz, kontrolü kolay, geniş ve farklı yüzey morfolojilerine kolaylıkla kaplanabilir olması onu farklı kılmaktadır. Ayrıca, bu yöntemde kaplamalar daldırma, döndürme, püskürtme ve boyama metotlarıyla da kolaylıkla hazırlanabilir. Dahası, bu süreçte hazırlanan çözeltinin pH'ı, viskozitesi, başlangıç kimyasallarının türü ve ortamın basıncı/nemi v.b. faktörler filmlerin yapısal, morfolojik, elektriksel, optik ve manyetik özellliklerini ciddi anlamda, çok düşük katkı oranlarıda bile, çok büyük değişimler yaratabilir [4-6].

Bu çalışmada, % 0-3 Na katkı oranlarının ZnS nanoyapılı ince filmlerin yapısal, yüzeysel ve optic özelliklerine etkisi incelenmiştir.

2. DENEYSEL YÖNTEM

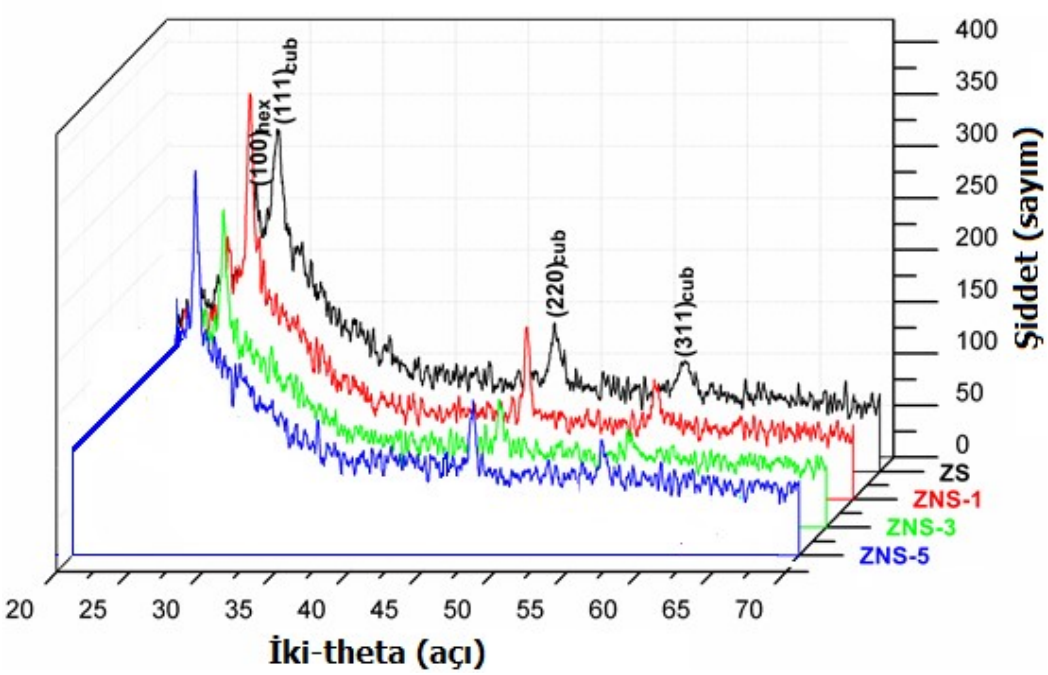
Sodyum katkı oranı % 0-3 olan ZnS nanoyapılı ince filmleri sol-jel kaplama metodu ile cam altlıklar üzerinde üretildi. Zn asetat, Na nitrat ve tiyoüre öncül kimyasaları 2-mtehoxyetanolde uygun molar oranda çözündürüldü. Çözeltiler manyetik karıştırıcı ile 30 dakika karıştırlarak hazırlandı. Çözeltilerdeki Zn/S molar oranı 1/3'ayarlandı. Etanolamin kullanılarak çözeltilerin pH'ları 10 olarak ayarlandı. Nihai çözeltiler 36 saat oda koşullarında karıştırılarak bekletildi. Aseton, saf su ve ultrasonic su banyosu kullanılarak cam altlıkların temizliği sağlandı. Temizlenen cam altlıklar, nihai çözelti kullanılarak, daldırma tekniği ile temizlenen camların üzerine 300 ^{o}C'de biriktirildi. Ek olarak, cama kaplanan filmler kristallenmesi için argon ortamında 600 ^{o}C'de 30 dakika tavlama işlemine tabi tutuldu.

Hazırlanan ince filmlerin yapısal özelliklerini incelemek için XRD (Rigaku Ultima III (40 kV, 40 mA and 1.54 A◦)) ve yüzeysel morfolojilerini araştırmak için de SEM (Zeiss Evo 50, 200 kV) ölçüm aygıtları kullanıldı. Optik özelikler ise oda sıcaklığında Perkin Emler 45 UV–Vis spektrofotometresi ile irdelendi.

