VII. INTERNATIONAL ICONTECH CONFERENCE ON INNOVATIVE SURVEYS IN POSITIVE SCIENCES

July 4-5, 2023
Ankara, Türkiye

PROCEEDINGS BOOK

Editor:
Prof. Dr. Samir LADACI

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7th International ICONTECH CONGRESS on Innovative Surveys in Positive Sciences

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on Innovative Surveys in Positive Sciences

DATE-PLACE

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EDITORS

Prof. Dr. Samir LADACI

EVALUATION PROCESS

All applications have undergone a double-blind peer review process

TOTAL NUMBER OF PAPERS: 61

THE NUMBER OF PAPERS FROM TÜRKİYE: 15

OTHER COUNTRIES: 46

PARTICIPANT COUNTRIES (14):

Türkiye, Azerbaijan, Uzbekistan, Serbia, North Macedonia, Romania, Nigeria, Algeria, Kyrgyzstan, Pakistan, India, Kosovo, Indonesia, Italy

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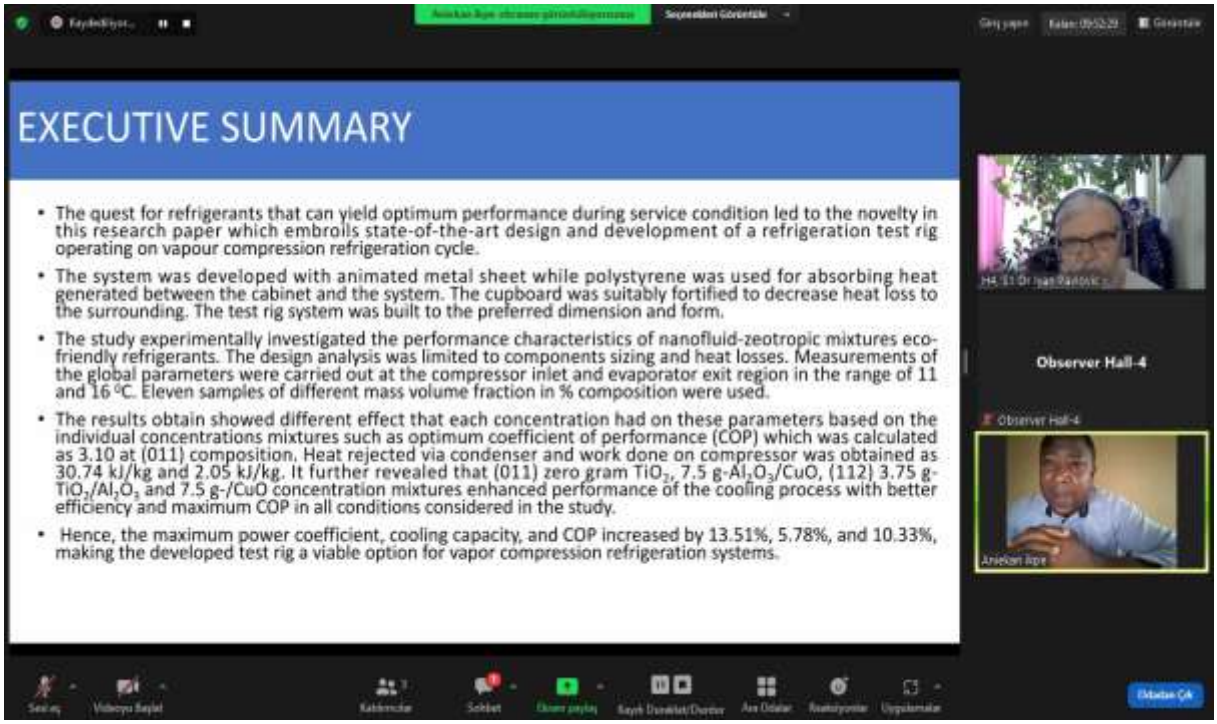

	Without Defect WD	Small Defect SD	Average Defect AD	Critical Defect CD
Peak2peak	21,62	21,85	34,05	44,38
Energy	3,09E+06	2,60E+06	3,80E+06	5,19E+06
K factor	25,92	24,75	43,51	68,36
Kurtosis	2,99	3,12	4,65	5,55
RMS	2,29	2,12	2,54	2,97


Zoom Toplantı - Hall-3
Observer Hall-3
Katılımcılar (5)
Session 1 Hall 3 Röstemova Zülfiye
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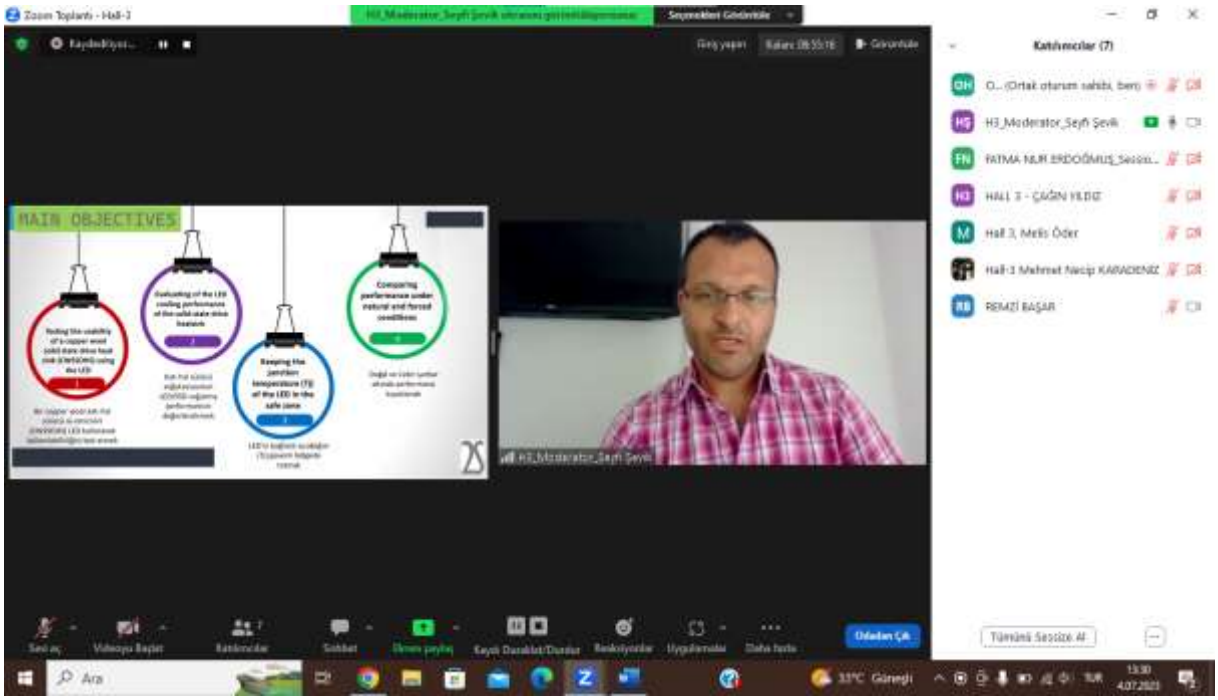
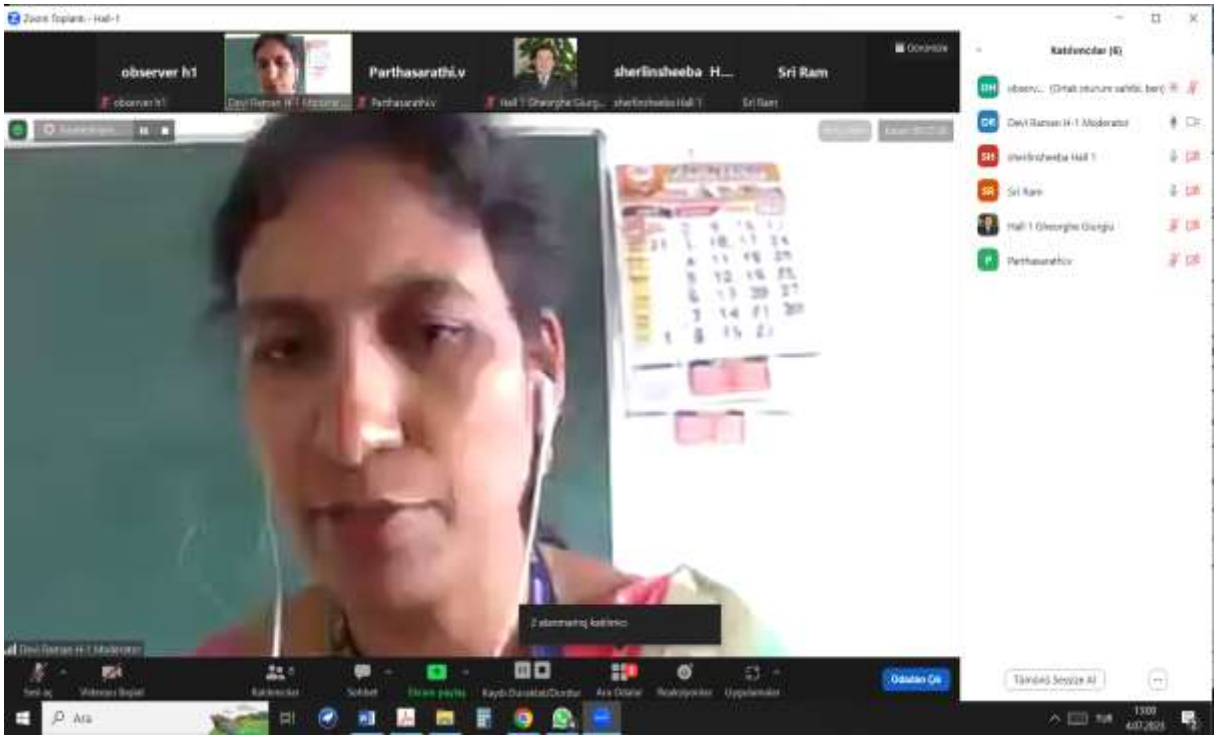

Zoom Toplantı - Hall-3
Katılımcılar (7)
MAIN OBJECTIVES
Ara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Parthasarathi.v
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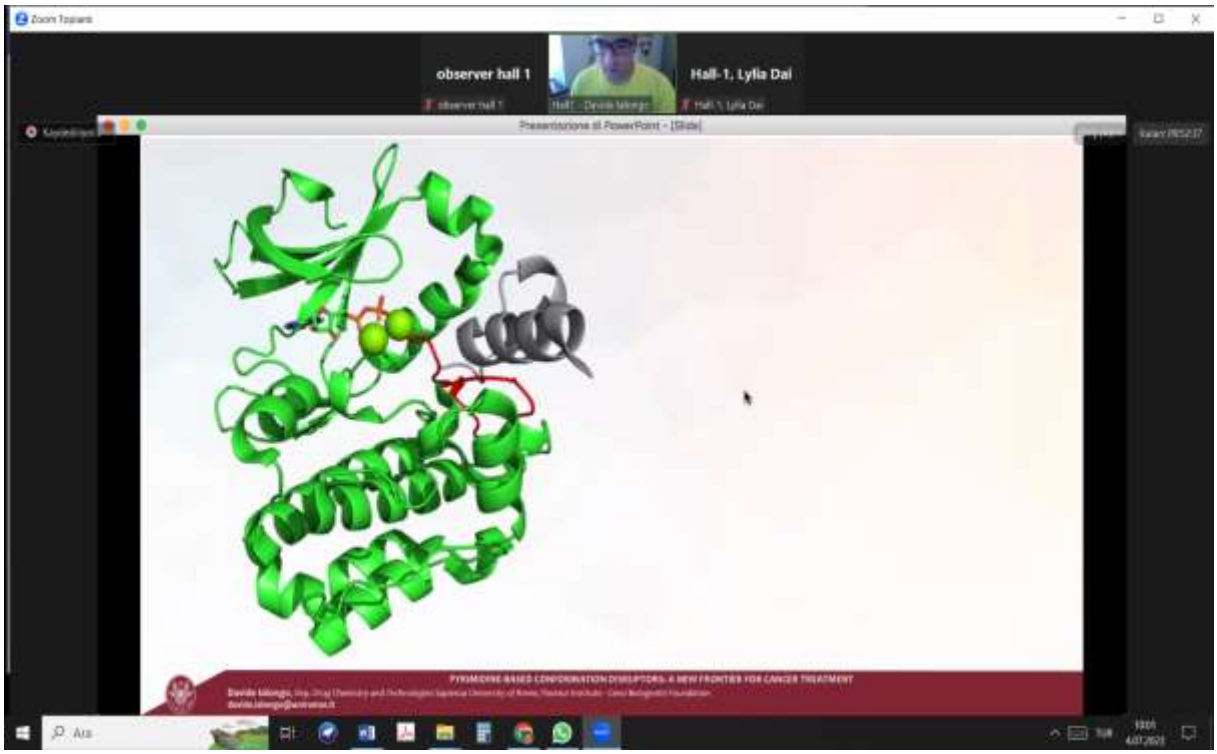
Sri Ram
Katılımcılar (6)


observer hall 1
Hall-1, Lylia Dal
PYRIMIDINE BASED CONFORMATION DISRUPTORS: A NEW FRONTIER FOR CANCER TREATMENT

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ICONTECH CONFERENCE-7

on Innovative Surveys in Positive Sciences

July 4-5, 2023

Ankara, Türkiye

CONGRESS PROGRAM

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Meeting ID: 856 5800 9901
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exp. Hall-1, Shahla Tahirgizi

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Meeting ID: 856 5800 9901
Passcode: 040404

04.07.2023	Session-1 / Hall-1

Ankara Time: 10^{00}-12^{00}

HEAD OF SESSION: Darwin H Pangaribuan

TOPIC TITLE	AUTHORS	AFFILIATION
PYRIMIDINE-BASED CONFORMATION DISRUPTORS: A NEW FRONTIER FOR CANCER TREATMENT	Davide Ialongo	Sapienza University of Rome, Italy
NANO PARTICLES OF NICKEL OXIDE- ACACIA NILOTICA LEAF EXTRACTS: GREEN SYNTHESIS AND THEIR BIOLOGICAL ACTIVITIES	Dr. Mahmood Ahmed	University of Education, Lahore-Pakistan
SIMULATION OF THE SUPERSONIC FLOWFIELD WITHIN THE DIVERGENT SECTION OF A PROPULSION NOZZLE	Lylia Dai Nahla Boughazi Prof. Dr. Abdelkrim Haddad	University 8 Mai 1945, LMANM, Faculty of Sciences and Technology, Department of Mechanical Engineering, Guelma, Algeria
USE OF ALOE VERA AS A BIO-COAGULANT FOR WASTEWATER TREATMENT	Abderrezzaq Benalia Ouiem Baatache Amira Fadia Ghomrani Kerroum Derbal Amel Khalfaoui Antonio Pizzi	Higher Normal School of Constantine, Algeria. Laboratory of Process engineering for sustainable development and health products (GPDDPS), Algeria
COMPARATIVE STUDY BETWEEN MINERAL COAGULANTS: ALUMINUM SULFATE, ALUMINUM CHLORIDE, FERRIC SULFATE AND FERRIC CHLORIDE	Abderrezzaq Benalia Ouiem Baatache Amira Fadia Ghomrani Kerroum Derbal Amel Khalfaoui Nadjiba Benmakhlouf Samira Bouabid Antonio Pizzi	Higher Normal School of Constantine, Algeria. Laboratory of Process engineering for sustainable development and health products (GPDDPS), Algeria
PREPARATION OF NEEM OIL AND ACRYLONITRILE COPOLYMER AS A POTENTIAL GREEN ADDITIVES AND ITS EFFECT ON POUR POINT DEPRESSANT OF A LUBE OIL	Aminu Musa, Faisal Sanusi Aliyu	Umaru Musa Yar'adua University, Nigeria
THE EFFECT OF LIQUID ORGANIC FERTILIZER BASED ON GOAT URINE, MORINGA LEAF, AND BANANA STEM ON THE GROWTH AND YIELD OF MUSTARD GREENS (Brassica rapa L.) AND PAKCOY (Brassica rapa L.)	Darwin H Pangaribuan, Yohannes C Ginting, Agus Karyanto, M Syamsoel Hadi, Afifa Meilin N, Prayogo Danang	Universitas Lampung, Indonesia

MUNICIPAL WASTE INCINERATOR BOTTOM ASH: A USEFUL SOURCE FOR NANO BIO FERTILIZER PRODUCTION FROM BIO RECOVERED METALS	Fozia Anjum, Muhammad Shahid	Govt. College University, Pakistan University of Agriculture, Pakistan.
EXTRACTION OF PHENOLIC COMPOUNDS FROM LEAVES OF CYDONIA OBLONGA MILLER AND STUDY OF THEIR ANTIOXIDANT PROPERTIES	Madrakhimova Sakhiba Matmurotov Bakhtishod Nuriddin Soliyev	Academy of Sciences of the Republic of Uzbekistan Tashkent Medical Academy Namangan State University

Meeting ID: 856 5800 9901
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04.07.2023	Session-1 / Hall-2

Ankara Time: 10^{00}-12^{00}

HEAD OF SESSION: Subhashish Dey

TOPIC TITLE	AUTHORS	AFFILIATION
OPTIMIZATION OF HYBRID RENEWABLE ENERGY SYSTEMS USING ARTIFICIAL INTELLIGENCE TECHNIQUES	Samira Boumous, Zouhir Boumous, Yacine Djeghader, Hadia Belhouchet	Univ Souk Ahras, Algeria
POWER GRAPHS OF GYROGROUPS DETERMINED BY THEIR GENERALIZED SPECTRA	Asma Faiz, Fawad Ali, Wali Khan Mashwani	Kohat University of Science and Technology, KPK, Pakistan
SIMILARITY SOLUTION OF 3D CASSON NANOFLUID FLOWS OVER A STRETCHING SHEET WITH CONVECTIVE BOUNDARY CONDITIONS	G.P. Ashwinkumar, C. Sulochana, N.Sandeep	Vijayanagara Sri Krishnadevaraya University, India Gulbarga University, India Central University of Karnataka, India
ASSESING THE EFFICENCY AND EFFECTIVENESS OF MAINTENANCE MANAGEMENT PRACTICES IN SELECTED PRIVATE INSTITUTIONS	Akomolafe M. A., Ajao F. O., Oyewo O. W.	Osun State Polytechnic, Nigeria
ELIMINATION OF CHLORIDES FROM WATER BY APPLING VARIOUS BIOSORBENTS	Subhashish Dey	Gudlavalleru Engineering College, Andhra Pradesh, India
IABILITY FOR DAMAGES BASED ON PRIVATE INTERNATIONAL LAW	Hajredin KUÇI Kastriote VLAHNA	University of Prishtina "Hasan Prishtina", Faculty of Law, Pristina, Kosovo
URBAN AGGLOMERATION - INFLUENCES ON THE GREEN TRANSITION	Mihaela-Georgiana Oprea Mihaela- Irma Vlădescu	National Institute for Economic Research "Costin C. Kiriţescu "; School of Advanced Studies of the Romanian Academy (SCOSAAR), Bucharest, Romania.

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04.07.2023	Session-1 / Hall-3

Ankara Time: 10^{00}-12^{00}

HEAD OF SESSION: Assoc. Prof. Dr. Nilgun ULUTASDEMIR

TOPIC TITLE	AUTHORS	AFFILIATION
EXAMINATION OF CYBER HUMAN VALUES IN TEACHERS ACCORDING TO DIFFERENT VARIABLES	Sümeyye Doğan Doç. Dr. Gözde Sezen Gültekin Prof. Dr. Mustafa Bayrakçı Zeynep Ülkü Altun Abdullah Çetin	Sakarya Üniversitesi, Sakarya, Türkiye Ankara Üniversitesi, Ankara, Türkiye. Karasu Anadolu İmam Hatip Lisesi Müdürlüğü, Sakarya, Türkiye.
AN EVALUATION OF HUMAN RELATIONSHIPS AND ETHICS IN THE FRAMEWORK OF SURAT AN-NISA	Melek ERDOĞAN	Kahramanmaraş Sütçü İmam Üniversitesi
IMPROVEMENT OF ACCOUNTING POLICY IN ENTERPRISES IN THE CONTEXT OF FINANCIAL MANAGEMENT	Aliyev Elmaddin Karim	Azerbaijan Tourism and Management University
ANALYSIS AND ASSESSMENT OF THE MODERN STATE OF FINANCIAL REPORTING IN THE FIELD OF PRODUCTION IN AZERBAIJAN	Aliyev Elmaddin Karim	Azerbaijan Tourism and Management University
THE ROLE OF THE FAMILY IN UPBRINGING OF THE YOUNG GENERATION	Zülfiyyə RÜSTƏMOVA	Azərbaycan Dövlət Pedaqoji Universiteti, Baki
SCHOOL AND BULLYING	Zülfiyyə RÜSTƏMOVA	Azərbaycan Dövlət Pedaqoji Universiteti, Baki
FACTORS AFFECTING QUALITY MANAGEMENT IN HEALTH SERVISES	Assoc. Prof. Dr. Nilgun ULUTASDEMIR	Gümüşhane University, Gümüşhane, Turkey
TOTAL QUALITY MANAGEMENT IN TURKEY	Assoc. Prof. Dr. Nilgun ULUTASDEMIR	Gümüşhane University, Gümüşhane, Turkey
PERCEPTIONS OF TEAM CAPTAINS REGARDING CAPTAIN SELECTION: THE EXAMPLE OF PROFESSIONAL FOOTBALL	Selman ORHAN	Aksaray University, Aksaray, Türkiye

Meeting ID: 856 5800 9901
Passcode: 040404

04.07.2023 | Session-1 / Hall-4

Ankara Time: 10^{00}-12^{00}

HEAD OF SESSION: Ivan PAVLOVIC

TOPIC TITLE	AUTHORS	AFFILIATION
THE MULTIFACETED ROLE OF HERBIVORE-INDUCED PLANT VOLATILES IN SHAPING COMMUNITY STRUCTURE AND FUNCTION: A COMPREHENSIVE REVIEW	Vidya Padmakumar Murugan Shanthakumar	Bangalore University, Bangalore, India
A NOVEL DESIGN AND DEVELOPMENT OF A TEST RIG FOR VAPOUR COMPRESSION REFRIGERATION SYSTEM (VCRS) USING NANOFLUID-ZEOTROPIC MIXTURES	Ekpenyong Akanimo Udofia Fidelis Ibiang Abam Aniekan Essienubong Ikpe	Akwa Ibom State Polytechnic, Nigeria University of Calabar, Nigeria
FAULT DETECTION IN ROTATING MACHINERY USING VARIATIONAL MODE DECOMPOSITION (VMD).	Ammar MRABTI Nouredine OUELAA Ramdane YOUNES Tarek Kebabsa Zakariya OUELAA	University 8 Mai 1945, Faculty of Sciences and technology, Mechanical engineering, Guelma, Algeria
IMPROVED DIAGNOSIS OF GEAR FAULTS USING CYCLOSTATIONARITY	KEBABSA Tarek Chanez CHEBICHEB Babouri Mohamed Khemissi Ammar Mrabti	Higher National School of Engineering Technologies, Annaba, Algeria. FGM & GP, University of Sciences and Technology Houari Boumediene, Algeria
A CENTRAL COMPOSITE DESIGN MATRIX BASED ON OPTIMIZATION OF TUNGSTEN INERT GAS WELDING INPUT VARIABLES FOR OUTPUT WELDS WITH OPTIMUM THERMAL CONDUCTIVITY	Jephtar Uviefovwe Ohwoekevwo Joseph Ifeanyi Achebo Aniekan Essienubong Ikpe	University of Benin, Nigeria
GREEN SYNTHESIS OF MAGNETIC IRON OXIDE NANOPARTICLES (Fe3O4 NPs) FOR IMAGING AND BRAIN CANCER TREATMENT	M. Asif, M.Fakhar-e-Alam, Muaazam Ali, M.Nasir, M.Adnan, M.Irfan	GC university Faisalabad, Pakistan. International university of Kyrgyzstan
CHALKBROOD DISEASE IN HONEY BEES	Ivan PAVLOVIC Nada PLAVSA Vesna KARAPETKOVSKA HRISTOVA Narcisa MEDERLE Aleksandra TASIC	Scientific Institute of Veterinary Medicine of Serbia, Belgrade, Serbia Faculy of Agriculture University of Novi Sad, Departmant of Veterinary Medicine Faculty of Biotechnical Science, North Macedonia Banat's University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania" from Timisoara, Timisoara, Romania

Meeting ID: 856 5800 9901
Passcode: 040404

04.07.2023	Session-2 / Hall-1

Ankara Time: 12^{30}-14^{30}

HEAD OF SESSION: Assist. Prof. R. Devi

TOPIC TITLE	AUTHORS	AFFILIATION
HERBAL COSMETICS USED IN SKIN WHITENING THERAPY-A REVIEW	Assist. Prof. R. Devi	Faculty of Pharmacy, Bharath Institute of Higher Education and Research, Chennai. India
POLYMERS IN PHARMACEUTICAL DRUG DELIVERY SYSTEM	SS. Sadhika, R. Devi, Dr.R. Srinivasan, Dr.R. Saravanan	Faculty of Pharmacy, Bharath Institute of Higher Education and Research, Chennai. India
STRATEGY FOR EFFICIENT PREPARATION OF GENUS-SPECIFIC DIAGNOSTIC ANTIBODIES FOR SNAKEBITES	A. Dhavamanikandan, M.K.Vijayalakshmi,R.Srinivasan, R.Saravan	Faculty of Pharmacy, Bharath Institute of Higher Education and Research, Chennai. India
THE PROPERTIES AND APPLICATIONS OF NANODIAMONDS	SRIRAM.R, DEVI.R, Dr. R. SRINIVASAN, PARTHASARATHI.V	Bharath Institute of Higher Education and Research, Chennai. India
A SHORT REVIEW OF THE APPLICATION OF PLATINUM NANOPARTICLES	PARTHASARATHI.V, DEVI.R, Dr. R. SRINIVASAN, SRIRAM.R	Bharath Institute of Higher Education and Research, Chennai. India
SYNTHESIS AND EVALUATION OF SILVER NANOPARTICLES FROM ETHANOLIC LEAF EXTRACT OF TRIDAX PROCUMBENS.L	Dr. R. Saravanan	Bharath Institute of Higher Education and Research, Chennai, India 600 073.
REVIEW ON APPLICATION OF GOLD NANOPARTICLES IN GENE DELIVERY	R. DEVI, R.JOTHILAKSHMI, S.SHERLIN SHEEBA, K.SNEHA, Dr.R.SRINIVASAN	Bharath Institute of Higher Education and Research, Chennai, India
THE THERAPEUTIC EFFECTS OF DENIPLANT NUTRACEUTICALS ON THE GUT MICROBIOME IN PATIENTS WITH PSORIASIS	Major Gheorghe GIURGIU, Prof. dr. Manole COJOCARU	Deniplant-Aide Sante Medical Center, Bucharest, Romania Titu Maiorescu University, Bucharest, Romania
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HEAD OF SESSION: Moses Adeolu AGOI

TOPIC TITLE	AUTHORS	AFFILIATION
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INVESTIGATION OF DESIGN PARAMETERS FOR MICROCHANNEL HEAT EXCHANGERS	Fatma Nur ERDOĞMUŞ Ahmet Ali SERTKAYA Havva DEMİRPOLAT Mustafa AKTAŞ Süleyman ERTEN	Nurdil Refrigeration Inc., Ankara, Turkey Selcuk University, Faculty of Technology, Konya, Turkey Gazi University, Ankara, Turkey
INVESTIGATING THE EFFECTS OF SUBCOOLING / SUPERHEATING APPLICATIONS ON THE PERFORMANCE OF REFRIGERATION SYSTEMS	Melis ÖDER Ahmet Ali SERTKAYA Mustafa AKTAŞ Süleyman ERTEN	Nurdil Refrigeration Inc., Ankara, Turkey Selcuk University, Konya, Turkey Gazi University, Ankara, Turkey
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THERMAL PERFORMANCE OF THE ALUMINUM FIN-COPPER WOOL HEAT SINK FOR COOLING SOLID-STATE DRIVES	Assoc. Prof. Dr. Seyfi ŞEVİK	Hitit University, Çorum, Türkiye
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CYBERBULLYING IN YOUTH AND ADULTS	Assis. Prof. Dr. Remzi BAŞAR	Düzce University, Düzce, Türkiye

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THE IMPORTANCE OF STRESS HORMONES IN FISH	Azime Küçükgül Altuğ Küçükgül	Munzur University, Tunceli, Türkiye Mustafa Kemal University, Hatay, Türkiye
INVESTIGATION OF THE pH EFFECT OF ACID ORANGE 8 ADSORPTION TO AX1 POLYMER	Yıldız Nur BEYAZ Ali KARA	Uludağ University, Bursa, Türkiye
PARASITE DIVERSITY OF FISHES IN TÜRKİYE – III-ACANTHOCEPHALA	Ahmet Özer	Sinop University, Sinop, Türkiye
PARASITE DIVERSITY OF FISHES IN TÜRKİYE – II-MYXOZOA	Ahmet Özer	Sinop University, Sinop, Türkiye
THE USAGE OF MEDICINAL PLANTS IN FISH PARASITIC DISEASES	Azime Küçükgül Ahmet Özer	Munzur University, Tunceli, Türkiye Sinop University, Sinop, Türkiye

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PYRIMIDINE-BASED CONFORMATION DISRUPTORS: A NEW FRONTIER FOR CANCER TREATMENT

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ABSTRACT

In neuroblastoma, Aurora Kinase A (AURKA), independently of its kinase activity, binds to the oncoprotein N-Myc, preventing its degradation and contributing to the progression of neuroblastoma since it interferes with the cell-cycle exit of neuroblasts. While intense efforts have been made to develop AURKA inhibitors, the very low druggability of N-Myc has prevented any successful strategy for chemotherapeutic intervention. However, recent studies demonstrating the interaction between AURKA and N-Myc have provided an innovative therapeutic approach. These findings have prompted the identification of new compounds able to disrupt the AURKA/N-Myc complex, in order to promote N-Myc degradation. New studies indicated that RPM1722, a promising orthosteric bis- anilinopyrimidine AURKA inhibitor, was capable of blocking this protein-protein interaction [1]. RPM1722 bromine atom is thought to be responsible for induced-dipole forces that freezes the enzyme in an unusual "DFG-out/loop-in" conformation. However, although in vitro assays RPM1722 was able to also inhibit the N-Myc/AURKA interaction, it seemed quite ineffective in cell-based assays. In this scenario, we described the design and synthesis of a new library of 2,4-disubstitued pyrimidine structurally related to RPM1722. The pyrimidine core and the 4-carboxyphenylamino substituent in position 2 have been kept. Conversely, the nitrogen atom was replaced with an oxygen or sulfur and the phenyl ring in position 4 of the pyrimidine was modified by introducing halogens in 2, 3 and 4 positions. On the other hand, it has been also shown a covalent Coenzyme A inhibition of AURKA as a result of the formation of a sulfur bridge between the thiol group of the pantetheine tail and the side chain of Cys290 residue located in the activation loop of AURKA [2-3]. This mechanism is specific and provides the proof of concept for a potential irreversible inhibitory mechanism of AURKA which would possibly keep the AURKA in a conformation unsuitable for N-Myc binding. Hence, we retained the 2- (4-carboxyphenylamino) pyrimidine core of RPM1722 as anchor site and decided to design a long branch with a terminal electrophilic warhead to mimic the pantetheine tail of acetyl-CoA to reach for the Cys290 residue. All the newly synthetized compounds were evaluated in enzymatic inhibition assays and X-ray crystallographic experiments were performed to corroborate our biological results. Further investigations are needed to better understand the mechanism of action of our compounds.

Keywords: pyrimidines; AURKA; N-Myc; conformation disruptors; kinase inhibitors.

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THE EFFECT OF LIQUID ORGANIC FERTILIZER BASED ON GOAT URINE, MORINGA LEAF, AND BANANA STEM ON THE GROWTH AND YIELD OF MUSTARD GREENS (Brassica rapa L.) AND PAKCOY (Brassica rapa L.)

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ABSTRACT

The use of fertilizer for mustard greens and pakcoy cultivation still uses fertilizer inorganic materials which if used continuously will reduce soil fertility. Fertilizer Organic is the solution to overcome these problems. This research intendedto determine the effect of applying liquid organic fertilizer based on goat urine, moringa leaves, and banana stems on the growth and yield of mustard greens and pakcoy plants and to determine the effectiveness of liquid organic fertilizer based on goat urine, moringa leaves, and banana stems as a substitute for NPK fertilizer in mustard greens cultivation.This research was conducted at the Integrated Field Laboratory, Faculty Agriculture, University of Lampung from February to March 2023. Treatment arranged in a Randomized Complete Block Design (RCBD) with 4 treatments and 10 test. Each experimental unit was planted 2 plants/polybag so that the total population pakcoy is 80 plants. Homogeneity of variance was tested using the Bartlett test. If assumptions are met, analysis of variance (ANOVA) and separation of mean values is performed using the Least Significant Difference (LSD) test at the 5% level. This research is done using three kinds of treatment namely control, 100% NPK, POC made from basic goat urine, Moringa leaves, and banana stems 100%, and 50% NPK + POC made from goat urine, moringa leaves, and 50% banana stems. Administration of POC urine goats, moringa leaves and banana stems had a significant effect on almost all variables plant. POC urine treatment Goat, Moringa leaves and banana stems 100% showed the highest yields on fresh weight of leaves, stalk fresh weight, plant height, leaf width, leaf length, stem diameter, green level leaves, and dry weight of leaves on pakcoy. while for the mustard greens, POC urine treatment Goat, Moringa leaves and banana stems 100% showed the highest yields on fresh weight of leaves, plant height, leaf width, leaf length, stem diameter, green level leaves, and dry weight of root. Use of organic

fertilizers liquid based on goat urine, moringa leaves, and banana stems can be used as a substitute for inorganic NPK fertilizer in mustard greens and pakcoy cultivation.

Keywords: liquid organic fertilizer, goat urine, moringa leaves, banana stems, NPK, mustard greens, pakcoy

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OPTIMIZATION OF HYBRID RENEWABLE ENERGY SYSTEMS USING ARTIFICIAL INTELLIGENCE TECHNIQUES

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Abstract

Hybrid renewable energy systems refer to the integration of multiple renewable energy sources to enhance overall system efficiency, reliability, and power generation. By combining different renewable energy technologies, such as solar, wind, hydro, biomass, or geothermal, hybrid systems can leverage the complementary characteristics of these sources to overcome individual limitations and maximize renewable energy utilization. Optimizing hybrid renewable energy systems using artificial intelligence (AI) techniques can help find the best configuration, control strategies, and operational parameters to maximize system performance and economic benefits. AI techniques can handle complex, non-linear relationships and large amounts of data, enabling more efficient and effective optimization of hybrid systems. There is AI techniques commonly used for optimizing hybrid renewable energy systems, we cite, Genetic Algorithms (GA), Particle Swarm Optimization (PSO), Artificial Neural Networks (ANN), Reinforcement Learning (RL), Fuzzy Logic, Genetic Programming (GP). These AI techniques can be applied individually or in combination to tackle different optimization challenges in hybrid renewable energy systems. They allow for efficient exploration of the solution space, handling of complex system dynamics, and consideration of multiple objectives such as maximizing renewable energy utilization, minimizing costs, and reducing environmental impacts. By utilizing AI techniques, hybrid systems can be optimized more effectively, leading to improved system performance, increased renewable energy penetration, and enhanced economic viability. In this work, optimization of hybrid systems based on renewable energies is studied and simulated using Matlab Simulink.

Keywords: Hybrid renewable system, Artificial Intelligence, Electrical energy.

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USE OF *ALOE VERA* AS A BIO-COAGULANT FOR WASTEWATER TREATMENT

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ABSTRACT

The presence of various pollutants in the water imposes the treatment of this water before use, to improve its quality, several treatment processes have been used such as mechanical (screening), biological (aerobic or anaerobic), physico-chemical (Coagulation flocculation)...etc,. The latter allows reduces of total suspended solids (TSS), the colloidal particles, the chemical oxygen demand (COD), the total organic carbon (TOC) and the water turbidity.

In this work, we used Aloe Vera extract as a natural coagulant to improve wastewater quality. This liquid coagulant was obtained after the preparation of Aloe Vera powder with distilled water;

Several results were obtained, for example, the maximum reduction in turbidity, organic matter (OM), total carbon (TC), inorganic carbon (IC) and total organic carbon (TOC) were 93.08 ; 5.39; 18.15; 19.49; 10.14% respectively.

When using the test jar, different water parameters were measured, namely pH, total alkalinity, TSS and sludge volume. In this study, the active components responsible for coagulation were determined using

different techniques and devices namely ultraviolet-visible spectrometry (method of Dubois et al , Folin Ciocalteu and Bradford,...),FTIR,XRD,SEM-EDS,....etc.

Keywords: Natural coagulant, water pollution, wastewater, jar test, turbidity.

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COMPARATIVE STUDY BETWEEN MINERAL COAGULANTS: ALUMINUM SULFATE, ALUMINUM CHLORIDE, FERRIC SULFATE AND FERRIC CHLORIDE

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ABSTRACT

This study was conducted at the level of the drinking water treatment plant of Oued El Athmania, Mila. The experimental work allowed to study the efficiency of some mineral coagulants such as the aluminum sulfate ($Al_2(SO_4)_3$), the aluminum chloride ($AlCl_3$), the ferric sulfate ($Fe_2(SO_4)_3$) and the ferric chloride ($FeCl_3$) as well as the mixture of the two coagulants ($Al_2(SO_4)_3$) and $FeCl_3$ .In this part and for each mineral coagulant used, the effect of different parameters such as coagulant dose, pH, flocculant dose

and settling time...etc. was followed in the Jar Test. In addition, other parameters such as conductivity, salinity, temperature, pH, organic matter, alkalinity, total alkalinity, total hardness, color, sludge volume, etc. were also measured. The results obtained show that all the coagulants used have a remarkable and variable effect on drinking water quality, for example, the maximum reduction in turbidity was 96.72;96.48;96.25;95.14 and 95.65% when using $Al_2(SO_4)_3$, $AlCl_3$, $Fe_2(SO_4)_3$,$FeCl_3$ and mixture of ($Al_2(SO_4)_3$ and $FeCl_3$),respectively. In this study, the coagulant $AlCl_3$ gave a good color removal performance (95.95%) compared to the other coagulants, while the maximum reduction in organic matter (66.67%) was obtained for the mixture ($Al_2(SO_4)_3$ and $FeCl_3$).

Keywords: Mineral coagulants, coagulation, Jar test, turbidity, color, organic matter

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ELIMINATION OF CHLORIDES FROM WATER BY APPLING VARIOUS BIOSORBENTS

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ABSTRACT

The chlorides are regulated in drinking water quality primarily because excess amounts can cause disease. Chlorides present in water can be irritating to the eyes, respiratory tract and skin due to its alkaline nature. The biological effects of hardness and chlorides in humans after acute exposures are dose-related depend on their concentration; the amount is taken by the body and duration of exposure.

1. Objectives

Chlorides present in water/wastewater are a serious concern in the era of water conservation and reuse. There is a need for different methods which are low cost and efficient. It is also to be considered in order to maintain the permissible limits. Chloride contaminated water is prepared by using chloride and the tap water is taken for the hardness. Volumetric titration method is used to know the concentration levels of the chlorides.

2. Methods

Biosorption process is a simple, economical and eco-friendly in order to remove the chlorides and hardness from the contaminated water. Rice husk, rape straw, parthenium, sawdust and egg shell are the five biosorbent materials taken for the process of removal of chlorides from synthetic water. In order to select the most efficient bio-adsorbent from rice husk, rape straw, parthenium, sawdust and egg shell they are tested for the removal of chlorides from the water and selected the parthenium biosorbent material which shows the best results in both removal of chloride from water.

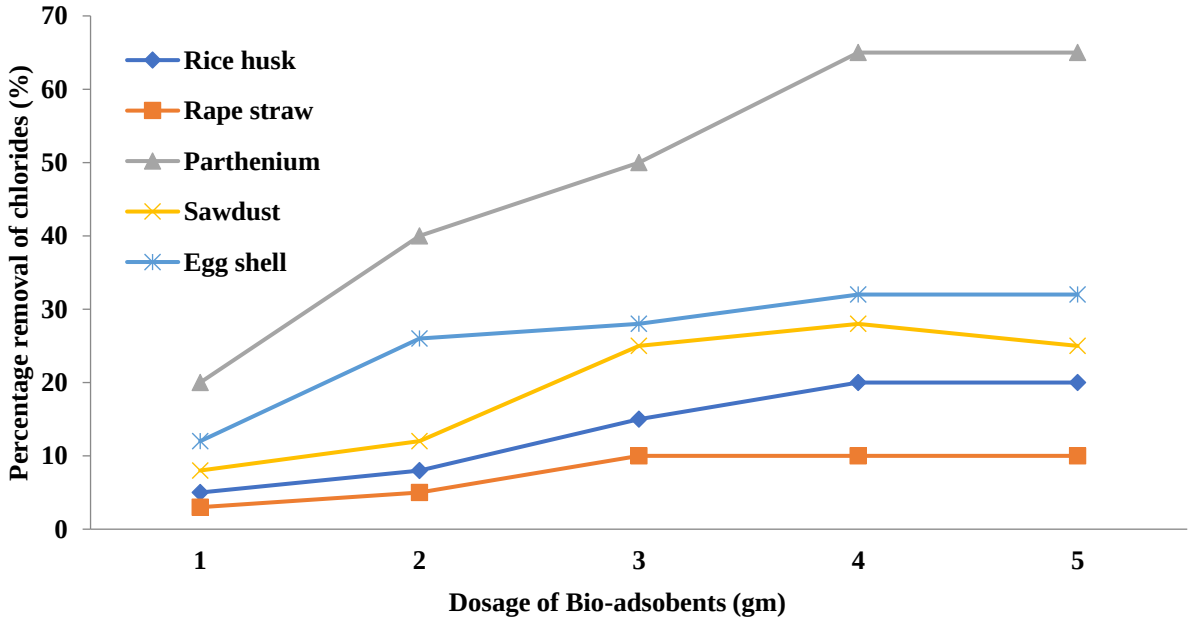

Fig. 1. Comparison of different bio-adsorbents in removal of chlorides

The percentage removal of chloride varies from one biosorbent to another. Parthenium has high removal percentage and rape straw has low removal percentage when compared to other bio-adsorbent materials. The graph shows the various percentage removal of each biosorbent at different dosages. From the Table 1, it is observed that parthenium and egg shell has shown maximum effect on removal of chlorides in contaminated water. The order of percentage removal of chlorides is found as rape straw < rice husk < sawdust < egg shell < parthenium.

Table 1. Comparison of different bio-adsorbent for chloride removal

Dosage of bio adsorbent (gm)	Rice husk (%)	Rape straw (%)	Parthenium (%)	Sawdust (%)	Egg shell (%)
1	5	3	20	8	12
2	8	5	40	12	26
3	15	10	50	25	28
4	20	10	65	28	32
5	20	10	65	25	32

3. Result

Further the parethenium biosorbent material is tested for combined removal of chlorides from contaminated water and then the parthenium biosorbent material is tested for various optimum conditions like temperature, pH, contact time and agitation speed for the removal of chlorides from the contaminated water. By using plant biomass of Parthenium, chloride removal of 65% can be achieved. The required temperature for this process is 25-30^{o}C, pH is 7-7.5, contact time is 60min and agitation speed is 80rpm.

4. Conclusions

The presence of pollutants in aqueous solution particularly from hazardous heavy metals and metalloids is an important environmental and social problem. The chlorides are regulated in drinking water quality primarily because excess amounts can cause disease. Every biosorbent had different physical, chemical and biological properties for heavy metals removal by biosorption from the water. The biosorption process can be made economical by regenerating and reusing of biosorbent after removing the heavy metals. Various bioreactors can be used in biosorption for the removal of metal ions from large volume of water.

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HERBAL COSMETICS USED IN SKIN WHITENING THERAPY-A REVIEW

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ABSTRACT

Herbal cosmetics are products made from natural plant extracts, herbs, and botanical ingredients that are used for various skin therapies. These products are known for their potential benefits in nourishing and improving the health of the skin. Here are some commonly used herbal cosmetics in skin therapy: Aloe Vera: Aloe vera gel is a popular herbal cosmetic known for its soothing and moisturizing properties. It is used to treat sunburns, dry skin, and minor skin irritations. Tea Tree Oil: Derived from the leaves of the tea tree, this essential oil has antimicrobial and anti-inflammatory properties. It is commonly used to treat acne, fungal infections, and other skin conditions. Calendula: Calendula extracts, derived from marigold flowers, are used in herbal cosmetics for their anti-inflammatory and healing properties. They can help soothe irritated or sensitive skin and promote wound healing. Chamomile: Chamomile is known for its calming and anti-inflammatory effects. It is often used in herbal cosmetics to alleviate skin redness, irritation, and allergic reactions. Turmeric: Turmeric contains a compound called curcumin, which has antioxidant and anti-inflammatory properties. It is used in herbal cosmetics to brighten the skin, reduce hyperpigmentation, and improve overall skin tone. Rosehip Oil: Rosehip oil is rich in vitamins, antioxidants, and essential fatty acids. It is commonly used in herbal cosmetics for its moisturizing and rejuvenating properties. It can help improve the appearance of scars, fine lines, and wrinkles. Neem: Neem is a powerful herbal ingredient with antimicrobial and antifungal properties. It is often used in skincare products to address acne, eczema, psoriasis, and other inflammatory skin conditions. Lavender: Lavender oil is known for its calming and soothing effects. It is used in herbal cosmetics for its ability to promote relaxation and relieve skin irritations, such as itching and redness. Green Tea: Green tea extracts are rich in antioxidants and have anti-inflammatory properties. They are used in herbal cosmetics to protect the skin against environmental damage, reduce signs of aging, and improve overall skin health. Witch Hazel: Witch hazel is a natural astringent derived from the leaves and bark of the witch hazel plant. It is commonly used in herbal cosmetics as a toner to tighten pores, reduce inflammation, and soothe the skin. When using herbal cosmetics or any skincare products, it's important to consider individual sensitivities and allergies. It's recommended to perform a patch test before applying new products to a larger area of the skin and to consult with a dermatologist if you have specific skin concerns or conditions.

Keywords: Anti-inflammatory, Aloe Vera, Witch Hazel, Green Tea, Calendula

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POLYMERS IN PHARMACEUTICAL DRUG DELIVERY SYSTEM

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ABSTRACT

Aim and objective: polymers in pharmaceutical drug delivery of therapeutic agents. These dosage forms include tablets, patches, tapes, films, semi-solids, and powders. Polymers are the backbone of a pharmaceutical drug delivery system as they control the release of the drug from the device. Polymeric drug delivery has defined as a formulation or a device that enables the introduction of a therapeutic substance into the body. **Method**: A proper consideration of surface and bulk properties can aid in the designing of polymers for various drug delivery applications. These newer technological developments include drug modification by chemical means carrier-based drug delivery and drug entrapment in polymeric matrices or within pumps that are placed in desired compartments. **Result**: the drug release behavior as per requirements, such as controlled drug release and improvement in biocompatibility. They are also combined with pharmaceutical implants and therapeutic medical devices to prevent surface-induced reactions as well as to facilitate targeted drug delivery **Conclusion:** These improvements contribute to making medical treatment more efficient and minimizing side effects and other types of inconveniences for patients. The drug is released from the polymer by diffusion, degradation, and swelling.

Keywords: polymers, drug delivery, polymeric matrices, biocompatibility.

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STRATEGY FOR EFFICIENT PREPARATION OF GENUS-SPECIFIC DIAGNOSTIC ANTIBODIES FOR SNAKEBITES

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ABSTRACT

Introduction: Snakebite envenomation affects thousands of people worldwide, leading to severe morbidity and mortality. Timely administration of appropriate antivenom is critical for saving lives. However, the identification of the snake species responsible for the bite is often challenging, delaying the administration of the correct antivenom. Genus-specific diagnostic antibodies offer a potential solution by providing a rapid and accurate method for snakebite diagnosis. Selection of Target Genus: The first step in preparing genus-specific diagnostic antibodies is selecting the target genus. This choice should consider the prevalence of venomous snakes in the region of interest and the clinical significance of their bites. Common genera such as Naja, Dendroaspis, Bothrops, and Crotalus may be suitable candidates, depending on the geographical location. Venom Collection and Antigen Preparation: Venom samples from representative snake species within the target genus are collected under controlled conditions. The venom is then fractionated and purified using techniques such as chromatography or ultrafiltration to isolate venom components specific to the target genus. These purified venom components serve as antigens for antibody production. Antibody Production: Polyclonal antibodies are generated by immunizing animals, such as rabbits or goats, with purified venom components. The animals are injected with the antigen in a controlled manner, typically in multiple doses over a specific period. Serum samples are collected, and the antibodies specific to the target genus are isolated and purified. Antibody Characterization: The genus-specific antibodies obtained from the immunized animals are characterized to determine their specificity and sensitivity. Various immunoassays, such as ELISA (enzyme-linked immunosorbent assay) or Western blotting, can be employed to evaluate the antibodies' performance. The antibodies with high specificity and sensitivity are selected for further development. Diagnostic Assay Development: The selected genus-specific antibodies are utilized to develop a diagnostic assay for snakebite identification. This assay may involve lateral flow devices, immunochromatographic strips, or other portable platforms. The diagnostic assay should be user-friendly, cost-effective, and capable of delivering rapid results in resource-limited settings. Clinical Validation and Field Testing: The diagnostic assay is validated using clinical samples from snakebite patients. Field testing in snakebite-endemic regions helps evaluate the assay's accuracy, reliability, and performance under real-world conditions. The feedback obtained from healthcare professionals and stakeholders can guide further optimization of the diagnostic assay.

Keywords: Naja, Dendroaspis, Bothrops, ELISA, Antibody

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SUSTAINABILITY INFLUENCERS: AN EXPLORATIVE STUDY ON CONSUMERS' MOTIVATIONS TO ENGAGE WITH INFLUENCERS' SUSTAINABLE CONTENT ON YOUTUBE

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ABSTRACT

The level of digital media consumption is constantly growing, therefore digital advertisement dynamic increase in expenditure on online promotional activities. In this context, the aim of this article is to explore the significance of digital influencers in the overall functioning of the online sustainable consumption promotional system, and the impact of the influencer marketing concept on sustainable development. In multi-stage research, a literature analysis was carried out on former research and statistical data. After the completion of this stage of the research, a 24 semi-structured interview was conducted on a group of individual YouTube users in order to obtain detailed primary data. assumption that the group selected for the study use Internet access and social media very intensively has been confirmed. The data were analyzed by content analysis. The main categories in which the interviewees can recall the most are waste, overconsumption, and recycling. The results of the research indicate that there is great potential for promoting sustainable activities involving digital influencers.

Keywords: sustainable development; sustainable consumption; influencer marketing; digital promotional activities

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THE IMPACT OF UTILIZATION OF INTERNET SERVICES ON TEACHING AND RESEARCH OUTPUT IN PRIVATE UNIVERSITIES IN NORTH-WESTERN, NIGERIA

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ABSTRACT

This study investigated the utilisation of Internet services or resources and their impact on teaching and research output in two purposively selected private universities in North-Western Nigeria. The advent of the Internet has been seen as one of the major exciting events in the second half of the 20th century. The reason the Internet seems this significant is because it contains the biggest resource for information in the entire world and enables people to utilise an interactive mechanism to constantly communicate with each other. Both quantitative and qualitative methods were used for data collection. Questionnaires were administered to 214 academic staff, selected through simple random sampling technique. In-depth interviews complemented the quantitative data. The utilisation of Internet services aided 54.3% of the respondents to publish their works, 61.6% to attend conferences and 74.2% to teach. Two thirds of the respondents reported that the utilisation of Internet services had also improved their quality of teaching (77.5%) and research output (79.1%). Most of the respondents used Internet services to meet the requirements for career advancement, especially promotion. Internet services or facilities were found to have contributed to the increase in teaching and research outputs of academic staff of the universities in the study and had the potential for enhancing the teaching and research outputs of respondents in the future.

Keywords: Internet – Internet Facilities – Information Communication Technology – Academic Staff – Private Universities – Research Output

INTRODUCTION

The world is fast becoming a global village, and this is claimed to have been facilitated by the Internet and other information and communication technologies (Bamiro, Oluleye & Tiamiyu 2005; Obilor 2004; Onimode 2000). The advent of the Internet has been seen as one of the major exciting events in the second half of the 20th century. The reason the Internet seems this significant is because it contains the biggest resource for information in the entire world and enables people to utilise an interactive mechanism to constantly communicate with each other. As Bussiek (2005) has noted, the spread of the Internet is an unprecedented success story in the history of communication as compared to radio, which took 38 years to reach more than 50 million users, and television which took 23 years, the Internet is said to have spread to 50 million users within only 5 years.

The growing relevance and speed of information retrieval in all aspects of human life is considered vital to development in countries the world over. With the current information explosion, and the clamour for digital libraries, users can source and utilise information with less stress (Okoro & Okoro 2006). The tremendous growth of the Internet and the World Wide Web is said to have revolutionised

communication, so much so, that the ancient dream of "a scholar who knows all things happening in the world without venturing outdoors" has finally become a reality (Ololube 2005).

The rapid changes taking place in the world economy and industrial development have been driven by three technological waves: information technology, technology, and materials. Of these, according to Ajayi (1996), information technology has the greatest influence on virtually every aspect of human activities. The Internet, in particular, has been considered to have revolutionised the way people collaborate and communicate through the global services it offers. Such services include electronic mail, file transfer protocol, Gopher, Wais and Telnet, to mention but a few (Osofiyan 1996).

In spite of the rapidly changing world economic order, several studies (Ajayi 1996; Nwagwu & Agarin 2007; Singh 2002) have pointed out that the African continent is still lagging behind because of its existing poor infrastructure, and its unique socio-economic, cultural and political situations – all of which pose major obstacles to the introduction and implementation of new technologies for Internet workings. Similarly, Nwagwu and Agarin (2007) have observed that there is a paucity of empirical studies regarding the influence of Internet services on teaching and research outputs (publications and conference attendance) in Nigeria. This is important because the application of Internet services on other sectors such as banking, medicine, agriculture, communication, has been previously documented (Onwubiko 2004; Tusubira & Kyeyune 2001;Yusuf 2006). Conversely, evidence abounds regarding the impact of Internet services on research activities and other academic exercises in developed and industrialised societies of the world (Slabbert 2006; Udoh 2001; Ughegbu 2001).

As some scholars have noted, the academic communities of North America, Japan and Europe are becoming increasingly reliant on the use of information and communication technology, particularly, computer and Internet facilities, in promoting research activities for subsequent national development (Udoh 2001; Ughegbu2001). Thus, it is evident that for Nigerian universities and academia to participate in contemporary international ICT development – in terms of the utilisation of Internet services for teaching and research activities – the academic community must go beyond just the use of email and browsing on the Internet to utilising other packages like e-workshop, e-conferencing, and e-learning opportunities which can facilitate, speed up and improve the quality and quantity of teaching and research activities.

This study became necessary for the following reasons. Firstly, because of the 2006 World Universities' Rating, which was principally based on the amount of research output on the web, indicated that no Nigerian university was listed among the first 6,000 universities in the world (Adeyeye 2006). Secondly, because most of the private universities in Nigeria were established at the very time Internet facilities were diffused into developing countries like Nigeria. Proprietors of these private universities undertook massive investment in the acquisition of Internet technology and its facilities, as a means to enhance their competitive advantage over public universities and to facilitate the process of teaching and research activities for their academic staff. These reasons thus provided the impetus for the current study, which investigated the utilisation of Internet services on teaching and research outputs in private universities in North-Western Nigeria

Al-Qalam University Katsina (AUK) is the first Islamic University and the only not-for-profit university in Nigeria. It does not receive subventions or grants from any of Nigeria's three tiers of Government. It is owned by the Muslim Community (Ummah) as opposed to private universities owned by individuals. The Vision of the University is to impart meaningful and relevant knowledge with high moral standing and fear of Allah (SWT) through the provision of up-to-date teaching and research facilities in informatics, sciences and humanities thereby serving as a model to similar institutions in Nigeria. The University is on a mission to pursue academic excellence in an Islamic, morally sound, efficient, and conducive learning environment. It provides quality education and promotes research and community service through high standards in students' admission and staff recruitment.

The University enrols more than seven thousand (7,000) students and offers thirty (30) undergraduate academic programmes and forty (40) postgraduate programmes in the following four (4) Colleges: 1. College Computing and Information Science 2. College of Education

3. College of Humanities 4. College of Natural and Applied Sciences 5. College of Social and Management Sciences

To promote accessibility of university education especially to children from low-income households, and particularly in the region where the University is sited, the university charges affordable registration fees – the least when compared to other private universities in the Country. The university prioritises research in poverty alleviation, robotics, ICT for development, peace, stability and sustainable growth through multi-disciplinary approaches. At the time of this research, there were cybercafés/ICT centres located within and outside the school campus where Internet services were available for both students and staff. The mission to establish Skyline University Nigeria took concrete form in 1990 when Skyline University College was established by the proprietor, at Sharjah, United Arab Emirates. The fame of this University College grew exponentially and students' enrolment soon increased at an increasing rate with a large number of international students coming from Nigeria. Thus, in the 30 years of its involvement in the private university education business in the Middle East, Skyline Investments Limited has spread so widely. This is a testimony that the little spark of 1990 in the UAE, has blossomed into a full flame of excellent university educational opportunities for the young Nigerians in particular and the West African sub-region in general.

The major motivation to establish Skyline University Nigeria is to achieve the same mark of academic and all-around excellence that Skyline University College (SUC) has achieved within 3 decades of her existence in the United Arab Emirates (UAE) by providing a total life-changing education at the tertiary level. The aim, therefore, is to complete the circle of education, which began humbly in 1990 to educate the young Nigerians as a commitment to exceptional life-long learning.

The University concentrates, deepens and extends the frontiers of knowledge of the students who are to become the catalysts for the development of Nigerian society. This goal whose root was firmly planted over 30 years back, has flourished and blossomed into an international institution of higher learning in Kano State, Nigeria. At the time of research, the university was well connected with Internet technology and other modern information and communication facilities. It also had a special ICT centre where students and staff had access to Internet facilities.

Thus, this paper, an excerpt of a larger study, investigated the impact which the use and ability (technique) of Internet services had on the teaching and research outputs of academics of the selected universities. Specifically, the study was concerned with whether the utilisation of available Internet services had influenced the teaching and research outputs of academics in the study areas as they have been seen to have done in universities located in developed societies. The study also tried to identify if there were other factors which motivated the respondents to increase their research outputs and the challenges they encountered doing so.

OBJECTIVES OF THE STUDY

The study sought to achieve the following key objectives:

•Ascertain the extent to which academic staff of the selected private universities embraced computer literacy and utilised Internet services

•Examine the extent to which the use of Internet services had affected teaching and research outputs of academic staff at these private universities

•Identify factors that may have affected the research output of these academic staff

The following section outlines the methodology used in this study.

METHODOLOGY

The study involved surveying the extent to which computer literacy and utilisation of Internet services affected teaching and research outputs among academic staff at two private universities in North-western state, Nigeria. In addition to the survey, in-depth interviews were conducted in each of these institutions. The in-depth interviews were used to generate qualitative data to supplement the quantitative data from

the survey. This was necessary to elicit information on some aspects of the study which dealt with attitude, behaviour, individual differences and perceptions of the use of Internet services, the purpose to which they were used and their effects.

Population and Sample Size

Two private universities in North-Western Nigeria were selected for this study: Alqalam University, Katsina and Skyline University, Kano. The total population of the academic staff of the universities at this time was 608. However, 214 academic staff were sampled for the study (see Table 1).

Table 1. Selection of Sample Size

Names of Universities	Number of Academic Staff	Sample Size Expected	Actual Sample Size
Alqalam University(AU)	306	122	106
Skyline University(SU)	302	120	108
Total Number	608	242	214

Source: Field Survey, 2023

The sample size was representative of the various colleges within these institutions, taking into consideration the need for gender balance, inclusion of a cross-section of respondents (senior and junior academics) and others. This was done through convenience sampling.

Sampling Technique

The two universities were purposively selected based on the following criteria: First, the two universities were among the first set of private universities established in North-Western Nigeria. Second, their proprietors had massively invested in the acquisition of Internet technology and there was availability of Internet facilities. Third, the two universities had a relatively stable power supply. And lastly, they both had similar faculties and departments.

Instrument of Data Collection

Two major research instruments were used to collect quantitative and qualitative data for the study. A questionnaire was used to collect quantitative data while a structured interview was used to collect qualitative data.

Method of Data Processing and Analysis

Quantitative data were analysed using the Statistical Package for Social Sciences (SPSS), while qualitative data were analysed through content analysis. Where necessary throughout this article, important comments are quoted verbatim.

Measurement of Utilisation of Internet and Research Outputs

In this study, the utilisation of Internet services represented the independent variable, while teaching and research outputs of academic staff represented the dependent variable. In measuring the utilisation of Internet services, the estimated number of hours spent weekly on browsing the Internet by individual academic staff was used (Jagboro 2003; Oduwole 2004). Specifically, this was divided into: between zero (0) and seven (7) hours; eight (8) and fifteen (15) hours; and sixteen (16) hours and above. Correspondingly, three categories of utilisers/users were established, namely; low utilisers/users, moderate utilisers/users and high utilisers/users.

On the other hand, the output of members of academic staff was measured using three main criteria as formulated by Singh (2002) and modified by Oduwole (2004). These were: publications (books, chapters in books, referred conference proceedings, monographs/technical reports and journal articles);conference attendance and the use of Internet material for teaching purposes. Based on careful study and harmonisation of the various policies and promotion criteria adopted by the study universities, the following maximum scorable points were attached to these different outputs; publications(20

points); conferences(10 points) and teaching (5 points). On the basis of the total score of each academic staff on the above mentioned items, three categories of output were established. These were: low output(between 0 and 35 points); moderate output(between 36 and 71 points); and high output(72 points and above). The uniformity in the policies and promotions criteria of the study areas suggested that emphasis was placed on publications (journal articles, books, technical reports, and others) while less emphasis was given to teaching. This seems to justify the popular saying within the university system in Nigeria that advises academics to either "publish or perish" (Imhonopi 2010).

The values attached to publications are: books (6 points); chapters in books (3 points); refereed conference proceedings (2 points); monographs/Technical reports (3 points) and journal articles (6 points). Conference attendance is 10 points (three conferences were selected, one for each year for three years). Teaching was assigned a value of 5 points (this was considered once for each year for three years). There was no limit placed on the number of publications, since the universities which took part in the current research study considered publications as the main output of every academic staff every three years, and this criterion was used for promotion consideration.

RESULTS AND DISCUSSION

Extent of Computer Literacy and Internet Availability

Table 3 indicates that the majority of respondents were computer literate (94.4%), while only an insignificant percentage claimed they were not computer literate (5.6%). This was based on self-assessment. The implication here is that the majority of academic staff in the study had embraced computer literacy and Internet services. This is a promising finding for the future of Nigeria, if one considers the importance of computer and Internet literacy as the impetus for development and academic relevance in the world, as previously argued by Bamiro et al. (2005) and Bussiek (2005).

With reference to the availability of Internet services, the table also indicates that all respondents agreed that Internet services were available for their use within their institutions, accessible either from Internet centres on their campuses or from their offices.

Table 2. Extent of Computer Literacy and Internet Availability by Institution

Computer literacy by Institution				
Are you computer literate?	AU	SU	Total	Percentage
Yes	98	104	202	94.4
No	8	4	12	5.6
Total	106	108	214	100
Internet availability by Institution				
Are Internet services available for your use in your Institution?	AU	SU	Total	Percentage
Yes	106	108	214	100
No	0	0	0	0
Total	106	108	214	100
Source: Field Survey, 2023				

In confirmation of this, a junior male lecturer from AU who had access to Internet services said: I have access to Internet services in my university here and I believe that computer literacy and Internet usage is very important for any serious-minded academic, especially in this age and time. Internet services have made our work easier. Now, one can explore information and share ideas with other scholars in the world. I have been using the Internet for the past five years and the difference is clear now that I am a lecturer and a researcher (Male/2023).

It is important to note here that all the ICT staff of all the study universities that were interviewed agreed that academic staff had access to Internet services; as they either came to the ICT centres to browse or were able to browse in their various offices if there was no system breakdown or server problems.

Estimated Hours Spent on Internet Services Weekly

Table 4 presents the estimated number of hours utilised weekly for browsing the Internet by respondents in their different ranks. Note: The senior category is made up of Professors, Associate Professors and Senior Lecturers. The middle-ranked category consists of Lecturer I and Lecturer II, while the junior category is made up of Assistant Lecturers.

The table portrays that junior academic staff (67.2%) spent relatively more time using Internet services (that is, 16 hours and above a week) than middle and senior academic staff. This finding begs the question, could the reasons for this be that junior academic staff are eager for promotion and career advancement and are therefore more disposed to spending more time on the Internet in their research and teaching assignments than their middle and senior-level colleagues?

Table 3. Estimated Hours Spent on Internet Services Weekly by Academic Ranking

Hours Spent on the Internet Per Week				
Categories	**0-5 hours Low (%)**	**6-10 hrs Moderate (%)**	**11 hrs High (%)**	**Total**
Senior	31 (44.8)	19 (27.5)	7 (10.4)	57
Middle	38 (45.4)	35 (43.3)	19 (22.4)	92
Junior	6 (9.8)	18 (29.2)	41 (67.2)	65
Total	75 (100)	72 (100)	67 (100)	214
Source: Field Survey, 2023				

A female Senior lecturer from SU clarified this contention by stating that junior lecturers were more inquisitive and more adventurous in the use of Internet services for research purposes than their senior counterparts. To strengthen her argument she said:

Junior lecturers are supposed to be more inquisitive and more adventurous in the use of Internet services for research purposes than the senior ones. You know, a professor may not necessarily engage Internet services in order to publish papers for promotion. If at all he needs to get anything from the Internet, he simply requests for the assistance of junior lecturers. But on the other hand, the junior lecturer wants to explore every opportunity to increase their paper publications and output because they are desperate for promotion and career advancement. (Female/2023).

A Professor from AU further alluded that the reason for the involvement of more junior academic staff in Internet services than their senior colleagues, was a function of what he called a generational gap. According to him:

…there is a generational gap. I didn't see any computers until decades after I had finished my Masters. Most of us, especially professors, have already completed our Ph.D. and even become professors before the emergence and popularity of Internet usage in this part of the world. But for those who studied abroad, they may have acquainted themselves with the Internet overseas. So, those of us here find it a little difficult to go through the rigour it takes to learn computer and Internet use now. Meanwhile, most junior academic staff who are also younger in age came into academia at the time information technology has become widespread. (Male/2008)

However, a professor from the same university disagreed with this position. She argued that the late arrival of the Internet for senior academics notwithstanding, since Internet facilities have been found very useful in sourcing material for research and academic purposes, senior lecturers, including professors, just have to embrace it. In her comments she said:

Personally, I wouldn't subscribe to the view that since the professors have reached the peak of their career, most of them no longer use Internet services for academic purpose. For instance, I am a professor and I want to tell you that I typed my Ph.D. thesis by myself because I learnt how to type many years ago before the emergence of modern computers. So, when computers came on board, it wasn't difficult for me to adjust. Even up till now, I still browse the Internet myself and type most of my documents myself. The fact that we are professors does not stop us from carrying out research and keep writing papers. As a matter of fact, writing papers is easier now than in the past because all the materials you need are there on the net. So it is intellectual laziness that will make a professor think that since he or

she has become a professor, Internet facilities should be left to the younger ones who are struggling to be promoted… everybody should therefore embrace it. That's the situation in Western countries (Female/2008).

Thus, to an extent, the findings corroborate the position of Jagboro (2003) and Oduwole (2004) who found that junior members of academic staff spent more time in the utilisation of Internet services than senior members. Although, like one of the interviewees revealed, some senior lecturers were as computer literate and aware as their junior colleagues and used the Internet services for their teaching and research tasks.

Research Output Prior to the Use of Internet Services

Table 5 shows the percentages of research output of respondents, three years before they began to access and utilise Internet services. The results showed that their output was low, especially for those who published between 0 and 5 books (84.4%), 0 and 5 Chapters in Books (82.2%), and 0 to 5 Technical Reports/Monographs (76.2%). Those who recorded moderate output published bet 6 to 11 Journal Articles (43.4%) and attended 6 to 11 conferences (33.4%).

Table 4. Research Output of Academic Staff Prior to the Use of Internet Services

Publications Within Three Years Prior to the Use of Internet Service						
No. of Publications/ Conferences Attended Prior to Internet Usage	Books	Chapters in Books	Technical Report/ Monograph	Refereed Conference Proceedings	Journal Article	Number of Conferences Attended
0-5	84.4%	82.2%	76.2%	70.2%	26.2%	46.1%
6-10	15.5%	17.4%	23.6%	29.3%	43.4%	33.4%
11 and above	0.1%	0.4%	0.2%	0.5%	30.4%	20.5%
Source: Field Survey, 2008						

Respondents identified certain factors that weighed against their efforts to increase research output. Such factors included: fear of rejection of articles for publication (56.7%), lack of funds (72.6%), unfavourable university guidelines and policies on promotion (53.7%). This result confirms the findings of Olukoju (2002) who also identified some reasons for the decline in research and publishing in Nigerian universities. According to him, the economic and political crisis that befell the country in the 1980s culminated in the adoption of the Structural Adjustment Programme (SAP) in 1986, which impacted negatively on the financial status of many academic staff, thus also negatively affecting their research and publishing efforts. While some academics fled the country and pursued careers overseas, others undertook other vocational pursuits in an attempt to achieve material survival and financial security.

A senior lecturer in one of the study universities lamented about the deplorable state of Nigerian higher institutions. In his words:

Not that Nigerian academics are not brilliant, neither can I say that those abroad write better than us, but our working conditions here are very poor. Take for instance, you come to the office only for you to discover that there is no electricity for you to work with, and even if you have a deadline to meet in sending a paper for publication, you may not have electricity to type the paper not to talk of sending it via the Internet…. (Male/2008).

The next section highlights the difference in research output after the implementation of Internet services.

Research Output after the Implementation of Internet Services

Table 5 indicates the publication output of respondents with the advent of Internet services. As argued earlier, it can be seen that there is an emphasis on journal article publications, as 54.3% of the respondents indicated they had published between 12 journal articles and above with the aid of Internet services, in contrast with insignificant numbers of those that had published books or had chapters in books (0.2% and 0.8% respectively). Most of the respondents in the course of their in-depth interviews

confirmed that their universities emphasised journal publications because of the associated peer review process, unlike books or chapters in books, which might not be subjected to the same review process. On the whole, when comparing the research output of respondents before (Table 6) and within three years of the introduction of Internet services (Table 6), the data indicates that respondents' research output increased with the advent of Internet services more than the era before Internet services/tools emerged.

Table 6. Research Output with the Use of Internet Services

Publications Within Three Years as a Result of Utilization of Internet Service							
No. of Publications/ Conferences Attended /Times Used Internet Materials for Teaching	Books	Chapters in Books	Technical Report/ Monograph	Refereed Conference Proceedings	Journal Article	Number of Conferences Attended	Use of Internet Materials for Teaching
0-5	82.6%	71.2%	56.2.%	68.2%	9.1%	26.0%	0.4%
6-10	17.2%	28.%	35.6%	13.4%	36.8%	12.4%	25.4%
11 and above	0.2%	0.8%	8.2%	18.4%	54.3%	61.6%	74.2%
Source: Field Survey, 2023							

Furthermore, Table 6 shows that the advent of Internet services and tools increased the volume of respondents' research output in the following ways. For respondents who had more than 12 publications, chapters in books rose from 0.4% to 0.8%; technical reports and monographs rose from 0.2% to 8.2%; refereed conference proceedings rose from 0.5% to 18.4%; journal articles rose from 30.4% to 54.3%, while the number of conferences attended also increased from 20.5% to 61.6%. This phenomenal increase was attributed to the use of Internet services, tools and technologies. In fact, 74.2% of respondents admitted they relied more on Internet materials for the pursuit of their research publications, conference notifications and for teaching and career advancement generally.

Other factors have also been found to affect the research output of academic staff. Data from the in-depth interviews indicated less emphasis is placed on the publication of books in Nigerian universities than might otherwise be the case elsewhere. In fact, some university policies stand against the production of books by academic staff, because some academics have made buying their own books a basis for extra marks, with the result that this practice is seen as a form of exploitation of students. The reading culture of students in higher institutions in Nigeria is also said to be very poor (Ololube 2002), thus making any attempt to publish books virtually impossible under the circumstances. It is likely therefore that junior academics within the study institutions do not bother to spend unnecessary time in writing books and monographs that might never be bought or considered for their promotion.

To substantiate the finding that academics now focus more on journal articles for promotion and career advancement purposes, a Lecturer from SUK remarked in the course of the in-depth interview that:

What is the point trying to publish a book that will take many years and which may not be accepted by the authorities if you didn't publish it with a reputable company? As a matter of fact, no matter how good the book may be, it will be equated with only one journal article of may be 10 to 15 pages. In my former university, the University of Ibadan, for the purpose of promotion, a book is regarded as a publication if it is more than 80 pages, cover excluded, and it must be published by a reputable publishing firm (Male/2023).

It is important to note, however, that many journal editors in both Nigeria and abroad charge assessment fees before they accept any article for review (Olukoju 2002). This means, therefore, that despite some articles meeting the criteria for publication, without the necessary assessment fee such articles might never be published. A junior lecturer from AUK corroborated this view:

…the use of Internet, no doubt, has affected my research pursuits in the sense that I now have free access to materials and information with which I have been able to put together some articles, but yet I have not been able to publish any of them because before any of such articles could be accepted you will be asked to pay a certain amount of money and if you don't have that money at that time, it means your article will be rejected even though it is a good one. Another reason is that I am a bit discouraged because my papers were constantly being rejected in the places I sent them to. Well, I will not give up. I will continue to do my best (Female/2023).

The study further revealed that the Internet has helped many academics to know when and where conferences are to be held. As an example, a senior respondent from CU said that he had a particular package in his computer called "Conference Alert" and that wherever and whenever there were conferences to be held in any part of the world, he would be informed with the help of the alert. Thus, Internet services have helped to increase the awareness of respondents about conferences.

Factors Affecting Research Output

The survey considered different factors which affected the research output of respondents, both positively and negatively (see Table 7). The results indicate that 75.6% of respondents identified the search for knowledge and the need to extend the frontiers of knowledge as the primary rationale for their research efforts. The desire for promotion (64.3%) was another important motivator, followed by access to local and international grants (51.7%) and personal motivation (45.2%).

A total of 16.8% of respondents believed all these factors combined provided the motivation for their quest for research output.

Table 7. Factors Affecting Research Output

Questions	**Responses**		
What are those factors that positively affected your research output?	**Yes Frequency (%)**	**No Frequency (%)**	**Total N (%)**
Personal Motivation	97 (45.2)	117 (54.8)	214 (100
Desire for Promotion	138 (64.3)	76 (35.7)	214 (100
Contribution to Knowledge	162 (75.6)	52 (24.4)	214 (100
Access to Local/Int'l Research Grants	111 (51.7)	103 (48.3)	214 (100
All of the Above	36 (16.8)	178 (83.2)	214 (100
What are those factors that negatively affected your research output?	**Yes Frequency (%)**	**No Frequency (%)**	**Total N (%)**
Fear of rejection of articles for publication	121 (56.7)	93 (43.3)	214 (100
Lack of funds	155 (72.6)	59 (27.4)	214 (100
Unfavourable University policies/ guidelines on promotion	115(53.7)	99(46.3)	214 (100
All of the Above	15 (6.9)	199 (93.2)	214 (100
Source: Field Survey, 2023			

The main factors which had a negative effect on academics' research output were identified as: a lack of funds (72.6%), a fear of rejection of articles for publication (56.7%) and unfavourable university policies/guidelines on promotion (53.7%). A senior academic in one of the in-depth interview sessions held during the course of the research project, empathised with junior lecturers who were mostly at the receiving end of the rejection of their articles. This senior lecturer advised the junior academic staff not to give up, but to persist as success came with persistence. In his words, he said:

Well, we know that it is not an easy thing to remain focused as an academic. There are a lot of challenges and distractions along the way. It is not every article that would be accepted for publication from the

beginners. One has to persist without getting discouraged easily. So, my advice for upcoming academics is for them to stay focused, work harder and be disciplined. They should learn to follow the example of successful colleagues, ready to observe and practise what they see especially for those that are worth emulating (Male/2008).

Other respondents (6.9%) claimed that a combination of the identified factors affected their research output negatively.

ABSTRACT

This study has investigated the influence of the utilisation of Internet services on teaching and research output among academic staff in two private universities in North-Western Nigeria. The study also investigated the following specific objectives: the extent to which academic staff of selected universities embraced computer literacy and utilised Internet services; the extent to which the use of Internet services affected teaching and research outputs (publications and conference attendance) of academic staff of study universities; and the factors that might affect the utilisation of Internet services as well as research output of respondents.

From the research, it was highlighted that computer and Internet technologies have become an integral component of academic life in these two private universities. In fact, as identified by the respondents in this study, academics may not be able to carry out in depth, robust, relevant and internationally recognised research works without the aid of the services that the computer and Internet offer. Hence, the findings of the research showed that the respondents' self-assessed level of computer literacy (94.4%) and accessibility to Internet services (100%) were high. This finding confirms the impression that the academic culture in Nigerian universities is presently tilting towards global academic best practices, as much emphasis is now being placed on research activities with the aid of information and communication technology.

The study further revealed that academic staff from the sampled institutions made use of computers and Internet services mostly for academic purposes – notably for statistical analysis, word processing and Internet browsing for materials for teaching and research works. The Internet was found to have aided the respondents in sending and receiving email, obtaining and participating in peer group paper review, having access to databases which were not available in their campus libraries and sharing of ideas on the Internet.

However, the study also showed that certain factors such as academic ranking (senior, middle or junior); inconsistent servers, power interruptions and a lack of funds, affected the level of Internet utilisation.

The study further revealed that the utilisation of Internet services aided the respondents to publish their works (54.3%), to attend conferences (61.6%) and to improve both the quality of their teaching (74.2%) and the quality of their research output (79.1%). Furthermore, respondents recorded an improved research output in terms of books, chapters in books, monographs and journal articles, from when they began to use Internet services compared to their research output prior to the implementation of computers and Internet services at their institutions.

Respondents (72.0%) identified a lack of funds (72.0%), unfavourable university guidelines on the promotion of academic staff (53.7%), and a fear of rejection of articles for publication (56.7%) as factors that affected their research output. It was also observed in the study that journal articles were the most frequent form of academic output than other such pursuits, for example, books and chapters in books. The reason for this disparity was attributed to the fact that journal articles carried more weight and attracted higher grades during promotion exercises. In the case of academics, individual traits and environmental factors, as well as differences in perspectives and other social constraints, informed the extent to which they utilised Internet services and for different purposes. These factors also influenced the type of research output they concentrated on (books, chapters in books, monographs, journal articles or conference attendance).

While some academics placed great value on the role of Internet services on their teaching and research output, others, especially many in the senior rank (professors) who had already reached the peak of their career, did not see the need to pursue the Internet, neither did they feel the need to publish their works as much as those in a more junior ranking. In this respect, the junior and middle ranked academic staff,

were found to be more motivated in browsing for materials on the Internet for promotional advantages than for scholarship purposes. These choices were based on how they perceived their situations and goals in the university system.

The study, especially from the in-depth interviews, showed that Internet services gave academic staff of these selected universities greater access to collaborative research works, rigorous peer review processes as well as inclusion of their published works in academic journals and on the Internet, which all led to international recognition and enhanced reputations.

CONCLUSION

In conclusion, the current study found that most academic staff of the study universities professed to be high Internet utilisers. Furthermore, the study found that ground-breaking research work and effective teaching were done more as a basis for promotion and career ascent, than on the basis of scholarship or contribution to the expansion of knowledge frontiers. Thus, many of the respondents saw Internet resources as a way of improving their research outputs and teaching on one hand, while on the other hand enhancing their career prospects within their institutions. Consequently, academics within the universities of study were driven by the desire to attain high career prospects and also to meet internationally accepted academic standards. Nevertheless, the adoption and consistent utilisation of Internet services as this study has shown has the potential to greatly improve and contribute immensely to effective teaching and increased research output among academic staff of these universities if sustained.

This new century and the third millennium have been termed the information age, and present-day society is often regarded as the information society. Further, it has been shown previously that information and communication technology, particularly Internet services, can have a tremendous impact on the gathering, processing and dissemination of relevant information in various aspects of human endeavours and the economic and social development of countries, as well as among academic communities all over the world. Excellence in tertiary education in Nigeria will be determined by the quality of teaching and research outputs coming from its universities. As the current study has shown, these outputs may very well be dependent on the proper utilisation of Internet services and technologies.

Much further study in this area is required to analyse the effect of Internet services on the teaching and research of academic staff within state and federal universities in Nigeria. In particular, further study could help to identify the constraints inhibiting such institutions in their utilisation of Internet services to further their teaching and research objectives. Such research could help not only to identify new strategies regarding how to effectively utilise Internet services for teaching and research in Nigerian universities, but also how to overcome any shortcomings – both individual and institutional – which currently exist.

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THE ROLE OF ICT IN EDUCATIONAL SYSTEM

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ABSTRACT

Computers and information communication technologies in general are playing a very vital and important role in the information age. They deeply impact in many or almost all areas of life, undoubtedly, in the area of education to improve the quality of teaching and learning as well as practical training. Computer technology should be used to reform the teaching methods and curriculum program and the author also present a report on the usage of computer in the field of education. Various resources and technologies have been used to improve the quality of the education system. Prospective teachers, as well as teachers in-service, must aware about the impact of computers in the field of education as well as their subject area to make learning effective. Computer can be used in education by three different ways such as “As a teacher”, “As a learner”, and “As an assistant”. Computer has become an important part of every walk of life such as on campus, at home and in office. Computer and related technologies have been used in distance learning through various ways such as Teleconferencing, video-conferencing, audio graphics, Teletext, video text, multimedia and hypermedia, e-books, online database, online discussion, on-demand call in course etc. This will help teachers to know the integrated technologies helps in and outside their classroom teaching. This paper will discuss the various usages of computers which make effective teaching and learning as well as a training process.

Keywords: Computer, Education system, learning, teaching, ICTs (Information and communication Technology).

INTRODUCTION

This is the era of information technology (IT) . Nowadays, every aspect of our life is connected to IT. Huge usage of IT is emerging in all over the world. Although, use of information and technology is spreading its impact in every field of life. But, it impacts significantly in the field of education to make the learning process interesting as well as successfully B. Bhattacharjee and K. Deb (2016), According to J. T. Fouts(web), the first use of the computer in 1970 into the education field. But, now computer and its technology almost use in every educational institution across the world. According to Sahin and Thompson (2016), there is frequent use of the technology in the various fields such as research, marketing, business, banking, administration etc. but the frequency of IT use is not much in an education system. But, today, use of IT in an education system has been received more attention for improving the standard of learning as well as teaching. Various resources such as computer, internet, broadcasting technologies are being used to improve the education system M. I. Majoka, S. Fazal, M. S. Khan (2013).In earlier days, teachers were not much aware of the need of bringing IT as an essential part of their day to day activities. Moreover, it was impossible to do study in foreign universities without going over there. But, today’s scenario is completely changed. IT makes it possible by using various

technologies such as online education, distance education, Computer Aided Courses etc.in the field of education. No doubt, computers have become essential for everyone in every field. Teachers now started using technology like smart classes, LCD projectors, EDUCOM, Laptops, memory sticks in their classroom to make effective learning process. Haddad et.al.(2002) identify the five levels of technologies which are used in education such as presentation, demonstration, drill and practice, interaction and collaboration.

Expansion of the use of information technology gives us many favourable circumstances in tutoring-teaching and educational management abilities. The effective use of IT resources such as virtual classroom has the great potential to allow for participate the audience from all over the world D. Geladze (2015).Moreover, IT allows making the students as well as their parents to participate in the modern educational process. Education system can be effective by using the various technologies such as e-mail, multimedia, internet etc. Some educational documents like NCTM 1989, 2000 encourages the teacher to use the IT in their daily activities. There is a huge gap between the way of using the computer today or in earlier days in education system. In earlier days, computer and related technology were used to improve the basic skills of the students. Evaluation of the students was also based on standardized test scores or other traditional measures. Traditional computer education was based on the only traditional curriculum. But, nowadays, computer and its related technology have dramatically changed the education system.

Fig.1 shows the relationship between the use of computer and student achievement:-

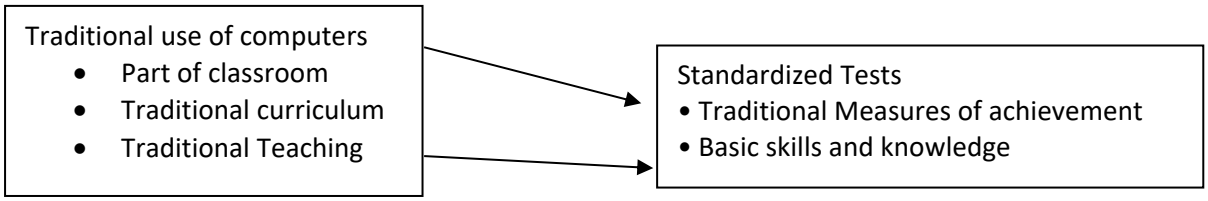

Fig.1. Relationship between computer and traditional education[2]

Today, the use of computer and its related technologies has expanded in education system to fulfil the following purposes:-

- Used as traditionally to teach, practice writing
- Used to provide simulation and real- world environment to improve cognitive thinking
- Used to enhance the communication through Internet and communication media
- Used as productivity tool such as spreadsheet, databases, word processor etc.

Fig.2 shows the relationship between the new use of technology and new learning environment

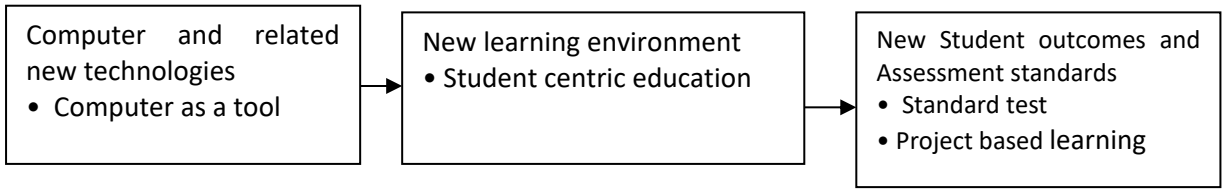

Fig.2. Relationship between the new use of computer, new learning environment and new student outcomes [2]

There are other more benefits of using computer in education are as following:-

- Computer can improve the student learning and basic skill area.

- Computers not only improve the learning process, it also increases retention of the students.
- Effective and adequate teacher learning is an integral element of the successful learning program.

ROLE OF COMPUTER AND INFORMATION TECHNOLOGY(IT) IN EDUCATION

In earlier days, computers were used in the classroom to teach the basic skills and provide the knowledge of computer as per the curriculum. For example, word processor was used to improve the writing skills of the students. Moreover, students were evaluated on the basis of standardized test scores or other traditional measures to assess the student's achievement Computer and its technology has been performed various roles such as tutor, surrogate teacher etc.in different field of education. It changed dramatically in the nature of way of teaching has been used in classrooms. Its technology has proved very successful in education management applications like planning, data analysis etc[2].According to J. T. Fout[2] ,the first computer was introduced into the field of education as students and teachers learning program". Thereafter, learning process was improved by software sophistication and instruction design and it is still in progress. According to Y.Bo (2011), computer technology should be used to reform the teaching methods and curriculum program and the author also present a report on the usage of computer in the field of education. According to Li. Yumei(2012), computer can be used in education by three different ways such as "As a teacher", "As a learner", and "As an assistant" and author also describe each role in detail. Broadly, one can consider the following roles of education where computer has been effectively used as shown in Fig.3.

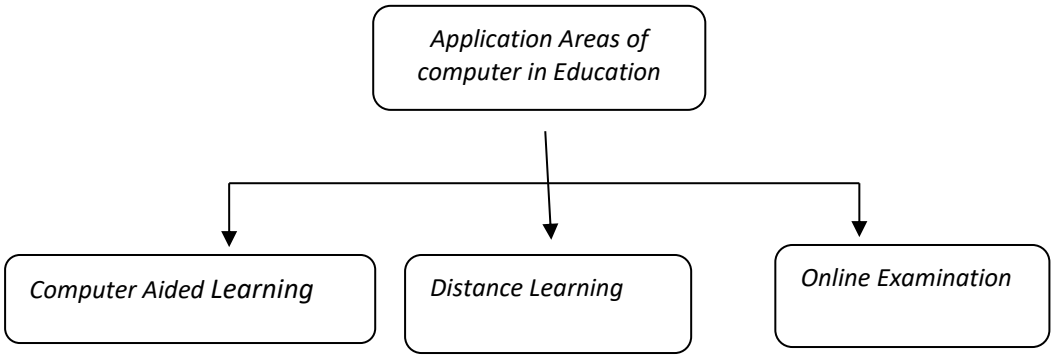

Fig.3. Different roles of Computer in Education

2.1 Distance Learning

Computer has become an important part of every walk of life such as on campus, at home and in office. Computer and related technologies have been used in distance learning through various ways such as Teleconferencing, video-conferencing, audio graphics, Teletext, video text, multimedia and hypermedia, e-books, online database, online discussion, on-demand call in course etc H. Rahman, (2014).Virtual classrooms play an important role in distance learning. Students can raise their doubts and teachers can provide the solutions without going to one's place[retrieved from www.byte-notes.com/uses-computers-various -fields.].

The following are the different benefits of using technology in distance learning:-

- Cost effective
- Independent of time and place
- Quality education through results access from mass product of course material
- Simultaneously a lot of students can be benefitted

2.2 On-Line examination and monitoring

Online examination and monitoring system have completely changed due to the development of modern education technology. These systems ensure about the fairness and impartiality in the examination P. Guo, H. F. Yu and Q. Yao (2008).Various researchers Ketwal, S.Bhadke, A. Gunjal and P. Biswal, (2016) and S.K.Singh and A.K.Tiwari,(2016) have been developing online examination system based on web. Today, various exams like GRE, GMAT, SAT, CCNA, MCSE and much more have been conducting computers in all over the world. There are following benefits of using the online examination and monitoring systems:-

- Security
- Fairness and impartiality
- Save time and cost

2.3 Computer-Aided Learning

Today, computers have improved the quality of teaching and enhance the learning process with the help of various tools such as multimedia projector, PowerPoint presentations etc. Traditional methods of teaching can be monotonous, boring and students start getting frustrated. But information technology make learning process more interested through games, animated graphics etc. There are the following benefits of computer-aided learning:-

- Interest and motivation
- Individualization
- Compatible learning style
- Optimal use of learning time
- Immediate feedback
- Error analysis
- Repetitive practice
- Pre-determined to process syllabus

CONCLUSIONS

Computer and its related technology have completely revolutionized our lives. Now, information technology is important in every walk in life. Undoubtedly, computer and information technology great impact in our education system. Various technologies have been used to improve the teaching and learning process. Information technology makes our education system interested and effective. Students can learn better without getting bored and frustrated. This paper presents the current scenario of information technology based education system

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POWER GRAPHS OF GYROGROUPS DETERMINED BY THEIR GENERALIZED SPECTRA

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ABSTRACT

Graphs are discrete structures having nodes and edges. Many graphs vary based on either directions of edges or number of edges. They may have connected identical nodes where loops are mostly permitted. Graph models have wide applications in almost all branches of Sciences and Engineering technologies. Graphs demonstrate, for example, the competition between distinct ecological classes that influences an institution and the outcomes of round-robin tournaments. The graphs might be used to replicate personal friendships, telephone talks between telephone numbers, research collaboration, website linkages, road maps, and the tasks allocated to organization staff. Graph spectra contain a significant amount of combinatorial knowledge regarding the provided graphs. Several directions have been studied in recent years. So far, the power graph is the latest study. The power graph P(G) of a finite group G is the graph where G is its node-set. Two different nodes are being connected in P(G) if and only if one is an integer power of the other. This thesis discusses specific spectral properties of graphs, that is, the power graphs of gyrogroups. This paper presents the characteristic polynomials and spectral radii of the power graphs. In this paper, we also examine the Laplacian, signless Laplacian, and normalized Laplacian spectrums of the graphs. Moreover, we discuss the newly established spectra, such as the Aα-spectrum and the Aα-Laplacian spectrum of the power graphs over the mentioned groups.