3. SONUÇ VE TARTIŞMALAR

3.1. XRD ve SEM Ölçümleri

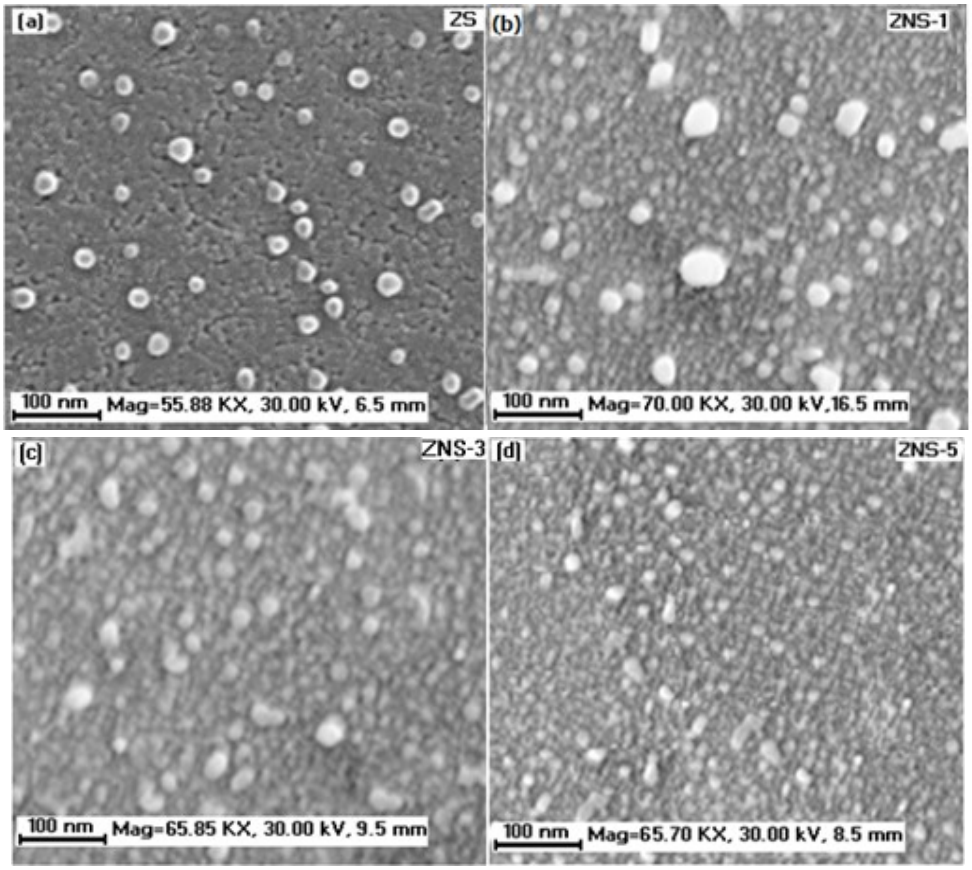
Sodyum katkılı filmlere ait alınan XRD spektrumları filmlerin baskın kübik yapıyla beraber hekzagonal ZnS yapısında kristallendiği ve örgü içerisinde herhangi bir safsızlığa sahip olmadığını gösterdi [7]. Şekil-1'den anlaşılacağı gibi film örneklerin (002) kübik kristal düzlemi yönünde daha çok kristallendiği ve polikristal doğasına sahiptir.



Şekil-1. ZnS (ZS) ve Na katkılı ZnS (ZNS-1, ZNS-3ve ZNS-5) ince filmlerinin XRD spektrumları

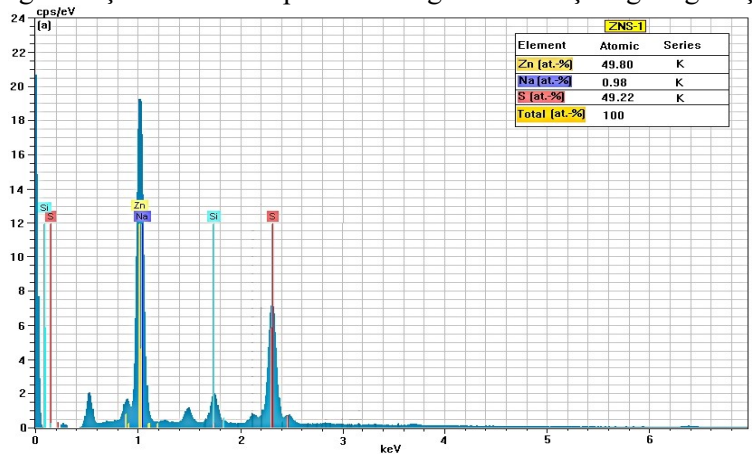
Film örneklerinin, Debye Scherrer förmülü yardımıyla hesaplanan kristal büyüklükleri yaklaşık 9-17 nm arasında değişmektedir. Bu sonuç, Na katkılı ZnS filmlerinin kristallenme kalitesinin Na aracılığı ile değişebileceğini yansıtmaktadır.

SEM analizleri filmlerin yüzeylerinin yoğun ve homojen olduğunu yansıtmaktadır (Şekil-2). Bu şekilden, ZNS-1 ince film daha büyük tanecik boyutlarına sahip olduğu görülmektedir. Bu sonuçlar, XRD ölçümleri ile uyumludur.



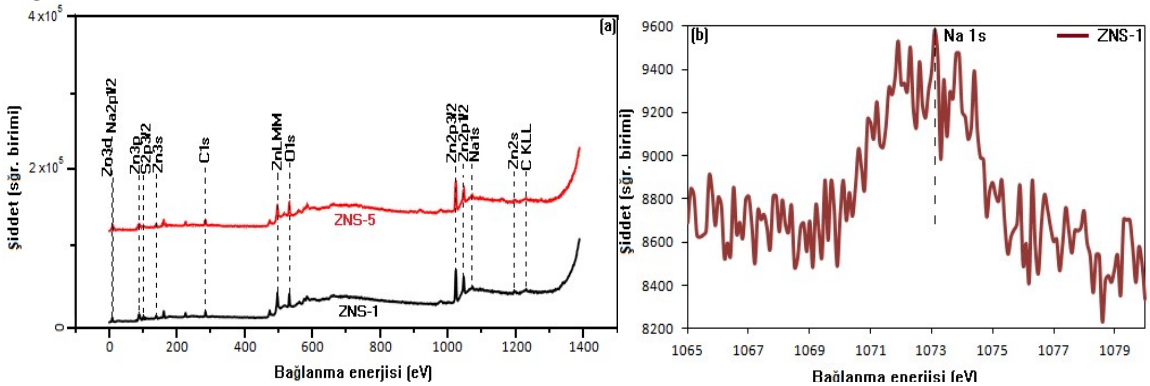
Şekil-2. ZnS (ZS) ve Na katkılı ZnS (ZNS-1, ZNS-3ve ZNS-5) ince filmlerinin SEM görüntüleri

Katkılı ZNS-1 ince filminin EDX spektrumu Şekil-3'te verilmiştir. Sonuçlardan film örneğinin Zn, Na, S atomlarından oluştuğu anlaşılmaktadır. Si pikinin varlığı cam alt taştan geldiği düşünülmektedir.