Keywords: Graph Theory, Power Graph, Gyrogroup and Laplacian spectrum

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THE MULTIFACETED ROLE OF HERBIVORE-INDUCED PLANT VOLATILES IN SHAPING COMMUNITY STRUCTURE AND FUNCTION: A COMPREHENSIVE REVIEW

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ABSTRACT

Herbivore-induced plant volatiles (HIPVs) are a diverse group of secondary metabolites that plants release into the atmosphere when they are attacked by herbivores. HIPVs can act as infochemicals that convey information to various biotic agents, such as natural enemies of herbivores, conspecific and heterospecific plants, and soil microbes. HIPVs can also modulate the behavior and physiology of herbivores, either directly or indirectly. Through these complex and context-dependent interactions, HIPVs can have profound ecological implications for the organization and dynamics of plant and animal communities, as well as the provision and maintenance of ecosystem services. This review synthesizes the current state of knowledge on the role of HIPVs in community ecology, emphasizing the underlying mechanisms, adaptive functions, and ecological outcomes of HIPV-mediated interactions. The review also identifies the challenges and opportunities for advancing the field of HIPV ecology, such as integrating molecular and ecological methods, exploring the evolutionary history and variation of HIPV interactions, and assessing the impacts of global change factors on HIPV production and perception.

Keywords: herbivore-induced plant volatiles, infochemicals, plant-herbivore interactions, community ecology, ecosystem services

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A NOVEL DESIGN AND DEVELOPMENT OF A TEST RIG FOR VAPOUR COMPRESSION REFRIGERATION SYSTEM (VCRS) USING NANOFLUID-ZEOTROPIC MIXTURES

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ABSTRACT

The quest for refrigerants that can yield optimum performance during service condition led to the novelty in this research paper which embroils state-of-the-art design and development of a refrigeration test rig operating on vapour compression refrigeration cycle. The system was developed with animated metal sheet while polystyrene was used for absorbing heat generated between the cabinet and the system. The cupboard was suitably fortified to decrease heat loss to the surrounding. The test rig system was built to the preferred dimension and form. The study experimentally investigated the performance characteristics of nanofluid-zeotropic mixtures eco-friendly refrigerants. The design analysis was limited to components sizing and heat losses. Measurements of the global parameters were carried out at the compressor inlet and evaporator exit region in the range of 11 and 16 ^{0}C. Eleven samples of different mass volume fraction in % composition were used. The results obtain showed different effect that each concentration had on these parameters based on the individual concentrations mixtures such as optimum coefficient of performance (COP) which was calculated as 3.10 at (011) composition. Heat rejected via condenser and work done on compressor was obtained as 30.74 kJ/kg and 2.05 kJ/kg. It further revealed that (011) zero gram TiO_2, 7.5 g-Al_2O_3/CuO, (112) 3.75 g-TiO_2/Al_2O_3 and 7.5 g-/CuO concentration mixtures enhanced performance of the cooling process with better efficiency and maximum COP in all conditions considered in the study. Hence, the maximum power coefficient, cooling capacity, and COP increased by 13.51%, 5.78%, and 10.33%, making the developed test rig a viable option for vapor compression refrigeration systems.

Keywords: Refrigerants, Refrigerator, Nanofluid-zeotropic mixtures, coefficient of performance.

1. INTRODUCTION

In eateries' centers, homes, workplaces, occasions, humans desire taking cold water, drinks as well as fruits in a cold setting rather than in moody atmospheres. According to Vuppaladadiyam et al. (2022), refrigeration is the surest and superlative means of getting these chilly items done. This mechanical system operate on the vapour compression method, which uses a flowing refrigerant that go into a compressor at stumpy pressure vapour before being compressed further. This high-pressure superheated vapour is expelled from the compressor after it has been compressed and heated, the refrigerant releases its concealed heat into the nearby condensing channel, which is often air or liquid. The condenser is responsible for cooling the refrigerant vapour, which then condenses and liquefies. To do this, the liquid refrigerant is driven through an expansion valve into a significantly lower pressure area.

As times goes on, some of this refrigerant were found to be highly flammable and some extremely toxic and corroded and had damaging effect on the ecosystem because they contain chlorine molecules. Hence, these awake the need to search for new and better eco-friendly refrigerants that possess excellent heat transfer characteristics, and energy-efficient in the face of this looming energy resource crisis according to Said *et al.* (2016).

Now attention is focusing on developing novel mixtures that ensure the same features as the phase out conventional refrigerant by the Montreal and Kyoto Protocol. Recently, nanotechnology has given rise to the improvement of a new trend of heat transfer fluids called nanofluids. Such development has grown to include nanorefrigerants, which consistently enhance refrigerating systems' operating efficiency. These mixtures are blend by string up nano-sized particles (1-100 nm) in choice liquids which resulted to having greater thermal conductivity than the base fluids.

Nevertheless, the second law-exergy analysis stands a potent way in the plan-enhancement, and performance assessment of energy patterns. This examination aids to know openly irreversibility impacts from energy consumption system, and allows determining different exergy losses in various sections, so as to carry out optimization enhancement and efficiency. However, selecting an ecofriendly refrigerant has become a global concern now. As a result, the concept of using zeotropic mixtures as a refrigerant raises some novel concerns about the operation of vapour compression systems. Accordingly, the current work seeks to design a sizeable test rig to experimentally study the influence of varied zeotropic mixtures on the performance of a nanofluid refrigerant in a VCRS.

A research conducted by Akilu *et al.* (2017) with Nano combination between (TiO_2/CuO)/ethylene glycol opined that thermal conductivity and viscidness of nanoparticle suspensions were quantified relative to volume fraction and nanoparticles temperature. Results obtained demonstrated that particles viscidness and thermal conductivity are vastly reliant on the volume application of nanoparticles and temperature. While compared with ethylene glycol at 40.4^{o}C, an improvement of 16.7% and an increase of 80% were obtained at 2.0% vol concentration.

Ziegler and Alefeld (1987) proposed an in depth exergy study of a definite VCR cycle. R502, R404A, and R507A were studied using a computer model to determine the COP, exergy destruction, exergetic efficiency, and efficiency flaws. Findings indicated that R507A is a more effective alternative for R502 than R404A in this study. For the refrigerants considered, the efficiency defect in the condenser is the greatest, while the efficiency defect in the liquid vapour heat exchanger is the smallest.

Bukola and Bolaji (2015) identified a viable alternative to R22: R152a/R125/R32. It was necessary to construct a computer code using a package known as (Yet-REFPROP NIST 5.0) to conduct a proportional examination of the thermo-physical characteristics via refrigerant performance of the new blend in comparison to R-22. When this new mix was dropped into residential air-chiller that was initially built for R-22, it worked perfectly. Both the calculations and the experimental findings indicated that this new mix might stand considered as a primary replacement for R-22 in a wide range of applications with minimal risk.

Chu *et al.* (2020) conducted a theoretical studied dealing with an exergy investigation of a VRS. Results revealed that the best COP and exergy efficiency were obtained when the system was operated with the R134a refrigerant, but the worst values were obtained when the system was operated with the R407C refrigerant.

This paper is aimed at performing an experimental investigation of hybrid nanofluids-zeotropic mixtures in a VCRS using exergy tools. The objectives are to: design and development of a VCR test rig; determine different zeotropic mixtures concentration in (contents and sizes) for HFC nanofluid refrigerant and evaluate amongst others, best operating mixtures for optimum performance of the VCRS. The rationale behind using this novel mix yielded a tremendous enhancement on the global parameters, as well as a reduction in energy consumption, environmentally friendly, compared to the conventional (phase out) refrigerants. The scope also includes measurement of some global parameters along the inlet and exits axis. Areas which were not covered in this work include leak analysis and flow pattern.

2. MATERIALS AND METHODS

The following were the materials used for this study: galvanized/ aluminum plate, cork board 3cm angle bar, hybridize-nanofluids zeotropic mixtures, as refrigerant, ¼Hp rating compressor, Polystyrene, Fan, Pipes and hose, evaporator, capillary tube, condenser. These materials were locally obtained while nano materials were ordered from dealers from Lagos. The main compartment-cabinet contains other divisions with firmness and ergonomics in mind.

2.1. Design Concept

The design concept behind the VCRS is that the refrigeration processing system comprises of refrigerator cabinet chamber, compressor, condenser, evaporator, capillary tube and the refrigerant piping. The system works in two manifold ways, high and low pressures, the function stage are determined via freezing supplies rate. Assumptions made are as follows:

i. Stable-state flow process in individual parts

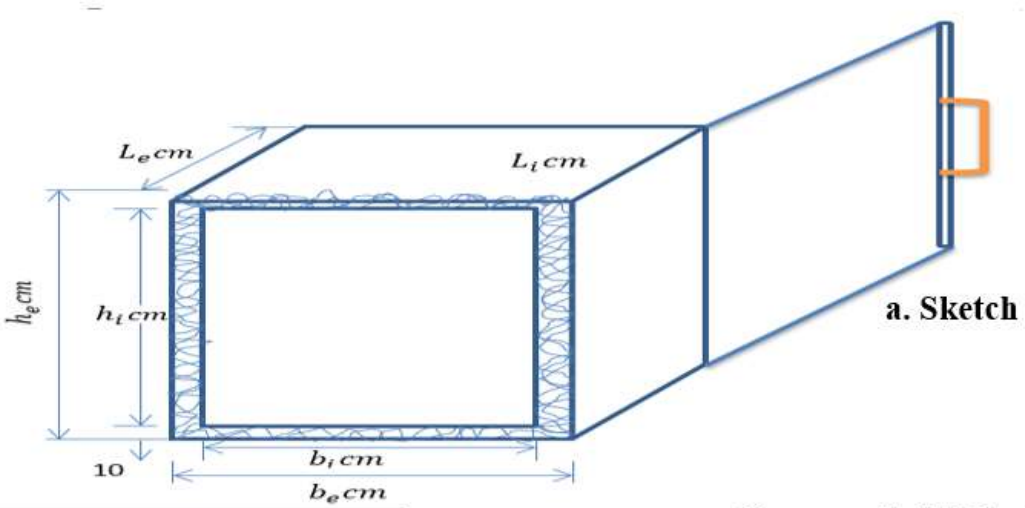
ii. The mass flow rate varied from each experimental run

iii. The working fluid has varied percentage composition throughout the cycle

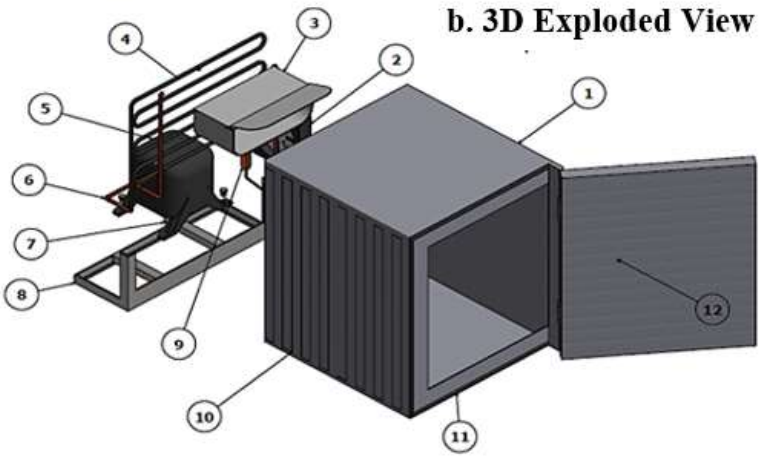
iv. Zero pressure and negligible heat losses

2.2. Surface Area and Volume of the Refrigerator Cabinet

Based on the kind of load that will be supply, a rectangular cross section frame with 552 mm width was selected to avoid underestimation. The framework and 3D exploded view of the refrigerator chamber cabinet is shown in Figure 1



Part List	
Part No	Component
1	Chamber
2	Frame
3	Evaporator
4	Refrigerant Condenser
5	Compressor
6	Expansion Valve
7	Fan
8	Compressor base
9	Tubing
10	Side bottom
11	Opening
12	Door



Where W = width of the frame = 552 mm, H= body height = 615 mm, L = length = 605 mm

Figure 1. Configuration of the refrigerator chamber cabinet frame

The volume capacity of the refrigerator cabinet chamber (V_{RCC}) is given by Equation 1 (Akintunde 2015).

$$V_{RCC} = \text{length} \times \text{width} \times \text{height. (L x B x H)} \quad (1)$$

Surface area of the refrigerator body is divided into external surface area of the refrigerator metal part (S_{pe}) expressed in Equation 2 and internal surface area of the refrigerator metal part (S_{pi}) expressed in Equation 3.

$$S_{pe} = [2(b_e l_e)] + [2(h_e l_e)] + [2(h_e b_e)] \quad (2)$$

$$S_{pi} = [2(b_i l_i)] + [2(h_i l_i)] + [2(h_i b_i)] \quad (3)$$

The volume of the internal cooling compartment (V_{icc}) according to Equation 1 is given as:

$$V_{icc} = \text{height} \times \text{width} \times \text{length} = (575\ \text{mm} \times 512\ \text{mm} \times 565\ \text{mm}) = 1652\ \text{mm}^3. \quad (4)$$

Total surface area of the refrigerator metal part is given by Equation 5.

$$S_T = S_{pe} + S_{pi} + V_{icc} \quad (5)$$

2.3. Heat Transmission from the Materials

The heat transmission process is given by (Akintunde 2015) Equation 6:

$$q_T = \left[\frac{A(T_0 - T_1)}{\frac{1}{h_o} + \frac{x_{gs}}{K_{gs}} + \frac{x_{cb}}{K_{cb}} + \frac{x_{al}}{K_{al}} + \frac{x_{ps}}{K_{ps}} + \frac{1}{h_i}}\right] \quad (6)$$

From the exterior area, heat generated from the materials is given by Equation 7:

$$\dot{Q} = \frac{\Delta T}{q_T} \quad (7)$$

2.4. Determination of the System Product Load

From the evaporator jug, mass of H_2O = (Density of water × Volume of water). In this case, mass of the fluid is given by Equation 8.

$$m_{fluid} = \rho\ x\ \frac{\pi}{4} x D^2 x h \quad (8)$$

Where, ρ_{H_2O}- (1000); D – Diameter of jug = 150 mm; 0.15 m; h_{H_2O} – in the jug = 15 mm = 0.015 m. The heat liberated from the system is given by Equation 9.

$$Q_{lib} = M_{H_2O} C_{pH_2O} (\Delta T) \quad (9)$$

Heat liberated per second; $H_{L/S} = \frac{Q_{lib}}{time\ taken\ for\ temperature\ drop}$ (10)

Experimental time determined to cool the water in 15 minutes = 15*60*60 = 54000 Sec

$$H_{L/S} = P_w = \frac{\dot{Q}_{req}}{t} \quad (11)$$

Safety factor of 10% was added to the overall refrigeration calculated capacity (load). [10% of (1.392 kW) = 0.1392 kW].

2.5. Design of Compressor and Choice

Compressor rate = mass flow rate multiplied by work done by compressor:

= 0.5352 * 5800 = 3104.16 W. But 746 Watts = 1 horse power.

Therefore,

$3104.16\ \text{W} = \frac{3104.16}{746} = 4.16\ horse\ power$

The compressor work input per kg required was determined using Equation 12, compressor work consumed using Equation 13, work input to compressor using Equation 14, the power consumed using Equation 15, heat rejected by the condenser using Equation 16, compressor pressure ratio (P_r) using Equation 17, and energy input to the compressor using Equation 18.

$$\text{W} = (h_2 - h_1) \quad (12)$$

$$\dot{W}_C = \dot{m}(h_1 - h_2) \quad (13)$$

$$W_{cs} = m_r(h_2 - h_1) \quad (14)$$

$$W_{el} = \frac{W_c}{\eta_{m*}\eta_e} \quad (15)$$

$$\dot{Q}_{Cond} = \dot{m}(h_2 - h_3) \quad (16)$$

$$P_r = \frac{P_{dis}}{P_{suc}} \quad (17)$$

power *time = p*t (18)

2.6. Design of Evaporator and Selection

Cooling Capacity Q_e is given by: $\dot{Q}_{Evap} = \dot{m}(h_1 - h_4)$ (19)

Evaporator Length: $L = \frac{\dot{Q}_{Evap}}{\pi DU\Delta T}$ (20)

The flow area of the evaporator is given by the relation: $A_{flow} = NHw$ (21)

The wetted perimeter of the evaporator is: $P = 2N(H + w)$ (22)

2.7. Design of Condenser

For the condenser design, heat rejected by the condenser was determined using Equation 23, condenser load using Equation 24, for the air-cooled condenser, the quantity of heat given out is was determined using Equation 25.

$$\dot{Q}_{Cond} = \dot{m}(h_2 - h_3) \quad (23)$$

Q_{lc} = Cooling capacity + effort done by the compressor, $Q_{lc} = R_E + W$ (24)

$$\dot{Q} = AU\Delta T_{1m} \quad (25)$$

But $T_{1m} = \frac{\Delta T_1 - \Delta T_2}{ln(\Delta T_1/\Delta T_2)}$ (26)

2.8. Capillary Tube ($\dot{m}h_3 = \dot{m}h_4$)

Refrigeration effect on the capillary tube was determined using Equation 27, mass flow rate using Equation 28, refrigerating capacity using Equation 29 and the coefficient of performance using Equation 30.

$$\text{RE} = h_1 - h_4 \quad (27)$$

$$\dot{m} = \text{QE} = \dot{m} * \text{RE} \quad (28)$$

$$Q_r = (\dot{m}) * \text{RE} \quad (29)$$

$$\text{COP} = \frac{\text{RE}}{W} = \frac{h_1 - h_4}{h_2 - h_1} \quad (30)$$

2.9. Experimental Setup

The materials selected for the experimental setup are presented in Table 1.

Table 1. Materials for Construction

S/N	Materials	Parts
1	Ankle bar (iron bar 3 cm)	Main frame for compressor
2	Galvanized steel	Capillary tube mixture
3	cork board material	Compressor
4	Polystyrene	Inlet and discharge hose
5	aluminum plate	Evaporator
6	Drilling machine	Condenser
7	Paint and rubber seal	Pad lock and key
8	Mild steel casing	Electric switch
9	Fan	Grill chamber door handle
10	Electrode	Pipes and hose
11	Connecting wires	

The metal sheets, angle iron bars were marked out based on the required dimensions and cut using hacksaw. Some materials were welded together. Holes were bored to accommodate bolts and nuts for fastening process. Holes and uneven surfaces were covered with filler material. Finally, the system was painted. Experiment was conducted using hybrid Nano fluids-zeotropic mixtures of (HFC-R407C) as a leading refrigerant replacement and results obtain recorded. A calibrated temperature sensors (thermometer) used for temperature reading of the choice product. The flow degree of the mixtures and the energy intake of compressor were evaluated. To vary the heat of the mixtures, a product of definite size and shape (water) was placed inside the evaporator chamber so as to determine the cooling temperature as well as the heat of the refrigerant.

The analysis was done via first and second law of thermodynamics in connection with mass and energy stabilities in all parts. The model is carry out in Minitab 18 from Microsoft Excel ™ through energy, exergy and blending equations of state. Figure 2a-b shows the pictorial view of VCR test rig developed with 25 liter capacity cooling space. The test rig used for this experimental study was modelled to work with R407C blended hybrid mixtures of nanoparticles, consisting of a fan cooled hermitically sealed

rotary compressor. Eleven different samples ratios of mass fraction mixtures were introduced ranging from 3.0 g to 15.0 g. Paramount, the device was flushed with ammonia gas and further reins with the next excess sample prepared mixture to eliminate remnant of the previous mixtures impurities with some particles in the device that can additionally disturb the whole model. Hence, model is turned on, upon injecting the proper sample working fluid through charging line; hence compressor and condenser inlet and outlet temperature and pressure were taking at steady state after 15 min interval by the introduction of the product.

A digital electronic weighing device of 1gram division was engaged to determine the mass of mixtures charged in each investigation. Tests were performed after each sample survey with a view to determine: COP, energy intake, amongst others at ambient temperature fall of the product to its cooling time.

a. b.

Figure 2. Set-up of the vapour compression refrigeration test rig

3. RESULTS AND DISCUSSION

3.1. Data Presentation

Table 2 shows calculated and measured parametric results for the system under study.

Table 2. Calculated and measured parameters

Nanoparticles mix ratios (g)	Measured Values			Calculated Values						
	Mean cooling Time (s)	Mean temp (°C)	Mean Mass (g)	RE (kJ/kg)	Q_{evap} (kJ/kg)	Q_{cond} (kJ/kg)	W_c (kJ/kg)	COP	VCC (kJ/m^3)	P_r (kN/m^2)
(001)	19.5	11	223	3.1	1.659	68.83	2.048	0.53	12.75	0.77
(010)	18	10	221.5	2.3	1.658	94.23	1.132	0.45	345.5	0.83
(100)	12.5	12.5	229.1	3.5	1.65	62.62	1.229	0.69	21.80	0.75
(011)	14	14	211.5	12.1	1.658	18.88	0.888	3.10	56.98	0.35
(111)	18	18	222	3.5	1.65	60.86	0.648	1.21	16.49	0.75
(211)	20	21	223.5	2.3	1.658	108.7	1.040	0.50	12.89	0.83
(121)	17	17	204.2	1.2	1.65	187.9	0.806	0.31	5.61	0.90
(112)	15.5	15.5	209.6	5.5	1.66	14.71	1.006	1.41	22.12	0.63
(221)	15.5	15.5	207.8	4.7	1.65	52.03	1.488	0.83	22.15	0.67
(212)	14.5	14.5	207.7	7.6	1.65	32.79	1.497	0.59	44.8	0.53
(122)	14	14	192.5	3.5	1.65	69.58	0.881	0.71	16.49	0.79

3.2. Mass Flow Rate

Figure 3 shows the mass flow rate versus evaporator temperature operating with eleven different concentration fractions ranging from 3.0 to 15g mixtures. Conversely, effective and optimum performance was obtain during operation with (100) 15g- CuO, zero gram of Al_2O_3/TiO_2 refrigerant charge of 0.236 kg and 0.226 kg greater than with (121) % fraction and (112) sampler in turn. The cooling outcome (R.E) was boosted owing to rise in mass composition conforming to those obtained by Ghorbani *et al.* (2017), and Oyedepo *et al.* (2017).

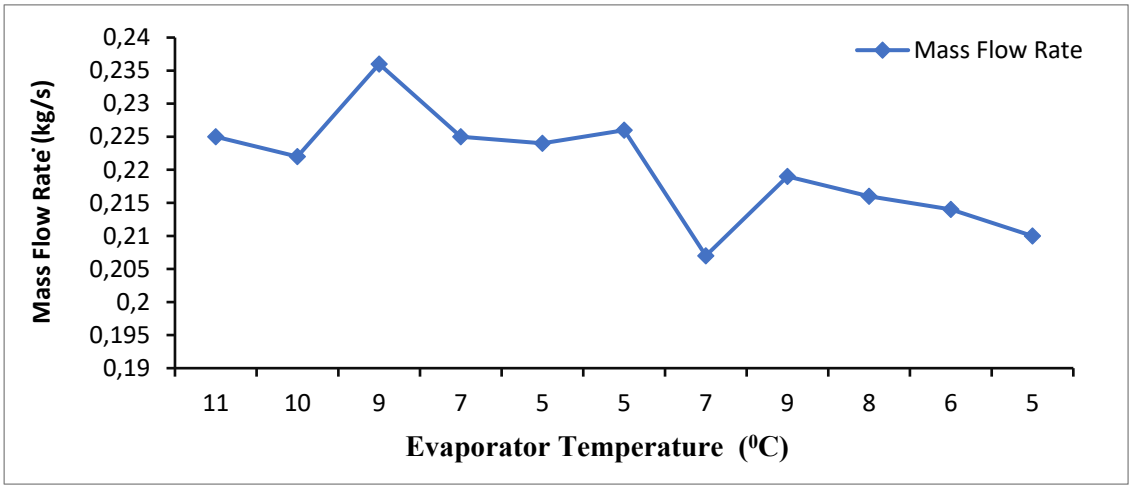


Figure 3. Plot of mass flow rate vs evaporator temperature

3.3. Compressor Power Consumption (kW)

It is observed from Figure 4 that hybridization of nanofluid-zeotropic mixtures of TiO_2, Al_2O_3 and CuO with a less volume fraction and evaporation temperature has the firmness of lowering power consumptions in a refrigeration system from 2.199 kW to 0.696 kW when compared with pure refrigerant (LPG) which gave the highest consumption power of 73.20 kW as recorded in the literature. However, in the work conducted by Bolaji et al. (2011), using already phased out conventional R134a refrigerant with TiO_2/SiO_2 lubricant, the power consumption rate was higher to about 23.5 kW compared to this work which bring decline in power ingestion as obtained from the study conducted by Subramani and Prakash (2011) and Jwo et al. (2009).

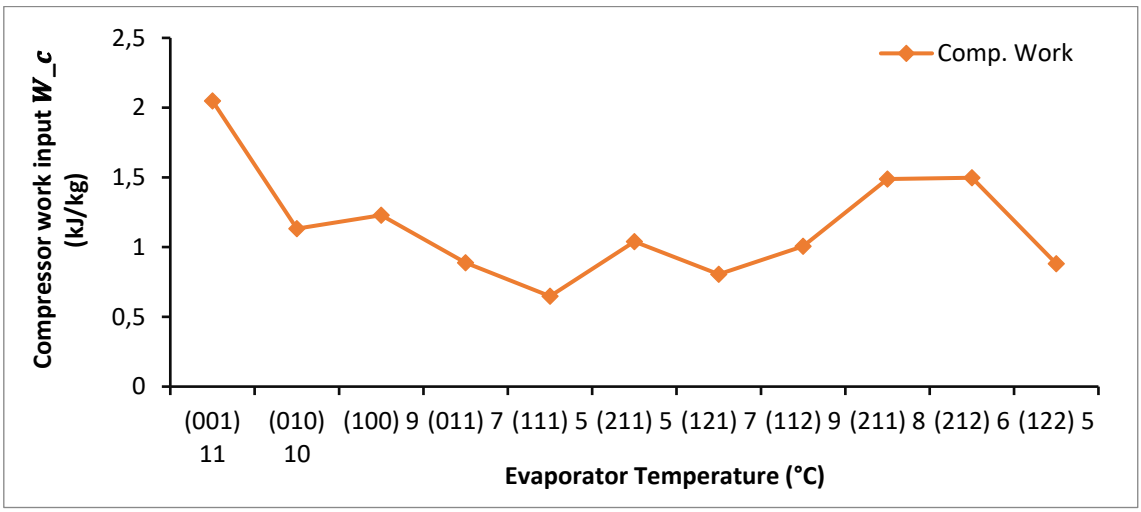


Figure 4. Plot of compressor power consumption versus evaporator temperature

3.4. Refrigerating Effect (Re)

Figure 5 revealed that the cooling outcome of the device rises while the evaporating temperature decreases from (001) 15g-TiO_2, zero gram-Al_2O_3/CuO with 3.1 to 1.2 kJ/kg having an optimum operating system of 12.1kJ/kg under volume fraction of (011) with zero gram of -TiO_2 and 15g of -Al_2O_3/ CuO. In view of the above, the cooling outcome of the model rises after the evaporating temperature rises. Bolaji *et al.* (2011) examined refrigeration effect of a similar model and obtain result of refrigerating effect that agreed with this current study. Also, Mohanraj *et al.* (2009) had exactly similar refrigeration output and power coefficient that agrees with this study.

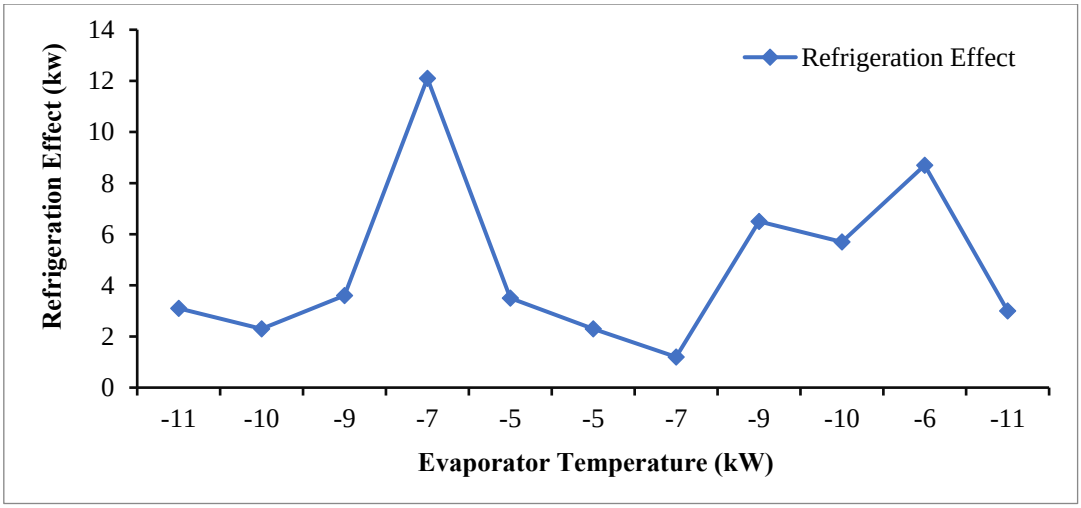


Figure 5. Plot of refrigerating effect versus evaporator temperature.

3.5. The Volumetric Cooling Capacity

Figure 6 above illustrate the distinction between VCC and evaporator temperature aimed different volume fraction refrigerants. Upward and downward trend displayed shows that VCC raises per decrease in evaporator temperature owing to rise in refrigerating outcome then decline in definite size. Result obtain shows three optimum volume fraction at (011) zero gram-TiO_2, 7.5g-Al_2O_3/CuO having 68.03 (kJ/m^3), follows by (121) 3.75g-TiO_2/CuO, 7.5g-Al_2O_3 with 67.03 (kJ/m^3) and (212) 6.0g-TiO_2/CuO, 3.0g- Al_2O_3 having 48.84 (kJ/m^3). Other possible combination to be considered follows by (112) 3.75g-TiO_2/ Al_2O_3, 7.5g- /CuO, (221) 6.0g-TiO_2/ Al_2O_3, 3.0g-CuO with 37.03 and 32.01 (kJ/m^3) respectively. To acknowledge that nanofluid-zeotropic mixture has a good performance characteristic as a possible future (ozone-friendly) refrigerant alternative in VCRS, this work is compared with the study conducted by Bukola and Bolaji (2015) and Jung *et al.* (2020).

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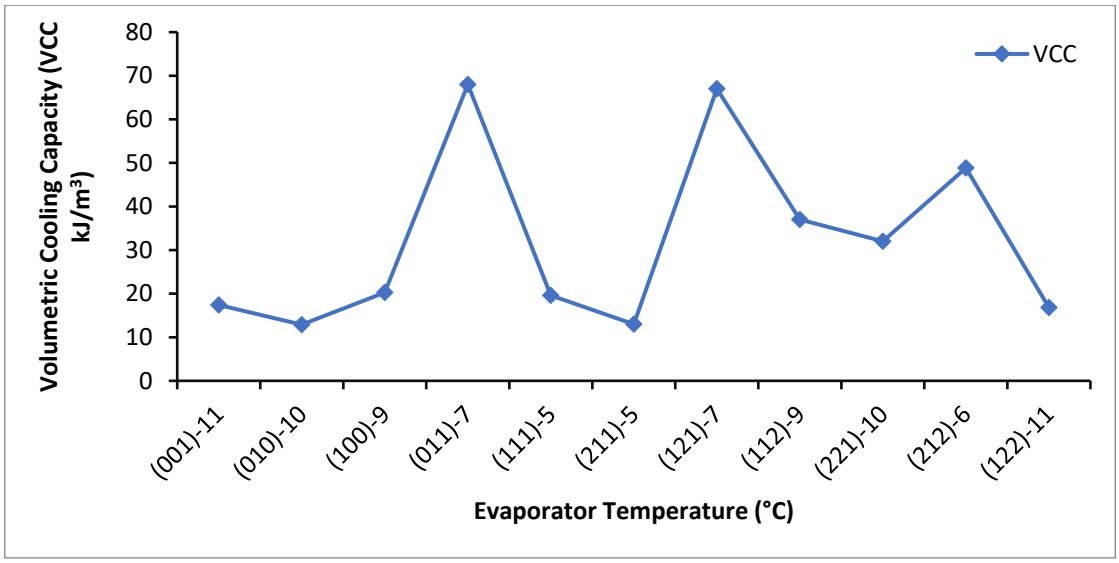

Figure 6. Plot of (VCC) versus evaporator temperature

3.6. Coefficient of Performance

Figure 7 graphically shows the relationship between COP and evaporator temperature. Both plot displays that COP rises such as the evaporation temperature rises with the condensation temperature ranging from 11 to 16 ^{0}C and the evaporation temperature ranging from -11 to -5 ^{0}C, having the optimum performance efficiency of 3.1 % at particles combination of (011) 0g-TiO_2, 7.5g-Al_2O_3/CuO. This implies that volume fraction of (011) is a new desirable refrigerant mixture alternative. This follows by (211) with 0.83 %, (112) with 0.71 % and (100) with 0.69 % as recorded in Table 2. Improved COP of 2.06% stood verified from the study conducted by Flores *et al.* (2020); König-Haagen *et al.* (2019); and Dossat and Horan (2001).

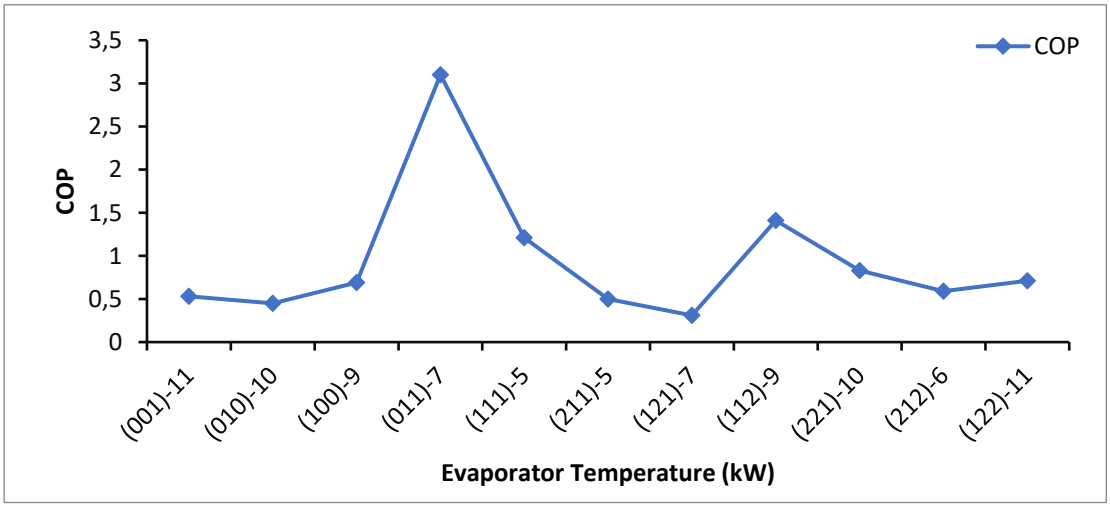

Figure 7. Plot of COP versus evaporator temperature and volume fraction

4.7. Exergy Destruction Ratio (EDR) in the System Components

Figure 8 shows a plot of exergetic system performance work input against evaporator temperature. The results obtained from the experimental data gotten from this test rig agreed with other researchers findings such as (Oyedepo *et al.* (2017); König-Haagen *et al.* (2019); Adelekan *et al.*, (2017) and many others, that to specify the exergy losses or destructions in a compression system, exergy analysis is necessary. Figure 8 further shows the theoretical exergy damage (losses) in the four unit's devices. It is shows that the highest exergy destruction value is obtain in the condenser having 68.46 kW at volume fraction of (001), with 7.5g-TiO_2, zero gram-Al_2O_3/CuO, follows by (211), 7.5g-TiO_2, 3.75g-Al_2O_3/CuO with 51.67 kW and (112), (011) and (100) with 48.85, 48.48 and 47.96 kW respectively. The second

highest exergetic losses is seen in expansion valve at (211) and (011) with 45.31 and 44.72 kW, followed by compressor at (011) with 41.99 kW then evaporator at (011) with -9.37 Kw respectively.

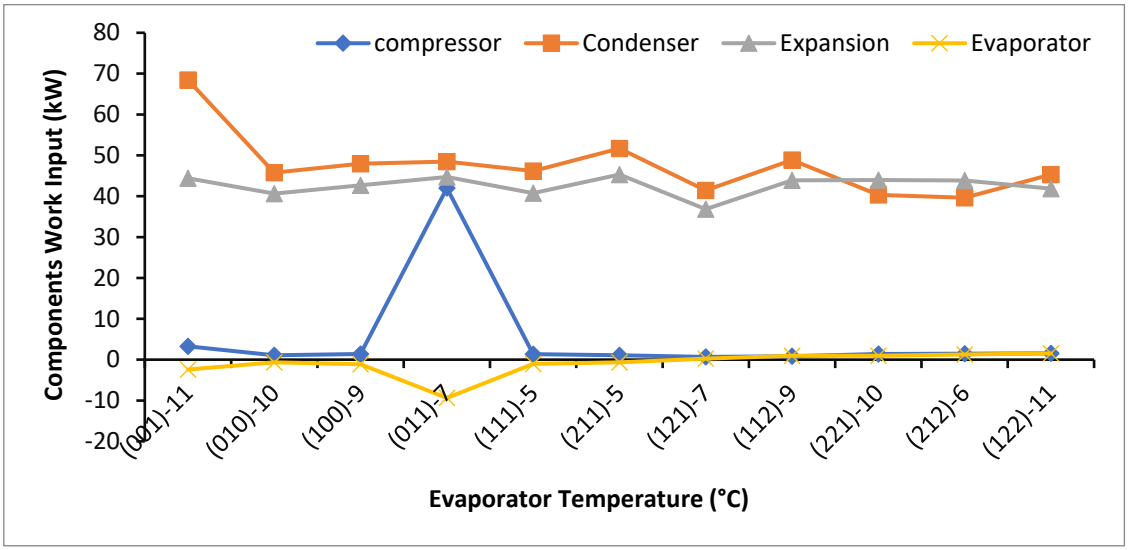

Figure 8. Variation of individual system components versus evaporator temperature

4. CONCLUSION

The assembly plan and development of VCRS went through fruitfully. Convincingly this study shows that refrigeration unit can be couple together using locally made materials and supply it to the general market at an affordable price, better than those imported. Worthy of note is that arising practical issues could be handled by the background of literature obtain in the areas relevant to the problem. Moreover, with unfailing determination, better achievement can be accomplished within the developmental (industrial) progression in the country. Results obtained were compared with findings gathered from other researchers. The optimization enhancement obtained with the cooling system when using the hybrid nanofluid-zeotropic mixtures shows a brilliant warmth transmission boost in heat transmission and decrease of energy intake in the system. The rejections of heat via condenser channel plus compressor work done were obtained to be: 30.74 kJ/kg and 2.05 kJ/kg. It further revealed that (011) zero gram-TiO_2, 7.5 g-Al_2O_3/CuO and (112) 3.75 g-TiO_2/Al_2O_3, 7.5 g-/CuO concentration mixtures enhances the demonstration of the cooling process with better efficiency and the maximum COP in entirely process look at. Hence, the maximum power coefficient, cooling capacity, and COP increased by 13.51%, 5.78%, and 10.33% respectively.

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THE PROPERTIES AND APPLICATIONS OF NANODIAMONDS

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ABSTRACT

Diamond fragments smaller than 1 micron are known as Nanodiamonds. Additionally, they are non-toxic, making them ideal for biological applications. These characteristics make them perfect for a variety of uses in industries including electronics, biology, and energy. Detonation, laser ablation, high-energy ball milling of high-pressure, high-temperature (HPHT) diamond microcrystals, plasma-assisted chemical vapor deposition (CVD), autoclave synthesis from supercritical fluids, chlorination of carbides, and ion irradiation of graphite have all been used to create them. Nanodiamonds are employed in biomedicine as imaging probes and medication delivery systems. Diamond is an exceptional substance in many ways, and Nanodiamond inherits and offers the majority of its superlative qualities at the nanoscale. The majority of study on bright photoluminescent Nano diamonds has been on materials produced via high-pressure, high-temperature synthesis. Due to the fact that a variety of tiny molecules, proteins, antibodies, medicines, and nucleic acids may adhere to the surface of Nanodiamonds, they have been employed as additives for electrolytic and electroless metal plating. This section covers fluorescence and biocompatibility, and the section on applications covers the other relevant characteristics of Nanodiamonds.

Keywords: Nanodiamonds, photoluminescent, chemical vapor deposition, HPHT,

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A SHORT REVIEW OF THE APPLICATION OF PLATINUM NANOPARTICLES

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ABSTRACT

Platinum nanoparticle Compared to the previously mentioned nanosystems, the use of platinum nanoparticles (PtNPs) in bacterial infections for wound applications is far less common. However, due to its intriguing inherent qualities, it is beginning to draw more and more attention. Pt has a strong potential for clinical uses because it is a valuable metal that is unlikely to induce allergies and does not exhibit genotoxicity. The use of PtNPs in applications for wound healing has, however, only sometimes been evaluated, despite the fact that the growth inhibition of Escherichia coli by Pt2 + has been recognized since the 1960s. The bactericidal effect of PtNPs is assumed to be mediated via chemical interactions, in which free radicals, formed from the antioxidant reaction of PtNPs, break the cell membrane of the bacterium, leading to the outflow of the cytoplasm and invasion of NPs into the cell. This is owing to the functional potential of PtNPs to degrade proteins and their significant efficiency against lipopolysaccharides (LPS), which are elements of the cell wall of Gram-negative bacteria. Therefore, PtNPs have a higher antibacterial effect against Gram-negative bacteria, while they have also been found to demonstrate antibacterial action against Gram-positive pathogens.

Keywords: Platinum nanoparticles, Pt NPS, Nanoparticles, Escherichia coli, genotoxicity

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SYNTHESIS AND EVALUATION OF SILVER NANOPARTICLES FROM ETHANOLIC LEAF EXTRACT OF *TRIDAX PROCUMBENS*.L

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ABSTRACT

In recent science Nanotechnology is a burning field for the researchers. Nanotechnology deals with the Nanoparticles having a size of 1-100 nm in one dimension used significantly concerning medical chemistry, atomic physics, and all other known fields. Silver nanoparticles were synthesized using aqueous extract of *Tridax procumbens* leaves, and silver nitrate. XRD, SEM, FTIR, Optical absorption were measured and analyzed. The synthesized AgNps exhibits lowest energy absorption band at 400 nm. Synthesis of Nanoparticles may involve various routes including physical, chemical and biological approaches. Traditionally these are manufactured by wet chemical methods which require toxic and flammable chemicals. Nanoparticles thus formed are confirmed and characterized by using UV-Visible Spectroscopy, SEM, FTIR, Zeta Analysis, XRD measurements.

Further, these green synthesized Nanoparticles showed bactericidal activity against multidrug-resistant human pathogenic bacteria. The AgNps formed were found to have enhanced antimicrobial properties and showed zone of inhibition against isolated bacteria (Escherichia coli) from garden soil sample. In totality, the AgNps prepared are safe to be discharged in the environment and possibly utilized in process of pollution remediation. AgNps may also be efficiently utilized in agricultural research to obtain better health of crop plants as shown by our study.

Keywords: Silver nanoparticles; FTIR; SEM; Antimicrobial Activity ; Tridax procumbens.

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THE INFLUENCE OF THE APPLICATION OF MUHAMMAD ALI PASHA'S THOUGHT IN IDONESIA

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ABSTRACT

Muhammad Ali Pasha is a person of Turkish descent and a prominent figure Islamic reformers in Egypt. Muhammad Ali Pasha made efforts in the field education, economy, and military. He founded the Ministry of Education, repairing old irrigation and making new irrigation, and in the Military field of Muhammad Ali Pasha founded a Military school in Cairo. The birth of the modern Egyptian state cannot be separated from Muhammad Ali Pasha. He is known as the torchbearer of enlightenment for doing modernization in almost all sectors of life. Muhammad Ali Pasha also had an influence major in making Egypt a modern country and advancing education in the University al-Azhar. The purpose of this study is to determine the application and influence of thinking Muhammad Ali Pasha in Indonesia. This research uses descriptive qualitative method. Results This research shows the application of Muhammad Ali Pasha's thought if applied in Indonesia raise pros and cons. In the idea of modernization get a good response if implemented in Indonesia, in the field of education Ali Pasha founded several vocational schools and formal which of course has been implemented in Indonesia but still in moral education not enough. In economic terms, if implemented in Indonesia, it will have a good impact related to irrigation and greening where Indonesia is a maritime country so it is suitable for doing things. In the military it can be applied to strengthen the Indonesian state as well as advance it countries to be like developed countries in Europe.

Keywords: Muhammad Ali Pasha, Thought, Influence, Indonesia

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ÖĞRETMENLERDEKİ SİBER İNSANİ DEĞERLERİN FARKLI DEĞİŞKENLERE GÖRE İNCELENMESİ

EXAMINATION OF CYBER HUMAN VALUES IN TEACHERS ACCORDING TO DIFFERENT VARIABLES

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ÖZET

Küreselleşen dünyada iletişim teknolojisindeki yeniliklerin günlük hayatımıza hızla girmesi içinde bulunulan çağa iletişim çağı adı verilmesine neden olmuştur. Bu çağdaki teknolojik gelişmeler ile iletişim yüz yüzden ziyade sanal ortamlara taşınmıştır denilebilir. Siber terimi de bilişim araçları ile kurulan iletişimde yeri olan bir kavramdır. Sanal ortamlarda kurulan bu iletişimde bireylerin sosyal hayatlarında önem verdikleri değerlere ne ölçüde dikkat ettikleri önem arz etmektedir. Bu bağlamda araştırma genelde sanal ortam özelde ise sosyal medya kullanıcılarına ait siber davranışların saygı, doğruluk ve dürüstlük, hoşgörü, barışçıl olma ve dayanışma olmak üzere siber insani değerler olarak tanımlanan değerler açısından incelenmesine odaklanmaktadır. Bu çalışmanın amacı, öğretmenlerin siber insani değer düzeylerinin cinsiyet, medeni durum, kıdem, branş ve sosyal medya kullanım süresi tutumlarına göre incelenmesidir. Araştırmanın çalışma grubunu, 2020-2021 eğitim öğretim yılının sonbahar döneminde Millî Eğitim Bakanlığında görevine devam etmekte olan ilkokul, ortaokul ve lise öğretmenleri oluşturmuştur. Çalışmaya 155 kadın öğretmen ve 99 erkek öğretmen olmak üzere toplam 254öğretmen katılmıştır. Araştırmada, öğretmenlerin siber insani değer düzeylerini belirlemek amacıyla Kılıçer, Çoklar, A.N., Özeke, V. (2017) tarafından yapılmış "Siber İnsani Değeler Ölçeği" adı verilen ölçekten faydalanılmıştır. Ayrıca, araştırmadaki bağımsız değişkenlere yönelik olarak araştırmacı tarafından hazırlanan "Kişisel Bilgi Formu" kullanılmıştır. Çalışmada, betimsel araştırma yöntemi (alan araştırması) kullanılmış olup verilerin analizinde betimsel ve ileri istatistik teknikleri kullanılmıştır. Elde edilen verilerin ortalama ve standart sapmaları hesaplanmıştır. Veri türüne göre cinsiyet gibi ikili gruplarda Mann Whitney U testi, kıdem gibi ikiden fazla gruplarda Kruskal Wallis H testi kullanılmıştır. Araştırmanın bulgularına bakıldığında erkek öğretmenlerin kadın öğretmenlere göre saygı değerine daha çok önem verdikleri görülmüştür. Öğretmenlerin kıdemleri açısından ise siber insani değer düzeyinin "11-15" kıdem yıllarında yükseldiği görülmektedir. Öğretmenlerin branşlarına göre siber

insani değerlerinde bir farklılık bulunmamışken sosyal medya kullanımı açısından 4 saat ve üzeri sosyal medya kullananların siber insani değerlerden saygı ve barışçıl olma değer düzeylerinin daha yüksek olduğu tespit edilmiştir.

Anahtar kelimeler: Siber, Değer, Öğretmen.

ABSTRACT

In the globalizing world, the rapid introduction of innovations in communication technology into our daily lives has caused the current era to be called the age of communication. With the technological developments in this age, it can be said that communication has moved to virtual environments rather than face-to-face. The term cyber is a concept that has a place in communication with information tools. In this communication established in virtual environments, it is important to what extent individuals pay attention to the values they attach importance to in their social lives. In this context, the research focuses on the examination of cyber behaviors of virtual environments in general and of social media users in particular in terms of values defined as cyber human values such as respect, honesty and honesty, tolerance, being peaceful and solidarity. The purpose of this study is to examine the cyber human value levels of teachers according to their attitudes of gender, marital status, seniority, branch and duration of use of social media. The study group of the research consisted of primary, secondary and high school teachers working in the Ministry of National Education in the fall semester of the 2020-2021 academic year. A total of 254 teachers, 155 female teachers and 99 male teachers, participated in the study. In the research, the scale called “Cyber Human Values Scale” made by Kılıçer, K.Çoklar, A.N., Özeke, V. (2017) was used to determine the cyber-human value levels of teachers. In addition, "Personal Information Form" prepared by the researcher for the independent variables in the research was used. In the study, descriptive research method (field research) was used and descriptive and advanced statistical techniques were used in the analysis of the data. The mean and standard deviations of the obtained data were calculated. According to the data type, Mann Whitney U test was used in binary groups such as gender, and Kruskal Wallis H test was used in groups of more than two such as seniority. Considering the findings of the study, it was seen that male teachers gave more importance to the value of respect than female teachers. In terms of seniority of teachers, it is seen that the level of cyber human value rises in the years of “11-15” seniority. While there was no difference in the cyber humanitarian values of the teachers according to their branches, it was determined that those who use social media for 4 hours or more in terms of social media use have higher levels of respect and peace from cyber humanitarian values.

Keywords: Cyber, Value, Teacher.

1. GİRİŞ

1.1. Problem Durumu

Siber bir terim olarak sibernetik kökenine dayanmaktadır. Sibernetik ise makineler ya da canlıların kurmuş olduğu iletişim disiplinini inceleyen bir bilim dalının adıdır (Wikizero, 2019). Siber terimi ise günümüzde bilgisayar ile bilgisayarların birbirine bağlanmasını sağlayan ağlarla alakalı olan temel kavramları adlandırmak amacıyla kullanılmaktadır (Yaşar, 2014). Günümüz çağının bilişim çağı olduğu kabul edildiğinde siber güvenlik de ön plana çıkmaktadır.

Sosyal bilimin geniş alanındaki temel sorunlardan bir tanesini de son birkaç yüzyıla bakıldığında değerlerin oluşturduğu görülmektedir. Psikologlar, sosyologlar ve benzeri araştırma yapan bilim insanları bu alana eğilim göstermişlerdir. Değerlerin toplumsal alandaki önemi, yapısı, diğer disiplinlerle olan ilişkisi nispeten belirlenmiş olsa da değerlerin içeriğinin ne olduğunu tam olarak söylemek günümüzde de zor bir durumdur (Bacanlı,1999; Bacanlı, 2002; Mehmetoğlu, 2006).

Günümüzde dijital dünya toplumsal yaşamımızda yadsınamaz bir yerde bulunmaktadır. Bu durum değerleri de sadece sosyal yaşamda dikkat etmemiz gereken bir boyuttan alarak evrensel değerler bazında değerlendirmemizi gerekli kılmaktadır. Çünkü günümüzde beğeni, eleştiri ya da boykot gibi

tutum ve davranışlar daha ziyade bilgisayar başında gerçekleştirilir olmuştur. özellikle bu hareketler kitleleri hızlı bir şekilde harekete geçirir durumdadır.

Özellikle sanal ortamlardaki "Kimliğim nasıl olsa bilinmiyor" veya “Nasıl olsa başka biri gibiyim” benzeri fikirlere sahip kişilerin bu ve benzeri ortamlarda yanlış ve olumsuz davranışlar göstermesine sebep olmaktadır (Rösner, Winter and Krämer, 2016). Bu durumların yanı sıra doğru bilgi vermeme, siber şiddet ya da nefret suçu işlemek gibi olumsuz davranışların rahatlıkla sergilenmesine sebep olmaktadır. Bilginin doğruluğundan emin olmadan paylaşılması ve hızla yayılıyor olması da başka bir olumsuzluğu ortaya çıkarmaktadır (Çevik, 2013). Siber zorbalık ise günümüzde sıkça karşılaştığımız bireysel ya da kurumsal saldırıların bilgisayar ortamında yapılan haline verilen isimdir (Karabağ, 2012). Bu gibi sıkıntıların önüne geçmek ve ilerlemesinin engellenmesini sağlamak adına ise bütün insanlık adına bir farkındalık oluşturulacak bir değer sistemi önem arz etmektedir (Kılıçer, 2013). Bu açıdan bu araştırma genel anlamda sanal ortamda özel anlamdaysa sosyal medya kullanan bireylerin siber davranış ve tutumlarının “saygı, doğruluk ve dürüstlük, hoşgörü, barışçıl olma ve dayanışma”dan oluşan siber insani değerlerinin incelenmesine odaklanmaktadır. Sosyal yapının bir parçası olan öğretmenler de dünya üzerindeki teknolojik gelişmelerden, dünyanın küreselleşmesinden ve benzeri birçok sebepten ötürü birbirlerinden farklı özelliklere sahiptirler. Değişimin bir parçasının da değerler olduğu alanyazın incelendiğinde görülmüştür. Bu bağlamda araştırmada öğretmenlerin siber insani değerlerine ilişkin eğilim düzeylerinin bütüncül olarak belirlenmesi ve farklılık var ise bunun ortaya koyulması açısından araştırma ehemmiyet arz etmektedir. Ayrıca siber insani değerlerin öğretmenler arasındaki farklılaşma durumunu bu araştırmadan önce inceleyen bir başka araştırmanın da olmaması araştırmanın önemli bir diğer yanıdır. Sonuç olarak bakıldığında bu araştırmada siber insani değerlerinin öğretmenlere göre farklılaşıp farklılaşmayacağı belirlenmek istenmektedir. Bu bağlamdan bakılarak oluşturulan araştırmanın problem cümlesi ile alt problemleri aşağıdaki şekilde belirlenmiştir:

“Problem cümlesi

Öğretmenlerin sahip olduğu siber insani değer düzeyleri nedir?”

Alt problemler

- Öğretmenlerin sahip olduğu siber insani değerler düzeyleri cinsiyetlerine göre anlamlı bir farklılık göstermekte midir?
- Öğretmenlerin sahip olduğu siber insani değerler düzeyleri medeni durumlarına göre anlamlı bir farklılık göstermekte midir?
- Öğretmenlerin sahip olduğu siber insani değerler düzeyleri kıdemlerine göre anlamlı bir farklılık göstermekte midir?
- Öğretmenlerin sahip olduğu siber insani değerler düzeyleri branşlarına göre anlamlı bir farklılık göstermekte midir?
- Öğretmenlerin sahip olduğu siber insani değerler düzeyleri sosyal medya kullanım sürelerine göre anlamlı bir farklılık göstermekte midir?”

1.2. Araştırmanın amacı ve önemi

Araştırmada, öğretmenlerin siber insani değerler düzeylerinin medeni durum, cinsiyet, branş, kıdem ve sosyal medya kullanım süreleri değişkenlerine göre incelenmesi amaçlanmıştır.

Geleceğe yön veren öğretmenlik mesleğini icra edenlerde birçok değerin bir arada bulunması gerekmektedir. Çünkü bu değerler öğretmenlerin öğrencilere yaklaşımlarında ve eğitim yaşantılarında önemli bir yer tutmaktadır. Saygı, doğruluk, hoşgörü, dayanışma ve barışçıl olma da bu değerlerin en önemlilerindendir. Bu değerler sahip olan ve onu öğrencilerine de yansıtan bir öğretmenin sınıf ortamı da olumlu şekilde etkilenecektir. Küreselleşen dünya ile sosyal mecra hayatımızın her yerinde yer bulmaktadır, öğretmelerin sosyal mecrada bu değerlere ne derece önem verdikleri de kendi davranış ve tutumlarının ne düzeyde olduğunu gösterecektir. Böylece araştırma genel olarak sanal ortamda özel

olarak ise sosyal medya kullanan öğretmenlere ait siber davranışların doğruluk ve dürüstlük, saygı, hoşgörü, dayanışma ve barışçıl olmak üzere siber insani değerler olarak nitelenen değerler çerçevesinden araştırılmasına odaklanmaktadır.

Bütün bu durumlar göz önüne alınarak yapılan bu araştırma öğretmenlerin siber insani değerleri etkilediği düşünülen asıl değişkenleri incelemesi ve bu sebeple siber insani değerler olgusunu işleyerek ona yol açması bakımından önem arz etmektedir. Siber insani değerleri öğretmenler açısından inceleyen akademik bir çalışmaya rastlanmamıştır. Siber insani değerler üzerinde yapılan çalışmaların az olması sebebiyle, öğretmenlik mesleği açısından bu düzeyde böyle bir araştırmanın ilk defa yapılıyor olmasının alanyazına katkı sağlayacağı düşünülmektedir.

2. ARAŞTIRMA VE BULGULAR

2.1. Yöntem

Bu çalışmada Survey (betimsel) yöntemi uygulanmıştır. Bu yöntem sosyal bilimler alanlarında sıkça tercih edilen yöntemlerden birisidir. Geniş kitlelerin düşüncelerini, tutumlarını ve eğilimlerini ölçmede en iyi araçtır. Survey araştırmasında veriler toplanır, analiz ve sentezler yapılır. Aynı zamanda olayların açıklaması, yorumlanması ve değerlendirilmesi yapılır (Arslanoğlu, 2016). Çalışmanın bağımlı değişkeni siber insani değerler eğilimi, bağımsız değişkenleri ise kıdem, cinsiyet, branş, medeni durum ve sosyal medya kullanım süreleri tutumudur.

2.2. Araştırmanın evreni ve örneklemi

Araştırmanın çalışma grubunu, Millî Eğitim Bakanlığı bünyesinde çalışan araştırmacı tarafından ulaşılabilen öğretmenler oluşturmaktadır.

Tablo 1. Katılımcıların Demografik Özelliklerine Göre Dağılımları

Değişkenler	**Gruplar**	**F**	**%**
Cinsiyet	Kadın	155	61.0
	Erkek	99	39.0
Medeni Durum	Evli	173	68.1
	Bekâr	81	31.9
Kıdem	1-5 Yıl	54	21.3
	6-10 Yıl	107	42.1
	11-15 Yıl	29	11.4
	16-20 Yıl	23	9.1
	21-25 Yıl	29	11.4
	26 ve Üzeri Yıl	12	4.7
Branş	Beden Eğitimi	8	3.1
	Din Kültürü ve Ahlak Bilgisi	32	12.6
	Felsefe Grubu	2	0.8
	Fen Bilimleri	34	13.4
	Güzel Sanatlar Dersleri	7	2.8
	İmam Hatip Lisesi Meslek Dersleri	16	6.3
	Matematik	27	10.6
	Meslek Lisesi Meslek Dersleri	2	0.8
	Okul Öncesi	4	1.6
	Özel Eğitim	3	1.2
	Psikolojik Danışmanlık ve Rehberlik	16	6.3
	Sınıf Öğretmeni	26	10.2
	Sosyal Bilimler Dersleri	14	5.5
	Teknoloji Tasarım	4	1.6
	Türkçe Öğretmenleri	16	6.3
	Türk Dili ve Edebiyatı	15	5.9

	Yabancı Dil	28	11.0
Sosyal Medya Kullanımı	0-1 Saat Arası	36	14.2
	1-2 Saat Arası	91	35.8
	2-3 Saat Arası	67	26.4
	3-4 Saat Arası	32	12.6
	4 Saat ve Üzeri	28	11.0

Tablo 1 incelendiğinde araştırmaya katılanların cinsiyet durumlarının %61'ini (155 kişi) kadın, %39'unu (99 kişi) erkek katılımcılar oluşturmaktadır. Kişilerin medeni durumlarını incelendiğimizde %68.1'i (173 kişi) evli, %31,9'u (81 kişi) evli olmayan katılımcılardan oluşmaktadır. Araştırmaya dahil bireylerin kıdem durumlarını incelediğimizde araştırmacıların %21.3'ü (54 kişi) 1-5 yıl arasında çalıştığını, %42.1'i (107 kişi) 6-10 yıl arasında çalıştığını, %11.4'ünün (29 kişi) 11-15 yıl arasında çalıştığını, %9.1'i (23 kişi) 16-20 yıl arasında çalıştığını, %11.4'ünün (29 kişi) 21-25 yıl arasında çalıştığını, %4.7'sinin (12 kişi) 26 yıl ve üzeri çalıştığını belirtmiştir. Katılımcıların %3.1'i (8 kişi) beden eğitimi öğretmeni olduğunu, %12.6'sı (32 kişi) dkab öğretmeni olduğunu, %0.8'i (2 kişi) felsefe grubu öğretmeni olduğunu, %13.4'ü (34 kişi) fen bilimleri alanı öğretmeni olduğunu, %2.8'i (7 kişi) güzel sanatlar dersleri öğretmeni olduğunu, %6.3'ü (16 kişi) ihl meslek dersleri öğretmeni olduğunu, %10.6'sı (27 kişi) matematik öğretmeni olduğunu, %0.8'i (2 kişi) meslek lisesi meslek dersleri öğretmeni olduğunu, %1.6'sı (4 kişi) okul öncesi öğretmeni olduğunu, %1.2'si (3 kişi) özel eğitim öğretmeni olduğunu, %6.3'ü (16 kişi) psikolojik ve rehberlik ve danışmanlık öğretmeni olduğunu, %10.2'si (26 kişi) sınıf öğretmeni olduğunu, %5.5'i (14 kişi) sosyal bilimler alanı öğretmeni olduğunu, %1.6'sı (4 kişi) teknoloji tasarım öğretmeni olduğunu, %6.3'ü (16 kişi) Türkçe öğretmeni olduğunu, %5.9'u (15 kişi) Türk dili ve edebiyatı öğretmeni olduğunu, %11'i (28 kişi) yabancı dil öğretmeni olduğunu belirtmiştir. Araştırmaya katılan bireylerin sosyal medya kullanım durumlarını incelediğimizde katılımcıların %14.2'sinin (36 kişi) 0-1 saat arası, %35.8'inin (91 kişi) 1-2 saat arası, %26.4'ünün (67 kişi) 2-3 saat arası, %12.6'sının (32 kişi) 3-4 saat arası, %11'inin (28 kişi) 4 saat ve üzeri kullandığını belirtmiştir.

2.3. Veri toplama araçları ve veri toplama süreçleri

Çalışmada veriler toplanırken bağımsız değişkenleri belirlemek için "Kişisel Bilgi Formu" ve bağımlı değişkene yönelik olarak Kılıçer, Özeke ve Çoklar (2018)'ın geliştirdiği "Siber İnsani Değerler Ölçeği (i-değer ölçeği)" kullanılmıştır.

Siber İnsani Değerler Ölçeği (i-değer ölçeği): Kılıçer, Özeke ve Çoklar (2018) tarafından etkin olarak sosyal medya kullanıcılarının siber insani değerler düzeyini ortaya koymak amacıyla geliştirilen beş unsurlu ölçek, Likert tipi 25 maddeden oluşmaktadır. Ayrıca ölçek; hoşgörü, barışçıl olma, doğruluk-dürüstlük, dayanışma ve saygı olmak üzere beş unsurdan oluşmaktadır. Ayrıca çalışmada veri toplama aracı olarak "Siber İnsani Değerler Kişisel Bilgi Formu" kullanılmıştır. Formda katılımcıların cinsiyet, medeni durumu, kıdemi, branşı, sosyal medya ve internet kullanım süresi gibi demografik sorular bulunmaktadır.

Bu araştırmanın verileri, Türkiye'nin farklı okullarında görev yapan 254 öğretmene çevrimiçi anket uygulaması yapılması sonucunda elde edilmiştir. Çalışmada kullanılan ölçekler çevrimiçi olarak hazırlandıktan sonra WhatsApp uygulaması ile çeşitli sosyal medya hesaplarından öğretmenlerin doldurmaları için paylaşılmıştır ve elde edilen veriler projeye aktarılmıştır.

2.4. Verilerin analizi

Araştırma sonucunda ulaşılan veriler SPSS 21 paket programı kullanılmış ve çalışmanın soruları ile araştırmanın amacı bağlamında çözümlenmiştir. Verilerin çözümlenmesi aşamasında "frekans, yüzde, aritmetik ortalama, standart sapma, korelasyon ve çift yönlü varyans analizleri" yapılmıştır. Öğretmenlerin siber insani değerlerinin düzeylerinin belirlenmesinde ölçüt olarak 1.00-1.80 "hiç katılmıyorum", 1.81-2.60 "katılmıyorum", 2.61-3.40 "Kararsızım", 3.41-4.20 "katılıyorum", 4.21- 5.00 "tamamen katılıyorum" aralıkları kullanılmıştır. Bununla birlikte analizler yapılmadan önce normallik ve varyansların homejenliği testleri uygulanmıştır. Veri setinin normallik ve varyansların homojenliği varsayımlarını karşıladığı tespit edilmediğinden ve elde edilen sonuca göre analizlerde parametrik olmayan testler kullanılmıştır.

2.5. BULGULAR

2.5.1. Problem cümlesine ilişkin bulgular

Öğretmenlerin, siber insani eğilim düzeyleri genel ölçek ve alt boyutları bazında "cinsiyet, medeni durum, kıdem, branş ve sosyal medya kullanımı gibi" çeşitli özelliklerine göre anlamlı farklılık gösterip göstermediğini belirlemek amacıyla *Mann Whitney-U, Kruskal*

Wallis-H Testi yapılmıştır. Araştırmaya katılan kişilerin siber insani değerler eğimi genel, saygı, doğruluk, hoşgörü, dayanışma ve barışçıl olma boyutlarının puan ortalamalarına ilişkin Betimsel İstatistikleri Tablo 2'de yer almaktadır.

Tablo 2. Katılımcıların Siber İnsani Değerler Eğilim Düzeylerinin Betimsel İstatistikleri

	N	**En Düşük**	**En Yüksek**	**Ortalama**
Saygı	254	1.60	5	3.35
Doğruluk	254	1.80	5	4.13
Hoşgörü	254	1.25	5	3.22
Dayanışma	254	3	5	4.52
Barışçıl olma	254	2.17	5	3.83
Siber İnsani Değerler Genel	254	2.70	4.96	3.81

Tablo 2 incelendiğinde siber insani değerler eğilimi ölçeği toplam puan ortalaması 3.81, saygı alt boyut puan ortalaması 3.35, doğruluk alt boyut puan ortalaması 4.13, hoşgörü alt boyut puan ortalaması 3.22, dayanışma alt boyut puan ortalaması 4.52, ve barışçıl olma alt boyut puan ortalaması 3.83 olarak bulunmuştur. Katılımcıların ortalama puanları incelendiğinde saygı, doğruluk, hoşgörü ve dayanışma düzeylerinin "katılıyorum" derecesinde, dayanışmanın ise "tamamen katılıyorum" derecesinde olduğu söylenebilir.

Genel olarak siber insani değer düzeylerinin de "katılıyorum" derecesinde olduğu şeklinde yorumlanabilir.

2.5.2. Alt probleme ilişkin bulgular

2.5.2.1. Birinci alt probleme ilişkin bulgular

Tablo 3. Katılımcılarının İnsani Değerler Eğilim Ölçeği Puanlarının Cinsiyet Durumu Değişkenine Göre Farklılaşıp Farklılaşmadığını Belirlemek Üzere Yapılan Mann Whitney-U Testi Sonuçları

	Cinsiyet	*N*	**Sıra Ortalaması**	**Sıra Toplamı**	*U*	*p*
Saygı	Kadın	155	119.48	18519.00	6429.00	.028
	Erkek	99	140.06	13866.00		
Doğruluk	Kadın	155	125.65	19475.00	7385.00	.612
	Erkek	99	130.40	12910.00		
Hoşgörü	Kadın	155	128.60	19933.00	7502.00	.763
	Erkek	99	125.78	12452.00		
Dayanışma	Kadın	155	130.68	20255.00	7179.50	.378
	Erkek	99	122.52	12129.50		
Barışçıl olma	Kadın	155	119.91	18586.50	6496.50	.038
	Erkek	99	139.38	13798.50		
Siber İnsani Değerler Genel	Kadın	155	124.02	19223.00	7133.00	.345
	Erkek	99	132.95	13162.00		

Tablo 3 incelendiğinde; cinsiyet değişkenine göre katılımcıların saygı (U=6429.00, p<.05) ve barışçıl olma (U=6496.50, p>.05) alt faktörlerine yönelik algılarında anlamlı fark varken doğruluk (U=7385.00,

p>.05), hoşgörü (U=7502.00, p>.05) ve dayanışma (U=7179.50, p>.05) alt faktörleri ile siber insani değerler ölçeği geneline (U=7133.00, p>.05) yönelik algılarında anlamlı fark görülmemiştir.

Saygı alt faktörü sıra ortalamaları dikkate alındığında erkek katılımcıların saygı alt faktörüne yönelik tutumları (140.06), kadın katılımcılara (119.48) göre daha olumludur. Bu değeler bize saygı alt faktörüne erkek katılımcıların daha fazla sahip olduğunu göstermektedir.

2.5.2.2. İkinci alt probleme ilişkin bulgular

Tablo 4. Katılımcılarının İnsani Değerler Eğilim Ölçeği Puanlarının Medeni Durum Değişkenine Göre Farklılaşıp Farklılaşmadığını Belirlemek Üzere Yapılan Mann Whitney-U Testi Sonuçları

	Cinsiyet	*N*	**Sıra Ortalaması**	**Sıra Toplamı**	*U*	*p*
Saygı	Evli	173	122.72	21230.00	6179.00	.127
	Bekar	81	137.72	11155.00		
Doğruluk	Evli	173	123.89	21433.50	6382.50	.249
	Bekar	81	135.20	10951.50		
Hoşgörü	Evli	173	117.57	20339.00	5288.00	.001
	Bekar	81	148.72	12046.00		
Dayanışma	Evli	173	127.25	22013.50	6962.50	.934
	Bekar	81	128.04	10371.50		
Barışçıl olma	Evli	173	125.01	21627.50	6576.50	.428
	Bekar	81	132.81	10757.50		
Siber İnsani Değerler Genel	Evli	173	120.29	20810.00	5759.00	.022
	Bekar	81	142.90	11575.00		

Tablo 4 incelendiğinde; medeni durum değişkenine göre katılımcıların hoşgörü (U=5288.00, p<.05) alt faktörüne ve siber insani değerler ölçeği geneline (U=5759.00, p<.05) yönelik algılarında anlamlı fark varken saygı (U=6179.00, p<.05), doğruluk (U=6382,500, p>.05), dayanışma (U=6962.50, p>.05) ve barışçıl olma (U=6576.50, p>.05) alt faktörlerine yönelik algılarında anlamlı fark görülmemiştir.

Hoşgörü alt faktörü sıra ortalamaları dikkate alındığında bekar katılımcıların hoşgörü alt faktörüne yönelik tutumları (148.72), evli katılımcılara (117.57) göre daha olumludur. Bu değeler bize hoşgörü alt faktörüne bekar katılımcıların daha fazla sahip olduğunu göstermektedir.

Siber insani değerler ölçeği geneli sıra ortalamaları dikkate alındığında bekar katılımcıların siber insani değerler ölçeği geneli yönelik tutumları (142.90), evli katılımcılara (120.29) göre daha olumludur. Bu değeler bize siber insani değerlerin geneline bekar katılımcıların daha fazla sahip olduğunu göstermektedir.

2.5.2.3. Üçüncü alt probleme ilişkin bulgular

Tablo 5. Katılımcıların Kıdem Durumlarına Göre Siber İnsani Değerler Eğilim Düzeyleri Arasındaki Farklılıklara İlişkin Kruskal Wallis-H Testi Sonuçları

Alt Boyut	**Gruplar**	*N*	$\bar{x}_{sira}$	x^2	*sd*	*p*	**Fark**
Saygı	1-5 Yıl	54	132.56	11.17	5	.048	6-10 Yıl-11-15 Yıl 11-15 Yıl-21-25 Yıl 11-15 Yıl-26 Yıl ve Üzeri
	6-10 Yıl	107	116.72				
	11-15 Yıl	29	158.41				
	16-20 Yıl	23	149.11				
	21-25 Yıl	29	117.91				
	26 Yıl ve Üzeri	12	107.92				
Doğruluk	1-5 Yıl	54	115.46	9.08	5	.106	-
	6-10 Yıl	107	124.84				
	11-15 Yıl	29	128.74				

	16-20 Yıl	23	116.52				
	21-25 Yıl	29	162.38				
	26 Yıl ve Üzeri	12	139.13				
Hoşgörü	1-5 Yıl	54	128.72	5.07	5	.407	-
	6-10 Yıl	107	122.03				
	11-15 Yıl	29	152.14				
	16-20 Yıl	23	135.20				
	21-25 Yıl	29	121.90				
	26 Yıl ve Üzeri	12	110.04				
Dayanışma	1-5 Yıl	54	112.23	8.33	5	.139	-
	6-10 Yıl	107	122.27				
	11-15 Yıl	29	150.62				
	16-20 Yıl	23	142.26				
	21-25 Yıl	29	130.59				
	26 Yıl ve Üzeri	12	151.25				
Barışçıl olma	1-5 Yıl	54	117.89	9.64	5	.086	-
	6-10 Yıl	107	120.63				
	11-15 Yıl	29	156.38				
	16-20 Yıl	23	139.30				
	21-25 Yıl	29	119.38				
	26 Yıl ve Üzeri	12	159.25				
Siber İnsani Değerler Genel	1-5 Yıl	54	123.69	7.51	5	.185	-
	6-10 Yıl	107	117.41				
	11-15 Yıl	29	156.12				
	16-20 Yıl	23	138.89				
	21-25 Yıl	29	128.67				
	26 Yıl ve Üzeri	12	140.70				

Tablo 5'teki veriler homojen dağılmadığı için kıdem durumu değişkeninin siber insani değerler geneli ve alt boyut ortalamalarına dair farklılık oluşturulup oluşturulmadığını anlamak için Kruskal Wallis testi uygulanmıştır. Tablo 5 incelendiğinde, kıdem durumu değişkeninin saygı alt boyutuna ilişkin görüşlerinde ($p<.05$) anlamlı fark ortaya çıkardığı görülmektedir. Siber insani değerler geneline ilişkin görüşlerinde ($p>.05$), doğruluk, hoşgörü, dayanışma ve barışçıl olma ve alt boyutlarında ise ($p>.05$) anlamlı bir farklılığın ortaya çıkmadığı görülmektedir. Ortaya çıkan bu anlamlı farklılığın yönü Mann-Whitney U testleri yapılarak belirlenmiştir. Buna göre katılımcıların kıdem durumuna göre siber insani değerlerin saygı alt boyutunda ortaya çıkan anlamlı farklılığın 11-15 yıl arası çalışanlarla; 6 10 yıl arasında çalışanlar, 21-25 yıl arasında çalışanlar ve 26 yıl ve üzerinde çalışanlar arasında, 11-15 yıl arası çalışanlar lehine olduğu bulunmuştur. Buna göre 11-15 yıl arasında çalışan katılımcıların diğer katılımcılara göre saygı eğilimlerinin daha yüksek olduğu sonucuna varılmıştır.

2.5.2.4. Dördüncü alt probleme ilişkin bulgular

Tablo 6. Katılımcıların Branş Durumlarına Göre Siber İnsani Değerler Eğilim Düzeyleri Arasındaki Farklılıklara İlişkin Kruskal Wallis-H Testi Sonuçları

Alt Boyut	**Gruplar**	N	$\bar{x}_{sira}$	x^2	sd	p
Saygı	Beden Eğitimi	8	155.56	24.65	16	.076
	Din Kültürü ve Ahlak Bilgisi	32	117.58			
	Felsefe Grubu	2	52.50			
	Fen Bilimleri	34	124.34			
	Güzel Sanatlar	7	148.29			
	İHL Dersleri	26	107.06			
	Matematik	27	132.52			
	Meslek L. Dersleri	2	172.50			

	Okul Öncesi	4	92.38			
	Özel Eğitim	3	204.17			
	PDR	16	89.88			
	Sınıf Öğretmeni	26	167.65			
	Sosyal Bilimler Dersleri	14	133.64			
	Teknoloji Tasarım	4	94.13			
	Türkçe Öğretmeni	16	132.69			
	Türk Dili ve Edebiyatı	15	112.70			
	Yabancı Dil	28	126.13			
Doğruluk	Beden Eğitimi	8	178.56	19.33	16	.252
	Din Kültürü ve Ahlak Bilgisi	32	115.89			
	Felsefe Grubu	2	59.25			
	Fen Bilimleri	34	124.93			
	Güzel Sanatlar	7	126.07			
	İHL Dersleri	26	142.84			
	Matematik	27	119.98			
	Meslek L. Dersleri	2	71.25			
	Okul Öncesi	4	38.38			
	Özel Eğitim	3	157.83			
	PDR	16	109.63			
	Sınıf Öğretmeni	26	125.77			
	Sosyal Bilimler Dersleri	14	132.86			
	Teknoloji Tasarım	4	103.75			
	Türkçe Öğretmeni	16	136.44			
	Türk Dili ve Edebiyatı	15	142.60			
	Yabancı Dil	28	145.86			
Hoşgörü	Beden Eğitimi	8	176.06	22.09	16	.140
	Din Kültürü ve Ahlak Bilgisi	32	121.05			
	Felsefe Grubu	2	71.50			
	Fen Bilimleri	34	123.72			
	Güzel Sanatlar	7	156.57			
	İHL Dersleri	26	91.09			
	Matematik	27	122.33			
	Meslek L. Dersleri	2	96.50			
	Okul Öncesi	4	120.38			
	Özel Eğitim	3	205.33			
	PDR	16	110.13			
	Sınıf Öğretmeni	26	157.12			
	Sosyal Bilimler Dersleri	14	115.71			
	Teknoloji Tasarım	4	126.25			
	Türkçe Öğretmeni	16	109.84			
	Türk Dili ve Edebiyatı	15	149.17			
	Yabancı Dil	28	129.98			
Dayanışma	Beden Eğitimi	8	153.13	18.79	16	.280
	Din Kültürü ve Ahlak Bilgisi	32	107.70			
	Felsefe Grubu	2	140.50			
	Fen Bilimleri	34	120.41			

	Güzel Sanatlar	7	167.93			
	İHL Dersleri	26	126.94			
	Matematik	27	111.19			
	Meslek L. Dersleri	2	127.00			
	Okul Öncesi	4	76.75			
	Özel Eğitim	3	155.83			
	PDR	16	112.59			
	Sınıf Öğretmeni	26	158.02			
	Sosyal Bilimler Dersleri	14	153.71			
	Teknoloji Tasarım	4	170.25			
	Türkçe Öğretmeni	16	118.78			
	Türk Dili ve Edebiyatı	15	127.13			
	Yabancı Dil	28	126.82			
Barışçıl olma	Beden Eğitimi	8	122.00	10.77	16	.824
	Din Kültürü ve Ahlak Bilgisi	32	131.84			
	Felsefe Grubu	2	106.00			
	Fen Bilimleri	34	138.75			
	Güzel Sanatlar	7	124.14			
	İHL Dersleri	26	148.84			
	Matematik	27	105.46			
	Meslek L. Dersleri	2	152.25			
	Okul Öncesi	4	131.00			
	Özel Eğitim	3	102.67			
	PDR	16	98.50			
	Sınıf Öğretmeni	26	143.23			
	Sosyal Bilimler Dersleri	14	113.36			
	Teknoloji Tasarım	4	133.63			
	Türkçe Öğretmeni	16	124.84			
	Türk Dili ve Edebiyatı	15	144.30			
	Yabancı Dil	28	122.95			
Siber İnsani Değerler Genel	Beden Eğitimi	8	175.13	21.66	16	.154
	Din Kültürü ve Ahlak Bilgisi	32	115.81			
	Felsefe Grubu	2	73.00			
	Fen Bilimleri	34	120.59			
	Güzel Sanatlar	7	153.86			
	İHL Dersleri	26	116.13			
	Matematik	27	120.74			
	Meslek L. Dersleri	2	114.75			
	Okul Öncesi	4	59.38			
	Özel Eğitim	3	180.33			
	PDR	16	96.34			
	Sınıf Öğretmeni	26	162.81			
	Sosyal Bilimler Dersleri	14	130.61			
	Teknoloji Tasarım	4	122.00			
	Türkçe Öğretmeni	16	121.47			
	Türk Dili ve Edebiyatı	15	138.67			
	Yabancı Dil	28	132.66			

Tablo 6'daki veriler homojen dağılmadığı için branş durumu değişkeninin siber insani değerler eğilimi geneli ve alt boyut ortalamalarına dair farklılık oluşturulup oluşturulmadığını anlamak için Kruskal Wallis testi uygulanmıştır. Tablo 6 incelendiğinde, branş durumu değişkeninin siber insani değerler eğilimi geneline ve alt boyutlarına ilişkin görüşlerinde (p>.05) anlamlı bir farklılığın ortaya çıkmadığı görülmektedir.

2.5.2.5. Beşinci alt probleme ilişkin bulgular

Tablo 7. Katılımcıların Sosyal Medya Kullanım Durumlarına Göre Siber İnsani Değerler Eğilim Düzeyleri Arasındaki Farklılıklara İlişkin Kruskal Wallis-H Testi Sonuçları

Alt Boyut	**Gruplar**	*N*	$\bar{x}_{sira}$	x^2	*sd*	*p*	**Fark**
Saygı	0-1 Saat Arası	36	116.19	12.85	4	.012	0-1 Saat Arası-4 Saat ve Üzeri 1-2 Saat Arası-3-4 Saat Arası 1-2 Saat Arası-4 Saat ve Üzeri 2-3 Saat Arası-3-4 Saat Arası 3-4 Saat Arası-4 Saat ve Üzeri
	1-2 Saat Arası	91	129.86				
	2-3 Saat Arası	67	130.58				
	3-4 Saat Arası	32	97.02				
	4 Saat ve Üzeri	28	161.84				
Doğruluk	0-1 Saat Arası	36	119.51	3.23	4	.521	-
	1-2 Saat Arası	91	134.21				
	2-3 Saat Arası	67	131.11				
	3-4 Saat Arası	32	109.92				
	4 Saat ve Üzeri	28	127.39				
Hoşgörü	0-1 Saat Arası	36	147.60	4.71	4	.318	-
	1-2 Saat Arası	91	129.48				
	2-3 Saat Arası	67	119.34				
	3-4 Saat Arası	32	114.48				
	4 Saat ve Üzeri	28	129.63				
Dayanışma	0-1 Saat Arası	36	123.75	.76	4	.943	-
	1-2 Saat Arası	91	126.30				
	2-3 Saat Arası	67	133.50				
	3-4 Saat Arası	32	122.22				
	4 Saat ve Üzeri	28	127.91				
Barışçıl olma	0-1 Saat Arası	36	102.15	11.94	4	.018	0-1 Saat Arası-2-3 Saat Arası 0-1 Saat Arası-4 Saat ve Üzeri 1-2 Saat Arası-4 Saat ve Üzeri
	1-2 Saat Arası	91	119.45				
	2-3 Saat Arası	67	139.23				
	3-4 Saat Arası	32	127.95				
	4 Saat ve Üzeri	28	157.66				
Siber İnsani Değerler Genel	0-1 Saat Arası	36	122.13	5.44	4	.245	-
	1-2 Saat Arası	91	127.98				
	2-3 Saat Arası	67	132.36				
	3-4 Saat Arası	32	105.2				
	4 Saat ve Üzeri	28	146.93				

Tablo 7'deki veriler homojen dağılmadığı için sosyal medya kullanım durumu değişkeninin siber insani değerler eğilimi geneli ve alt boyut ortalamalarına dair farklılık oluşturulup oluşturulmadığını anlamak için Kruskal Wallis testi uygulanmıştır. Tablo 7 incelendiğinde, sosyal medya kullanım durumu değişkeninin saygı alt boyutuna ilişkin görüşlerinde ($p<.05$) ve barışçıl olma alt boyutuna ilişkin görüşlerinde ($p<.05$) anlamlı fark ortaya çıkardığı görülmektedir. Doğruluk, hoşgörü, dayanışma alt boyutlarında ve siber insani değerler genelinde ise ($p>.05$) anlamlı bir farklılığın ortaya çıkmadığı görülmektedir. Ortaya çıkan bu anlamlı farklılığın yönü Mann-Whitney U testleri yapılarak belirlenmiştir. Bu durumda katılımcıların kıdem durumuna göre siber insani değerlerin saygı alt boyutunda ortaya çıkan anlamlı farklılığın sosyal medyayı 4 saat ve üzeri kullananalar ile 0-1 saat arası kullananlar,

1-2 saat arası kullananlar ve 3-4 saat kullananlar arasında, 4 saat ve üzeri kullananlar lehine olduğu bulunmuştur. Buna göre sosyal medyayı 4 saat ve üzeri kullanan katılımcıların saygı eğilimlerinin daha yüksek olduğu tespit edilmiştir. Sosyal medyayı 1-2 saat kullananlarla 3

4 saat kullananlar arasında, 1-2 saat kullananlar lehine anlamlı fark olduğu bulunmuştur.

Sosyal medyayı 2-3 saat kullananlar ile 3-4 saat kullananlar arasında, 2-3 saat kullananlar lehine anlamlı fark olduğu bulunmuştur.

Katılımcıların sosyal medya kullanımlarına göre siber insani değerlerin barışçıl olma alt boyutunda sosyal medyayı 0-1 saat kullananlar ile 2-3 saat kullananlar arasında, 2-3 saat kullananlar lehine anlamlı fark olduğu bulunmuştur. Sosyal medyayı 4 saat ve üzeri kullananlar ile 0-1 saat arası kullananlar, 1-2 saat arası kullananlar arasında, 4 saat ve üzeri kullananlar lehine anlamlı fark olduğu bulunmuştur. Araştırmanın bu sonucuna bakıldığından saygı eğiliminin yüksek olanların sosyal medyayı 4 saat ve üzerinde kullananlar olduğu belirlenmiştir.

3. SONUÇ, TARTIŞMA VE ÖNERİLER

Çalışma neticesinde tespit edilen veriler, öğretmenlerin siber insani değer düzeylerinin genelinde ve doğruluk, hoşgörü, dayanışma alt faktörlerinde anlamlı olarak farklılaşmadığı görülürken saygı ve barışçıl olma alt faktörlerinde cinsiyetlerine göre anlamlı olarak farklılaştığını göstermektedir. Erkek öğretmenlerin saygı ve barışçıl olma alt faktörü düzeyi puan ortalaması, kadın öğretmenlerin saygı ve barışçıl olma alt faktörü düzeyi puan ortalamasından daha yüksek bulunmuştur. Başka bir deyişle ise erkek öğretmenlerin saygı ve barışçıl olma değerlerine verdikleri önem düzeyi kadın öğretmenlerden daha yüksektir. Benzer çalışmalara bakıldığında Sarı (2005)'nın araştırmasında erkek öğrenciler kız öğrencilere nazaran incelenen değerler açısından daha yüksek puan aldığı belirtilmektedir. Alanyazın incelendiğinde değerler üzerine yapılan çeşitli çalışmalarda kadınların değerler konusunda daha pozitif eğilime sahip oldukları tespit edilmiştir (Altunay ve Yalçınkaya, 2011; Başçı, 2012; Çalışkur, 2008; İşcan, 2007).

Araştırmada elde edilen bulgular, öğretmenlerin saygı, doğruluk, dayanışma ve barışçıl olma alt faktörlerinde anlamlı olarak farklılaşmadığı görülürken siber insani değer düzeylerinin genelinde ve hoşgörü alt faktöründe medeni durumlarına göre anlamlı olarak farklılaştığını göstermektedir. Bekar öğretmenlerin siber insani değer düzeylerinin genelinde ve hoşgörü alt faktörü düzeyi puan ortalaması, evli öğretmenlerin siber insani değer düzeylerinin genelinden ve hoşgörü alt faktörü düzeyi puan ortalamasından daha yüksek bulunmuştur. Farkı bir ifadeyle, bekar öğretmenlerin siber insani değer düzeylerinin geneli ve hoşgörü alt faktörü düzeyi evli öğretmenlerden daha yüksektir. Araştırma sonucumuzdan farklı olarak Kılıçer, Özeke ve çoklar (2018)'ın çalışmalarındaki bulgulara göre evli bireylerin siber insani değerlerinin bekar olan kişilere nazaran anlamlı bir şekilde daha yüksek bulunduğu neticesine varmışlardır.

Çalışmada, siber insani değerler genelinin, doğruluk, hoşgörü, dayanışma ve barışçıl olma alt faktörlerinde anlamlı olarak farklılaşmadığı görülürken saygı alt faktöründe kıdem durumlarına göre anlamlı olarak farklılaştığını göstermektedir. Saygı alt faktörü açısından bakıldığında 11-15 yıl arasında çalışanların puan ortalamalarının diğer kıdemlerden daha yüksek olduğu tespit edilmiştir. Alanyazında, öğretmenlerin kıdem düzeyleri ile siber insani değer düzeyleri arasındaki ilişkiyi inceleyen farklı bir araştırmaya rastlanmamıştır.

Çalışmanın neticesindeki bulgular incelendiğinde öğretmenlerin branşları açısından siber insani değer geneli ve alt faktörleri düzeyleri arasında anlamlı bir farklılık bulunmamaktadır. Ayrıca alanyazında, öğretmenlerin branşlarına göre siber insani değer düzeylerini inceleyen farklı bir araştırmaya rastlanmamıştır. Araştırmanın bulgularına bakıldığında ortaya çıkan sonuçların öğretmenlerin sahip oldukları eğitim düzeyleri ile ilgili olabileceği düşünülmektedir. Bununla birlikte öğretmenlerin uzmanlık alanlarındaki konuların içerdiği farklılıklar ve bu farklılıkların getirdiği iletişim süreci öğretmenlerin siber insani değer düzeyleri üzerinde etkili olabilir.

Araştırmada elde edilen bulgular, öğretmenlerin siber insani değer düzeylerinin genelinde ve doğruluk, hoşgörü, dayanışma alt faktörlerinde anlamlı olarak farklılaşmadığı görülürken saygı ve barışçıl olma alt faktörlerinde sosyal medya kullanım sürelerine göre anlamlı olarak farklılaştığını göstermektedir. Saygı ve barışçıl olma alt faktörleri açısından bakıldığında sosyal medyayı 4 saat ve üzeri kullananların puanlarının daha yüksek olduğu görülmektedir. Alanyazında, öğretmenlerin sosyal medya kullanımlarına göre siber insani değer düzeylerini inceleyen farklı bir araştırmaya rastlanmamıştır.

3.1. Öneriler

- Araştırmada öğretmenlerin siber insani değer düzeyleri cinsiyet, sosyal medya kullanım süreleri, kıdem ve branşa göre incelenmiştir. Bununla birlikte öğretmenlerin siber insani değer düzeyleri üzerinde etkisi bulunan farklı değişkenlerin var olma durumu ile ne ölçüde etkide bulundukları saptanarak eğitim sistemine ve ilgisi bulunan alanyazına katkıda bulunabilir.
- Bu çalışma sadece öğretmenleri kapsamaktadır. Farklı meslek grupları üzerinde de siber insani değerlere dair çalışmalar yapılabilir.
- Eğitim kurumlarındaki öğretmen-öğrenci-veli-idareci bağlamında genel bir bakış ile siber insani değerler incelenebilir.
- Siber insani değerlerin daha derinlemesine incelenmesi açısından nitel çalışmalar da yapılabilir.