Şekil-3. %1 Na katkılı ZnS ince filminin EDX spektrumu

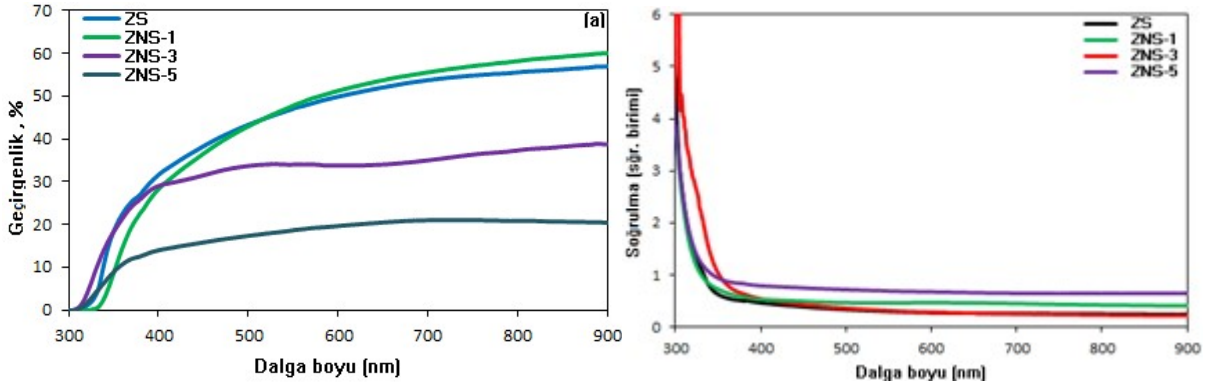
Katkılı ZNS-1ve 5 nolu ince filminin XPS spektrumu Şekil-4a-b'de görünmektedir. Analiz sonucu EDS ile uyum içerisinde olup, Zn, Na ve S atomlarının sırasıyla +2, +1 ve -2 değerliğe sahip olduğu ve film numunelerde XRD ile uyumlu olacak şekilde herhangi bir ikincil faza sahip olduğu yapılan değerlendirmelerden anlaşılmıştır.



Şekil-4. %1 ve %5 Na katkılı ZnS ince filminin XPS spektrumları

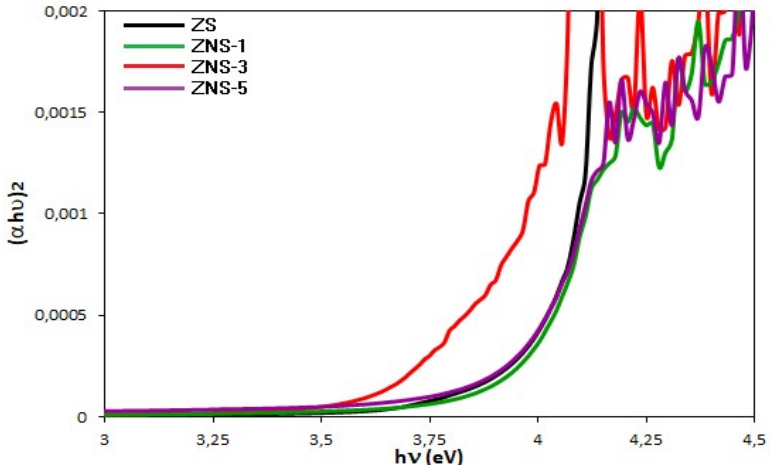
3.2. Optiksel Ölçümler

Na Katkılı ve katkısız ZnS ince filmlerinin optiksel geçirgenlik ve soğurma tayfları 300-900 nm dalga boyu aralığında Şekil-5a ve b'de verilmiştir. Optiksel geçirgenliğin %1 Na katkılı ZnS ince filmi hariç, ZnS göre azaldığı gözlemlenmiştir (Şekil-5a). Diğer taraftan optiksel soğurma sonuçları %1 Na katkılı ZnS ince filmi hariç, ZnS göre arttığını göstermiştir (Şekil-5b).



Şekil-5. ZnS (ZS) ve Na katkılı ZnS (ZNS-1, ZNS-3ve ZNS-5) ince filmlerinin geçirgenlik (a) soğurma (b) spektrumları.

Filmlerin soğurma kenarının katkısız ZnS filmine göre önce daha düşük dalga boylarına (ZNS-1 için) daha sonar daha yüksek dalga boylarına (ZNS-3 ve ZNS-5 için) kaydığı gözlemlenmiştir. Bu kayma filmlerin hesaplanan yasak band enejisi değerlerindeki önce artma sonra azalmayı desteklemektedir (Şekil-6).



Şekil-6. ZnS (ZS) ve Na katkılı ZnS (ZNS-1, ZNS-3ve ZNS-5) ince filmleri için $(\alpha h\upsilon)^2$ ile $(h\upsilon)$ ifadelerinin değişim eğrisi.

4. SONUÇLAR

Sol-jel tekniği kullanılarak sentezlenen Zn1-xNaxS (x=0.00~0.05) ince filmlerinin (111) b yansıma düzlemi yönünde ZnS baskın kübik yapıda kristallendiği gözlemlendi. Film örneklerin XRD ve SEM ölçümleri $Zn_{0.99}Na_{0.01}S$ ince filminin diğer Na katkılı film örneklerden daha iyi kristallendiği, yüzey tanelerinin daha iri, yoğun ve homojen olduğunu gösterdi. EDX analiz sonuçları, film örneklerin Zn, Na ve S atomlarını içerdiğini saptadı. Yapılan optik ölçümler, film örneklerinin, ZnS'e göre $Zn_{0.99}Na_{0.01}S$ hariç daha düşük geçirgenliğe sahip olduğunu gösterdi. Ayrıca filmlerin tahmin edilen yasak bant aralığı, öncelikle %1 Na kakılı ZnS filmi için ZnS filmine göre önce arttı, sonra tekrar azaldı. Elde edilen sonuçlar ZnS ince filmlerinin yapısal, morfolojik ve optik özelliklerinin rahatlıkla Na katkısı ile değiştirilebileceği anlaşıldı. Bu değişken özelliklerin elektronik ve optoelektronik devre elemanları için faydalı olabileceği düşünülmektedir.

5. TEŞEKKÜR

Bu çalışma Harran üniversitesi K21051 nolu HÜBAK projeleri tarafından desteklenmiştir.

KAYNAKLAR

[1] M. Zuo, S. Tan, G.P. Li, SY. Zhang (2012), "Structure Characterisation, Magnetic and photoluminescence properties of Mn-doped ZnS nanocrystalline" Science (China) 55 (2012): 219–223.