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TAKIM KAPTANLARININ KAPTANLIK SEÇİMİNE İLİŞKİN ALGILARI: PROFESYONEL FUTBOL ÖRNEĞİ

PERCEPTIONS OF TEAM CAPTAINS REGARDING CAPTAIN SELECTION: THE EXAMPLE OF PROFESSIONAL FOOTBALL

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ÖZET

Sporda takım kaptanı resmi lider konumundadır. Kaptan resmi sporcu lideri konumunda olduğu için takım kaptanından önemli roller beklenmektedir. Literatürde takım kaptanının rolleri detaylı bir şekilde araştırılmıştır. Fakat mevcut literatürde takım kaptanlarının kendi algı ve deneyimlerine göre kaptanlık seçimine ilişkin yeterli literatürün olmadığı gözlenmiştir. Bu amaçla yapılan araştırmada profesyonel 10 erkek takım kaptanı ile derinlemesine bireysel görüşme yapılmıştır. Araştırmanın katılımcıları, Türkiye Futbol Federasyonu 2021-2022 ile 2022-2023 sezonun da Türkiye de bulunan Elazığ ve Malatya illerindeki takımlarda kaptanlık yapan profesyonel futbolculardan oluşmaktadır. Araştırma katılımcıları için amaçlı örnekleme yöntemlerinden kolay ulaşılabilir durum örneklemesi ve ölçüt örneklemesi kullanılmıştır. Veriler Yarı yapılandırılmış görüşme formu aracılığıyla toplanmıştır. Veriler, yorumlayıcı fenomenolojik analiz kullanılarak tematik olarak analiz edildi. Analizler sonucunda, kaptan seçilme kriterleri, kaptanlık seçim usulü, kaptanlık seçimini yapan faktörler ve kaptanlık seçimini yapması gereken faktörler temaları saptanmıştır. Araştırmada, tecrübeli olma, liderlik özelliğinin olması, yaşça büyük olma, kulüpte eski oyuncu olma, yaşça genç olma, iletişim becerisi iyi olma, olgunluk, daha önce kaptanlık yapmış olma, teknik direktör ve/veya kulüp yönetiminin tarafını tutma, teknik direktöre göre baskın olmayan oyuncu olmanın kaptan seçilme kriterleri olduğunu belirtmişlerdir. Sonuçta takım kaptanları tarafından kaptanlık seçiminde birçok kriterin baz alınarak teknik direktörlerce kaptanın görevlendirme yoluyla seçildiği belirlenmiştir.

Anahtar kelimeler: sporcu lider; kaptan; kaptanlık seçimi; futbol

ABSTRACT

In sports, the team captain is the official leader. Since the captain is the official athlete leader, important roles are expected from the team captain. In the literature, the roles of the team captain have been investigated in detail. However, it has been observed that there is not enough literature on the selection of captains according to the perceptions and experiences of the team captains in the existing literature. For this purpose, in-depth individual interviews have conducted with 10 professional male team captains. The participants of the research consist of professional football players who captained the teams in the provinces of Elazig and Malatya in Turkey in the 2021-2022 and 2022-2023 seasons of the Turkish Football Federation. For the research participants, easily accessible case sampling and criterion sampling, which are purposive sampling methods, were used. Data has collected through a semi-structured interview form. The data were thematically analyzed using interpretative phenomenological analysis. As a result of the analysis, the themes of the captain selection criteria, the captain selection procedure, the factors that make the captain's selection and the factors that should make the captain's selection were determined. In the research, being experienced, having leadership characteristics, being older, being a former player in the club, being younger, good communication skills, maturity, having been a captain before, taking the side of the coach and/or club management, ıt has been determined that being a non-dominant player according to the coach is the criteria for being a captain selection. As a result, it has determined that the captain was selected by the coaches by assignment, based on many criteria in the selection of captaincy by the team captains.

Keywords: athlete leader; captain; captaincy selection; football

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FAULT DETECTION IN ROTATING MACHINERY USING VARIATIONAL MODE DECOMPOSITION (VMD)

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ABSTRACT

Fault detection in gears and bearings is crucial for ensuring the reliability and safety of industrial machinery. The vibratory signals produced by these components contain vital information about their health condition, which makes them valuable for monitoring and diagnosing faults. In this study, we introduce the use of Variational Mode Decomposition (VMD) for detecting and diagnosing defects in gears and bearings. VMD is an innovative adaptive signal processing technique that effectively separates the underlying oscillatory modes present in the vibratory signals, allowing the identification of fault-related signatures. The resulting modes are demodulated using the Hilbert transform to obtain the envelope spectra of each mode. These spectra are then analyzed to detect faults in gears and bearings. To evaluate our approach, we utilize real-world data obtained from two different sources: gear defect measurements provided by the Technical Centre for Mechanical Industries (CETIM) in France, and high-speed bearing defect measurements supplied by Green Power Monitoring Systems in

the USA. The experimental results validate the effectiveness and accuracy of the VMD-based fault detection method in identifying faults.

Keywords: VMD, Envelope, Fault Detection, Gears Defect, Bearing Defects.

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IMPROVED DIAGNOSIS OF GEAR FAULTS USING CYCLOSTATIONARITY

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ABSTRACT

This paper presents an innovative approach to enhance the diagnosis of gear faults by utilizing the cyclostationarity method. By applying the cyclostationarity method to signals obtained from the gearbox bearings, the presence of defects is clearly identified. Experimental results demonstrate that cyclostationarity indicators can improve the prediction of signal roughness during the production process. This approach offers new perspectives for increasing the reliability of vibration measurements and enhancing the diagnosis of gear faults.

Keywords: Classical indicator, Cyclostationary indicator, spectral analysis, MID, IMID, , simulated signals, reducer 101 BJT.

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SIMILARITY SOLUTION OF 3D CASSON NANOFLUID FLOWS OVER A STRETCHING SHEET WITH CONVECTIVE BOUNDARY CONDITIONS

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ABSTRACT

In this study, we analyzed the three-dimensional magnetohydrodynamic Newtonian and non-Newtonian fluid flow. Heat and mass transfer over a stretching surface in the presence of thermophoresis and Brownian motion is investigated. The transformed governing equations are solved numerically via Runge-Kutta based shooting technique. We obtained good accuracy of the present results by comparing with the exited literature. The influence of dimensionless parameters on velocity, temperature and concentration profiles along with the friction factor, local Nusselt and Sherwood numbers are discussed with the help of graphs and tables. It is found that an increase in the stretching ratio parameter enhances the heat and mass transfer rate. The heat and mass transfer rate in non-Newtonian fluid is comparatively high while compared with the heat and mass transfer rate in Newtonian fluid.

Keywords: Newtonian and Non-Newtonian fluids, Thermophoresis, Brownian motion, Stretching sheet.

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INTERPRETATION AND APPLICATION OF FOREIGN LAW

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ABSTRACT

The Customs Code is considered as an instrument, which will increase security for importers and exporters, simultaneously starting an era of transformation, having a new approach with business, which he called a strategic partner. Customs and excise duties are also of particular importance when it comes to the formation of a country,s budget. So, precisely for this reason, a special code must be formulated for the customs system on the basis of which the customs system will have to function. Thus, for example, within the customs system, it should be taken into account what is the customs territory, customs lines, customs roads, customs border zone, customs goods, customs oliguria, customs payment obligation as well as exemption from payment of the obligation from customs payment. So, for all these issues, a code must be defined on the basis of which the customs system of a country will have to function, since the special importance of customs for the formation of the state budget was just mentioned. We will talk more broadly about the customs system, specifically the customs code, during the presentation of this paper.

Keywords: Customs, customs system, customs code, importance, state budget.

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INTERPRETATION AND APPLICATION OF FOREIGN LAW

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Abstract

Based on the legislations that define international law, or more specifically the implementation of the laws of other countries in the event that a private right is required to be created, changed, or protected in the given country. For this case and in the state of Kosovo, the law of private international law has been created, so that if the parties are put in a dilemma as to which laws of which state to use, then the answer will be found in the same law. For these cases, we must take into account how the interpretation is done, specifically the clarification of foreign law. Thus, based on the Law on private international law, it is emphasized that the law of the foreign state is interpreted and applied in accordance with the interpretation and application of the legal system from which it comes. Misapplication of foreign law is the basis for exercising the right to legal remedy. This means that we must take into account how the provisions of this law are defined, more specifically, make the correct interpretation of how and where these provisions should be applied, since otherwise the party can file a lawsuit in court either for damages if it feels damaged or other cases. Thus, I will speak more broadly about the interpretation and application of foreign law during the presentation of this paper.

Keywords: international, private law, law, application, interpretation.

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IABILITY FOR DAMAGES BASED ON PRIVATE INTERNATIONAL LAW

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ABSTRACT

The law on private international law, the rules on the competence of courts and other bodies for examining these relations and the rules on the procedure, as well as the rules on recognition, apply to the determination of the competent law in legal-private relations with an international element. and the execution of decisions of foreign courts and decisions of other bodies of foreign countries, defined in the provision of Article 1 of this same law, which can be applied in cases of causing damage. Specifically, for damage caused by non-contractual liability, according to which law it is emphasized that the law of the state where the damage was caused is competent, regardless of the state in which the action that caused the damage was undertaken, and regardless of the state or states in which it is caused indirect consequences from that action. In the following, it is emphasized that if the responsible person and the injured party have permanent residence in the same state at the time when the damage was caused, the law of the state in which the damage was caused is competent. In all cases where we are dealing with an agreement between the parties, specifically with a contract concluded between the parties, then the relationship is significantly closer to the state in which that contract was concluded, so this means that the law of country, where the contract was concluded, specifically the agreement of the parties. These clarifications are made in accordance with the international law of Kosovo, according to which in all cases where a foreign element appears in private legal relations, specifically in subjects or objects, then based on this law we have proper guidance on which provisions the state must applies to that legal relationship, whether for the creation, change, protection or termination of international legal relationships.

Keywords: International law, right, application, liability for damage, contract.

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URBAN AGGLOMERATION - INFLUENCES ON THE GREEN TRANSITION

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ABSTRACT

Considering that the large urban areas in Romania are agglomerating while the population in the less developed areas is decreasing significantly, we propose in this study to identify the connection between this type of demographic change and the evolution of the green transition. Urban agglomeration has significant influences on the green transition and efforts to achieve sustainable development goals. According to INS data, in Romania there is a tendency to agglomeration of developed cities and surrounding areas, which often leads to an increase in the number of homes built at the expense of green areas, an increase in the volume of waste, heavy traffic problems, air pollution and congestion . As a result, promoting a sustainable and efficient transport system in urban areas is essential for the green transition. This may include developing public transport networks, encouraging the use of bicycles and walking, and promoting electric or low-emission vehicles. Another factor that slows down the achievement of green transition goals is the intensive consumption of resources such as energy, water and construction materials, which can lead to a negative impact on the environment and increased greenhouse gas emissions. In the context of the green transition, it is important to promote the efficient use of resources and implement technologies and practices that reduce consumption and optimize the use of resources. On the other hand, the high concentration of population and activities in urban areas can generate significant amounts of waste. In this situation, proper waste management, including recycling and reducing waste production, is a key component of the green transition in the urban environment. Another important aspect is the green infrastructure. Urban agglomerations can benefit from the development of green infrastructure such as parks, urban gardens and green spaces in general. They contribute to improving air quality, reducing high urban temperatures, increasing biodiversity and improving the health and well-being of residents. In conclusion, urban congestion caused especially by internal population movement has significant influences on the green transition. Addressing issues related to resource consumption, urban mobility, waste management, green infrastructure development and community engagement are essential elements to achieve a sustainable and environmentally friendly transition in developed urban areas.

Keywords: urban agglomeratıon, population movement, green transıtıon.

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A CENTRAL COMPOSITE DESIGN MATRIX BASED ON OPTIMIZATION OF TUNGSTEN INERT GAS WELDING INPUT VARIABLES FOR OUTPUT WELDS WITH OPTIMUM THERMAL CONDUCTIVITY

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Abstract

While some metals during welding operation exhibit high thermal conductivity and contain several fast-moving electrons primarily responsible for heat conduction, some are poor thermal conductors, such as mild steels which dissipate heat at a slow rate. Therefore, materials with low thermal conductivity can increase the chances of post-weld material distortion. This is due to increased shrinkage effect brought on by the steep temperature gradient. Therefore, this study is focused on optimization of welding input variables for optimum output thermal conductivity based on the principles of Design of experiment (DOE). A design matrix having six (6) center points, six (6) axial points and eight (8) factorial points, resulting in twenty (20) experimental runs was employed as TIG welding input variables, which included welding current ranging from 199.77-250.23A,voltage ranging from 20.98-26.0 V and gas flow rate ranging from 11.98-16.0 L/min. The twenty variables were employed as input for TIG welding experimental procedure as well as prediction and optimization using Response Surface Methodology (RSM), with the output responses being thermal conductivity of mild steel. Optimal solution of the numerical optimization of welding input variables revealed that welding current of 199.77 amp, voltage of 26 volts and gas flow rate of 11.98 L/min can produce minimum weld thermal conductivity of 40.99 W/m.k. The solution was selected by design expert as the optimum solution with a desirability value of 0.940 (94%). To validate the results, regression plot between the experimental values and RSM predicted values showed the value for coefficient of determination (R^2) for the output responses as 0.9801. Considering that the closer the r^2 value to one (1), the more accurate the prediction, indicating that RSM can be used as alternative tool to predict and optimize weld input variables for optimum thermal conductivity that can yield minimum weld distortions.

Keywords: Welding, Design of experiment, Mild steel, Optimization, Experimental approach.

1. INTRODUCTION

Tungsten inert gas (TIG) welding approach is one of the welding process that most manufacturers sought after in order to save production costs and create lightweight components. Thus most manufacturers are concentrating on the combining of different materials of steels components which are used for their structural components due to its desirable characteristics of affordability and lightweight property (Assefa et al., 2022; Bahar, 2018). When combining two materials with different chemical, physical, and thermal properties, extra care must be taken to ensure a strong and rigid joint connection. The workpieces that need to be linked are melted at the joining surfaces during welding, and after they have

solidified, a permanent joint can be created. In some circumstances, a filler material is injected to create a pool of molten material during the welding process. Once the pool has solidified, the materials are joined together tightly. The TIG welding technique is well-known for its adaptability, consistency as a heat source, low equipment cost, and high-quality welds, which make it popular across a variety of sectors. Despite all of its benefits, there is one problem that prevents TIG welding from being widely used (Singh and Khanna, 2021).

The degree of metallurgical changes during welding, fluctuations in hardness in the weld zone due to quick solidification, quantity of oxidation due to materials reacting with air oxygen, and propensity for crack development in the joint location are some of the elements that affect a material's weldability (Mandal et al., 2022; Bahar, 2018; Muluken, 2020). Moreover, Eki et al. (2022) and Eki et al. (2023) observed that Tungsten inert gas (TIG) is used as a shielding gas mixture, albeit only trace amounts of inert gases like nitrogen or hydrogen are used. Thin edge-square (2 mm) sections were used for autogenous GTA welding (filler metal was not used); bigger sections required V and X-type preparation and filler metal addition. In this situation, filler metal must be added. This metal joining procedure makes substantial use of pieces of carbon and low alloy steels, including thin pieces of stainless steel, titanium alloys, magnesium, and aluminium.

Additionally, previous research has been done on the TIG welding of various and dissimilar metals: characterisation, parameter optimization, and application. The amount of energy required to melt the base metal locally is determined by the degree of heat conduction from the molten weld pool to a base metal with a higher thermal conductivity, which absorbs thermal energy (Chaudhari et al., 2021; Venukumar et al., 2019). Vora et al. (2021) in his experimental study described the integration of Response Surface Methodology (RSM) with a cutting-edge Heat Transfer Search (HTS) optimization algorithm to optimize the machining parameters of the A-TIG welding technique, notably for achieving full penetration in 6 mm thick carbon steels. The experiments used welding current, arc length, and torch travel speed as input process parameters and penetration depth, depth-to-width ratio, heat input, and width of the heat-affected zone as outcome variables.

On the other hand, based on Taguchi L9 orthogonal array, experiments were conducted. Regression equations were formulated using the response surface methodology, and the process parameters were improved using the genetic algorithm (GA) and simulated annealing (SA). The quality of the output was dependent on input factors including current, voltage, welding speed, and gas flow rate in a multi-input to single output (tensile strength) process. The goal of the experimental study was to correct the input parameters and increase the output of A-TIG welding of sintered hot-forged AISI 4135 steel (Joseph and Muthukumaran, 2017; Azadi and Kolahan, 2020).

Bodkhe and Dolas (2018) in its experimental study opined that welding of stainless steel (SS) alloy 304L used in its studies was employed to determine the best set of process parameters to obtain a better depth of penetration (DOP). Current, welding speed, and arc gap were the input parameters chosen for the tests, and the experiments were designed using the central composite design of response surface methodology. This was performed to gather data and examine the impact of input variables on DOP, autogenous bead on plate welds with mono-component flux were performed on SS 304L plates with a 6 mm thickness.

Moreover, Pondi et al. (2021) in its experimental study on TIG welding operations employed central composite design approach which used several independent variables with input parameters ranging from the welding current, voltage and speed with respect to measured response parameter (heat input). The research study deployed five specimens per run on mild steel coupons (60 mm x 40 mm x 10 mm). The findings further revealed that when optimum values of the welding variables are correctly established, the use of an appropriate welding heat input that could reduce the amount of residual stress created during welding can prevent the harmful formation of heat affected zone cracking during the TIG welding process.

The application of Response Surface Methodology (RSM) provides an alternative means of reducing the high cost requirement for experimental procedure. In other words, RSM combines mathematical and statistical models for computation of input variables to obtain desired output response (Ugur et al., 2009). The main components of RSM includes experimental design, regression analysis and

optimization algorithms which are applicable in the analysis of empirical relationships. The tool RSM is a software that mostly have its relevance in development of empirical models, usually known as response surface, for controlling the variables. Therefore, it determines optimum input variables that can produce optimum output response (Pawan et al., 2011). Uwoghiren and Erhunmwunse (2022) developed a model using Response Surface Methodology to predict and optimize weld heat input and heat affected zone from input parameters such as current, voltage and welding speed. Based on Design of experiment (DOE), Ikpe and Owunna (2018) developed an experimental design matrix to optimization TIG welding input variables for AISI 1020 low carbon steel plate using RSM. Similarly, a central composite design (CCD) in Design Expert 7.01 software was employed by Owunna and Ikpe (2021) to develop a statistical DOE for optimization of Tungsten Inert Gas (TIG) welding process parameters relative to mechanical properties of AISI 1018 mild steel plate using RSM. In this study, a central composite design matrix based on optimization of tungsten inert gas welding input variables was employed for output welds with optimum thermal conductivity of mild steel plate. The analysis was carried out via experimental and numerical approaches using RSM, and the optimum desirable solution as well as the coefficient of determination were obtained accordingly.

2. MATERIALS AND METHODS

2.1. Materials

This section will focus on the description of the various types of materials required for the analysis and predictions of temperature effects and induced stresses on the material weldment. Materials that were employed in this study includes: AISI 1020 mild steel plate (10 mm thickness), tungsten inert gas welding machine, argon shielding gas, tensometer, vertical milling machine for milling the angles, G-clamp for clamping the work pieces, welding electrode and type K-thermocouple

2.1.1. AISI 1020 Mild Steel Plate

The American Iron and Steel Institute (AISI) defines mild steel also known as carbon steel or plain carbon steel as having no more than 2% of carbon composition and no other appreciable alloying elements. Yadav et al. (2014) in their investigation described mild steel as one of the metals with iron (Fe) as the primary composition. Mild steel is strong and tough but not readily tempered and exhibits good welding ability as a result of low carbon content, whereas, high carbon steels containing high percentage of carbon and other alloying elements may result in brittle zones around the welded joints (Khanna, 2006).

The austenitic structure of AISI 1020 mild steel also gives these grades excellent toughness, even down to cryogenic temperatures. Excellent forming and welding characteristics by all standard fusion methods, both with and without filler metals. A number of researches have been carried out on the weldment of different materials but only few studies have been done on mild steel plate, as it is seldom investigated. Mild steel is easily fabricated, readily available and relatively cheaper compared to most materials. The chemical compositions of AISI 1020 mild steel proposed for this study are presented in Table 1.

Table 1. Chemical composition of the mild Steel

S/N	Metal elements	percentage
1	C	0.094±0.043
2	Si	0.210±0.043
3	Mn	0.310±0.73
4	P	0.056±0.40
5	Cu	0.094±0.109
6	Al	0.002±0.004
7	S	0.022±0.114
8	Cr	0.214±0.073
9	Ni	0.315±0.120
10	Fe	98.32±52

Since temperature induced stress is a function of the material properties, the properties required in this case includes Young's Modulus, Poisson's ratio, thermal conductivity, specific heat, thermal expansion coefficient and density. Modulus of elasticity is a measure of the stiffness of a material. Materials with higher elastic modulus shows a higher tendency to resist distortion. The extent at which a metal will undergo expansion or contraction as a result of heating or cooling during welding depends on the coefficient of thermal expansion which determines the behaviour of a material in response to the rate of heat flowing through its cross section. The AISI 1020 mild steel properties proposed for this study is presented in Table 2 while V-butt specimen of the AISI 1020 mild steel is shown in Figure 1.

Table 2. Mechanical Properties of AISI 1020

Name	AISI 1020
Yield strength	351.571 N/mm^2
Tensile strength	420.507 N/mm^2
Elastic modulus	200000 N/mm^2
Poisson's ratio	0.29
Mass density	7900 g/cm^3
Shear modulus	77000 N/mm^2
Thermal expansion coefficient	1.5e-005 /Kelvin

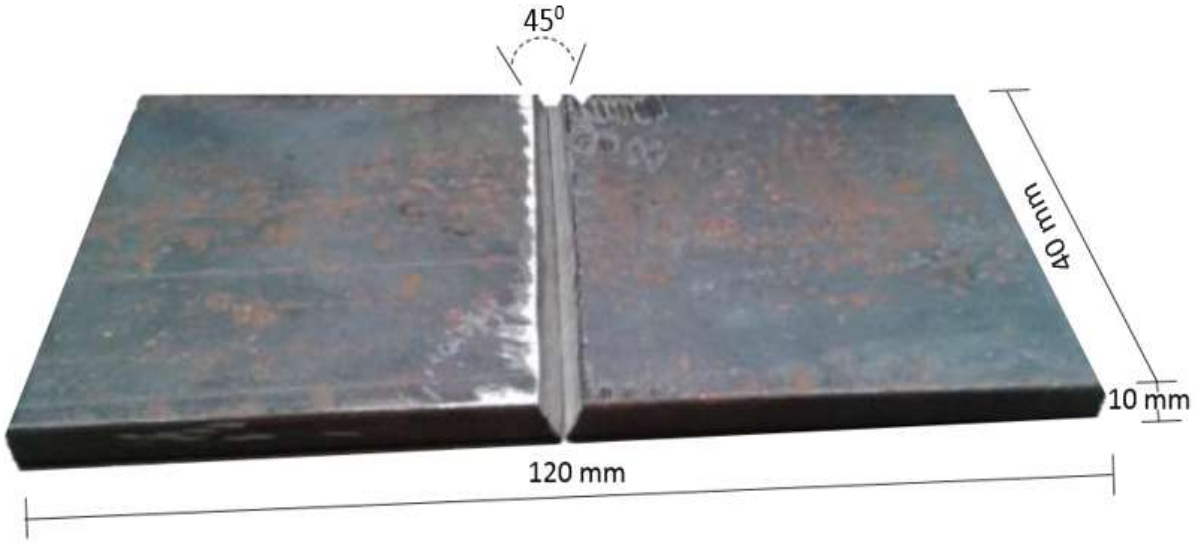

Figure 1. V-butt specimen of mild Steel

2.2. Methods

2.2.1. Experimental Design

Experimentation is a very important aspect of scientific study, which can be developed, using computer software like design expert and Minitab. For proper polynomial approximation, an experimental design is used to collect the data. There are different types of experimental designs which include central composite design, taguchi, D-optimal design, factorial design and latin hyper cube designs. Design of Experiments is a systematic series of tests, in which purposeful changes are made to input factors, so that you may identify causes for significant changes in the output responses. The optimization objectives were separately to:

i. Optimize the input variables (current, voltage and gas flow rate)

ii. Minimize the output response (thermal conductivity)

The final solution of the optimization process was to determining the optimum value of each input variable namely: voltage (volt), current (Amp) and gas flow rate (L/min) that will minimize thermal conductivity set by the objective function.

To generate the experimental data for the optimization process;

i. First, statistical design of experiment (DOE) using the central composite design method (CCD) was done. Central composite design (CCD) is unarguably the most acceptable design for response surface methodology (RSM). Design Expert 7.01 was used to deduce design of experiment for the welding parameters for 20 runs, with variable voltages ranging from 20.98-26 V, variable currents ranging from 199.77-250.23 A and variable gas flow rates ranging from 11.98-16 L/min as presented in Table 3.

ii. Secondly, an experimental design matrix having six (6) center points, six (6) axial points and eight (8) factorial points resulting to 20 experimental runs was generated. The key parameters considered in this work are welding current, welding voltage, gas flow rate. Table 3 shows the welding parameters symbols and unit.

iii. The central composite design matrix was developed using the design expert software, producing 20 experimental runs. The input parameters and output parameters make up the experimental matrix while the responses recorded from the weld samples were used as the data. The Table 3 shows the central composite design matrix.

Table 3. Central composite design matrix (CCD)

std	Weld Runs	Block	Current	Voltage	Gas flow Rate
12	1	Block 1	250.23	23.5	13.5
16	2	Block 1	225	26	14.5
10	3	Block 1	250.23	24.5	14.5
19	4	Block 1	240	25	16
6	5	Block 1	225	25	16
13	6	Block 1	240	20.98	13.5
9	7	Block 1	199.77	24.5	13.5
18	8	Block 1	210	25	16
15	9	Block 1	199.77	26	11.98
14	10	Block 1	250.23	20.98	13.5
3	11	Block 1	240	22	11.98
11	12	Block 1	225	24.5	11.98
5	13	Block 1	210	22	16
7	14	Block 1	199.77	23.5	14.5
20	15	Block 1	210	20.98	14.5
8	16	Block 1	225	22	13.5
2	17	Block 1	199.77	26	11.98
17	18	Block 1	240	20.98	13
4	19	Block 1	210	22	16
1	20	Block 1	250.23	22	11.98

2.2.2. Performing of Welding Experiment

AISI 1020 low carbon steel plate of 10 mm thickness each was cut into 60x40x10 mm (length x width x width) dimension as shown in Figure 1. Emery paper (coarse: P24 grit size with 715 μm and fine: P80 grit size with 201 μm) was used to smoothen and eliminate rough particles and rust from the surface of specimen before welding the samples in Figure 2. This was followed by cleaning the surface of the samples to be welded with acetone in order to eliminate surface contamination. Using vertical milling machine, the welding sample (plate) was chamfered (2mm depth) with 45 degrees at the edge to form a V-groove angle while clamping it to a G-clamp. The Milling angle was done using a vertical milling machine. The welding was carried out with the plates properly clamped to avoid misalignment during welding process. TIG welding was applied to the chamfered area of the plate and filling the chaffered region using 2% thoriated tungsten electrode. This was achieved through the use of Dynasty 210 DX welding machine and 100 % Argon as the torch gas to protect the welding region from contaminants.

The TIG welding specifications employed in the welding process are presented in Table 4 while samples of the steel plates subjected to welding are shown in Plate 1.

Table 4. Materials and specifications used for the welding experimentation

S/N	Material Specification	Welding Specification
1	Welding Type	Tungsten Inert Gas (TIG)
2	Material	AISI 1020 Low Carbon Steel Plate
7	Material Thickness	10 mm
8	Filler Material	ER 70 S-6
9	Joint Type	Butt Joint (V-groove)
10	Joint Preparation	Abrasive Clean (Sand paper)/Acetone Wipe
11	Joint Gap	2 mm
12	Welding Current	D.C.E.N (Direct Current Electrode Negative)
13	Pulse Width	0.8 Seconds
14	Filler Rod Angle	15^{o}
15	Welding Torch Angle	45^{o}
16	Fixed Frequency	60Hz
17	Torch Type	Pro-torch (TIG Torch)
18	Tungsten Type	2% thoriated
19	Tungsten Size	3/1326” Diameter x 25.4 mm
20	Torch Gas	Argon (100%)
21	Heat Input Ratio	10.75 KJ/min
22	Weight of Filler Rod	78.5 Kg/m^2
23	Welding machine	Dynasty 210 DX
24	Clamp type	G-clamp for clamping the work pieces
25	Vertical milling machine	For milling the V-groove angle

K-type thermocouples were attached to the surface of the workpiece and the temperature was recorded at different points as the arc passed along the workpiece. Also, the welding torch passed over the plate at a height of 2.5mm from the workpiece at constant velocity of 1.72 m/s. The welding experiments were carried out according to the Central Composite Design Matrix (CCD) in Tables 3 and in a random order to avoid any systematic error in the experiment. The welded samples are shown in Plate 3.3. The welded plates were checked for any visible defects and uniformity and then cross-examined at their axial midpoints to make test specimens. These 60 x 40 x10 mm dimensioned test specimens were polished and etched after completing all the experiments.

Figure 2. Mild steel welded samples

2.2.3. Optimization of Welding Parameters

There are many statistical techniques for solving multiple response problems, such as overlaying the contours plot for each response, constrained optimization problem and desirability approach. The common statistical software packages, such as GPSS, NEMROD and Design-Expert, include multiple response optimization techniques. The desirability method is recommended due to its simplicity, availability in the software and it also provides flexibility in weighting and giving importance to individual responses. Solving such multiple response optimization problems using this technique

consists of using a technique for combining multiple responses into a dimensionless measure of performance called the overall desirability function. The desirability approach consists of transforming of each estimated response, Yi, into a dimensionless utility bounded by $0 < di < 1$, where a higher di value indicates that the response value Yi is more desirable, if $di = 0$ this means a completely undesired response or vice versa when $di = 1$. Figure 3 shows a flow chart of the optimization steps in the design-expert software 7.

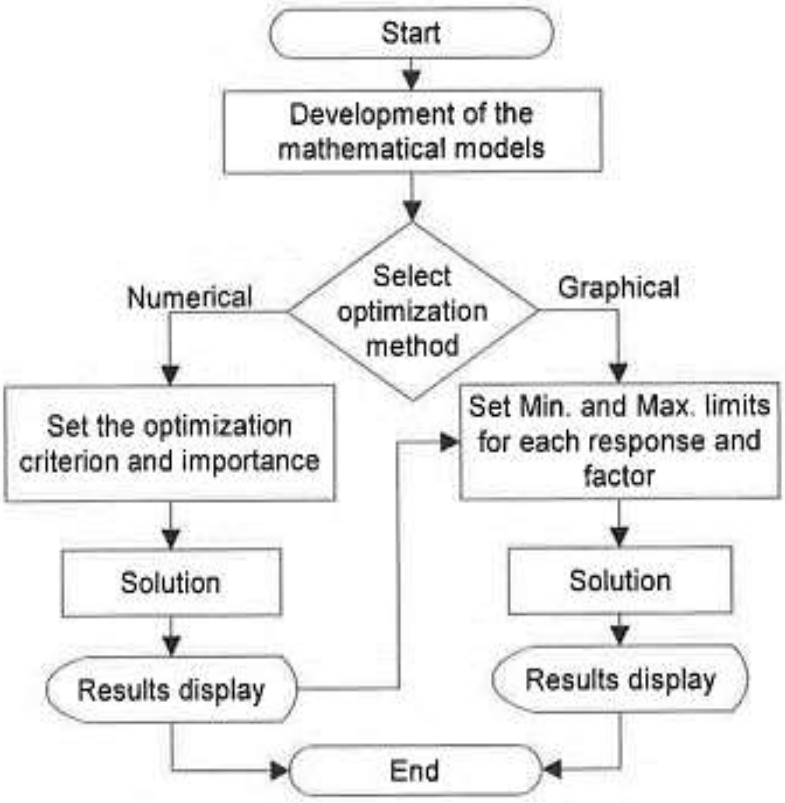

Figure 3. Optimization sequential steps

2.2.4. Response Surface Methodology (RSM)

Response Surface Methodology (RSM) is a collection of statistical and mathematical data useful for modeling, prediction and optimizing processes. RSM works adequately with the use of Design of Experiment (DOE), where a number of independent parameters (input variables) are optimized for desired output response (output variables) which must be minimized. In this case, experiment is a sequence of test known as runs where adjustments are made to the input variables in order to point out the cause for changes in the output response. The most substantial use of RSM is in applications where various input variables significantly influence the performance characteristic (response) of the process. The input variables are also known as independent variables and they are dependent on the feed data from the researcher. The field of RSM involves experimental techniques for investigating the unknown variables in the process, empirical statistical modeling to develop the proper approximating relationship between the yield and the process variables, and optimization methods for identifying appropriate values of the process variables to generate desirable values for the response. Response Surface Methodology was originally developed for modeling of experimental responses, but its application later diversified into modeling of numerical experiments. It is important to note that the difference is mainly in the type of error generated by the response. For example, physical experiment can generate certain inaccuracies such as measurement errors, inappropriate selection of welding electrode, uncontrolled welding parameters etc. whereas numerical noise in computer aided experiment is a function of partially completed convergence iterative processes, round-off errors etc. Hence, computer aided experiment eliminates possible errors encountered in physical experiments and provides computational iterations to enable the researcher choose between previously generated result and subsequent results. This in turn

saves iteration time, cost and damages that errors resulting from physical experiments would cause to structures designed through welding processes. Statistical modeling will be incorporated in this study to develop an appropriate approximating model between the response y and independent variables ξ_1, $\xi_2, \ldots\ldots \xi_k$. Generally, the relationship is given as by Equation 1.

$$y = f(\xi_1, \xi_2, \ldots\ldots \xi_k) + \varepsilon \quad (1)$$

Where the real response function *f* is unknown and the symbol ε represents other sources of variability not accounted for in *f*. On the other hand, ε encompasses operational effects such as measurement error on the response, background noise, effect of other variables etc. ε is sometimes considered as a statistical error, usually assuming it to have a normal distribution with mean zero and variance σ^2. Therefore,

$$E(y) = \eta = E\,[f(\xi_1, \xi_2, \ldots\ldots \xi_k)] + E\,(\varepsilon) = f(\xi_1, \xi_2, \ldots\ldots \xi_k) \quad (2)$$

The variables $\xi_1, \xi_2, \ldots\ldots \xi_k$ are oftentimes known as the natural variables, because they are expressed in the natural units of measurement, such as ^oC, lb/in² etc. In several RSM applications, it is appropriate to transform the natural variables to coded variables $x_1, x_2, \ldots\ldots x_k$ which are usually considered dimensionless with mean zero and the same standard deviation. For the coded variable is given by Equation 3.

$$\eta = f(x_1, x_2, \ldots\ldots x_k) \quad (3)$$

Since the real response function *f* is unknown, approximation is allowed. However, successful application of RSM is significantly dependent upon the researcher's ability to develop a suitable approximation for *f*. A low-order polynomial in comparatively small part of the independent variable margin is appropriate. In some cases, either a first-order or a second order model is considered suitable, but the first model may be considered in cases where the researcher is approximating the real response surface over a small area of independent variable margin in a domain with little curvature in *f*. In a case of two independent variables, the first-order model in terms of the coded variables is given by Equation 4:

$$\eta = \beta_o + \beta_1 x_1 + \beta_2 x_2 \quad (4)$$

The first-order model expressed in Equation 4 is also known as the main effects model, because it consist only of the focal effects of the two variables x_1 and x_2. In some cases where the two variables interact, it can be incorporated to the model as expressed in Equation 5.

$$\eta = \beta_o + \beta_1 x_1 + \beta_2 x_2 + \beta_{12} x_1 x_2 \quad (5)$$

The expression in Equation 5 represents the first-order model with interaction, and computing the interaction term introduces curvature into the response function. Generally, curvature in the real response surface is so effective that the first model even with the inclusion of the interaction term is inadequate. Similar cases as this usually require a second order model, in which case is given by Equation 6 for the case of two variables;

$$\eta = \beta_o + \beta_1 x_1 + \beta_2 x_2 + \beta_{11} x_1^2 + \beta_{22} x_2^2 + \beta_{12} x_1 x_2 \quad (6)$$

This first order model would possibly be applied as an approximation to the real response surface in a relatively small region, whereas, the second-order model has a wide range of application in RSM for the following reasons;

i. The second-order model is very flexible and can support a wide variety of functional forms, so it will function appropriately as an approximation to the real response surface.

ii. Estimation of parameters (the β's) is easy with the second-order model. The method of least squares can be adopted for this purpose.

iii. There is extensive practical application indicating that second-order models work well in solving real response surface problems.

In summary, the first-order model is given by Equation 7:

$$\eta = \beta_o + \beta_1 x_1 + \beta_2 x_2 + \cdots \beta_k x_k \quad (7)$$

But the second-order model is given by Equation 8:

$$\eta = \beta_o + \sum_{j=1}^{k} \beta_j x_j + \sum_{j=1}^{k} \beta_{jj} + x_j^2 + \sum_{i<}^{} \sum_{j=2}^{k} \beta_{ij} x_i x_j \quad (8)$$

2.2.5. Test for Significance of Model

As shown in Table 5, Analysis of Variance (ANOVA) which is a method for collection of statistical models and their associated procedures, and the following ratings (lack of fit, VIF, goodness of feet test) will be used to determine the accuracy of each model.

Table 5. Statistical Measures for Determination of Model Significance

Variation	Sum of Squares	Degree of Freedom	Mean Square	f_0
Regression	SS_R	9	MS_R	MS_R/ MS_E
Error	SS_E	N-9-1	MS_E	
Total	SS_T	N-1		

The error sum of square SS_E is an approach that measures the extent of variation resolved by the regression. Thus, the smaller the SS_E, the better the regression model and vice versa. The variations shown in Table 5 is given by the following mathematical Equations 9-12:

$$SS_E = SS_T - SS_R \quad (9)$$

$$SS_T = Y'Y - \frac{\left[\sum_{i=1}^{n} y_i\right]^2}{n} \quad (10)$$

$$SS_R = \beta' X'Y - \frac{\left[\sum_{i=1}^{n} y_i\right]^2}{n} \quad (11)$$

$$SS_E = Y'Y - \frac{\left[\sum_{i=1}^{n} y_i\right]^2}{n} \left[\beta' X'Y - \frac{\left[\sum_{i=1}^{n} y_i\right]^2}{n}\right] \quad (12)$$

Where SS_E, SS_R and SS_T is the sum of square error, sum of square due to regression and sum of square total, respectively. $\sum_{i=1}^{n} y_i$ is the sum of the dependable variables, n in the total number of the dependable variable β' is the regression coefficient and X' is the dependent variable and Y is the response.

3. RESULTS AND DISCUSSION

In this study, twenty experimental runs were carried out, each experimental run comprising the current, voltage and gas flow rate, used to join two pieces of AISI 1020 mild steel plates of 10 mm thickness measuring 60 x 40 x 10mm (length x width x width). The thermal conductivity were measured and the results presented in Table 6.

Table 6. Experimental results

run	Block	Current	Voltage	Gas flow Rate	Experimental Thermal conductivity
1	Block 1	250.23	23.5	13.5	70.75

2	Block 1	225	26	14.5	68.73
3	Block 1	250.23	24.5	14.5	81.75
4	Block 1	240	25	16	66.76
5	Block 1	225	25	16	79.75
6	Block 1	240	20.98	13.5	63.75
7	Block 1	199.77	24.5	13.5	74.20
8	Block 1	210	25	16	72.65
9	Block 1	199.77	26	11.98	78.23
10	Block 1	250.23	20.98	13.5	73.0
11	Block 1	240	22	11.98	71.75
12	Block 1	225	24.5	11.98	59.75
13	Block 1	210	22	16	77.75
14	Block 1	199.77	23.5	14.5	58.8
15	Block 1	210	20.98	14.5	78.72
16	Block 1	225	22	13.5	57.75
17	Block 1	199.77	26	11.98	55.84
18	Block 1	240	20.98	13	76.69
19	Block 1	210	22	16	71.78
20	Block 1	250.23	22	11.98	63.75

In this study, an attempt is made to develop a second order mathematical relationship between selected input variables, namely; current (I), voltage (V) and gas flow rate coupled with two response output variable (thermal conductivity) using response surface methodology (RSM). The target of the optimization model was to minimize thermal conductivity. The final solution of the optimization process was to determining the optimum value of each input variable namely: current (Amp), voltage (Volt) and gas flow rate that will minimize thermal conductivity. To generate the experimental data for the optimization process;

i. First, statistical design of experiment (DOE) using the central composite design method (CCD) was done. The design and optimization was executed with the aid of statistical tool. For this particular problem, Design Expert 7.01 was employed.

ii. Secondly, an experimental design matrix having six (6) center points (k), six (6) axial points (2n) and eight (8) factorial points (2^n) resulting to 20 experimental runs was generated.

The model summary shows that the model is of the quadratic type which requires the polynomial analysis order as depicted by a typical response surface design.

To validate the suitability of the quadratic model in analyzing the experimental data, the sequential model sum of squares was calculated for thermal conductivity response which is presented in Table 7.

Table 7. Sequential model sum of square for thermal conductivity

	Sum of		Mean	F	p-value	
Source	Squares	df	Square	Value	Prob > F	
Mean vs Total	1059.39	1	1059.39			
Linear vs Mean	32.56	3	10.85	64.62	< 0.0001	
2FI vs Linear	1.71	3	0.57	7.54	0.0036	
Quadratic vs 2FI	0.83	3	0.28	18.59	< 0.0001	Suggested
Cubic vs Quadratic	0.085	4	0.021	1.98	0.2169	Aliased
Residual	0.064	6	0.011			
Total	1094.64	20	54.73			

The sequential model sum of squares in Table 7 indicates the accumulating improvement in the model fit as terms are added. Based on the calculated sequential model sum of square, the highest order polynomial where the additional terms are significant and the model is not aliased was selected as the best fit. To test how well the quadratic model can explain the underlying variation associated with the experimental data, the lack of fit test was estimated for each of the responses. Model with significant

lack of fit cannot be employed for prediction. Results of the computed lack of for thermal conductivity is presented in Table 8.

Table 8. Lack of fit test for thermal conductivity

	Sum of		Mean	F	p-value	
Source	Squares	Df	Square	Value	Prob > F	
Linear	1503.79	11	136.71	20.30	0.0019	
2FI	553.02	8	69.13	10.27	0.0101	
Quadratic	32.35	5	6.47	0.96	0.5169	Suggested
Cubic	0.068	1	0.068	0.010	0.9238	Aliased
Pure Error	33.67	5	6.73			

From the results it was again observed that the quadratic polynomial had a non-significant lack of fit and was suggest for model analysis while the cubic polynomial had a significand lack of fit hence aliased to model analysis. The model statistics computed for thermal conductivity response based on the model sources is presented in Table 9.

Table 9. Model summary statistics for thermal conductivity

	Std.		Adjusted	Predicted		
Source	Dev.	R-Squared	R-Squared	R-Squared	PRESS	
Linear	9.80	0.3271	0.2009	-0.1968	2734.42	
2FI	6.72	0.7432	0.6247	0.4426	1273.49	
Quadratic	2.57	0.9711	0.9451	0.8705	295.82	Suggested
Cubic	2.37	0.9852	0.9532	0.9722	63.47	Aliased

The summary statistics of model fit shows the standard deviation, the r-squared, adjusted r-squared, predicted r-squared and predicted residual error sum of square (PRESS) statistic for each complete model. Low standard deviation, R-Squared near one and relatively low PRESS is the optimum criteria for defining the best model source. Based on the results, the quadratic polynomial model was suggested while the cubic polynomial model was aliased hence, the quadratic polynomial model was selected for this analysis. In assessing the strength of the quadratic model towards minimizing thermal conductivity. One way analysis of variance (ANOVA) was generated which is presented in Table 10.

Table 10. ANOVA table for thermal conductivity

	Sum of		Mean	F	p-value	
Model	2218.67	9	246.52	37.34	< 0.0001	significant
A-current	0.73	1	0.73	0.11	0.7455	
B-voltage	722.09	1	722.09	109.38	< 0.0001	
C-gas flow rate	24.40	1	24.40	3.70	0.0834	
AB	80.33	1	80.33	12.17	0.0058	
AC	133.74	1	133.74	20.26	0.0011	
BC	736.70	1	736.70	111.59	< 0.0001	
A^2	0.98	1	0.98	0.15	0.7080	
B^2	504.34	1	504.34	76.39	< 0.0001	
C^2	18.82	1	18.82	2.85	0.1222	
Residual	66.02	10	6.60			
Lack of Fit	32.35	5	6.47	0.96	0.5169	not significant
Pure Error	33.67	5	6.73			
Cor Total	2284.69	19				

To validate the adequacy of the quadratic model based on its ability to mminimize the thermal conductivityn the goodness of fit statistics presented in Table 11.

Table 11. Goodness of fit statistics for thermal conductivity

Std. Dev.	2.57	R-Squared	0.9711

Mean	54.71	Adj R-Squared	0.9451
C.V. %	4.70	Pred R-Squared	0.8705
PRESS	295.82	Adeq Precision	23.324

To obtain the optimal solution, we first consider the coefficient statistics and the corresponding standard errors. The computed standard error measures the difference between the experimental terms and the corresponding predicted terms. Coefficient statistics for thermal conductivity variable is presented in Table 12.

Table 12. Coefficient estimates statistics generated for thermal conductivity

	Coefficient estimate	Standard error	95% CI low	95% CI High	VIF
Intercept	50.07	1.05	47.74	52.41	
A-current	-0.23	0.70	-1.78	1.32	1.00
B-voltage	7.27	0.70	5.72	8.82	1.00
C-gas flow rate	-1.34	0.70	-2.89	0.21	1.00
AB	-3.17	0.91	-5.19	-1.14	1.00
AC	4.09	0.91	2.06	6.11	1.00
BC	-9.60	0.91	-11.62	-7.57	1.00
A^2	-0.26	0.68	-1.77	1.25	1.02
B^2	5.92	0.68	4.41	7.42	1.02
C^2	1.14	0.68	-0.37	2.65	1.02
Intercept	50.07	1.05	47.74	52.41	

Variance inflation factor (VIF) value of 1.00 for the individual and combine terms, 1.02 for the quadratic terms as observed indicate a significant model in which the variables are highly correlated with the responses. The optimal solution which shows the individual effects and combine interactions of the selected input variables (current, voltage and gas flow rate) against the mesured thermal conductivity is presented based on the coded values in Figure 4.

$$
\begin{aligned}
\text{thermal conductivity} = {} & \\
& +50.07 \\
& -0.23 * A \\
& +7.27 * B \\
& -1.34 * C \\
& -3.17 * A * B \\
& +4.09 * A * C \\
& -9.60 * B * C \\
& -0.26 * A^2 \\
& +5.92 * B^2 \\
& +1.14 * C^2
\end{aligned}
$$

Figure 4. Optimal solution in terms ofcoded factors for thermal conductivity

The optimal solution which shows the individual effects and combine interactions of the selected input variables (current, voltage and gas flow rate) against the mesured thermal conductivity is presented based on the actual values in Figure 5.

thermal conductivity =

-152.45658

+1.18084 * current

-25.19539 * voltage

+43.71993 * gas flow rate

-0.14083 * current * voltage

+0.18172 * current * gas flow rate

-4.26500 * voltage * gas flow rate

-1.15933E-003 * current^2

+2.62921 * voltage^2

+0.50789 * gas flow rate^2

Figure 5. Optimal solution in terms of actual factors for thermal conductivity

The diagnostics case statistics which shows the observed values of thermal conductivity their predicted values is presented in Table 13 The diagnostic case statistics actually give insight into the model strength and the adequacy of the optimal second order polynomial equation.

Table 13. Diagnostics case statistics report of thermal conductivity

Runs	Actual	Predicted	residual	Leverage	Internally Studentized	Externally Studentized	Influence on Fitted Value	Cook's
1	70.75	68.49	2.27	0.670	1.538	1.670	* 2.38	0.480
2	68.73	65.19	0.80	0.670	0.545	0.525	0.748	0.060
3	81.75	80.10	-0.80	0.670	-0.543	-0.523	-0.745	0.060
4	66.76	67.58	-0.83	0.670	-0.564	-0.544	-0.775	0.065
5	79.75	81.76	0.95	0.670	0.643	0.623	0.887	0.084
6	63.75	64.88	0.92	0.670	0.622	0.602	0.857	0.078
7	74.20	72.52	-0.69	0.670	-0.466	-0.447	-0.637	0.044
8	72.65	70.89	-2.15	0.670	-1.459	-1.560	* -2.22	0.432
9	78.23	75.72	-0.97	0.607	-0.604	-0.584	-0.726	0.056
10	73.0	70.94	0.81	0.607	0.502	0.482	0.599	0.039
11	71.75	67.57	-2.88	0.607	-1.791	-2.061	* -2.56	0.496
12	59.75	56.03	2.72	0.607	1.688	1.894	* 2.36	0.441
13	77.75	74.55	-0.80	0.607	-0.497	-0.478	-0.594	0.038
14	58.8	54.05	0.64	0.607	0.395	0.378	0.469	0.024
15	78.72	75.07	1.68	0.166	0.716	0.697	0.312	0.010
16	57.75	53.07	-3.32	0.166	-1.415	-1.501	-0.671	0.040
17	55.84	40.99	1.68	0.166	0.716	0.697	0.312	0.010
18	76.69	72.07	1.68	0.166	0.716	0.697	0.312	0.010
19	71.78	68.07	-3.37	0.166	-1.437	-1.530	-0.683	0.041
20	63.75	61.07	1.68	0.166	0.716	0.697	0.312	0.010

Lower residual values resulting to higher leverages as observed as indicators of a well fitted model. To access the accuracy of prediction and established the suitability of response surface methodology using the quadratic model, a reliability plot of the observed and predicted values for thermal conductivity is obtained in Figure 6.

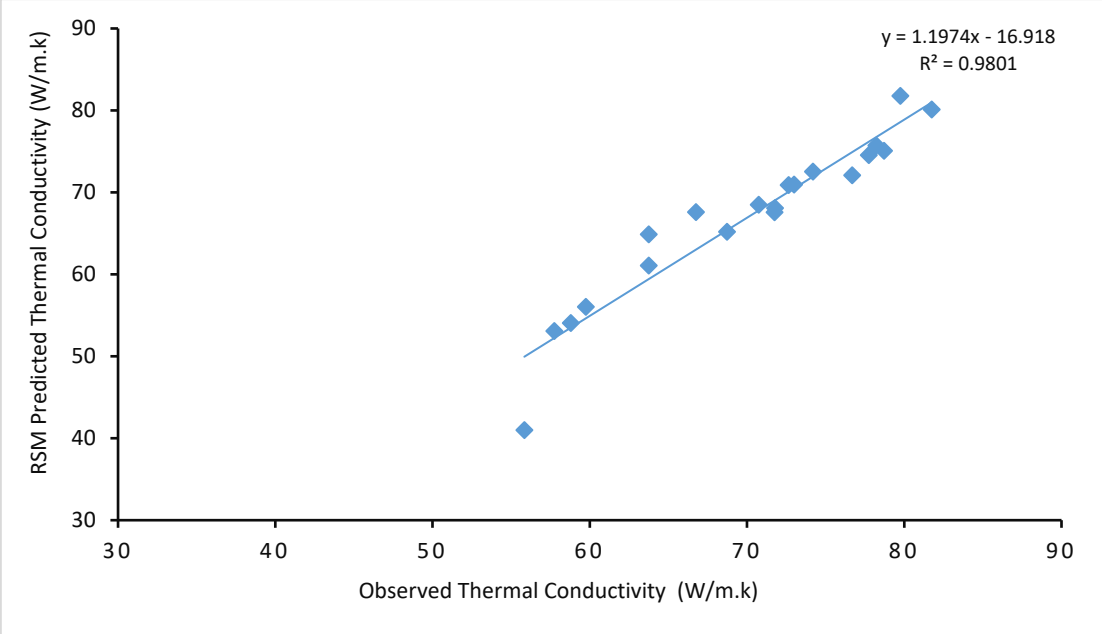

Figure 6. Regression plot of observed versus predicted thermal conductivity

The high coefficient of determination (r^2 = 0.9801) as observed in Figure 6 was used to established the suitability of response surface methodology in optimizing percentage of thermal conductivity. To accept any model, its satisfactoriness must first be checked by an appropriate statistical analysis output. To diagnose the statistical properties of the response surface model, the normal probability plot of residual presented in Figure 7. It can be observed that the points follow a straight line despite the slight scatter. This indicates that the residuals are normally distributed and no transformation of the response data is required for better analysis. To accept any model, its satisfactoriness must first be checked by an appropriate statistical analysis output. To diagnose the statistical properties of the thermal conductivity response surface model, the normal probability plot of residual presented in Figure 7.

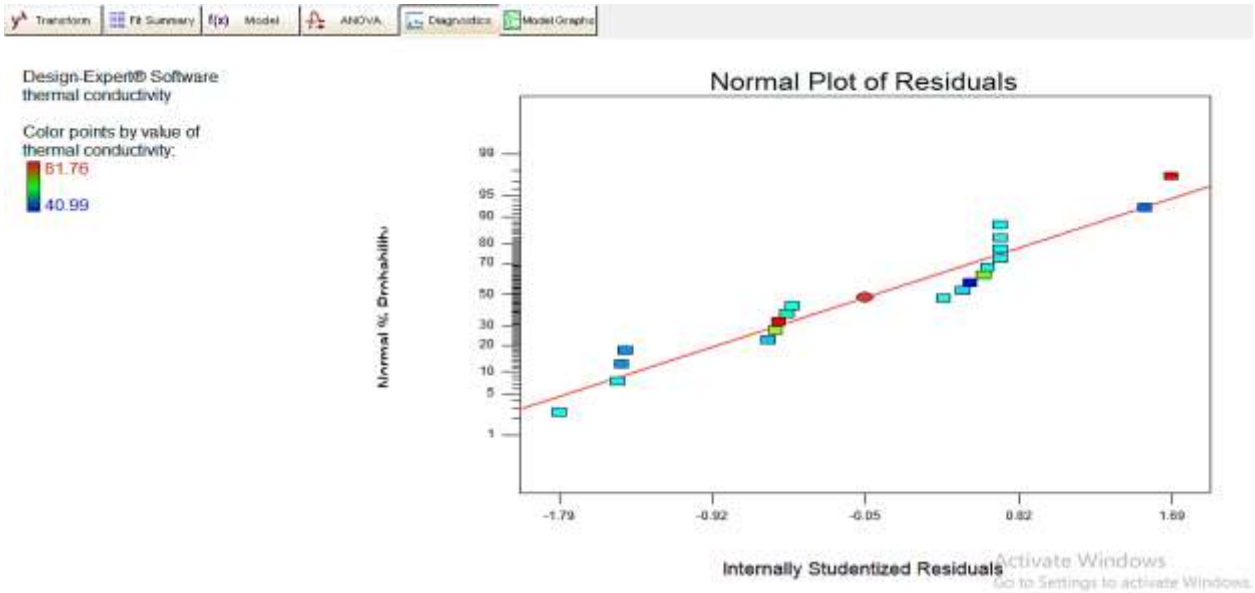

Figure 7. Normal plot of residuals for thermal conductivity

In order to detect a value or group of values that are not easily detected by the model, the predicted values is plotted against the actual values, for viscosity which is shown in the Figure 8.

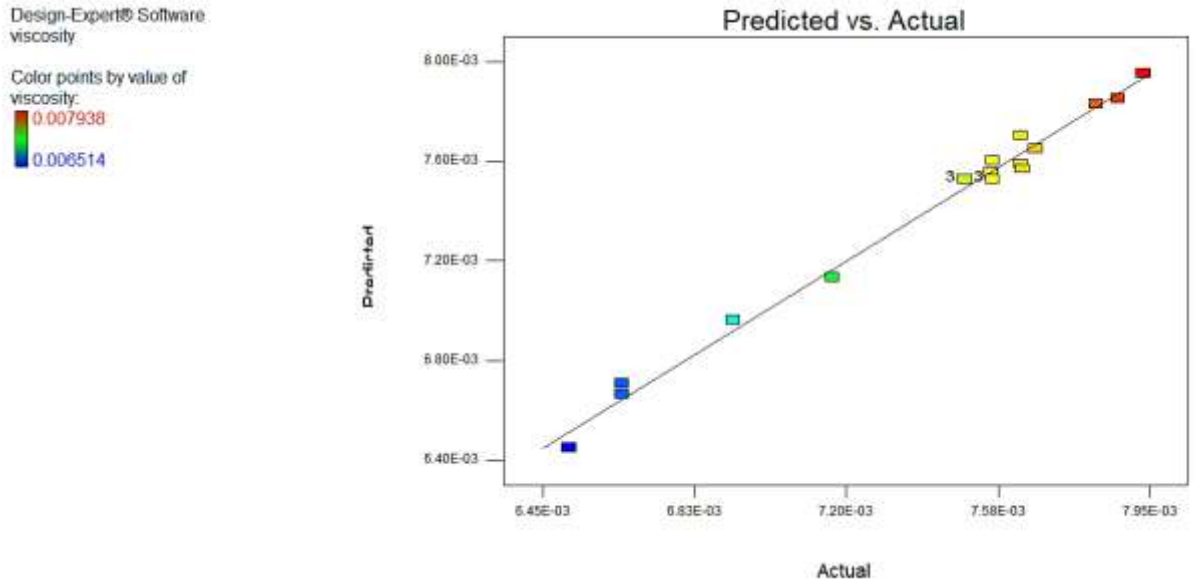

Figure 8. Plot of predicted Vs actual for viscosity

In order to detect a value or group of values that are not easily detected by the model, the predicted values is plotted against the actual values, for thermal conductivity which is shown in the Figure 9.

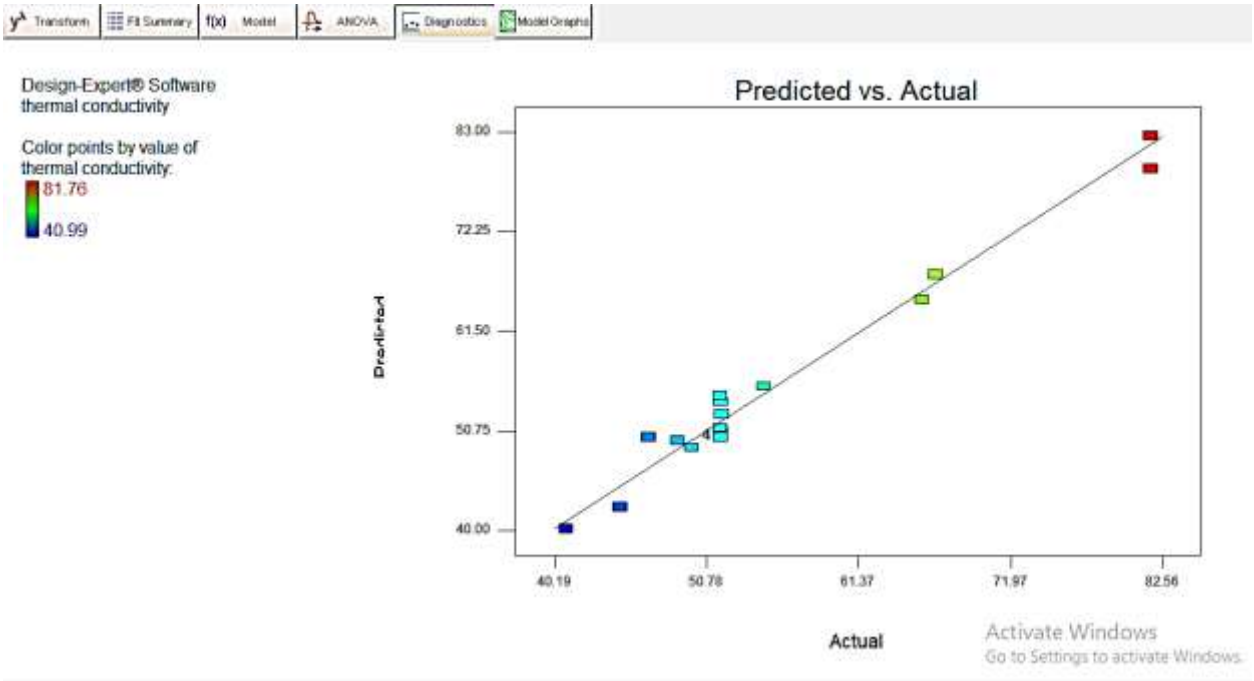

Figure 9. 4.11: Plot of predicted Vs actual for thermal conductivity

As can be seen from the graph, the points are close to the line of fit. The model essentially is able to predict most of the data points. To determine the presence of a possible outlier in the experimental data, the cook's distance plot was generated for the different responses. The cook's distance is a measure of

how much the regression would change if the outlier is omitted from the analysis. A point that has a very high distance value relative to the other points may be an outlier and should be investigated. The generated cook's distance for the thermal conductivity is presented in Figure 10.

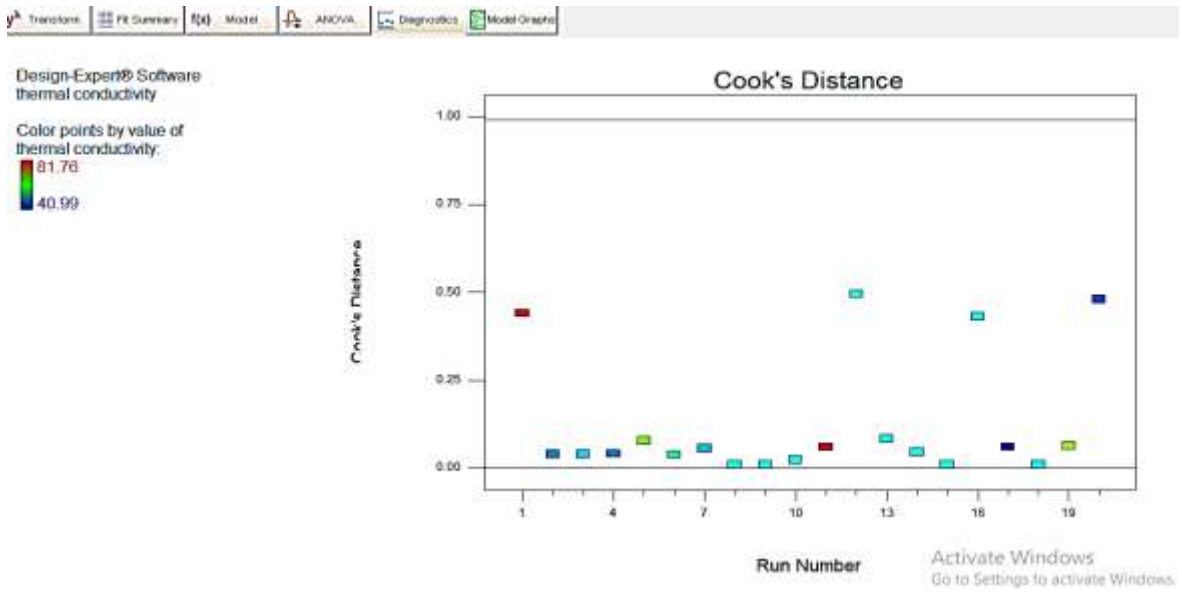

Figure 10. Generated cook's distance for thermal conductivity

The cook's distance plot has an upper bound of 1.00 and a lower bound of 0.00. Experimental values smaller than the lower bound or greater than the upper bounds are considered as outliers and must be properly investigated. To study the effects of current and voltage on the thermal conductivity, 3D surface plots presented in Figure 11 was generated while Figure 12 shows the effect of current and gas flow rate on the thermal conductivity. To study the effects of voltage and gas flow rate on the thermal conductivity, 3D surface plots was generated as presented in Figure 13.

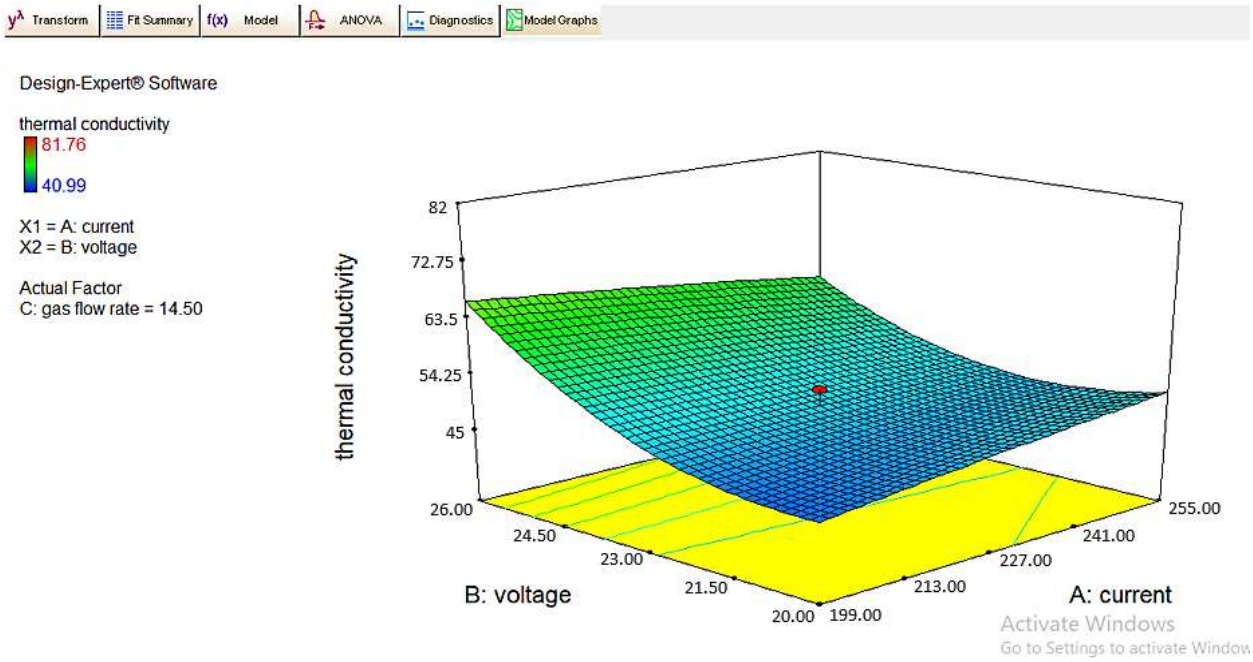

Figure 11. Effect of voltage and current on thermal conductivity

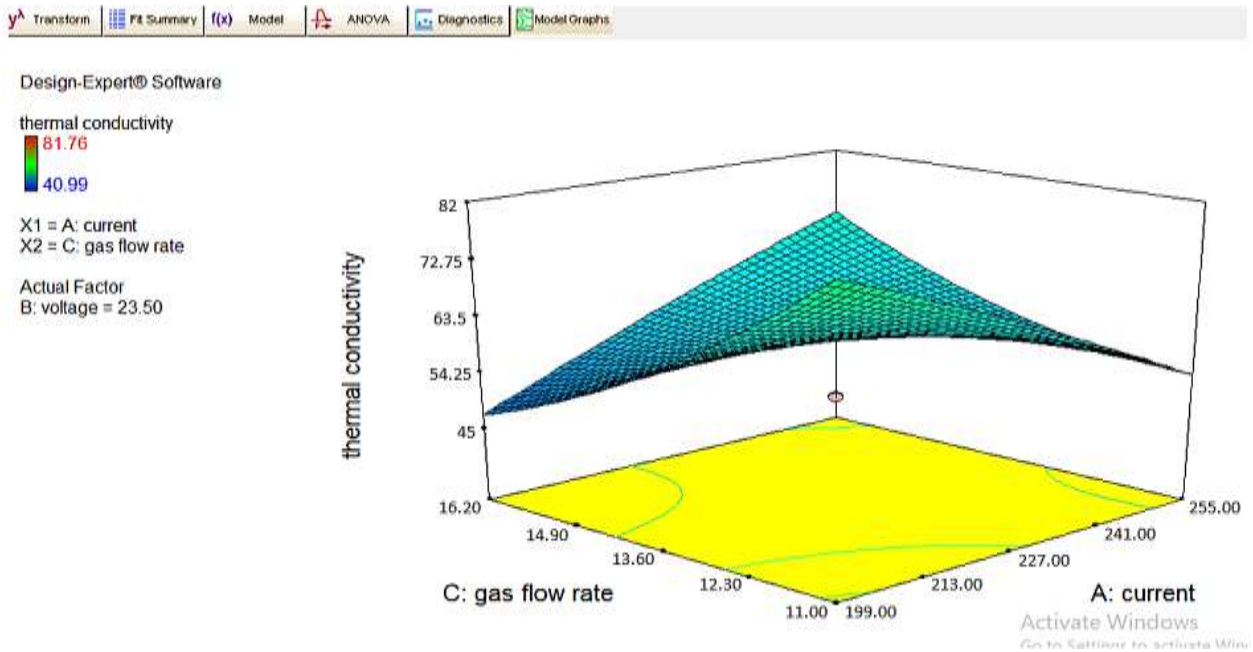

Figure 12. Effect of current and gas flow rate on the thermal conductivity

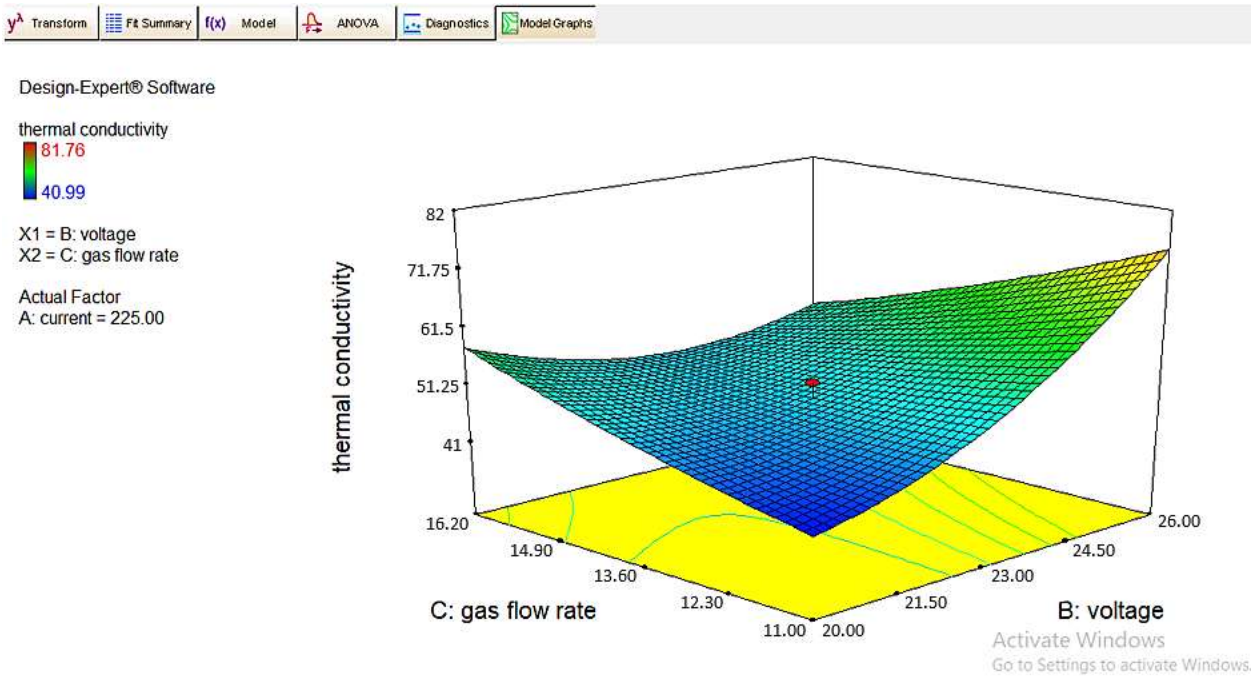

Figure 13. Effect of voltage and gas flow rate on the thermal conductivity

Finally, numerical optimization was performed to ascertain the desirability of the overall model. In the numerical optimization phase, design expert was programmed to minimize thermal conductivity. In addition, the optimum current, voltage and gas flow rate were determined simultaneously. The numerical optimization produces about nine (9) optimal solutions which are presented in Table 14.

Table 14. Numerical optimal solutions

Weld run	Current	Voltage	Gas flow rate	Thermal conductivity	Desirability	
1	210	22	16	65.19	0.925	
2	210	20.98	14.5	64.88	0.925	
3	199.77	23.5	14.5	67.57	0.915	

4	210	22	16	56.03	0.920	
5	199.77	26	11.98	54.05	0.930	
6	225	22	13.5	53.07	0.930	
7	199.77	26	11.98	40.99	0.940	Selected
8	240	20.98	13	68.07	0.915	
9	199.77	24.5	13.5	61.07	0.930	

From the results of Table 14, it was observed that a current of 199.77 amp, voltage of 26 volts and gas flow rate of 11.98 L/min produced a weld with thermal conductivity of 40.99 W/m.k. This solution was selected by design expert as the optimal solution with a desirability value of 94%. Finally, based on the optimal solution, the contour plots showing thermal conductivity response variable against the optimized values for current and voltage is presented in Figure 14.

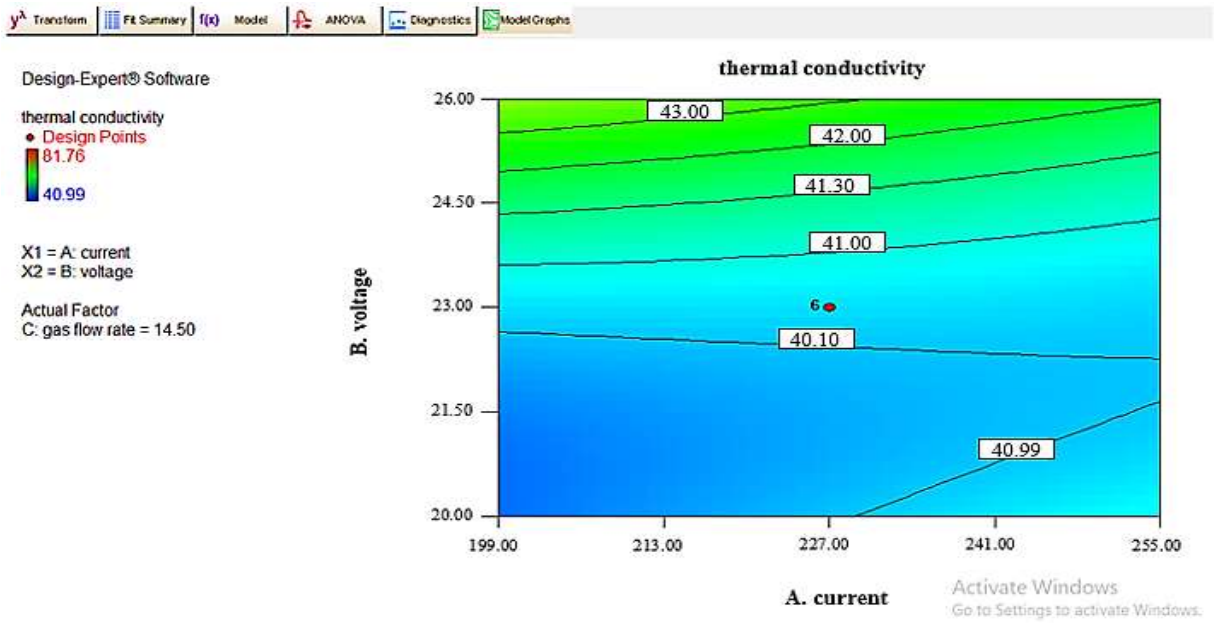

Figure 14. Predicting thermal conductivity using contour plot

The optimal solution of numerical optimization using RSM revealed that a current of 199.77 amp, voltage of 26 volts and gas flow rate of 11.98 L/min will produce a welded material having minimum thermal conductivity of 40.99 W/m.k. This solution was selected by design expert as the optimal solution with a desirability value of 94%.

CONCLUSION

A central composite design matrix based on optimization of tungsten inert gas welding input variables for output welds with optimum thermal conductivity have been successfully carried out in this study. From the experimental results, change in thermal conductivity of the welded joint was caused by the change in welding temperature gradient and material thermal cycle across the weldment. In addition, the welding thermal field intensely influenced the phase transformations and therefore the welded joint. Desirability value of 0.940 (94%) which is very close to 1 was obtained as the optimal solution from the computation process, indicating that RSM is a robust modelling tool that can perform seamlessly in studies involving optimization of input parameters for desired output. Hence, optimized input variables such as welding current of 199.77 amp, voltage of 26 volts and gas flow rate of 11.98 L/min produce welded joint with minimum thermal conductivity of 40.99 W/m.k. Therefore, welding input parameters should be properly selected and optimised using adequate optimization tools such as RSM, in order to achieve welds with good quality for industrial applications.

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GENDER DISCRIMINATION: A SOCIO-CULTURAL FACTOR FOR MALNUTRITION AFFECTING HEALTH OF FEMALES

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ABSTRACT

Gender discrimination in food distribution in households is a big issue that exists in society. Lack of education and awareness may be a contributing factor to the increasing tendency of providing good and healthy food for males first in the household while female members are regarded as second priority with limited and substandard meals. Gender discrimination varies according to the level and severity of patriarchy in different family systems. The present study was focused on females. For this purpose, a detailed questionnaire was developed which was pre-tested from 20 respondents so that the chances of validity of the questionnaire can be increased. Data were collected from two districts of the province of Punjab; Faisalabad and Rawalpindi's rural and urban areas respectively. For a quantitative study, a sample of 400 eligible females was interviewed through an interview schedule. For the qualitative study, in-depth interviews and focus group discussions were carried out with respondents. From the collected that it was analyzed that respondents think that gender discrimination is among the major reason for their malnourished health. Majority of them about 44.9% agreed to it to some extent, while 23.5% considered it as nothing. A huge majority of respondents 58.5% said that they are malnourished because their health is taken as secondary because of their gender. It has been observed from respondent's responses that the majority of them about 55.1% thought that they are malnourished because they took food at last. As a result, policy measures aimed at maternal education, greater working possibilities, particularly for educated mothers, and the provision of food to low-income families at subsidized rates may be beneficial. Awareness of equal social standing for male and female in society, via electronic, print, and especially social media, may also be useful in reducing gender discrimination.

Keywords: Gender Discrimination, Family Systems, Nutrition, Health.

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MUNICIPAL WASTE INCINERATOR BOTTOM ASH: A USEFUL SOURCE FOR NANO BIO FERTILIZER PRODUCTION FROM BIO RECOVERED METALS

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ABSTRACT

In the current study, an environment friendly and economically feasible waste management approach have been endeavored towards the bio recovery of metals from Municipal wastes Incinerator (MWI) bottom ash and further conversion into nanoparticles having potential importance in agriculture. *Aspergillus niger* was isolated and purified from rotten bread and inoculated for the production of acidic metabolites that exhibited good leaching efficiency of metals from wastes along with nanoparticles (NPs) formation at room temperature. Fourier-transform infrared spectroscopy (FT-IR) and Scanning electron microscopy (SEM) confirmed the formation of nanoparticles. Energy Dispersive X-ray spectroscopy (EDX) displayed strong signals for calcium, magnesium, Iron and zinc being leached out from wastes. Thus, a novel bio methodology was developed using fungal cell-free extract for bioleaching of metals and subsequently conversion of the waste materials into nano structured form. These biosynthesized nanoparticles were evaluated for their efficacy on seed germination activity of peas and presented enhanced growth at concentration of 18 ppm. These nanomaterials are expected to enhance plant growth properties and being targeted as additives in soil fertility and crop productivity enhancement.

Keywords: *Aspergillus niger*, Bioleaching, Fourier transform infrared spectroscopy (FTIR), Municipal waste incinerator bottom ash, Nanoparticles, Scanning electron microscopy (SEM), Seed-germination activity

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PREPARATION OF NEEM OIL AND ACRYLONITRILE COPOLYMER AS A POTENTIAL GREEN ADDITIVES AND ITS EFFECT ON POUR POINT DEPRESSANT OF A LUBE OIL

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ABSTRACT

In other to minimize environmental pollution, green additives prepared from bio-source with low cost and multi-functional application have attracted considerable attention in the field of lube oil industry. Neem oil was extracted using n-hexane as a solvent and some amount of Neem oil has mixed with turmeric rhizome (Antioxidant) to ascertain its oxidative stability and it was examined by FT-IR analysis. copolymer derived from Neem oil and acrylonitrile was prepared by direct polymerization through the double bond of the fatty acid chain in the present of free radical initiator led to the formation of environmentally friendly Copolymeric additive. The prepared Copolymer have been characterized by routine spectroscopic analysis. The rheological behavior and performance evaluation of the lube oil were examined in different concentration of additive Viz. 1% 2% 3% (w/v). However, the green additive act as good pour point depressant improver to the lube oil. The values of pour point for the lube oil blended with different prepared Copolymeric additives ranging from (9 to -11^0C). Thus, bio-source oil derived additive can be considered as a good alternative to be used in lube oil formulation.

Keywords: Antioxidant; Copolymer; Pour point depressant; Neem oil; Lube oil.

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INVESTIGATION of DESIGN PARAMETERS for MICROCHANNEL HEAT EXCHANGERS

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ABSTRACT

Microchannel heat exchangers are a technology that has attracted great interest in the refrigeration industry in recent years and is becoming more and more common. They stand out with their smaller size and improved performance compared to conventional heat exchangers. Therefore, they have become a preferred option in many application areas. Microchannel heat exchangers have many advantages such as high efficiency, low refrigerant charge, and compact design. This technology has different applications. In the automotive sector, more effective cooling is achieved by using microchannel heat exchangers in vehicles' air conditioning systems. In addition, in commercial and domestic air conditioners, energy efficiency is increased and lower energy consumption is achieved using this heat exchanger. In this study, the parameters affecting the performance in microchannel heat exchanger designs and the main factors to be considered were investigated, and the effects of these factors on energy efficiency and heat exchanger performance were determined. These factors are; the design of the collector structures and the control of the flow regime, the hydraulic diameter selection depending on the pressure loss, the design of the microchannel geometries and number of ports in the tube, design of fin geometry and the fin pitch, width and length, and the curtain design. In microchannel heat exchanger designs; to increase heat transfer, processes such as duct geometry design, minimum pressure loss, optimization of the number and size of ducts, as well as planning the production processes by making the correct material selection are important. In addition, the pollution in the channels and fins in microchannel heat exchangers negatively affects the heat exchanger performance. Controlling this pollution factor with smart technologies will make positive contributions to both energy efficiency and heat exchanger performance. Making designs by taking these factors into account will increase the efficiency of microchannel heat exchangers, thus contributing to energy savings and increasing their useful life.

Keywords: Energy efficiency, microchannel heat exchanger, refrigeration, design

Abbreviations

ALTM	Alternative laminated microchannel tube
CO_2	Carbon dioxide
DOP	Decentralized orifice plate
LSMC	Liquid-vapor separation microchannel condenser
MC-C	Microchannel condenser
PFMC	Parallel flow microchannel condenser
PMC	Parallel multi-section

Symbols

A	Surface area (m^2)
D	Diameter (m)
f	Friction factor
G	Mass flux (kg/m^2s)
L	Length (m)
ΔP	Pressure difference (Pa)
t	Height (m)
$\dot{V}$	Volumetric flow (m^3/s)
r	Radius (m)
v	Fluid velocity (m/s)
w	Width (m)
μ	Dynamic viscosity (Pa.s)
ρ	Density (kg/m^3)
Re	Reynolds number

Subscripts

Max	Maksimum
Min	Minimum
i	İnlet
o	Outlet
m	Katsayı
a	Average
f	Front
h	Hydraulic

INTRODUCTION

The main theme in the developing refrigeration industry is to design environmentally friendly and energy efficient chillers. The factors that enable us to reference these in our designs are global climate agreements, eco-design directives and national/international standards. When we reduce these limitations from general to specific, we can give examples such as the use of environmentally friendly refrigerants, refrigerant charge limitations for safety purposes, and limits on energy efficiency index values. There are many new or developing technologies to meet these requirements. To give examples of these, many elements such as the development of compressor, fan motor technologies and energy efficiency due to variable load by frequency control, designing efficient defrost techniques and management process, improving air flow structures and using microchannel heat exchangers, which is the focus of the study, can be addressed.

While hydraulic diameters of 3mm and above traditionally define heat exchanger channels, smaller hydraulic diameters are defined as minichannels and microchannels to provide higher heat transfer. Channels with hydraulic diameters between 1μm and 200μm are defined as microchannels in the literature (Kandlikar et al. 2001; Kandlikar et al. 2005). A wide range of fluids can be used in microchannel heat exchangers. For this reason, many theoretical and experimental studies on heat

transfer and flow have been carried out on microchannels. Heggs (1991), for example, evaluated the performance of microchannel heat exchangers by a method called compactness. He was able to evaluate the compactness of the heat exchanger with the ratio (m^2/m^3), which he defined as ratio of heat exchanger surface area to useful volume for the fluid. In human lungs, this ratio is 17500 m^2/m^3. As the size of the flow channels generally used decreases, the surface area density increases. Of course, the smaller channel size provides great advantages as it increases the heat exchange surface per unit volume.

The main reason for the inclusion of microchannel heat exchangers in designs is that they provide energy efficiency with refrigerant charge limitation and high heat transfer capacity. In addition to their advantages, they also have disadvantages. In case it is used as an evaporator, although the dense fin structure provides an advantage in terms of heat transfer, it can also create unfavorable conditions for us during the defrost phase. However, such a problem is not encountered when used as a condenser. Therefore, microchannel heat exchangers are generally used as condensers in cooling systems. There are many parameters affecting the performance of microchannel heat exchanger designs. Many studies have been conducted on these parameters.

Figure 1. Examples of new or emerging technologies in cooling systems

Li and Hrnjak (2021), conducted research on the development of a condenser prototype incorporating a unique separation circuit to effectively separate vapor and liquid phases. The prototype features an inlet positioned at the center of its height, which then splits into two distinct flow paths downstream of the second header. These two paths subsequently merge above the supercooling section of the condenser. Additionally, the study introduces a mechanism for evaluating the separation efficiency of the second header. The primary objective of the research was to determine the optimal design parameters for a microchannel condenser equipped with a separation circuit, utilizing R134a as the working fluid. The parameters subjected to optimization included the transition circuit, fin density, and air velocity distribution. Following the optimization process, the separation condenser exhibited a remarkable 17.8% enhancement in the mass flow rate of R134a when compared to a conventional condenser possessing an equivalent total air side area. Başaran and Yurddaş (2021), conducted a study focusing on the modeling and design aspects of a microchannel condenser (MC-C) specifically tailored for refrigeration applications employing isobutane as the working fluid. The researchers developed a thermal simulation model to explore novel MC-C designs. In this endeavor, a new correlation for the heat transfer coefficient was employed, and an experimental study was conducted to validate the model's accuracy. Remarkably, the model demonstrated precise predictions of the outlet temperature and heat transfer capacity of isobutane, with an error margin within ±2% and ±1%, respectively. The findings of the model revealed an interesting relationship between the hydraulic diameter and the heat transfer coefficient inside the microchannels. Specifically, as the hydraulic diameter decreases, the heat transfer coefficient increases; however, the heat transfer capacity decreases. Additionally, the researchers

considered the arrangement of transitions within the MC-C design. They observed that configurations with a larger number of tubes in transitions, where the vapor quality remains high, exhibited higher heat transfer capacity within the MC-C system. Boeng et al. (2020), conducted a comprehensive study on the thermal-hydraulic characteristics and system-level optimization of microchannel condensers for domestic cooling applications. The researchers developed a mathematical model aimed at predicting both the heat transfer rate and the air side pressure drop. They further established a correlation between the condenser geometry and the energy consumption of the device. The experiments were conducted in two stages to address different aspects of the study. In the first stage, the primary focus was on leveraging the condenser characteristics. In the second stage, the main objective shifted towards validating the accuracy of the developed model. Remarkably, the model successfully predicted the energy consumption with a margin of error within ±3.5%. The findings of the study revealed that a microchannel condenser with specific dimensions (200 mm height, 180 mm width, and 72 mm depth), comprising 46 rectangular channels with 200 fins per meter and a hydraulic diameter of 1.2 mm, resulted in a noteworthy 13% reduction in energy consumption compared to alternative configurations. This indicates the potential for significant energy savings when employing such optimized microchannel condenser designs in domestic cooling applications.

Ah et al. (2021), conducted a comparative analysis of the air-side heat transfer and pressure drop characteristics of three different microchannel condenser configurations (straight-type, U-shaped, and V-shaped) intended for use in refrigerators. The study concluded that the U-shaped microchannel condenser with an extended tube length exhibited superior heat transfer performance. On the other hand, the straight-type microchannel condenser was recommended for achieving high compactness and heat transfer efficiency. In another experimental research by Zhong et al. (2014), the focus was on parallel flow microchannel condensers (PFMC) with and without liquid-vapor separation coils (LSMC). The LSMC condensers featured headers designed to drain condensate after each pass. A comparison was made between the in-tube heat transfer coefficient and pressure drop of both types of microchannel condensers with similar heat transfer areas under varying mass flows, heat fluxes, and condensing temperatures. The experimental results indicated that, for mass flows exceeding 590 kg/(m^2s), the average heat transfer coefficient of LSMC surpassed that of PFMC. Furthermore, the pressure drop of LSMC was significantly reduced by 30.5% to 52.6% compared to PFMC. Based on these findings, it was concluded that the overall thermodynamic performance of LSMC outperformed that of PFMC. Xu et al. (2016), conducted experimental investigations on a novel low-charge microchannel condenser for domestic air conditioning systems utilizing hydrocarbon refrigerants. The experimental results revealed that the new condenser system, when compared to a conventional microchannel condenser, increased the cooling capacity by 1.6% and reduced the system refrigerant charge by 28.3%. These findings highlight the potential of the new condenser system for improved performance and reduced environmental impact.

Huang et al. (2014), introduced a generalized finite volume-based model designed for simulating microchannel heat exchangers (MC-Cs) featuring variable tube and fin geometries. These MC-Cs can exhibit diverse port sizes, tube sizes, fin surfaces, and may consist of single or multiple tube rows within the heat exchanger core. The presented model underwent validation using an extensive dataset comprising 227 experimental data points encompassing eight different fluids and eighteen MC-C geometries, including four microchannel condensers with variable geometries. This validation effort stands as the most comprehensive model validation conducted for MC-Cs in the existing literature. The average absolute capacity deviation between the predicted and measured values was found to be 2.7%, attesting to the accuracy of the model. Keniar et al. (2020), conducted a critical review focusing on analytical and numerical condensation models specifically tailored for microchannels. The study categorized the models based on the flow regimes applicable to condensation in microchannels and reviewed various models, particularly those pertaining to circular and intermittent flows. A criterion based on the film Reynolds number was proposed to assess the validity of modeling assumptions for internal forced convective condensation in microchannels. It was determined that circular flow models assuming laminar film behavior remained valid for Reynolds numbers below approximately 360, whereas turbulence effects had to be considered for higher Reynolds numbers. Similarly, intermittent flow models assuming laminar film behavior were deemed valid for Reynolds numbers below

approximately 130. This information provides valuable insights into the applicable modeling approaches for different flow regimes in microchannel condensation.

Li et al. (2023), conducted a study focused on measuring flow distribution and heat capacity potential within a microchannel evaporator. In microchannel heat exchangers, non-uniform distribution of the refrigerant can diminish the overall heat exchanger capacity, necessitating the optimization of heat exchanger designs. To address this issue, the study proposes a method that integrates a heat exchanger model with infrared thermography to accurately measure flow distribution and capacity potential in microchannel heat exchangers. The proposed method employs a comparison between simulation data and infrared images of the wall temperature within the heat exchanger to calculate the mass flow rates of liquid and vapor at the inlet of each microchannel tube. The simulation results reveal that when there is a higher proportion of liquid flowing into the center tubes, the liquid flow becomes unevenly distributed, resulting in reduced total mass flow rates and diminished heat capacity. The study highlights that the tested evaporator demonstrates a potential improvement in heat capacity ranging from 9.6% to 21.3% when the flow distribution is made more even. This emphasizes the significance of achieving uniform flow distribution within microchannel evaporators to enhance their overall heat capacity.

Guo et al. (2023), conducted a combined experimental and numerical investigation on the distribution and optimization design of two-phase refrigerant in new alternating laminated microchannel tube (ALMT) heat exchangers featuring vertical headers. Their findings indicated that, due to phase separation and gravity, a larger amount of liquid refrigerant is supplied to the middle tubes, while less is distributed to both ends. Building upon these results, the researchers proposed two design modifications to enhance refrigerant distribution: the decentralized orifice plate (DOP) and the parallel multi-compartment (PMC) approaches. The results obtained from the two designed models demonstrated the efficacy of these modifications. The application of the DOP approach reduced the mean standard deviation of the refrigerant flow rate from 0.21 to 0.07, while the PMC approach further decreased it to 0.03. These design modifications proved instrumental in achieving more uniform refrigerant distribution within the ALMT heat exchangers. In a related study, Park and Ha (2022), conducted an experimental investigation to explore the impact of vertical header geometry on two-phase refrigerant distribution and the overall performance of microchannel heat exchangers. The researchers examined three types of multi-chamber headers and two types of multi-chamber collectors to assess their effect on refrigerant distribution and performance. Among the configurations tested, the header with five independent refrigerant paths from the header inlet exhibited the most uniform distribution. Moreover, it was observed that implementing a double tubular vertical header led to an improvement in heat exchanger performance of up to 12%, owing to enhanced refrigerant distribution. Overall, these studies emphasize the importance of optimizing the design of vertical headers and employing design modifications like DOP and PMC to achieve more uniform refrigerant distribution and improve the performance of microchannel heat exchangers.