[2] A Goktas, A Tumbul, Z Aba, A Kilic, F Aslan (2020), “Enhancing Crystalline/Optical Quality, and Photoluminescence Properties of the Na and Sn Substituted ZnS Thin Films for Optoelectronic and Solar Cell Applications; A Comparative Study”, Optical Materials 107:110073.
[3] A.A. Bol, R.V. Beek, A. Meijerink (2012), “On the Incorporation of Trivalent Rare Earth Ions in II−VI Semiconductor Nanocrystals” Chem Mater 14:1121–1126.
[4] A. Goktas, F. Aslan, E. Yasar, I.H. Mutlu (2012), Preparation and Characterisation of Thickness Dependent Nano-structured ZnS Thin Films by Sol–gel Technique, J. Mater. Sci.-Mater. Electron., 23:1361.
[5] M. El-Hagary, M. Emam-Ismail, ER. Shaaban, A. Al-Rashidi, S. Althoyaib (2012), “Composition, Annealing and Thickness Dependence of Structural and Optical Studies on $Zn_{1-X}Mn_xS$ Nanocrystalline Semiconductor Thin Films” Mater Chem Phys. 132:581–590.
[6] A. Goktas, F. Aslan, I.H. Mutlu (2014), “Effect of Preparation Technique on the Selected Characteristics of $Zn_{1-x}Co_xO$ Nanocrystalline Thin Films Deposited by Sol–Gel and Magnetron Sputtering”, J. Alloys Compd. 615:765–778.
[7] Z.-L. Wang, J.-H. Song (2006), “Piezoelectric Nanogenerators Based on Zinc Oxide Nanowire Arrays” Science, 312: 242–246.
[8] A. Goktas, F. Aslan, A. Tumbul, S.H. Gündüz (2017), “Tuning of Structural, Optical and Dielectric Constants by Various Transition Metal Doping in ZnO:TM (TM=Mn, Co, Fe) Nanostructured Thin Films: A Comparative Study”, Cer. Int. 43:704-713.
[9] S. Serkis Yesilkaya, Unzile Ulutas, Huda M. Abd Alqader (2021), Effect of Na Doping on the Properties of ZnS Thin Films and ZnS/Si Heterojunction Cells, Materials Letters, 288: 129347,
[10] T. Hurma (2018), “Structural and Optical Properties of Nanocrystalline ZnS and ZnS:Al films” Journal of Molecular Structure, 1161:279-284.

5S SUPPORTING ALGORITHM IN DIABETIC FOOT ULCER: OUR EXPERIENCE

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ABSTRACT
A diabetic foot ulcer occurs in about 15 percent of diabetic patients, precedes 85% of diabetes-related amputations and is usually located on the plantar surface of the foot.
To avoid limb amputations, we have developed an "5S supporting Algorithm" for a speedy recovery and faster healing of diabetic foot ulcers, taking into account their pathogenetic mechanisms of formation.
1. **Sugar** – Effective correction of blood glucose levels: This is of paramount importance in the treatment of diabetic foot ulcers.
2. **Sanitation** – Preventive measures to control infection and refresh wounds:
- daily debridement of the wound - removal of necrotic elements, removal of callosal edges of the wound up to tight fusion of the skin with underlying tissues, keratoses,
- sanitation of the wound under pressure through a thin stream of saline NaCl solution and the application of a bandage with aseptic solutions, indifferent to the skin, wound and possible granulation). Isolation of the wound after dressing is imperative for drainage infection, which is more important than the old tactic of "air-to-wound" tactics.
3. **Squeeze** – Removal of pressure and friction (ie unloading) on the wound area, often caused by disturbance of plantar pressure when walking. Wearing special shoes or bandages, silicone mats, crutches, strollers and other devices that allow adequate unloading. This allows you to relieve pressure on the wound, eliminate irritation and promote the development of granulation (tissue growth) to close it. Avoid walking barefoot.
4. **Survive** – Improvement of microcirculation and elimination of tissue hypoxia (use of vasodilators, prostaglandins, sessions of hyperbaric oxygenation etc.). Treatment of diabetic polyneuropathy.
5. **Smoking** - Reducing, if possible, eliminating additional risk factors such as smoking, alcohol consumption, high cholesterol levels.
The results of our research have shown that the application of this algorithm can become the gold standard for the treatment and healing of diabetic foot wounds.

Keywords: Diabetic foot ulcer, 5S algorithm, wound healing, supporting, our experience.

ANTERIOR DEEP BITE AND TMD-CASE REPORT

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ABSTRACT

Introduction

Deep overbite is perhaps one of the most common dental malocclusions and the most difficult to treat successfully. Correction of deep overbite has always been challenging to orthodontists especially in adult cases. The ideal treatment protocol for an adult patient with skeletal deep bite, Class II division 1 malocclusion and TMD has been managed with conventional orthodontics therapy combined with orofacial myofunctional exercises. The modality of exercise therapy included improvement of proprioception, tonicity and mobility, working with the facial and cervical musculature, as well as with stomatognathic functions-respiration, mastication, deglutition and speech. The most important is aid in long-term retention.

Aim

The purpose of this study is to show how inappropriate orthodontics treatment (5 years ago the patient with Class II malocclusion 2, was treated with orthodontics fixed appliances only in maxilla), leads to Class II malocclusion 1 and TMD. Optimized the orofacial function, symmetry and control of mandibular movements, reliving the pain is basic aim in the myofunctional therapy.

Materials and Methods

The 26 years, female patient chief complaint was muscle spasm of the muscles of mastication, associated with pain of the right TMJ, cervical pain, fatigue, masticatory muscles tender to palpation and extraoral facial asymmetry. The pain gets worse in last six months. Intraoral examination revealed limited opening the mouth because of pain on the right TMJ, incoordination of the mandibular movements to the left during speech, anterior deep bite (maxillary incisors complete covered mandibular incisors), OJ was 11mm, decreased lower facial hight, competent lips with deep mentolabial fold. Angle classification was Class II division 1. The panoramic radiograph showed all teeth were present (excluding the third molars), TMJ space revealed normal size, shape and position of the condylar heads. In the cephalometric assessment the ANB value of 5° suggested a Class II skeletal pattern with low mandibular plane angle. The maxillary incisors and NA were 5mm and 14° and mandibular incisors and NB were 4mm and 32°.The gonial angle was decreased, 120°. The horizontal growth pattern is a key factor in the formation of deep bite malocclusion to this patient. Individual myofunctional appliance was made for correction the bite, latero- position, relax the hypertrophic muscles with mesialization on mandibula. Reconstruction will be in two phases because of limited opening the mouth and joy-pain. The reconstruction bite in first phase is on 7mm OJ. Myofunctional exercises were also ordered.

Results

The joy-pain decreased after 1 month treatment. The patient felt more comfortable with myofunctional appliance in the mouth and after practising myofunctional exercises.

Conclusion

TMD is often presented with deep bite malocclusions. Priority in orthodontists' therapy is to correct myofunctional and joy disorders, furthermore to decrease the pain and limited movement of mandibula.

Due to orofacial myofunctional therapy as well as the classic orthodontic treatment functional improvement was noticed.

Keywords: Deep bite, TMD, Myofunctional therapy.

ABNORMAL POSITIONS OF STRUCTURES IN THE FACE AND THEIR CLINICAL IMPLICATIONS

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ABSTRACT
The anatomy of the human face is one of the most complicated in our body. Relatively small area with complexity of the constructing structures is a predisposition for iatrogenic incidences in that region during surgical or interventional manipulations. The knowledge of normal human morphology of the face is of great importance for clinical practice. In this work we describe five cases with accessory salivary tissue on different parts of the face, found during dissection of 82 hemi-sectioned heads. All of them are isolated salivary tissue tumor mass located in facial musculature. Two are in the upper lip and the third is situated lateral to the left oral angle. The last two are in the buccal region. The size of all findings varies from few millimeters to few centimeters. The second part of this study is on the blood supply of the face. Though variations are most common among vessels and they show great individuality among humans in our study we present two cases with atypical facial arteries which are very uncommon. One of them is with unusual very high origin of the artery in the retromandibular fossa as well as availability of an accessory vessel at the level of origin of the usual facial artery. The latter is found only in the neck. The second case is of bilateral hypoplasia of the facial arteries, which disappear in buccinator. The insufficient facial artery is compensated by a larger transverse facial artery. All of the presented structures are atypical but not pathological. We classify them in the group of human anatomy variations, which are not usual but do not change normal function and normal life of the individual. The awareness of the clinicians of such atypical facial anatomy is of great importance especially in facial reconstructive surgery, surgery in cases of tumors in the face and during diagnostics imaging in that area.

Keywords: choristoma, facial artery, human anatomy variations

THE CLINICAL CHARACTERISTIC OF PM IN PATIENTS UNDER 40 YEARS

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ABSTRACT

Introduction. Primary myelofibrosis (PM) is a chronic myeloproliferative disease that belongs to the group of so-called Ph-negative pathologies. The etiology is unknown. The incidence of PM is approximately 0.5-1.5 per 100,000 population. Despite the typical PM splenomegaly, hepatomegaly, thrombosis of various localization, bone marrow fibrosis and various changes in the general blood count. The WHO criteria for confirmation include genetic mutations, histological changes, anemia, high level of white blood cells, leukoerythroblastosis, elevated level of LDH and splenomegaly. PM is identified in patients over the age of 50. Much less often PM is diagnosed in patients under 40 years of age and in extremely rare cases is found in children.

Objective. Identification of clinical characteristic of PM in patients under 40 years.

Design. This study is retrospective and it an analysis of patients registered in the period from 1987 to October 2021.

Results. We analyzed the data from 41 patients. The 10 patients are men and 31 women. The patients were divided into three groups according to age. In the first group, clinical manifestations are a massive s splenomegaly which was observed in all patients. The complete blood count was normal. In the third group, thrombocytosis was more common in 51.21% and an increased level of hemoglobin and the size of the spleen varied from normal in 1.64% to massive splenomegaly in 3.69% of cases. For patients aged 20-30 years, thrombocytosis is characteristic and splenomegaly was found in the entire group of varying severity.

Conclusion: The clinical aspects are different for any age. Thrombocytosis is characteristic for 65.85% of the total number of patients and leukocytosis for 46.34%. This analysis did not reveal any dependence of organomegaly on age or peripheral blood counts.

Keywords: primary myelofibrosis, splenomegaly, thrombocytosis.

ESTIMATED WEEKLY INTAKE AND THE POTENTIAL TARGET CANCER RISKS OF EXPOSURE TO PARTICULATE MATTER (PM 2.5) AMONG COMMUNITIES LIVING NEAR BOSOWA CEMENT INDUSTRY, INDONESIA

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ABSTRACT

Backgrounds; The findings of the negative impact of cement industry emission on public health is the increased risk of respiratory diseases. While the environmental impact is the contamination on water, air, soil and even on food due to the dropped dust carried by the wind, especially particulates measuring below 2.5 microns (PM2.5). This study aims to estimate weekly intake and investigate the target hazard risk of PM2.5 exposure in ambient air among communities in cement industry areas.

Materials and Method; Data analysis used is linear regression statistical test in order to determine the relationship between PM2.5 air quality with outdoor communities activities and respiratory disturbance experienced. Estimated weekly intake calculated used the PTWI conversion and Target hazard Quotient by applying the formulation provided by the EPA and WHO. The level of received both by environment and communities if exposed to PM2.5 within a certain period of time, field direct measurements were commenced in noon. 15 sample points measured level of PM 2.5 pollution during the period of June 2021.

Results; Of those 15 stations observed, the estimated weekly intake calculation results revealed that high values were in Station 6 with 0.220, followed by station 5 with 0.189 and station 7 with 0.172, respectively. Whereas, the result values of target hazard quotient (THQ) through inhalation route were high in station 11 with 0.577, then followed in station 9 with 0.561, and in station 14 with 0.514, respectively. In addition, values of THQ through dermal contact were high in station 2 and 9 with 0.008 and in station 10 with 0,007, respectively. The results of the calculation of the risk accepted for life (lifetime) show that the three highest areas are not at risk with a THQ value < 1, but have the potential for danger and risk because PM 2.5 pollutant emissions are continuously generated and accumulated in the long term.

Conclusion: Health risks through the inhalation route all exceed the standard >1 and the potential for pulmonary disorders among communities can occur, while the risk from the dermal route is still < 1 means it is still safe. Most of the Communities surround the area frequently expose to dust of PM 2.5 have experienced to suffer from lung diseases and may at risk.

Keywords: Estimated weekly intake, Particulate Matter 2.5, Community Health, Target Hazard , and EcologicalRisk.