Kosan et al. (2020), conducted an experimental study analyzing the performance of an industrial cooling system utilizing a microchannel condenser. The system was designed and tested with both a classical condenser and a microchannel condenser using R449a refrigerant. The test results indicated that the microchannel condenser provided approximately an 11% advantage in terms of total energy consumption and total CO_2 emissions compared to the conventional system. In a related study, Park and Hrnjak (2008), performed an experimental and numerical investigation comparing microchannel and round tube condensers in a residential air conditioning system employing R410A refrigerant. The two systems were operated in separate environmental rooms, and their performances were measured under ARI A, B, and C conditions. The study found that the microchannel condenser outperformed the round tube condenser in all test conditions, demonstrating higher coefficients of performance (COP) and cooling capacities compared to the other system. Additionally, a numerical model for the microchannel condenser was developed, and the results were compared with the experimental data. The numerical model analysis revealed that the effect of air and refrigerant distribution did not significantly impact the capacity prediction of the microchannel condenser investigated in the study.

The aim of this study is to investigate main factors to be considered in microchannel heat exchanger design, to determine effects of these factors on energy efficiency and heat exchanger performance, and to inform the designers about the issues that should be considered.

MATERIALS AND METHOD

Microchannel heat exchangers are important devices that effectively realize heat transfer and are used in many application areas. These designs provide higher performance compared to conventional heat exchangers with features such as microchannel structure, high surface area and thin walls. They have advantages such as high heat transfer efficiency, low flow resistance, fast response time and smaller/lighter weight. However, in addition to these advantages, the risk of clogging, high production costs, limited compressive strength and precise design requirements are also found as limiting factors. Therefore, a number of factors need to be considered in the design of microchannel heat exchangers. These factors and their effects are discussed in the next section.

Major Factors to Consider in Microchannel Heat Exchanger Design

There are many factors affecting the performance of heat exchangers. These factors are discussed in the study. In Figure 2, the main factors to be considered in microchannel heat exchanger design are listed and detailed in the following section.

Flow Regime

Flow regimes depend on many parameters such as pressure, geometry, pipe slope (Tosun, 2015). Under constant heat flow conditions, the in-channel heat convection coefficient increases as a result of reducing the channel hydraulic diameter in heat exchangers. Under fully developed laminar flow conditions, there is an inverse relationship between heat convection coefficient and hydraulic diameter. As the hydraulic diameter decreases, in-channel heat convection coefficient and therefore total heat transfer coefficient increases. The fluid enters the duct in vapor phase as a single phase and slowly changes to liquid phase along wall due to heat flux at duct walls. The condensation process causes the liquid film to thicken, which leads to a decrease in the degree of dryness and consequently to a decrease in the condensation heat transfer coefficient. Finally, vapor condenses completely and passes into the liquid phase. Depending on these flow regimes, the condensation heat transfer coefficient gradually decreases (Basaran, 2020). The flow regime in microchannel heat exchangers is determined depending on the velocity and characteristic dimensions of the fluid. Equations and expressions used for different flow regimes are given below:

1. Laminar Flow Regime:

Laminar flow regime occurs in the case of low flow velocities or small channel sizes. In the laminar flow regime, fluid moves layer by layer and the velocity of the fluid is uniformly distributed. The Hagen-Poiseuille Law used for the laminar flow regime (Loudon and Mcculloh, 1999);

$$\Delta P = \frac{128 \mu L \dot{V}}{\pi D^4} \quad (1)$$

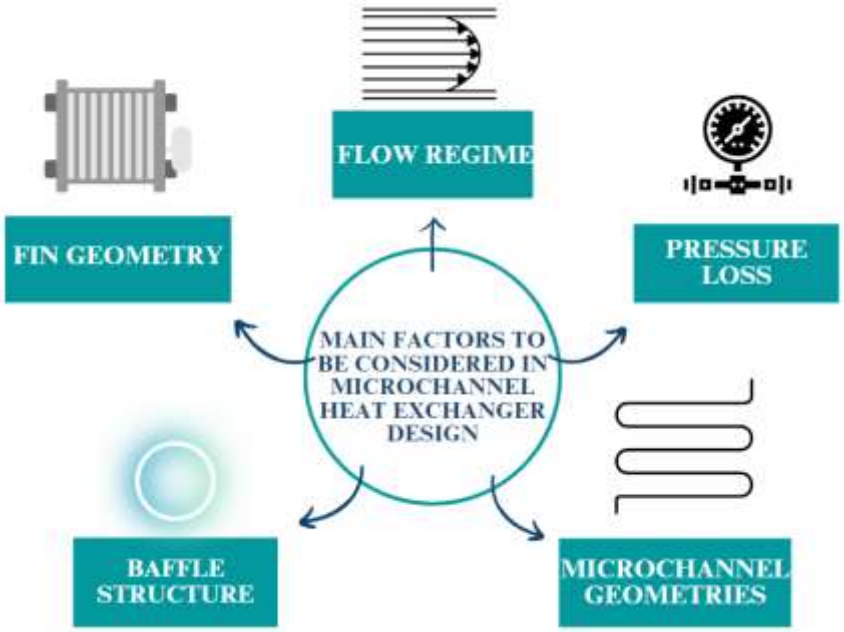

Figure 2. Main factors to be considered in microchannel heat exchanger design

2. Transitional Flow Regime:

The transitional flow regime refers to transition zone between laminar and turbulent flow. As the fluid velocity and channel dimensions increase, flow regime shifts from laminar to turbulent. A fractional Reynolds number is usually used for the transitional flow regime (Loudon and Mcculloh, 1999).

$$Re^{*} = \frac{\rho v D}{\mu} \tag{2}$$

3. Turbulent Flow Regime:

Turbulent flow regime occurs in case of high flow velocities or large channel sizes. In turbulent flow, the fluid motion is random and mixed. Darcy-Weisbach Equation used for turbulent flow regime (Coban, 2011);

$$\Delta \mathrm{P} = \mathrm{f}\frac{L}{D}\rho\frac{v^2}{2} \tag{3}$$

These equations are some of the basic expressions used to analyze and design performance of microchannel heat exchangers in different flow regimes. The control of the flow regime depends on the collector (manifold) structure in the heat exchanger. Thanks to the collector structure, the fluid is distributed homogeneously in the channels and the pressure losses are reduced by reducing the fluid velocity. Therefore, the design of the collector structure (especially its diameter) is important for the flow regime.

Pressure Loss/Drop

The high pressure drops of system not only demand high mechanical power to operate system, but also place extra demands on accessories such as connections and pumping devices. In heat exchangers, the relationship between heat transfer and pressure drop is important. The pressure drop in microchannels is classified into two types: condensate flow and dual-phase flow. Sakamatapan and Wongwises (2014) used two different multi-port microchannels to perform experiments on the condensate flow of R134a gas. The first set of microchannels has a hydraulic diameter of 1.1 mm and fourteen channels, while the second set of microchannels has a hydraulic diameter of 1.2 mm and eight channels. Their study, found that the friction factor dominates the total pressure loss. They observed that the friction factor increases with increasing mass flow and vapor quality, while friction factor decreases with increasing saturation temperature and channel size. Lopez-Belchi et al. (2014) investigated the pressure losses of dual-phase condensation flow of R1234yf, R134a and R32 refrigerants in a microchannel with an internal diameter

of 1.16 mm. Their experimental study revealed that mass flow, degree of dryness and thermophysical properties of the refrigerant have an effect on pressure losses. While increasing the fluid velocity in heat exchangers accelerates heat transfer, it increases pressure loss. Therefore, heat transfer and pressure drop should be evaluated together and the optimum solution should be found for the system. Accelerations and frictional pressure loss are expressed by the following equation (Tosun, 2015).

$$\Delta P = \frac{G_{max}^2}{2\rho_i}\left[\left(1+\frac{A_{min}^2}{A_f}\right)\left(\frac{\rho_i}{\rho_o}-1\right)+f\frac{A_o}{A_{min}}\frac{\rho_o}{\rho_a}\right] \quad (4)$$

Porosity method is used to reduce the pressure drop in microchannel heat exchangers. Porosity is achieved through the creation of small pores or holes in the channel surface. These pores or holes allow the fluid to move more freely within the channels and reduce the pressure drop. Porosity can also increase heat transfer surface area, thus improving heat transfer efficiency. In addition, different channel designs are another solution to reduce the pressure drop. In conclusion, methods such as porosity and different channel designs can be used to reduce pressure drop rates in microchannel heat exchangers. However, application requirements and other design factors should be taken into account and an optimized solution should be found.

Microchannel Geometries

Mini and microchannel heat exchangers are classified according to their hydraulic diameters as $D_h > 6$ mm conventional channel, 6 mm $\geq D_h <$ 1 mm compact channel, 1 mm $\geq D_h <$ 100 µm meso channels and 100 µm $\geq D_h <$ 10 µm microchannel. Reducing the size of the ducts increases the system efficiency, reduces the amount of refrigerant charge, and enables the production of more compact and low-cost heat exchangers (Guder, 2021). In this study, rectangular, circular and triangular duct geometries are explained and hydraulic diameter equations are mentioned.

Rectangular microchannels are a widely used geometry. The surface area and heat transfer capacity of these channels are usually increased, but the pressure drop can increase accordingly. Circular channels, on the other hand, with their round symmetry and smooth flow profile, can allow low pressure drop and good heat transfer. Triangular microchannels are another geometry used. Triangular channels can have special geometries that are preferred in certain applications. Hydraulic diameter equations for the mentioned channel geometries are given below:

Hydraulic diameter equation for rectangular channels (Dolu, 2007):

$$D_h = \frac{2wt}{w+t} \quad (5)$$

Hydraulic diameter equation for circular channel:

$$D_h = D \quad (6)$$

The correct selection of microchannel diameters, channel geometry and the number of ports in a tube are among the factors that affect efficiency. When a tube with many ports is designed, the fluid velocity and flow rate may decrease more than necessary. A small number of port inlets can also increase fluid velocity and cause excessive pressure loss. Therefore, number of ports in the tube and the design of microchannel diameters and geometries inside the ports are among the important parameters in the heat exchanger.

Baffle Structure

In microchannel heat exchangers, cross flow is provided by the curtain structure inside the collector. Thanks to the cross flow structure, performance of the heat exchanger is improved.

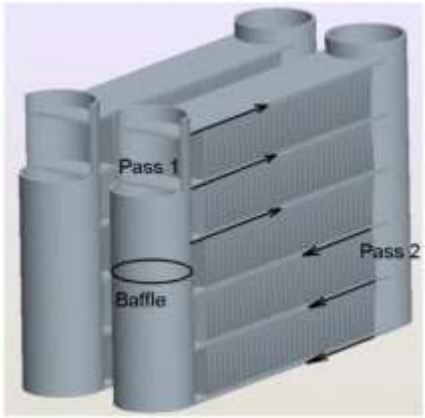

Figure 3. Location of the baffle and inlet/outlets in a microchannel heat exchanger (Yin et al., 2015)

Fin Geometry

Micro-finned surfaces increase the surface area of the area to be cooled, increasing the surface area contacted by the fluid. These micro fins play a crucial role in improving heat transfer by introducing turbulence into the flow, thereby enhancing convection. As a result, the overall convection and heat transfer performance are significantly improved (Guder, 2021). The surface area equations for straight, triangular and circular fins are given below (Incropera et al., 2007).

Rectangular fin;

$$A = 2wL + (2L + w)t \tag{7}$$

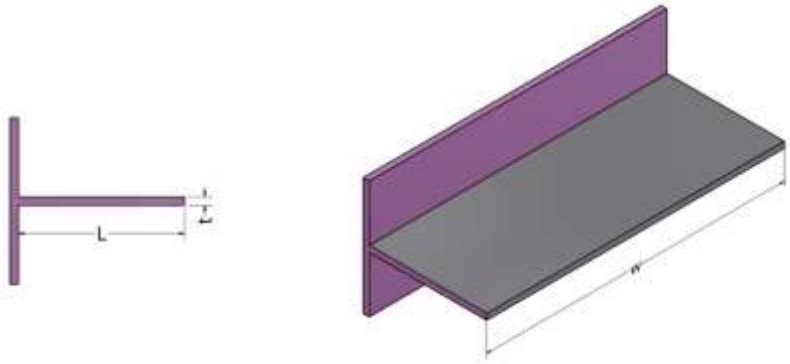

Figure 4. Rectangular fin

Triangular fin;

$$A = 2w[L^2 + (\frac{t}{2})^2]^{1/2} \tag{8}$$

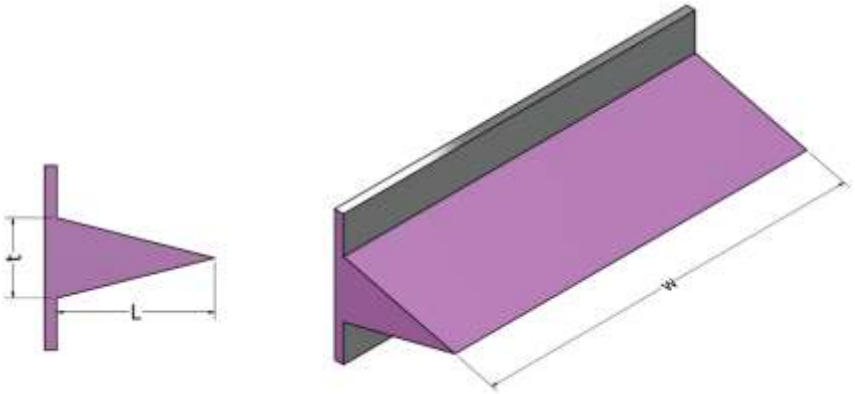

Figure 5. Triangular fin

Circular fin;

$$A = 2\pi(r_{2c}^2 - r_1^2) + 2\pi r_{2c} t \quad (9)$$

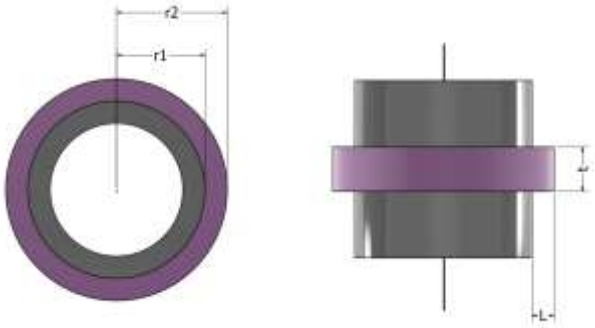

Figure 6. Circular fin

The number and width of fins are the main factors affecting the air side pressure loss and heat transfer surface area. The main purpose of the fin geometry is to increase surface area and thus increase the heat transfer rate. However, pressure drop on the air side is also an issue that should not be neglected. A high air side pressure drop requires an increase in the fan flow rate required for heat transfer at same rate. The use of larger fans here will negatively affect both the compactness of the system and energy consumption. Therefore, these two factors should be taken into consideration when creating the fin geometries.

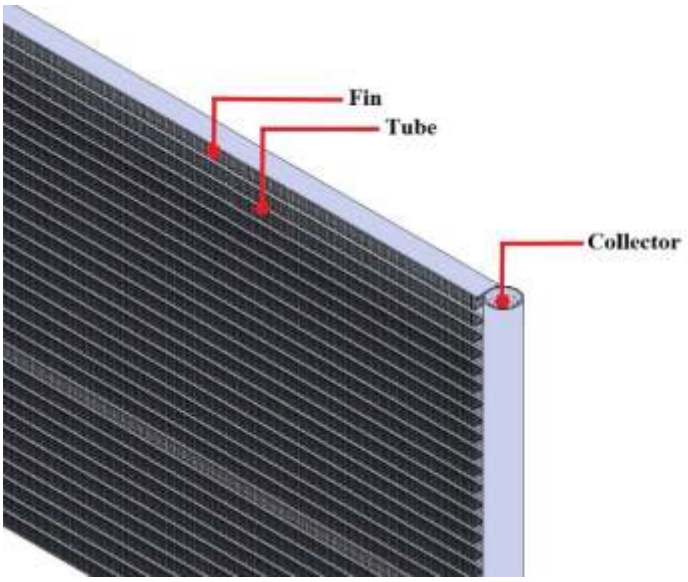

Figure 7. Position of the fin, tube and collector in the microchannel heat exchanger

CONCLUSIONS AND RECOMMENDATIONS

Microchannel heat exchangers have an indispensable position in the refrigeration industry due to their corrosion resistance, energy efficiency and less refrigerant gas charge. Microchannel heat exchangers with high heat transfer rate have less pressure loss on the air side and can perform better at lower fan flow rates than other air-cooled heat exchangers. Numerous other applications exist beyond those outlined here, as they are currently in various stages of development and maturation. The range is still quite wide for different designs and fluids. Some disadvantages, high-pressure drops, corrosion and fouling issues are important design constraints. Since heat extraction and heat dissipation is done by airflow, fouling in the microchannel heat exchanger will reduce heat transfer, so fouling control should be done for all operating times of the process. In this framework, the use of a microchannel heat exchanger will be more efficient.

Factors affecting efficiency in microchannel heat exchanger design;

- Hydraulic diameter due to pressure loss,
- Collector cross-sectional area depending on the flow regime,
- Microchannel geometries,
- Fin pitch, width and length (fin geometry),
- Tube length, width and depth,
- Number of tubes,
- Curtain width

as the most important factors in the development of the country's economy. These are discussed one by one in the study. It is obvious that compact microchannel heat exchangers, which will be designed with reference to the mentioned factors, will provide energy efficiency when used in cooling systems. Considering that manufacturers and users are faced with different regulations and binding applications every day, it is thought that the positive widespread effect in systems will increase.

ACKNOWLEDGEMENTS

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INVESTIGATING THE EFFECTS OF SUBCOOLING / SUPERHEATING APPLICATIONS ON THE PERFORMANCE OF REFRIGERATION SYSTEMS

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ABSTRACT

Recently, the demand for frozen and chilled foods has been increasing with the increase in the world population. It has become an important issue to store and display chilled and frozen foods in an energy-efficient and refrigeration-efficient way. Refrigeration systems generally work with mechanical vapor compression refrigeration cycles. For refrigeration systems to be energy efficient and have high cooling performance, it is extremely important to choose the equipment correctly and to use environmentally friendly refrigerants. It is known that superheating and subcooling processes are important in refrigeration systems to increase both heat transfer and cooling performance. Superheating and subcooling processes increase the cooling efficiency, allowing the products to stay longer in the desired temperature range. Thus, sustainability is ensured in cooling systems. Within the scope of this study, the effects of superheating and subcooling on heat transfer in refrigeration systems are analyzed in light of literature reviews. The advantages of superheating and subcooling may vary depending on the specific system design, the refrigerant used and the operating conditions. Optimum levels of superheating and subcooling should be determined according to the specific requirements and characteristics of the refrigeration system. Maintaining appropriate superheating and subcooling levels in a refrigeration system generally results in greater efficiency, increased cooling capacity, better system performance, longer equipment life and energy savings.

Keywords: Refrigeration systems, refrigerators, superheat, subcooling, heat transfer, cooling performance

1. INTRODUCTION

With the increase in the world population, the demand for refrigerated and frozen products is increasing day by day. Refrigerators are used to display and store refrigerated and frozen foods. Saving energy consumption in refrigerants, using environmentally friendly refrigerants and making cooling efficient have recently become important issues. The choice of equipment and refrigerant is of utmost importance in the refrigeration cycle. As long as the selected equipment is good and the Ozone Depletion Potential (ODP) and Global Warming Potential (KIP) of the refrigerant are low and at the same time environmentally friendly, it is possible to produce energy-saving refrigerants with high cooling efficiency.

It is noted that in the mechanical vapor compression refrigeration cycle, superheating and subcooling processes are important. Superheating is done at the evaporator outlet and allows more heat to be drawn from the medium to be cooled, while at the same time preventing refrigerant from entering the compressor in the liquid phase. If the superheating temperature is selected high, the compressor may need to consume more power. Subcooling, on the other hand, is used to increase the efficiency of system. During evaporation process, refrigerant is partially evaporated in the evaporator, and additional heat is drawn in to superheat the vapor. If superheating occurs in the evaporator, the enthalpy of the refrigerant rises and the cooling efficiency increases (Özdemir et al., 2021). In this context, the effects of superheating and subcooling in refrigeration systems on heat transfer will be examined. Studies on superheating and subcooling in refrigeration systems are examined.

Selbaş et al. (2006) used an exergy-based thermoeconomic optimization method called Kota's optimization procedure to optimize vapor compression refrigeration systems for subcooling and superheating applications. They worked on a 2 kW capacity system using three different refrigerants (R22, R134a and R407c) and determined the optimum heat exchanger areas and their corresponding subcooling-superheating temperatures. They calculated various thermodynamic properties of refrigerants and found that deviation rate was within acceptable limits. This study shows how thermoeconomic analysis can help determine the optimum design parameters of a thermal system for specific conditions, especially in the face of rising energy prices and investment costs.

Başaran et al. (2021) developed a mathematical simulation model to estimate the R600a refrigerant outlet temperature, total heat transfer capacity and entropy production for the louvered finned micro-channel heat exchangers shown in Figure 1 in single-phase refrigerant applications such as superheating and subcooling in air conditioning systems.

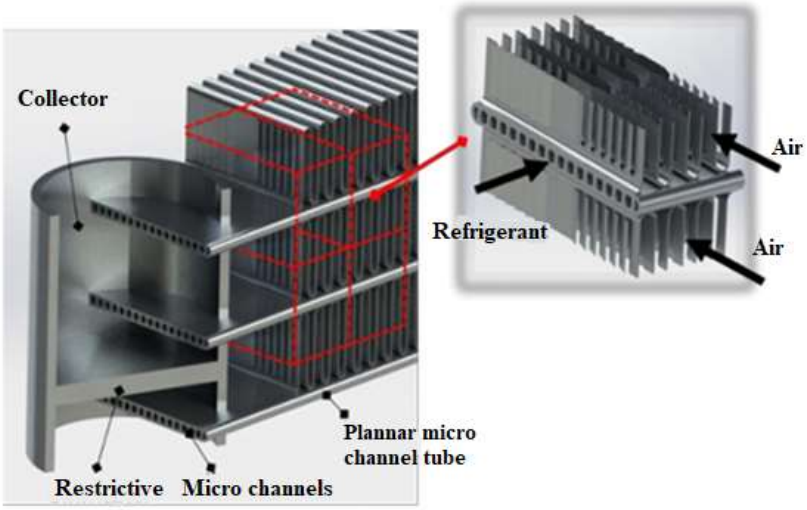


Figure 1. Cross-section of microchannel heat exchanger with superheating and subcooling (Başaran et al., 2021)

They empirically validated the model and found a maximum deviation of 3% and a minimum of 0.2% in the output temperature for 10 different tests. The authors also investigated the mechanisms of entropy generation in the microchannel heat exchanger shown in Figure 2 and found that heat transfer irreversible contribute significantly more to the production of entropy than fluid flow irreversible. The study reveals the potential of microchannel heat exchangers for efficient and effective single-phase refrigerant applications in air conditioning systems (Başaran et al., 2021).

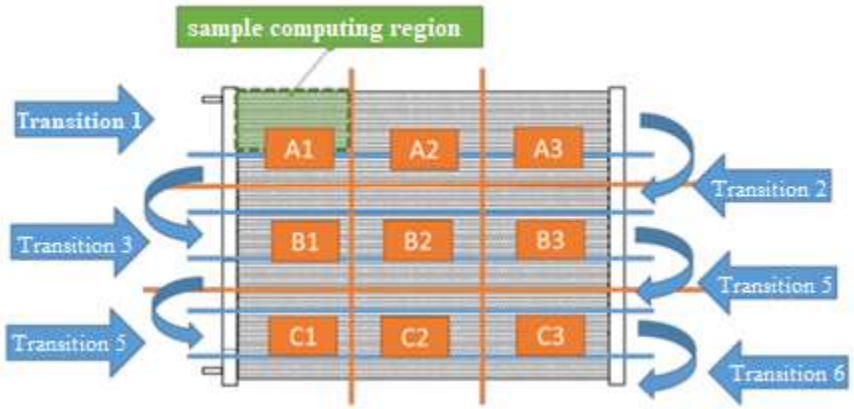


Figure 2. The regions of the heat exchanger where calculations are performed (Başaran et al., 2021)

Kızılkan et al. (2006) conducted a thermal economic analysis of superheating and subcooling heat exchangers in a refrigeration system using two different refrigerants, R22 and R407c. They have identified the best operating conditions for the system in terms of economic and operational performance. It identified the optimal areas for superheating and subcooling heat exchangers and determined the corresponding system efficiency for each refrigerant. The study shows how thermal economic analysis can help optimize the design and operation of refrigeration systems. In his thesis study, Uysal (2018) aimed to design and test a cold storage prototype based on a vapor compression refrigeration cycle using R404A refrigerant and a reference room temperature of -10°C. The prototype included a superheat controller to determine the optimum superheating value by changing the system's superheating values. The experiments were carried out with plastic water bottles placed in cold storage to create a partial cooling load, and a thermocouple was used to control the temperature of the water. The study analyzed changes in various temperatures and electricity consumption values during the experiments. The results showed that when the superheating value was set to 8°C, the desired water temperature was reached in the shortest time (145 minutes). The study shows that in cold storage applications using R-404A refrigerant, using a superheat value of 8°C as a reference can provide more precise room and product temperatures and reduce electricity consumption.

Qi et al. (2010) addressed a problem in a direct expansion air conditioning system with a variable speed compressor and supply fan and examined it experimentally (Figure 3). The degree of refrigerant superheating regulated by the built-in proportional-integral-derivative (PID) controller is intended to be controlled. The compressor and supply fan are regulated by a capacity controller, which affects operating efficiency and stability of the system. To address this, they have developed and tested a new superheating controller to improve its performance due to the degree of superheating due to the speed changes of the operating fluctuation. The test results found that the new superheating controller significantly improved the superheating control performance, while the indoor air temperature and humidity were controlled according to corresponding settings, thus improving the operating efficiency and stability of air conditioning system.

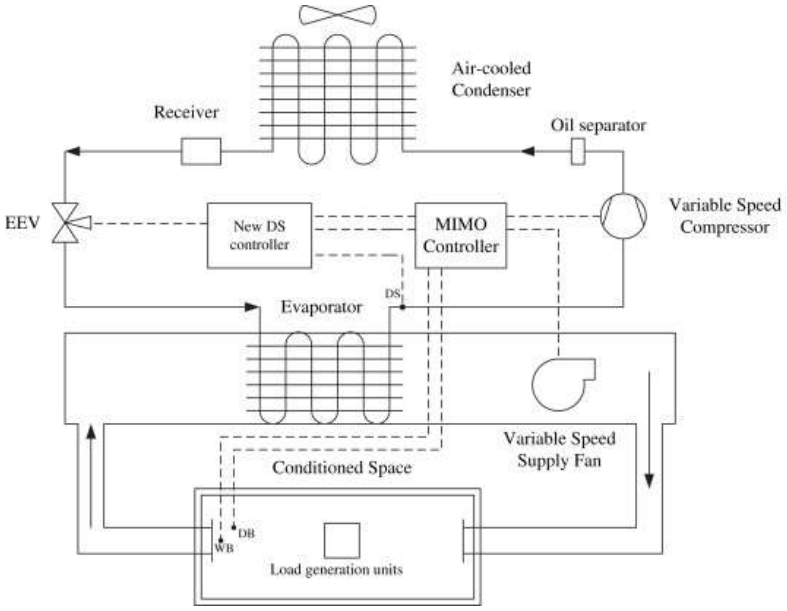


Figure 3. Schematic diagram of the experimental DX A/C system and its controllers (Qi et al., 2010)

Jolly et al. (2011) used the fuzzy logic method to control the superheating value in the evaporator of a commercial refrigeration system using an electronic expansion valve and an adaptive control algorithm. It improves the evaporator's performance by reducing the superheating value and leads to a 7.5% increase in the performance coefficient compared to a constant superheat control strategy. The use of intelligent control also ensures a more stable superheat control. In her thesis study, Aydınlı (2020) analyzed the effect of different superheating values on the performance of vapor compression cascade refrigeration cycle using R407C and R404A refrigerant pair (Figure 4). Ten different experiments with superheating values ranging from 3 to 12°C were carried out and experimental data were obtained using electronic expansion valves, electronic meters and temperature measuring equipment connected to the computer with the help of computer control. The results showed that changes in superheating values can significantly affect the Cooling Performance Coefficient (COP), evaporation pressures and condenser outlet temperatures. Experiments have shown that up to 18.3% savings in energy consumption can be achieved by changing the superheating values. The study also observed a temperature difference of 43°C at the compressor outlet and changes of up to 21% in COP due to changes in superheating values. The study also found that the response of R404A and R407C fluids to superheating values varies with evaporation pressures.

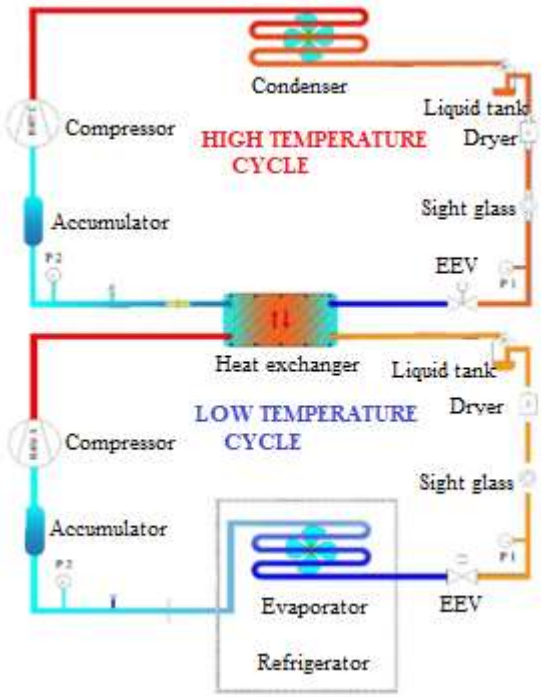


Figure 4. Cycle diagram of the experimental setup (Aydınlı, 2020)

Dai et al. (2022) propose a new system to improve energy efficiency of CO_2 refrigerant subcooled systems used in supermarkets by combining solar energy and waste heat (Figure 5). The system is optimized using a two-dimensional gold section search algorithm to improve energy efficiency, taking into account changes in ambient temperature and the intensity of the sun's rays. The study also takes into account the impact of meteorological conditions in eight Chinese cities and assesses the system's annual performance factor and life cycle carbon emissions. The results show that the proposed hybrid system can increase COP by 3.05-42.30% and reduce the discharge pressure by 7.86% compared to base system. Annual performance factor of hybrid system can be increased by 14.47% in Haikou and life cycle carbon emissions can be reduced by 39.54%. The study proposes a new hybrid absorption subcooling system, especially in hot or warm climate regions where solar energy is rich.

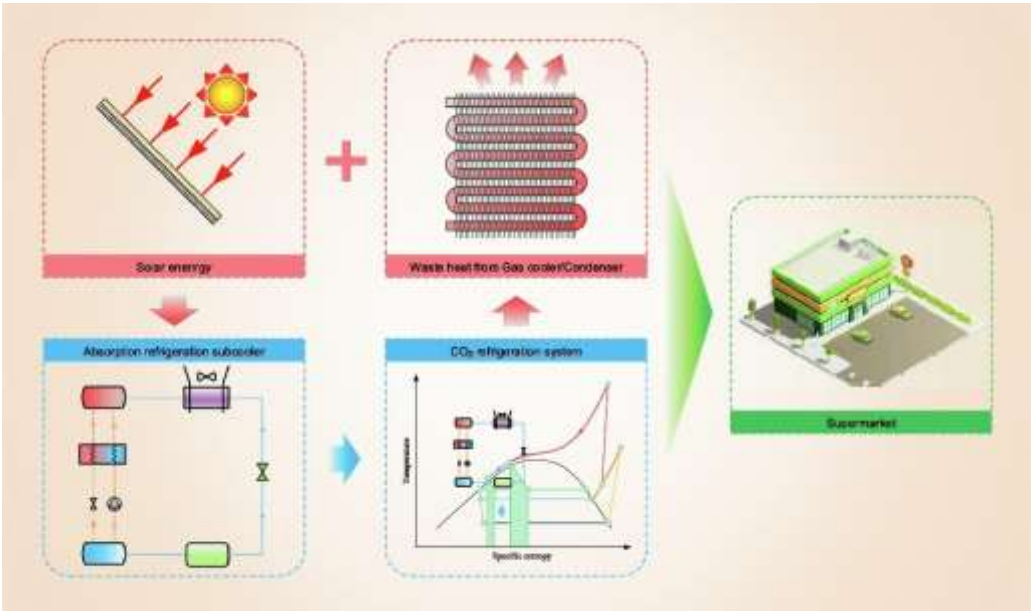


Figure 5. Scheme of the proposed CO_2 refrigerant subcooling system for a supermarket (Dai et al., 2022)

Karacayli et al. (2020) analyzed effect of superheating and subcooling values on cooling performance of the refrigeration cycle. They observed that increasing the superheating value by 1 degree resulted in a 0.7% reduction in compression work or electricity consumption rate. In addition, for every 1-degree increase in superheating and subcooling, the coefficient of performance (COP) increased by an average of 1.61 and 1.54, respectively. The change in exergy destruction in the refrigeration system decreased by 1.03% and 1.06% for each degree increase of superheating and subcooling, respectively. Increasing both the superheating and subcooling values by 1 degree Celsius led to a 1.56% increase in exergy efficiency. Ariyo et al. (2020) focused on designing and optimizing flow parameters for subcooled flow boiling in microchannel heat exchangers. Goal is to minimize thermal resistance while maintaining constant volume constraints. In the study, thermal performance was examined using heat fluxes with inlet temperatures between 25°C and $1x10^6$ – 1.2x107, deionized water as cooling fluid and aluminum as heat sink material. In the modeling and optimization process, various speeds and heat fluxes were taken into account. The simulations and optimization were performed using ANSYS computational fluid dynamics code, which was validated against experimental data. The two-phase flow regime in rectangular microchannels outperformed single-phase flow in terms of heat removal at low Reynolds numbers. Higher Reynolds numbers lead to lower thermal resistance (highest temperature), consistent with previous findings. The study also examined aspect ratio, optimized diameter and axial length of microchannel about the dimensionless pressure drop number.

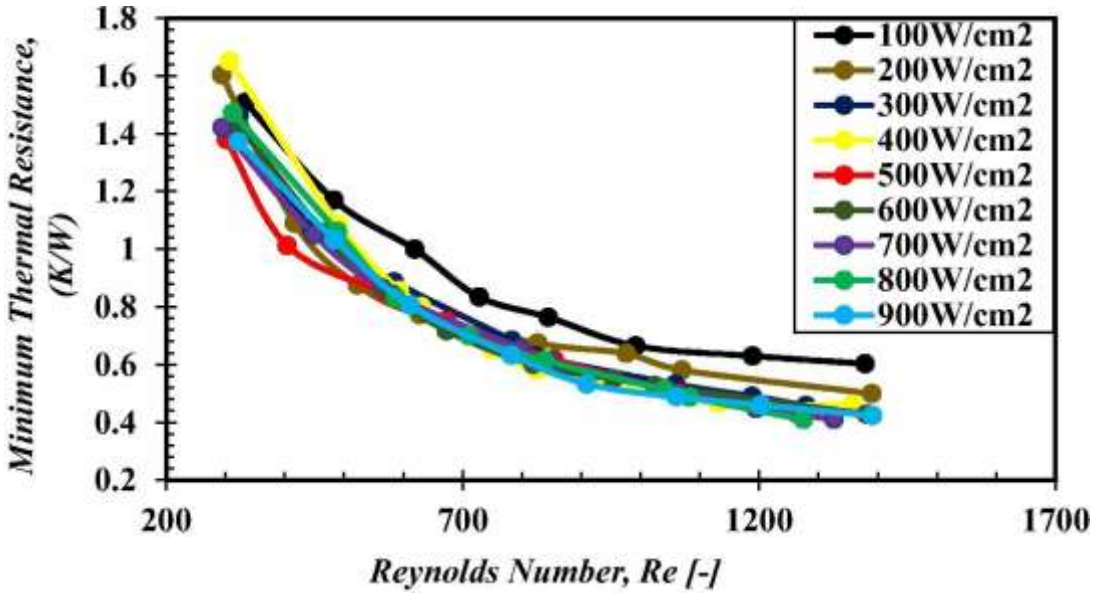


Figure 6. Thermal performance of optimized microchannels for heat fluxes between 1x106 and 1.2x107 (Ariyo et al., 2020)

In their study, Qureshi et al. (2013) investigated thermoeconomic considerations related to the allocation of heat exchanger inventory for subcooling in a mechanical vapor compression refrigeration cycle. The study investigates the constant operating rate, heat dissipation and cooling rates, and the effect of heat transfer in the refrigerant. The analysis revealed that there is no minimum value for any cost function related to absolute temperature ratio and the average subcooling absolute temperature ratio. They have stated that derivatives of integrated subcooling loop can be obtained from derivatives of special subcooling loop. They report that study concluded that the cost optimization of the refrigeration system follows the same qualitative principles as the subcooling system. Ma et al. (2023) designed and prototyped an experimental air-source heat pump system with multiple parallel-connected outdoor units (Figure 7). The system used the hot liquid from the condenser outlet to defrost the outdoor units sequentially. The study compared hot liquid subcooled defrosting performance with hot gas bypass defrosting, examining how heat pump performance under different outdoor temperatures and humidity levels changed with a defrosting start time. Experimental results have shown that hot liquid subcooling allows the defrosting heat pump to achieve effective return defrosting during continuous heating. Heating performance has been adversely affected by lower outdoor temperatures and higher air humidity, resulting in longer defrosting times. They reported that compared with hot gas bypass

defrosting, the use of hot liquid subcooling defrosting increased heating capacity and energy efficiency ratio of heat pumps from 10% to 20%.

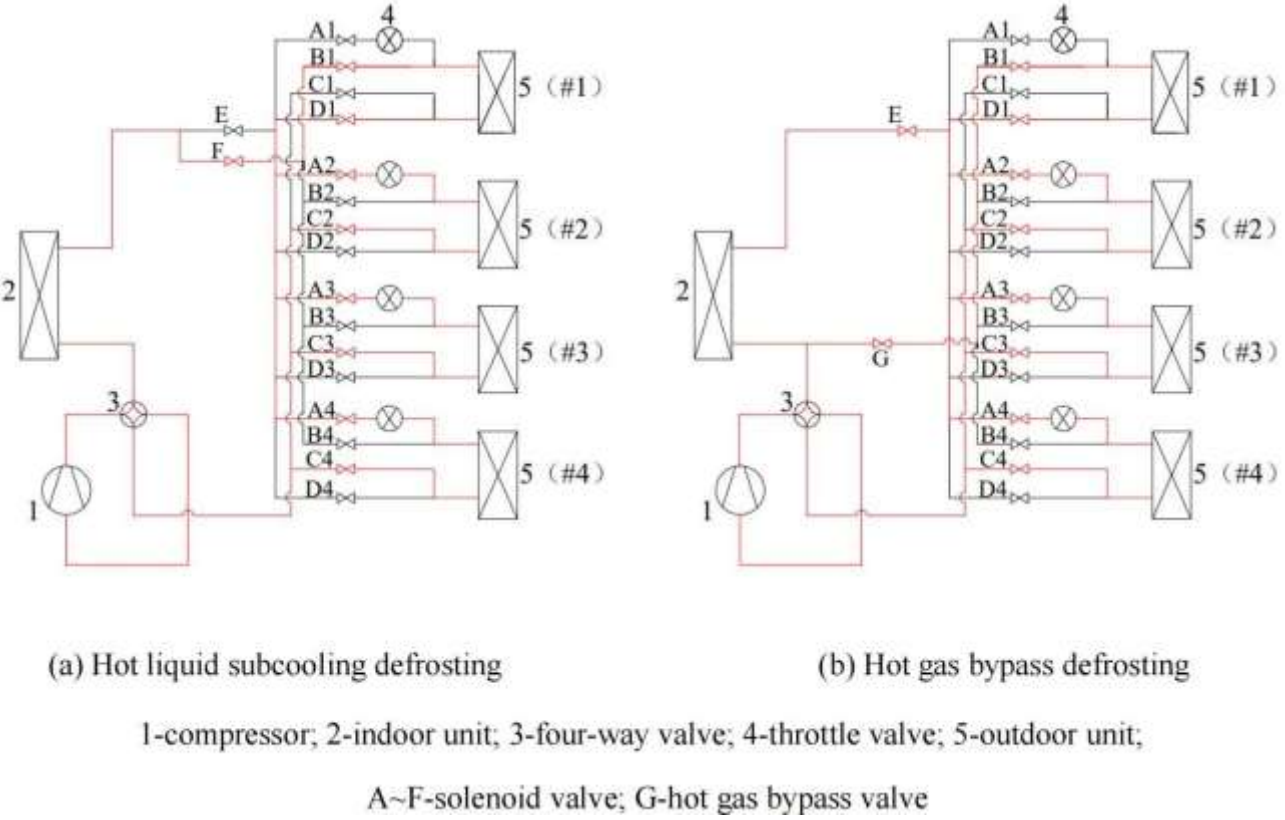


Figure 7. Schematic image of the experimental setup (Ma et al., 2023)

Shiravi et al. (2023) experimentally investigated the effect of using a mechanical subcooling system on performance of a heat pump system designed to deliver heat at condensation temperatures of 50, 60, and 70 °C (Figure 8). The system uses propane and isobutane as refrigerants in the main and secondary cycles, respectively, to achieve efficient energy consumption. The results found that the inclusion of the mechanical subcooling loop improved the system's COP and heating capacity by 15.1% and 34%, respectively. They observed that the Total Equivalent Warming Effect (TEIE) index, which measures environmental impact, decreased by 9-13% with the addition of a mechanical subcooling cycle.

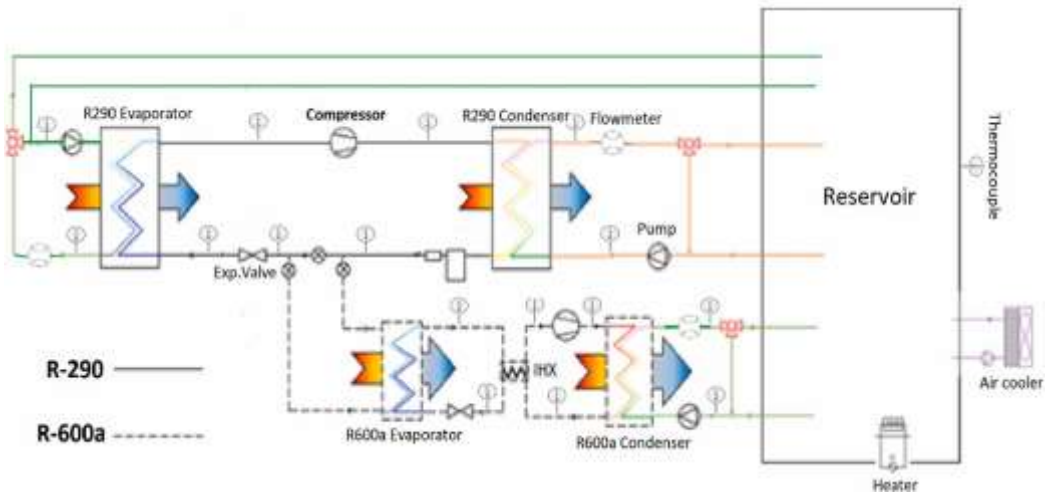
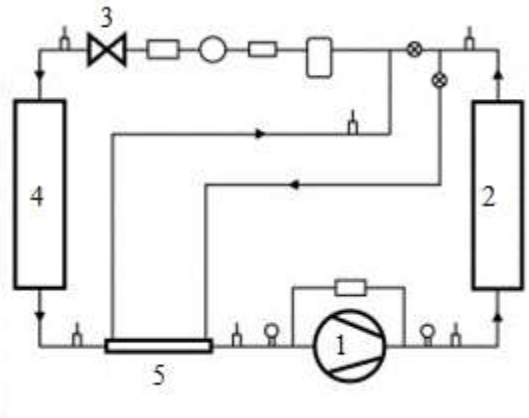


Figure 8. Schematic representation of the experimental setup (Shiravi et al., 2023)

Gil et al. (2019) examined the effects of mechanical subcooling on CO_2 systems used in supermarket applications. They found that the inclusion of mechanical subcooling resulted in a 5.1% reduction in annual energy consumption, which varied depending on environmental conditions. In the experiment conducted by Llopis et al. (2016), they analyzed the performance of a CO_2 system using an R1234yf mechanical refrigeration system. The study showed that when the temperature difference between evaporation and condensation temperatures was 24°C and 40°C, the system's coefficient of performance (COP) improved by 10.9% and 26.1%, respectively. This has shown that the inclusion of a mechanical refrigeration system leads to significant increases in the efficiency of the system.

Bakırcı et al. (2012) experimentally examined the effects of a superheating and subcooling heat exchanger on the performance of a ground-source heat pump system in Erzurum, Turkey, which has a cold climate (Figure 9). The study examined the performance of the ground-source heat pump system of the superheating and subcooling heat exchanger in January and February, the coldest months of 2010. According to test results, they observed that the average performance coefficient and overall system performance of subcooling heat exchanger for ground-source heat pump system were 2.31 and 2.07 in January and 2.73 and 2.55 in February, respectively. COP values in the ground-source heat pump system with superheating heat exchanger were 2.47 and 2.19 in January and 2.81 and 2.62 in February, respectively. Overall, results showed although COP values were similar between the two system configurations, the heat pump system using the subcooling heat exchanger exhibited a higher condenser outlet temperature, demonstrating its potential advantage in specific applications.