GENERAL ASPECTS OF TAX HAVENS

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From ancient times until nowadays, compulsory contributions have fueled the authorities' budget, a budget that has played a very important role in the development of societies. An old saying highlighted the fact that a fine is a fee for a mistake, while a fee is a fine for a right thing. Theoretically, whether we have a natural or a legal person in the foreground, they must imperatively observe any tax burden imposed by the competent authorities within a state. Although some taxpayers have enjoyed tax advantages which cannot be neglected, most countries face an inflation of entities that evade the mandatory rules that establish the payment of taxes through the use of so-called *offshore* tax havens and companies. In the context of financial globalization, tax planning is a major concern for large companies. By developing complex strategies for international tax optimization, profits can be directed from countries with high taxes to those with lower taxes. From this perspective, *offshore* companies can be considered one of the most effective solutions for companies in the fight against taxation[1]. The number of companies developing such plans is constantly growing, with opportunities to increase profits urging more and more companies to resort to offshore operations, with national budgets incurring increasing losses due to the actions of these giants.

In order to emphasize the importance of this "fiscal lever", several studies have been carried out and their results have been presented at the United Nations Conference on Trade and Development. The data obtained revealed that about a third of the gross domestic product at a global level is managed through tax havens. There have been some cases when various international organizations have proposed that the operations carried out by tax havens be characterized by

[1] Mihai-Bogdan Afrasinei, *Contabilitatea și fiscalitatea societăților off-shore*, PhD degree, „Alexandru Ioan Cuza” University, Iași, 2005, p.16.

transparency, but the result has not been satisfactory. The most eloquent example of this was the study carried out by Robert Thomas Kudrle. Thus, it conducted a survey, namely the passage by the Organization for Economic Cooperation and Development on a so-called "blacklist" of 36 countries to see if it will lead to a decrease in *offshore*-led financial activity, but the results showed that in reality the impact was not significant. The tax authority has long been a segment that the human being has tried to cheat. Whether we focus on big companies or even small entrepreneurs, they have all tried to take advantage of those shortcomings of the law to increase their profits. Called by twentieth-century literature "tax havens" or "offshore financial centers", legal entities with a special state in tax matters are not a phenomenon characteristic of the contemporary era[2].

Starting Antiquity, the persons who had the quality of merchant hunted every possibility to evade the fiscal taxes. In ancient Greece, philosophers used non-profit companies to financially support the universities of that time, as well as to circumvent the fees imposed in order to carry out educational activities. In the trade with goods, traders in the islands near Athens avoided a 2% tax levied by the Greek city on imports and exports. In this way, the first tax haven territory was Flanders, which levied a very low tax[3] on trade through its ports at the beginning of the 16th and 17th centuries. During this period, the term "tax haven" was used to define a place intended for the refuge of ships in the event of a storm or strong winds[4]. Analyzing the "offshore" lexeme, which is of Anglo-Saxon origin, it means, in a free translation, beyond the shore. A factor which favored the development of these centers that offer financial privileges, in the 17th century, was the maritime infrastructure, the most used method of transporting goods from one place to another. Among the people who used such tax oases in Antiquity were the pirates of those times, who acted in the area of the oceans identifying islands or localities where they stored their treasures resulting from the plundering of merchant ships[5]. In the glory of the Roman Empire, the island of Delos was preferred by Roman merchants to legally and transparently avoid the payment of taxes and duties by the rulers of the Empire[6]. At the same time, England was privileging certain Flemish traders, and Flanders were going to offer the same benefits to English traders on the principle of reciprocity.

Due to these privileges granted to traders, the banking branches in the *offshore* areas began to develop, and the banks of that time opened branches in the countries that offered financial privileges. A representative example is represented by The Bank of The New Scotland, which, in 1889, opened a branch in Jamaica, thus offering financial advantages to customers conducting international trade operations. Since 1920, as the *offshore* system has been adopted in more and more parts of the world,

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[2] Codruța Trandafir, *Societățile off-shore între reglementarea legală și ilicit*, Universul Juridic Publishing House, Bucharest, 2012, p.120.

[3] D.J. Cooper, L. Varadi, G. Kiss, *Paradisuri fiscale și firme neimpozabile*, Nevali Publishing House, Cluj, 1998, p.112.

4 E.R. Nandra, Competiția fiscală. Infernul și paradisul fiscal, Sfera Juridică Publishing House, Cluj, 2008, p.112.

5 C. Corduneanu, Sistemul fiscal în știința finanțelor, Codecs Publishing House, Bucharest, 1998, p. 355.

6 E.R. Nandra, „Impactul paradisurilor fiscale asupra economiei mondiale", în Lumea Financiară. Prezent și perspective, Sfera Juridică Publishing House, Cluj, 2004, p.114.

several industrial companies have resorted to the method of registering commercial vessels in territories that could offer tax advantages, such as Panama and Liberia in order to avoid paying the profit tax, as well as the withholding the dividends that had to be paid to the non-resident shareholders. Starting that moment, wealthy citizens protected their assets by setting up *offshore* trusts in tax havens such as the Bahamas and the Channel Islands, and international companies by registering captive insurance companies in countries such as Bermuda and Cayman Islands. The end of the Second World War generated a process of economic and financial reconstruction of the territories affected during the war, generating worldwide major capital flows and important changes at the economic level[7].

After the end of the Second World War, these tax haven systems experienced an environment conducive to development, given the reactions against state authorities that imposed high taxes, thus accentuating the conflicts between social classes. The development of capitalism was another factor which contributed to the multiplication of states with an offshore financial policy. In the 1970s, the development of tax havens was largely due to protectionist regulations and high taxes in basic markets[8].

I.2 The characteristics of tax havens

In everyday language, the notion of "tax haven" refers to a country, territory or even a region where taxation is low or even zero. Other definitions may emphasize the idea that a tax haven is the territory in which a natural or legal person is slightly "taxed" through taxes. At national level, in the literature, the tax haven is defined by some authors as a tool for tax fraud at the international level[9]. J.M. Rosenberg's Dictionary of Administration and Finance defines a tax haven as a country where very favorable tax laws are in place for the establishment of the registered office of individuals and legal entities who wish to pay a lower tax[10]. The term "tax haven" refers to those countries that charge either reduced or zero taxes on different categories of income, countries that provide a lower or higher level of trade or banking secrecy, or even countries that have not adopted restrictions for currency exchanges. Thus, the American states explain the use of tax havens by their economic agents, through their purpose: the expansion abroad by legal means that are left at their disposal by the legislators of their country. However, we associate tax havens with tax fraud[11].

As far as "offshore" is concerned, in its denotative meaning, the term was taken from English, "tax-haven", and in free translation means "refuge" or "fiscal harbour"[12]. The *word-for-word* translation of the lexeme "offshore", a word that comes from English, is "far from the shore"[13], indicating the idea of distant territory. Other meanings of the term were given by consulting various

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[7] Daniela Iuliana Radu, Dan Drosu Șaguna, *Paradisurile fiscale. Implicații economico-juridice*, C.H. Beck Publishing House, Bucharest, 2016, p. 6.

8 S. Gaftoniuc, Finanțe internaționale, ed. 3, Economică Publishing House, Bucharest, 2000, p.387.

9 V. Bîrle, Frauda fiscală, Teora Publishing House, Bucharest, 2005, p.58-59.

10 J.M. Rosenberg, Dicționar Internațional de Administrație și Finanțe, Universal Dalsi Publishing House, Bucharest, 2000.

11 D.D. Șaguna, Tratat de drept financiar și fiscal, All Beck Publishing House, Bucharest, 2001, p.653.

[12] Daniela Iuliana Radu, Dan Drosu Șaguna, quoted, p.10

13 „Away from the shoreline"

materials and interpreting its meaning depending on the socio-economic context. Thus, *Dictionary of Business* states that "offshore" is an adjective or an adverb, which can have two meanings. One of them refers to an oil field or even an oil platform, being located either on an island or on the sea, near the shore. The second meaning which can be given to the term is that of a tax haven that is located outside the country. The Romanian dictionary of neologisms also took over the notion, but it refers to submarine oil. Another view is that the term "offshore" was first used to designate those radio stations which, without operating legally, broadcast from other countries to which they were addressed. Eloquent examples in this regard would be the Caroline radio stations, which broadcast in Great Britain, and Voice of Peace, from Israel, radio stations that had their studio on ships outside the territorial waters of the two countries.

Legal literature has aimed, over time, to analyze the reasons which stood at the basis for the emergence and development of tax havens. Thus, it was concluded that due to the high level of taxation that is applied by states for income from commercial activities, or even those directly applicable to individuals, have directly favored their spread in the corners of the world. We can also consider as favorable factors the development of evasion technologies used to circumvent the rules that establish taxes, the development of harmonization of fiscal strategies of countries, or even the continuous pressure that is found worldwide, pressure applied by countries with regimes of high taxation.

We can identify a jurisdiction as a tax haven based on the factors established by the Organization for Economic Cooperation and Development. Thus, we will consider the use of very low or even zero tax rates, which non-residents benefit from, thus escaping the much higher taxes applicable in their country of residence. Another benchmark is related to the protection of personal information (we refer to financial information). Thus, tax havens provide secure levers through which the accounts in these countries are protected from the controls carried out by the authorities of the State of residence. The last assessment criterion is the one related to the lack of transparency, respectively the non-transmission of those data necessary to the foreign authorities in order to establish the situation of a taxpayer. The age of globalization has led legal and illegal businesses to reach an ever closer connection. Thus, organized crime gangs invest in various legal businesses, and then use the profit to develop the illegal economy, coming to control banks and companies involved in money laundering. Banking institutions were the main instrument through which money was transferred to tax havens. Moreover, banks are the ones which finance by granting high interest loans criminal activities for the purpose of huge commissions, to the detriment of legal productive investments in industry or agriculture[14].

Tax havens are developing and consolidating due to the mass of capital that transits their territory, and their typology differs either depending on the investors they address, or depending on the

14 C. Voicu, Spălarea banilor murdari, Sylvi Publishing House, Bucharest, 1999, p.174.

facilities they offer15. Therefore, the first criterion we can emphasize is that of the tax base. This can be general, in which case the legal regulations provide benefits for any category of investor, regardless of their activity. To exemplify, we can turn our attention to Cayman Island, the Principality of Monaco or even the Bahamas. The secondary tax base is represented by those countries where the level of taxation is high and still there are several exceptions applying to certain categories of investors or certain types of activities carried out (for example, Mauritius, the Vatican, and so on).

Another criterion according to which tax havens can be divided is related to their legal nature. Thus, we will distinguish between supranational unions, sovereign states, dependent territories, autonomous units with limited sovereignty, localities with free zone regime[16].

The third criterion we need to consider is the division according to the type of investor it favors. Thus, tax havens can be addressed especially to individuals, paradises that offer the privilege of a low personal income tax rate (an eloquent example in this regard is the Virgin Islands). The second type is the one that offers convenient conditions to the companies, creating small or even non-existent tax facilities for the profit realized as a result of carrying out commercial activities.

According to their main function, tax havens can be divided into four categories. The first of them is the production paradise, preferred by investments with foreign capital. The second category is aimed at multinationals, which are known for their benefits to large corporations, while the third category, called fictitious paradises, hides those phantom activities of companies in states that apply excessive tax policy. The last category, called paradises specialized in confidentiality, are those characterized by the lack of transparency granted, i.e. ensuring secrecy for the actions carried out by banking and commercial operations.

Tax havens are a reality today, and in the context of an economic and financial crisis which has left large gaps in the economies of many states, we are witnessing a spread within the European Union[17], of these states that bring numerous tax advantages for several investors who do not want part of the profit to be lost by paying taxes in the state of residence. The rise of tax havens has left its mark, on the one hand, on states with developed economies, and on the other hand, it is increasingly influencing the economy of developing countries. Thus, the action on these states particularly consists of the fact that the function of collecting taxes and duties from the state budget cannot be fulfilled, but at the same time by restricting access to investments in the social environment[18].

The mechanism of these tax havens is constantly fueled by competition between transnational companies, the continuous progress of the economy, and the monetary fluctuations faced by companies.

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15 I. Dascălu, Centrele financiare offshore, paradisurile fiscale și secretul bancar, Argument Publishing House, Bucharest, 2001, p.67.

16 Daniela Iuliana Radu, Dan Drosu Șaguna, *quoted.*, p.20.

17 G.L. Kiss, L. Varadi, D.J. Cooper, *Planificare fiscală 2000*, Napoca Star Publishing House, Cluj, 2000, p.56.

18 C. Voicu, G. Ungureanu, A. Vociu, *Globalizarea și criminalitatea financiar-bancară. Curs pentru masterat*, Universul Juridic Publishing House, Bucharest, 2005, p.221.

Tax havens are not distributed around the world according to well-defined criteria. However, most of them are located close to the metropolises that carry out large commercial activities, with the purpose of placing capital and attracting potential "investors". Thus, it is particularly important for a country carrying out such activities to have a well-developed telecommunications network and transport infrastructure. Also, another criterion that should not be omitted is that of economic and political stability, knowing that investors are reluctant to run a capital in a country heavily troubled by political conflicts and serious economic problems. At the same time, the impact of the legislation of the state of residence of the investors on the legal conditions for investing abroad and repatriating the profits obtained must take precedence in choosing a tax haven[19]. Most of the time, tax havens are located on the shores of the seas or oceans, with well-defined airspace, the country's fiscal policy being one that ensures confidentiality to third parties in the banking and tax fields. In the contemporary world, the largest *offshore* centers are even New York and London, centers whose financial services are used by over 1 million people.

Bibliography:

1. Mihai-Bogdan Afrasinei, *Contabilitatea și fiscalitatea societăților off-shore*, PhD degree, „Alexandru Ioan Cuza" University, Iași, 2005.

2. Codruța Trandafir, *Societățile off-shore între reglementarea legală și ilicit*, Universul Juridic Publishing House, Bucharest, 2012

3. D.J. Cooper, L. Varadi, G. Kiss, *Paradisuri fiscale și firme neimpozabile*, Nevali Publishing House, Cluj, 1998,

4. E.R. Nandra, Competiția fiscală. Infernul și paradisul fiscal, Sfera Juridică Publishing House, Cluj, 2008.

5. C. Corduneanu, Sistemul fiscal în știința finanțelor, Codecs Publishing House, Bucharest, 1998, 6. E.R. Nandra, „Impactul paradisurilor fiscale asupra economiei mondiale", în Lumea Financiară. Prezent și perspective, Sfera Juridică Publishing House, Cluj, 2004

6. Daniela Iuliana Radu, Dan Drosu Șaguna, *Paradisurile fiscale. Implicații economico-juridice*, C.H. Beck Publishing House, Bucharest, 2016.

7. S. Gaftoniuc, Finanțe internaționale, ed. 3, Economică Publishing House, Bucharest, 2000.

8. V. Bîrle, Frauda fiscală, Teora Publishing House, Bucharest, 2005.

9. J.M. Rosenberg, Dicționar Internațional de Administrație și Finanțe, Universal Dalsi Publishing House, Bucharest, 2000.

10. D.D. Șaguna, Tratat de drept financiar și fiscal, All Beck Publishing House, Bucharest, 2001.

11. C. Voicu, Spălarea banilor murdari, Sylvi Publishing House, Bucharest, 1999.

[19] R. Morar, *Companiile offshore între afacere și coșmar*, Sitech Publishing House, Craiova, 2006, p.24.

12. I. Dascălu, Centrele financiare offshore, paradisurile fiscale și secretul bancar, Argument Publishing House, Bucharest, 2001.

13. G.L. Kiss, L. Varadi, D.J. Cooper, *Planificare fiscală 2000*, Napoca Star Publishing House, Cluj, 2000.

14. C. Voicu, G. Ungureanu, A. Vociu, *Globalizarea și criminalitatea financiar-bancară. Curs pentru masterat*, Universul Juridic Publishing House, Bucharest, 2005.

15. R. Morar, *Companiile offshore între afacere și coșmar*, Sitech Publishing House, Craiova, 2006.

DIFFERENT TECHNIQUES IN CANINE RETRACTION-case reports

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ABSTRACT

Introduction: Canine retraction is a very important step in treatment of patients with crowding, an ectopically erupted canine and first premolar extraction cases. Correct positioning of the canines after retraction is of great importance for the function, stability, and aesthetics. Canines can be retracted by frictional (sliding) and non frictional (none sliding) mechanics, using T-loops for tooth movement. Both techniques depend on the type of malocclusion.

Aim: Two case reports were presented to compare the efficiency of two techniques for canine retraction, first case using segmented mechanics that involves placing braces only on the teeth of the posterior segment and retracting the ectopically placed canine at the site of the extracted first premolar using 0.017 x 0.025 titanium molybdenum alloy T-loop vs second case of canine retraction by sliding straight wire mechanics and elastomeric chains.

Material and method: First canine retraction case describes orthodontic treatment in patient with primary anterior maxillary crowding, an ectopically erupted upper left canine, buccally positioned and first premolar extraction. With 0.017 x 0.025 titanium molybdenum alloy T-loop, the horizontal force acted on the tooth performing its bodily distalization and its retraction by closing the extraction space. Second case describes a patient with deep bite and first premolar extraction where 0.022 × 0.028 MBT prescription was used and the extraction space was closed with elastomeric chains. In the first phase we did 9 mm canine retraction with preserved vertical dimensions of upper incisors. Canine retraction incorporated new forces and moments into the system so good anchorage control to overcome the side effects of the mechanics was crucial. For canine retraction with elastomeric chains in order to prevent incisor bite deepening we used 0.019 x 0.025 stainless steel as base archwire.

Results: Canine retraction in the first case using T-loop, provided space in the arch for leveling the teeth in the anterior segment without their proclination and without generation of unfavorable interbracket geometry as would have been the case if a straight wire technique was applied and all teeth were aligned at the same time. In the second case with deep bite patient and camouflage plan of treatment, 9mm canine retraction with elastomeric chains provided sufficient space for en masse retraction of the incisors. Depending on the type of malocclusion both friction and frictionless methods for canine retraction can be used. In both cases we achived successful canine retraction with good anchorage control and no mesial movement of the molars and there was no difference in efficiency for the two techniques used.

Conclusion: No difference in the rate of canine retraction between the two methods. Both method provide optimum rate of tooth movement and no one method can be considered superior to another in

terms of tooth movement or side effects, including rotation, tipping, root resorption, anchorage loss, as well as associated pain.

Keywords: Canine retraction, Biomechanics, Segmented technique, T-Loop, Straight wire technique, Elastomeric chains.