1- Compressor, 2- Condenser, 3- Expansion valve, 4- Evaporator, 5- Subcooling heat exchanger

Figure 9. Schematic representation of the heat pump system with a test stand (Bakırcı et al., 2012)

Direk et al. (2017) examined the effects of internal heat exchanger efficiency using R1234yf as a refrigerant on the performance of a refrigeration cycle. They developed a mathematical model based on the energy balance of the cycle to analyze performance parameters in specific temperature ranges. The parameters examined include cooling capacity, COP, subcooling, superheating and compressor purge temperature. In the study, they compared the performance of the R1234yf refrigeration cycle with a base cycle that used R134a as the refrigerant. Results showed that to achieve same COP as base cycle, the critical efficiency of the heat exchanger had to be 50% higher for the R1234yf cycle. The study also found that the degrees of subcooling and superheating increased with higher condensation temperatures. But these values have decreased with high evaporation temperatures. In addition, regardless of operating temperatures, both subcooling and superheating increased with higher efficiency values. They found that the rate at which resentment increased was higher than that of subcooling. Ekren et al. (2012) evaluated certain parameters to determine system performance characteristics in the water cooling group. These parameters include expansion valve opening, superheating, subcooling, evaporation/condensation temperatures, and refrigerant velocity. The study observed that increasing the frequency from 30 Hz to 60 Hz resulted in a 50% reduction in COP and a 37% increase in cooling capacity. The analysis revealed that changes in superheating had an effect on various parameters within the system and demonstrated the importance of monitoring these parameters. In their study, Parekh et al. (2011) optimized the design and operating parameters of the stepped refrigeration system of refrigerants R507A-R23. The optimized parameters include the temperatures of condensation,

evaporation, subcooling and superheating in the high-temperature circuit, as well as the temperature difference in the stepped heat exchanger. Similarly, the temperatures of condensation, evaporation, subcooling and superheating in the low-temperature circuit are also taken into account. The study found that the maximum COP, which measures the efficiency of the system, increased only slightly with a higher degree of superheating. However, they reported that with the increase in subcooling, COP increased significantly. They observed that a higher subcooling led to a significantly improved COP, while a higher superheating had only a marginal effect on the COP.

Within the scope of this study, many studies on the effects of subcooling and superheating in refrigeration systems on heat transfer were examined. It is aimed to inform the readers by examining the contributions of superheating and subcooling in refrigeration systems to heat transfer and cooling performance through literature reviews.

2. THEORETICAL ANALYSIS

Refrigeration systems generally operate according to the mechanical vapor compression refrigeration cycle. Mechanical vapor compression refrigeration cycle is given in Figure 10.

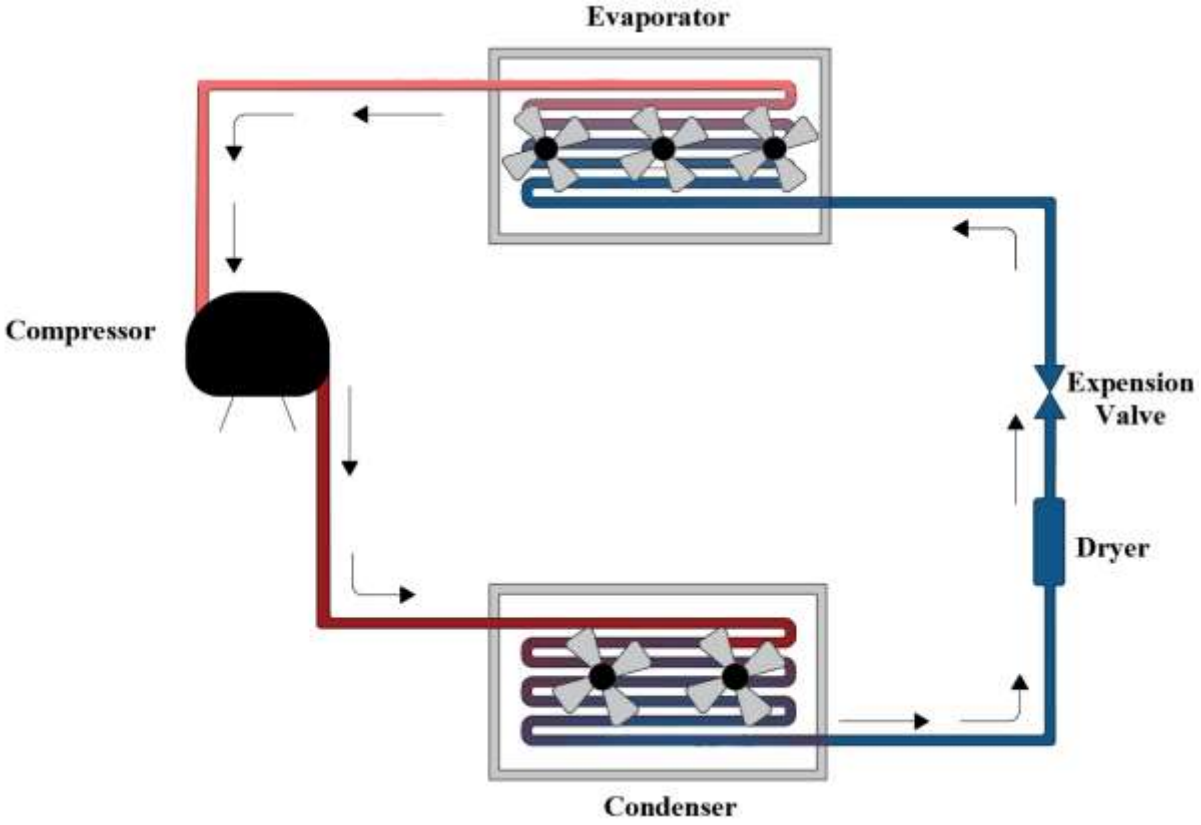


Figure 10. Mechanical vapor compression refrigeration cycle

In the mechanical vapor compression refrigeration cycle, the refrigerant passes from point 1 to point 1' in the logP-h diagram (Figure 11) as it goes through the process of superheating in the evaporator. This process occurs when the refrigerant draws heat from the environment and enters the superheated vapor phase. This zone (1-1') is called the superheating zone. The superheating zone (1-1') improves the temperature-pressure conditions of the refrigerant before it enters the compressor. In the condenser, the refrigerant discards heat and passes from the gas phase to the liquid phase and the subcooling process takes place by coming from the 3 point to the 3' point. This zone is called the subcooling zone (3-3').

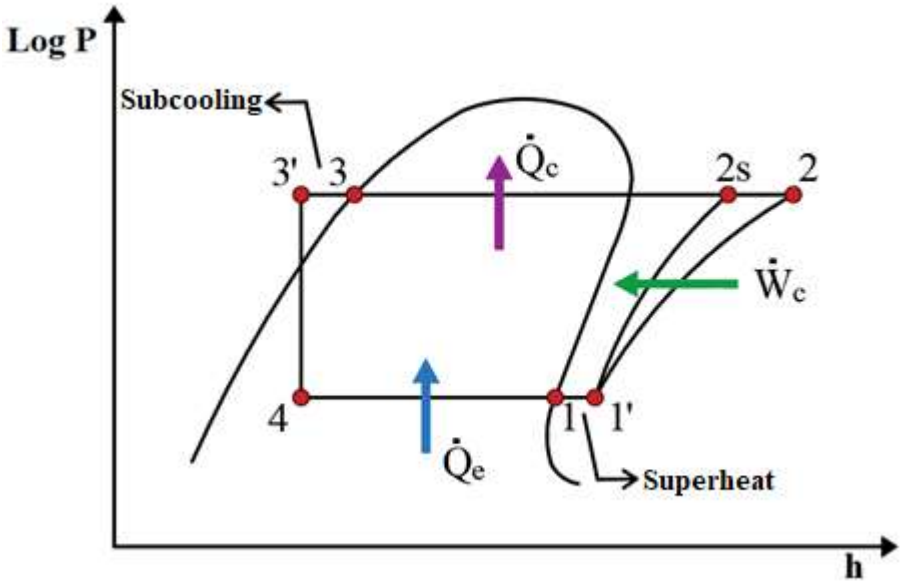


Figure 11. LogP-h diagram in the mechanical vapor compression refrigeration cycle

A graphical representation of the compressor, condenser, evaporator, superheating and subcooling capacities is given in Figure 11. The calculation of these capacities is given in equations 1, 2, 3, 4 and 5.

In the mechanical vapor compression refrigeration cycle, compressor, condenser and evaporator capacities, isentropic efficiency are calculated with the help of the following equations (Çengel et al., 2008).

$\dot{W}_{comp.} = \dot{m}(h_2 - h_1')$	(1)
$\dot{Q}_c = \dot{m}(h_2 - h_3)$	(2)
$\dot{Q}_e = \dot{m}(h_1 - h_4)$	(3)

Superheating in the vapor compression refrigeration cycle is an important factor affecting the cooling performance coefficient. Superheating means that steam is delivered to a high temperature before the steam compression process. The cooling performance coefficient represents ratio of cooling capacity to power consumed. Superheating reduces the cooling capacity in the condenser and increases the cooling capacity in the evaporator. Therefore, higher superheating, higher coefficient of performance.

In vapor compression refrigeration cycle, subcooling is an important factor affecting the cooling performance coefficient. Subcooling means that the steam is cooled to a lower temperature than normal in the evaporator. Subcooling causes steam to enter the evaporator at a lower temperature. In this case, temperature difference in evaporator increases, and the heat transfer becomes more efficient. This leads to an increase in cooling capacity taken from evaporator. The cooling performance coefficient represents the ratio of cooling capacity to power consumed. Subcooling increases cooling capacity in the evaporator while decreasing the cooling capacity in the condenser. Therefore, the subcooling value can change the performance coefficient depending on the balance between the evaporator and condenser. Generally, the coefficient of performance can increase as the subcooling temperature increases. Subcooling increases the cooling capacity in the evaporator while reducing the workload of the compressor and the refrigeration system consumes less energy.

Subcooling and superheating capacities are found with the help of the equations given below (Gülmez et al., 2022).

$\dot{Q}_{subcooling} = \dot{m}(h_3 - h_3')$	(4)
$\dot{Q}_{superheating} = \dot{m}(h_1' - h_1)$	(5)

In the mechanical vapor compression refrigeration cycle, COP Equation (6) is found with the help of isentropic efficiency Equation (7) (Çengel et al., 2008).

$$COP = \frac{\dot{Q}_e}{\dot{W}_{comp}} = \frac{\dot{m}(h_1 - h_4)}{\dot{m}(h_2 - h_1')} \quad (6)$$

$$\eta = \frac{(h_2 - h_1')}{(h_{2s} - h_1)} \quad (7)$$

The equation of conduction and convection and heat transfer can be found with the help of the following equation (Çengel et al., 2008).

$$\dot{Q}_{conduction} = -kA\frac{\Delta T}{\Delta x} \quad (8)$$

$$\dot{Q}_{convection} = hA\Delta T \quad (9)$$

The total heat transfer rate is calculated by following equation (Çengel et al., 2008).

$$\dot{Q} = UA\Delta T \quad (10)$$

The total heat transfer coefficient was calculated by using following equation (Halıcı, 2016);

$$U = (A_{cooling}[\left(\frac{1}{(\eta_0 hA)_{cooling}}\right) + \left(\frac{R'_{cooling}}{(\eta_0 A)_{cooling}}\right) + R_i])^{-1} \quad (11)$$

3. RESULTS AND DISCUSSION

In this study, use superheating and subcooling processes in cooling processes was evaluated. Studies in the literature on superheating and subcooling are given in Table 1.

Table 1. Studies in the literature on superheating and subcooling processes

Writer	Area of use	Work Done	Result
Bilgili et al. (2017)	Bus air conditioning system	Bus air conditioning system using R600 refrigerant, the superheating and subcooling temperature is set at 10 °C.	The total exergy destruction of the system was found to be 7.02 kW and the exergy efficiency was found to be 46.45%.
Dengue (2017)	Transcritical air conditioning system	Experimental studies have been carried out for the subcooling process of the transcritical CO_2 air conditioning system operating with a microchannel evaporator. Two subcooler, S1 and S2, were installed and tested in the system.	As a result of the experiments, the COP value of the S1 subcooler was found to be 6.6 and the COP value of the S2 subcooler was found to be 7.2.
Tian et al. (2020)	Heat pump system	Examines the cooling performance of a heat pump system powered by a gas engine. They examined the impact of the gas engine and superheating on various aspects of system performance, including cooling capacity, refrigerant mass flow rate, compressor, and system efficiency.	It has been observed that when the heat pump superheating drops from 13 °C to 6 °C, the system efficiency increases.
Xu et al. (2020)	Cold storage	They evaluated the performance of the solar-powered hybrid refrigeration system for cold storage through the subcooling process and calculated the payback period.	With the subcooling used in cold storage, the annual energy saving is 68 kWh. At the same time, the

			payback period of the system is calculated to be 4.96 years.
Astrain et al. (2019)	Refrigeration plant operating with transcritical CO_2 refrigerant	They examined the performance of the system by subcooling working with the thermoelectric system.	As a result of the tests, it was seen that the cooling capacity was improved by 33% and the COP was improved by 24%.
Yılmaz et al. (2017)	Two-stage refrigeration cycle	Thermodynamic analysis for superheating and subcooling of a two-stage refrigeration system using R404A refrigerant in the high-temperature cycle and R508B refrigerant in the low-temperature cycle was performed.	The effect of superheating in the low-temperature cycle on COP increased by 0.4%, while the effect on second-law efficiency increased by 0.38%. Superheating in the high-temperature cycle increased COP by 12%. In addition, increasing the extreme cooling temperatures in low and high-temperature cycles has been shown to contribute positively to the system COP.

Table 1 shows a comparison table with previous studies in terms of performance. As a result of the literature review, it has been observed that superheating and subcooling contribute positively to both cooling performance and energy consumption. Today, we are faced with the fact that the need for both cooling and energy is increasing and the available resources are limited. Therefore, energy consumption in refrigeration systems is of great importance. In particular, the rise in energy costs has been an effective factor in accelerating the study of systems with high energy and cooling efficiency. This study provides examples and practical information to the readers during design phase of refrigeration systems in superheating and subcooling processes.

4. CONCLUSION

In this study, effects of subcooling and superheating on performance in refrigeration systems were investigated. Effects of subcooling and superheating on performance in refrigeration systems can be listed as follows:

- Subcooling and superheating significantly affect performance of the refrigeration system. In this direction, attention should be paid to the subcooling and superheating criteria that will carry the refrigeration system to high performance.
- By reducing compressor work with superheating, COP increases, energy consumption decreases, thus increasing operating efficiencies in a controlled manner.
- By controlling superheating and subcooling with smart technologies in cooling processes, energy consumption is reduced, enabling the development of chillers with high energy label class.
- If refrigerant enters the compressor in liquid form, it can potentially cause compressor damage. By preventing the refrigerant from entering the compressor in liquid form by superheating, the compressor is protected.
- Subcooling the liquid refrigerant leaving the condenser allows it to be cooled below its saturation point. This extra cooling increases the cooling performance coefficient by allowing more heat to be absorbed in the evaporator.
- In refrigeration systems, superheating and subcooling with compact heat exchangers without increasing the refrigerant charge amount too much will contribute to the reduction of CO_2 emissions, environment and sustainability.

As a result, energy efficiency will be achieved through subcooling and superheating applications in refrigeration systems, contributing to the increase of the cooling capacity of the system. This results in energy savings for the refrigeration system, longer equipment life and high system performance.

SYMBOLS AND ABBREVIATIONS

A	Area (m^2)
COP	Coefficient of cooling performance
h	Enthalpy (kJ/kg)
h	Heat transfer coefficient by convection ($W/m^{2o}C$)
$\dot{m}$	Mass flow (kg/h)
k	Coefficient of heat transfer by conduction (W/m°C)
U	Heat transfer coefficient ($W/m^{2o}C$)
T	Temperature (°C)
$R'_{cooling}$	Heat resistance to pollution on the cold fluid side ($m^{2o}C/W$)
$\dot{Q}$	Heat transfer rate (W)
$\dot{Q}_{conduction}$	Heat transfer by conduction (W)
$\dot{Q}_{convection}$	Heat transfer by convection (W)
$\dot{Q}_{subcooling}$	Subcooling capacity (W)
$\dot{Q}_{superheat}$	Superheating capacity (W)
$\dot{Q}_e$	Evaporator capacity (W)
$\dot{Q}_c$	Condenser capacity (W)
$\dot{W}_{comp}$	Compressor power (W)
η	Isentropic efficiency
η_0	Total surface efficiency

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REVIEW ON APPLICATION OF GOLD NANOPARTICLES IN GENE DELIVERY

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ABSTRACT

Gold nanoparticles (AuNPs) have emerged as a promising tool for gene delivery due to their unique physicochemical properties, biocompatibility, and ease of functionalization. The use of AuNPs as gene delivery vehicles has gained attention due to their ability to protect nucleic acids from enzymatic degradation, enable cell-specific targeting and provide controlled release of genetic material. Here's a brief review of the application of gold nanoparticles in gene delivery.

One of the major advantages of AuNPs in gene delivery is their ability to protect the nucleic acid cargo from enzymatic degradation. Gold nanoparticles can protect DNA or RNA molecules from being degraded by nucleases, enzymes that break down nucleic acids. This property is due to the strong binding affinity between the negatively charged nucleic acids and the positively charged AuNPs. This protection ensures the stability and integrity of the nucleic acid cargo during delivery, which is crucial for successful gene therapy. Another advantage of AuNPs in gene delivery is their ability to target specific cells. AuNPs can be conjugated with ligands, such as antibodies or peptides, that recognize and bind to specific cell surface receptors. This targeting ability enhances the specificity and efficiency of gene delivery by ensuring that the genetic material is delivered only to the desired cells. AuNPs can also be designed to provide a controlled release of genetic material. This feature allows for the sustained release of the nucleic acid cargo over time, which can be critical for long-term therapeutic effects. Additionally, the release rate of the genetic material can be controlled by modifying the size and surface properties of the AuNPs.

Overall, the application of gold nanoparticles in gene delivery has shown great promise in preclinical studies. However, there are still challenges that need to be addressed, such as improving the transfection efficiency and reducing toxicity. Future research in this area will likely focus on optimizing the design of AuNPs to improve their gene delivery properties and developing safer and more effective methods for clinical applications.

Keywords: (AuNPs), PpAuNPs, thiols, intracellular release, surface plasmon resonance, site specificity.

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ASSESING THE EFFICENCY AND EFFECTIVENESS OF MAINTENANCE MANAGEMENT PRACTICES IN SELECTED PRIVATE INSTITUTIONS

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ABSTRACT

The Maintenance management sector in public section in Nigeria has suffered from lack of funds and negligence for a period of time. For a while, neglect and a lack of funding have plagued Nigeria's public maintenance management sector. The threat also affected the education sector, as significant sums of money are frequently spent on building facilities while upkeep is sometimes disregarded. Therefore, using private institutions in Nigeria as a case study, this study assessed the efficiency and effectiveness of maintenance management practises. The existing private institution was the only one included in the sampling survey. One hundred (100) questionnaires were sent in order to evaluate the physical and functional state of private institutions buildings in Ogun State as determined by each department's maintenance division to evaluate the efficiency of the maintenance strategies employed in preserving their structures, identify the most common technique for carrying out maintenance procedures and analyse its effectiveness. According to the data used, it was found that improper maintenance workload phasing can result in unprofitable maintenance management practises. Other significant factors that contribute to the inefficiency and ineffectiveness of the maintenance management processes include poor contract management, a lack of material availability, and the occurrence of inadequate projection and estimate.

Keywords: Management Practices, Maintenance, Effectiveness, Efficiency and Assessed.

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EFFECT OF COVID-19 ON EDUCATIONAL SYSTEM IN NIGERIA

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ABSTRACT

The purpose of this study is to examine the effect of Covid-19 on education system in Nigeria. Descriptive survey design was used for the study and 3 research questions were developed for the study as well. The sample for the study comprised of 400 students in Federal Polytechnic Ado-Ekiti, Ekiti State, Nigeria, using stratified random sampling to obtain the sample for the study. A well-structured questionnaire was used to obtain the data, which was analyzed with frequency distribution, percentages, bar-charts, relative importance index (RII) and proportional odds logistic model. The result indicates that covid-19 have effect on education system in Nigeria, majority of the respondents agreed that covid-19 will affect the academic calendar of all institution in Nigeria, and that it will also leads to suspension of lectures and examinations. The result also shows that 91% of the respondents agree that there is a negative impact of cocid-19 on education in Nigeria. The research also indicates the ways to control the spread of covid-19 in Nigeria. Its concluded that there should be public awareness to contain the spread of covid-19 across every states in Nigeria and also that institutions and government should make provisions for facemask and sanitizer so as to control the spread of covid-19 in Nigeria.

Keywords: Survey, Stratified Sampling, Utilized, Questionnaires, Logistic Model, Proportional Education, Respondent

1. INTRODUCTION

Nigeria has a federal system of government with 36 states and the Federal Capital Territory of Abuja. Within the states, there are 744 local governments in total. Education is administered by the federal, state and local governments. The Federal Ministry of Education is responsible for overall policy formation and ensuring quality control, but is primarily involved with tertiary education. School education is largely the responsibility of state (secondary) and local (elementary) governments. The country is multilingual, and home to more than 250 different ethnic groups. The languages of the three largest groups, the Yoruba, the Ibo, and the Hausa, are the language of instruction in the earliest years of basic instruction; they are replaced by English in Grade 4.WENR, (2017).

Nigeria's education system encompasses three different sectors: basic education (nine years), post-basic/senior secondary education (three years), and tertiary education (four to six years, depending on the program of study). According to Nigeria's latest National Policy on Education (2004), basic education covers nine years of formal (compulsory) schooling consisting of six years of elementary and three years of junior secondary education. Post-basic education includes three years of senior secondary education.(WENR, 2017). At the tertiary level, the system consists of a university sector and a non-university sector. The latter is composed of polytechnics, monotechnics, and colleges of education. The tertiary sector as a whole offers opportunities for undergraduate, graduate, and vocational and technical education. The academic year typically runs from September to July. Most universities use a semester

system of 18 – 20 weeks. Others run from January to December, divided into 3 terms of 10 -12 weeks. The National University Commission (NUC), the government umbrella organization that oversees the administration of higher education in Nigeria, listed 40 federal universities, 44 state universities and 68 private universities as accredited degree-granting institutions on its website as of 2017.

Many of these institutions are relatively new. In response to demographic pressures Nigeria's higher education sector expanded over a relatively short period. In 1948, there was only one university-level institution in the country, the University College of Ibadan, which was originally an affiliate of the University of London. By 1962, the number of federal universities had increased to five: the University of Ibadan, the University of Ife, the University of Nigeria, Ahmadu Bello University, and the University of Lagos (WENR, 2017).

Between 1980 and 2020, the number of recognized universities has grown tenfold from 16 to 170, as reported by Nigeria's National Universities Commission. For the first few decades of growth, higher education capacity building was primarily in the public sector, driven by Federal and State governments. More dramatic growth occurred beginning in the late 1990s, when the Nigerian government began to encourage the establishment of private universities. Since then, private institutions, which constitute some 45 percent of all Nigerian universities as of 2017, have proliferated at a rapid pace, from 3 in 1999 to 68 in 2017. About two thirds of these institutions are estimated to be religiously affiliated schools. Despite the sheer number of private institutions that have opened, enrollments seem to be relatively low. Although estimates are difficult to find, the small number of United Tertiary Matriculation Examination (UTME) applications to private universities indicates that private universities account for only a small percentage of Nigeria's total tertiary enrollment, which UIS reported as 1,513, 371 as of 2011. Covenant University, Nigeria's largest private university reportedly had a total enrollment of 6,822 students in 2010/2011 (WENR, 2017). Nigeria's 43 federal universities as well as dozens of teaching hospitals and colleges are under the direct purview of the NUC. State governments have responsibility for the administration and financing of the 48 state universities, private individual have responsibility for the administration of 79 private universities, bringing the total number of universities in the country to 170.

According to the World Health Organization (WHO), coronaviruses are a family of viruses that cause illnesses ranging from the common cold to more severe diseases such as severe acute respiratory syndrome (SARS) and the Middle East respiratory syndrome (MERS). These viruses were originally transmitted from animals to people. SARS, for instance, was transmitted from civet cats to humans while MERS moved to humans from a type of camel. Several known coronaviruses are circulating in animals that have not yet infected humans. The name coronavirus comes from the Latin word corona, meaning crown or halo. Under an electron microscope, the looks like it is surrounded by a solar corona. The novel coronavirus, identified by Chinese authorities on January 7 and since named SARS-CoV-2, is a new strain that had not been previously identified in humans. Little is known about it, although human-to-human transmission has been confirmed.

As of April 4, more than 60,000 people worldwide have died of COVID-19, the highly infectious respiratory disease caused by the coronavirus. The number of people who have tested positive for COVID-19 has exceeded 1 million, according to data compiled by Johns Hopkins University. Countries around the world are scrambling to halt the spread of the coronavirus pandemic. This outbreak of COVID-19 is a global health emergency, the WHO said on January 30, raising the alarm further on March 11 when it declared the crisis a pandemic.

On 27 February, Nigeria confirmed its first case in Lagos State, an Italian citizen who works in Nigeria had returned on 25 February from Milan, Italy through the Murtala Muhammed International Airport, fell ill on 26 February and was transferred to Lagos State Biosecurity Facilities for isolation and testing. Presently, Nigeria is having 199 COVID-19 cases, two death and twenty recovered. In order to contain the spread of the virus in Nigeria, the Federal Ministry of Education has directed all educational institutions in Nigeria to shut down and allow students to go home as cases of reported COVID-19 increased to 13. The Permanent Secretary in the Ministry of Education, Sonny Echono, told reporters on 19 March that the directive was part of the country's overall strategy to contain the spread of the virus. Nigeria joins the growing list of countries in Africa which have closed schools and universities. Before the official announcement by the permanent secretary, most universities had already sent their students

home (Wikipedia, 2020). This article is aim to discuss the impact COVID-19 School Close down on the higher institutions in Nigeria and to suggest some ways out. The aim of this study is to explore the possibility of the effect of COVID 19 on educational system in Nigeria and the objectives are; to examine the major effects of COVID-19 on educational system, to examine the impacts of COVID-19 on educational system and to identify ways the educational system could contain the spread of COVID-19

2. LITERATURE REVIEW

According to the World Health Organization (WHO), corona viruses are a family of viruses that cause illnesses ranging from the common cold to more severe diseases such as severe acute respiratory syndrome (SARS) and the Middle East respiratory syndrome (MERS).These viruses were originally transmitted from animals to people. SARS, for instance, was transmitted from civet cats to humans while MERS moved to humans from a type of camel. Several known corona viruses are circulating in animals that have not yet infected humans. The name corona virus comes from the Latin word corona, meaning crown or halo. Under an electron microscope, the looks like it is surrounded by a solar corona. The novel corona virus, identified by Chinese authorities on January 7 and since named SARS-CoV-2, is a new strain that had not been previously identified in humans. Little is known about it, although human-to-human transmission has been confirmed. Chinese health authorities are still trying to determine the origin of the virus, which they say likely, came from a seafood market in Wuhan, China where wildlife was also traded illegally. On February 7, Chinese researchers said the virus could have spread from an infected animal species to humans through illegally-trafficked pangolins, which are prized in Asia for food and medicine. Scientists have pointed to either bats or snakes as possible sources of the virus.

According to the WHO, signs of infection include fever, cough, and shortness of breath and breathing difficulties. In more severe cases, it can lead to pneumonia, multiple organ failure and even death. Current estimates of the incubation period - the time between infection and the onset of symptoms - range from one to 14 days. Most infected people show symptoms within five to six days. However, infected patients can also be asymptomatic, meaning they do not display any symptoms despite having the virus in their systems.

On 27 February, 2020, Nigeria confirmed its first case in Lagos State, an Italian citizen who works in Nigeria had returned on 25 February, 2020 from Milan, Italy through the Murtala Muhammed International Airport, fell ill on 26 February, 2020 and was transferred to Lagos State Biosecurity Facilities for isolation and testing. Presently, Nigeria is having 199 Covid-19 cases, two death and twenty recovered. In order to contain the spread of the virus in Nigeria, the Federal Ministry of Education has directed all educational institutions in Nigeria to shut down and allow students to go home as cases of reported COVID-19 increased to 13. From February 27 till May 10, the virus have infected over 434 people, spread to 34 out of 36 states of federation. Over 600 have recovered from the Covid-19 and the fatalities rate is 95. Submits that eighty-three thousand to 190 000 people in Africa could die of COVID-19 and 29 million to 44 million could get infected in the first year of the pandemic if containment measures fail, a new study by the World Health Organization (WHO) Regional Office for Africa finds. The research, which is based on prediction modelling, looks at 47 countries in the WHO African Region with a total population of one billion. The new estimates are based on modifying the risk of transmission and disease severity by variables specific to each country in order to adjust for the unique nature of the region. The model predicts the observed slower rate of transmission, lower age of people with severe disease and lower mortality rates compared to what is seen in the most affected countries in the rest of the world. This is largely driven by social and environmental factors slowing the transmission, and a younger population that has benefitted from the control of communicable diseases such as HIV and tuberculosis to reduce possible vulnerabilities. The lower rate of transmission, however, suggests a more prolonged outbreak over a few years, according to the study which also revealed that smaller African countries alongside Algeria, South Africa and Cameroon were at a high risk if containment measures are not prioritized.

Observes that the outbreak of pandemic Covid-19 all over the world has disturbed the political, social, economic, religious and financial structures of the whole world. World's topmost economies such as the US, China, UK, Germany, France, Italy, Japan and many others are at the verge of collapse. Besides, Stock Markets around the world have been pounded and oil prices have fallen off a cliff. In just a week

3.3 million Americans applied for unemployment and a week later another 6.6 million people started searching for jobs. Also, many experts on economic and financial matters have warned about the worsening condition of global economic and financial structure. Such as Kristalina Georgieva, Managing Director of International Monitory Fund (IMF), explained that "a recession at least as bad as during the Global Financial Crisis or worse". Moreover, Covid-19 is harming the global economy because the world has been experiencing the most difficult economic situation since World War-II. When it comes to the human cost of the Coronavirus pandemic it is immeasurable therefore all countries need to work together with cooperation and coordination to protect the human beings as well as limit the economic damages. For instance, the lockdown has restricted various businesses such as travelling to contain the virus consequently this business is coming to an abrupt halt globally.

Submits that the coronavirus (COVID-19) pandemic that has swept across the globe in the last few weeks and months has not only had a significant impact on public health, society, and the economy as a whole, it has also wreaked havoc to the sporting calendar. In a bid to stem the spread of the virus, many professional and amateur leagues across all continents and sports took the unprecedented step to postpone or suspend their seasons on the advice of the CDC to avoid gatherings of large amounts of people. Observes that the COVID-19 pandemic and the measures put in place to contain its diffusion are taking a heavy toll on the tourism sector. According to the United Nations World Tourism Organization (UNWTO), the COVID-19 pandemic will result in a contraction of the tourism sector by 20% to 30% in 2020. Observes that No matter where in the world or in which sector, the crisis is having a dramatic impact on the world's workforce", ILO said in its latest report. "Policy responses need to focus on providing immediate relief to workers and enterprises in order to protect livelihoods and economically viable businesses, particularly in hard-hit sectors and developing countries."

An additional concern is the fact that in low and middle-income countries, the worst-hit industries and services have a high proportion of low-wage workers in informal employment, with limited access to health services and State welfare safety nets. "Without appropriate policy measures, workers face a high risk of falling into poverty and will experience greater challenges in regaining their livelihoods during the recovery period", ILO said in its latest report on the situation. It underscored that around two billion people work informally, most of them in emerging and developing countries, and that "tens of millions" of informal workers have already been affected by COVID-19. In urban areas, moreover, these workers also tend to work in economic sectors that "not only carry a high risk of virus infection but are also directly impacted by lockdown measures": waste recyclers, street vendors and food servers, construction workers, transport workers and domestic workers. Highlighting the impacts already being felt in India, ILO pointed out that with its share of almost 90 per cent of people working in the informal economy, about 400 million workers in the vulnerable sector now face falling greater impoverishment. Current lockdown measures there have impacted these workers significantly, forcing many of them to return to rural areas, ILO explained, adding that Brazil and Nigeria had a similar level of informal employment as India, and faced the same risks.

Conducted a study is to find out the perception of undergraduate students on the impact of Covid-19 pandemic on higher education development in Federal Capital Territory, Abuja, Nigeria. This study adopted the descriptive research design of the survey type. The study population comprised all higher institutions in FCT, Nigeria. Out of this population, a sample of two higher institutions was taken and selected through the stratified random sampling technique. Out of the 2,05,878 undergraduate students, 200 undergraduate students made up of final years students were selected from the sampled two higher institutions. The method of selection was also through the stratified random sampling technique. The instrument used to collect data for the study was a questionnaire titled "Perception of Undergraduate Students on the Impact of COVID-19 Pandemic on Higher Institutions Development Questionnaire. The questionnaire was in two parts A and B. Part A was demographic. The reliability of instrument was determined using the test-retest reliability techniques. The instruments were administered through the use online medium. Data collected were analyzed using simple percentage and Chi-square test was used to test the hypotheses. Result collected and analyzed showed that;100% of the respondents agreed that Covid-19 pandemic affects the academic calendar of higher institutions; 90.5% of the respondent agreed that Covid-19 pandemic would have effect on implementation of higher institutions financial budget for 2020; 94.5% of the respondents agreed that Covid-19 pandemic have relationship with reduction of

manpower in higher institutions; 100% of the respondents agreed that Covid-19 pandemic have relationship with the cancelation of academic conferences of higher institutions and 89% of the respondents agreed that online education is the alternative measures for conversional in class teaching and learning for future occurrences of any pandemic.

Did a study to find out the effects of COVID-19 Schools Close Down on the Senior Secondary School Academic.

3. METHODOLOGY

The research designed used in conducting the study was descriptive survey. The target population for the study was the totality of all students in federal polytechnic Ado- Ekiti, which runs into thousands. However, for reason of feasibility, the sample was selected from each school(falculty) of the institution. Using stratified random sampling technique, the population were divided into four(4) strata using the school. A combination of stratified and simple random sampling techniques was ultilized in selecting a total of 400 students. The instrument used for data collection was a structured questionnaire. The questionnaire comprised of four sections. Section A comprises of three(3) items that sought to verify the respondent's demographic information. Section B comprised 3 items that deals with the impact of COVID-19 on education in Nigeria. Section C comprised of 5 items of the 5-likert type that sought to determine the effect of COVID- 19 on education in Nigeria. Section D comprised of 5 items of the 5-likert type that sought to determine the ways to control the spread of COVID- 19 in Nigeria.

4. TECHNIQUE OF DATA ANALYSIS

A total of 400 questionnaires were administered in the survey but 372 were returned valid for the research. The technique of data analysis is based on frequency distribution, percentages, bar charts. Frequency distribution is used to tabulate survey responses from SPSS. The percentages in the frequency tables were then used to plot bar charts to examine the impact of covid-19 on education in Nigeria. Relative importance index (RII) was used to analyze the respondent's response on the effect of covid-19 on education in Nigeria and their response on the ways to contain the spread of covid-19 in Nigeria. Proportional odds logistic model was use to measure the usage of facemask in Nigeria.

An evaluation rating of strongly agree, agree, undecided, disagree and strongly disagree was applied in assessing the effect of covid-19 on education in Nigeria.

Strongly agree: performance in tandem with target and carried out according to planned time.

Agree: performance might be in tandem with target but with time variation.

Undecided: performance is neutral.

Disagree: performance not in tandem with target and with time variation.

Strongly disagree: absolute non-performance.

Data and Analysis

This section is divided into four sub-sections for clarity presentation. The first section analyzes personal data of the respondents. The second section examines the impact and effect of Covid-19 on education system in Nigeria. While the third section identify the effect of Covid-19 on education in Nigeria, and the fourth section identify the ways to control the spread of Covid-19 in Nigeria.

5. PERSONAL DATA OF RESPONDENT

The following client's personal information was analyzed using frequency table and bar charts.

Table 1. Respondents gender

Sex					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	male	203	54.6	54.6	54.6
	female	169	45.4	45.4	100.0

	Total	372	100.0	100.0	

Source: field survey, 2021

The person that partakes in the survey consists of male and female. The field respondents reveals that male constitute the majority, i.e. male consists of about 55% while female respondent is 45%, respectively. This further suggested the quality of response from respondents.

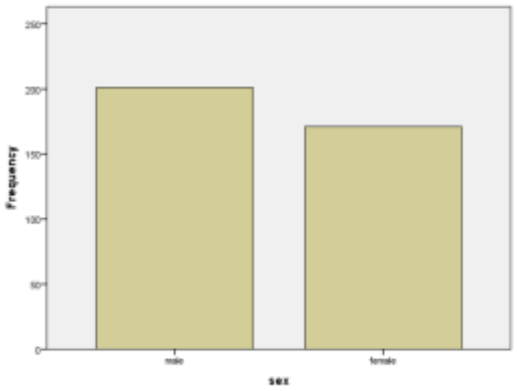

Figure 1. This graph shows the respondent's gender that participated in the survey

Table 2. Respondent's school (faculty)

School					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	SOS	95	25.5	25.5	25.5
	SOE	90	24.2	24.2	49.7
	SES	96	25.8	25.8	75.5
	SBS	91	24.5	24.5	100.0
	Total	372	100.0	100.0	

Source: field survey, 2021

It was indicated from the survey that the percentage of respondent that participated in the survey are equally distributed among the school, i.e 25.5% of the respondent are from school of science and computer studies, 24.2% of the respondent are from school of engineering, 25.8% of the respondent are from school of environmental and also 24.5% of the respondent are from school of business.

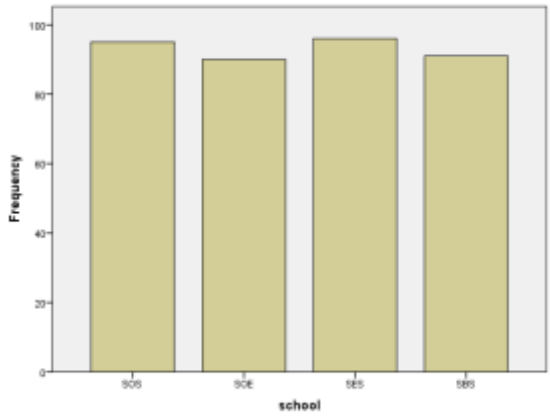

Figure 2. The graph shows the frequency of respondent's school that participated in the survey. In which school of environmental have the highest frequency of respondent that participated in the survey

QUESTIONS RELATED TO IMPACT OF COVID-19 ON EDUCATION IN NIGERIA

To examine the impact of covid-19 on education in Nigeria, we made use of frequency table and bar chart to analyse this section

Table 3. Respondent's awareness to COVID-19 crisis in Nigeria.

are you aware of COVID-19 crisis in Nigeria?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	368	98.9	99.5	99.5
	no	2	.5	.5	100.0
	Total	370	99.5	100.0	
Missing	System	2	.5		
Total		372	100.0		

Source: field survey, 2021

The above table shows that 98.9% of the respondents said they are aware of covid-19 crisis in Nigeria. While 1% of the respondents said they aren't aware of covid-19 crisis in Nigeria.

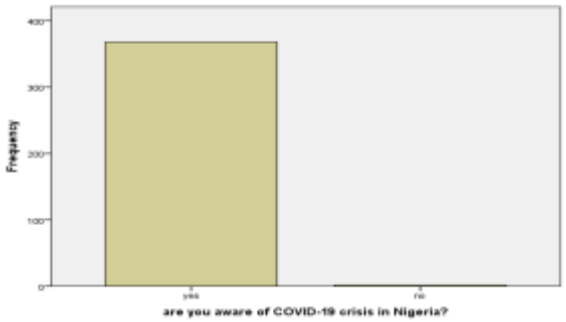

Figure 3. The chart above shows the respondent's awareness to covid-19 crisis in Nigeria

Table 4. Is there any impact of covid-19 on education in Nigeria?

is there any impact of COVID-19 on education in Nigeria?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	352	94.6	95.4	95.4
	no	17	4.6	4.6	100.0
	Total	369	99.2	100.0	
Missing	System	3	.8		
Total		372	100.0		

Source: field survey, 2021

From the table above, its shown that 95% of the respondent said that Covid-19 have impact on education system in Nigeria, while 5% of the respondents said that covid-19 has no impact on education in Nigeria.

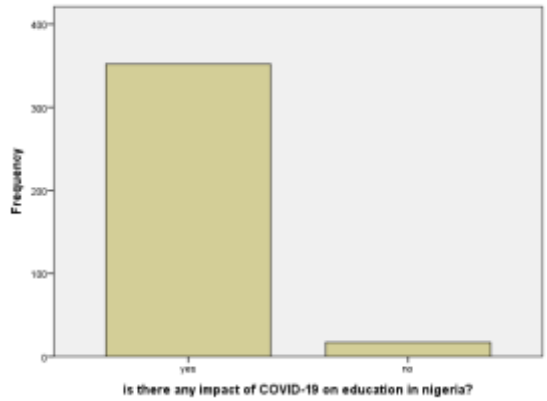

Figure 4. The chart shows the impact of covid-19 on education in Nigeria.

Table 5. if yes, what can you say about the impact of Covid-19 on education

if yes, what can you say about the impact					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	negative	337	90.6	92.6	92.6
	positive	27	7.3	7.4	100.0
	Total	364	97.8	100.0	
Missing	System	8	2.2		
Total		372	100.0		

Source: field survey, 2021

The table indicated that 91% of the respondent that participated in the survey said that covid-19 have a negative impact on education, while 7% of the respondents said that covid-19 have a positive impact on education.

Figure 5. The fig above shows that there is a negative impact of covid-19 on education in Nigeria.

4.3 QUESTIONS RELATED TO THE EFFECT OF COVID-19 ON EDUCATION IN NIGERIA

Table 6. Effect of Covid-19 on education in Nigeria.

This section of the survey was analyzed using relative importance index (RII)

EFFECT OF COVID-19	**SA**	**A**	**U**	**D**	**SD**	**∑**	**N**	**A*N**	**RII**	**rank**
It will lead to suspension of lectures and examination	242	104	8	11	7	372	372	1860	0.9027	2
Will affect the academic calendar	257	101	12	0	1	371	372	1860	0.9230	1

Suspension of all extra-curriculum activities of the school	162	149	50	8	1	370	372	1860	0.7731	4
Negative effect on student's performance in their studies	221	119	13	16	3	372	372	1860	0.8898	3
Decrease in population of student and staff	104	153	68	33	14	372	372	1860	0.7613	5

Source: field survey, 2021

The table above shows the relative importance index RII analysis for the criteria on the effect of covid-19 on education in Nigeria. The most effective is that it will affect the academic calendar with RII = 0.9230, the next most effective is it will lead to suspension of lectures and examination with RII = 0.9027. Follow by negative effects on student's performance in their studies with RII = 0.8898, suspension of all extra-curriculum activities in the school with RII = 0.7731, while the least effect is that there will be decrease in the population of student and staff with RII = 0.7613.

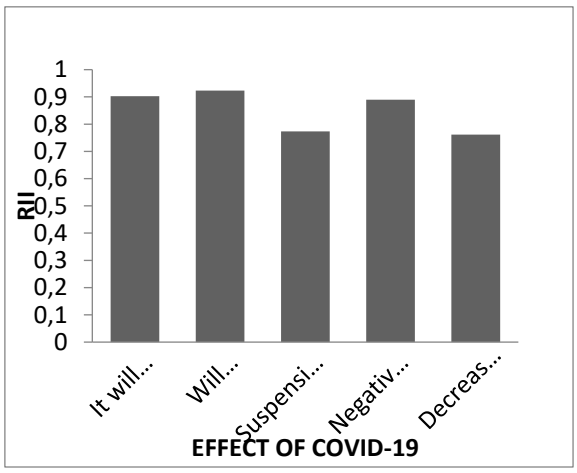

Figure 6. The graph above shows the effect of covid-19 on education system in Nigeria.

QUESTIONS RELATED TO THE WAYS TO CONTROL THE SPREAD OF COVID-19 IN NIGERIA

Table 7. Ways to control the spread of Covid-19 in Nigeria.

WAYS TO CONTROL COVID-19	SA	A	U	D	SD	∑	N	A*N	RII	Rank
Public awareness to contain the spread of COVID-19	234	128	5	2	1	370	372	1860	0.9151	1
Provision of facemask and sanitizer for staff and student	248	102	14	2	5	371	372	1860	0.9134	2
Practicing social distance	180	121	61	9	0	371	372	1860	0.8522	4
Making use of facemask and sanitizer compulsory	173	110	61	28	0	372	372	1860	0.8301	5
Collaboration of institutions on the research for COVID-19 vaccine	205	125	23	12	6	371	372	1860	0.8731	3

Source: field survey, 2021

The table above shows the relative importance index RII analysis for the criteria on the effect of covid 19 on education i awareness to contain the spread of COVID-19 with RII = 0.9151, the next most effective is Provision of facemask and = 0.9134. Follow by negative Collaboration of institutions on the research for COVID-19 vaccine with RII = 0.8731, Pr RII = 0.8522, while the least is Making use of facemask and sanitizer compulsory with RII = 0.8301

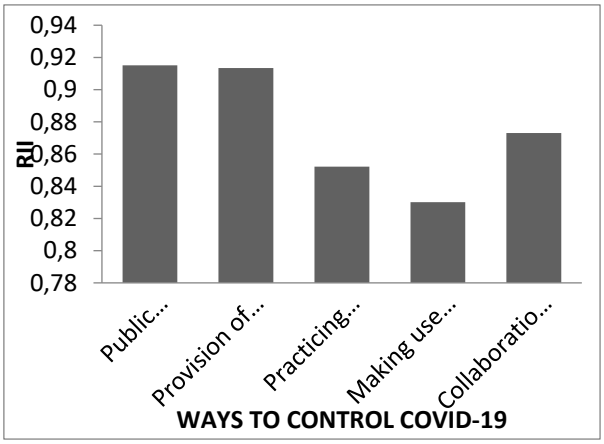

Figure 7. The graph above shows the ways to control the spread of covid-19 in Nigeria.

MEASURING THE USAGE OF FACEMASK IN NIGERIA

Using proportional odd logistic regression model. Making use of social distancing, gender and school as predictor for the usage of facemasks. Below are the output of logistic regression(proportional odds) from R package.

Table 8. Data presentation

	Face	gender	socdist	school	Age
1	sometimes	female	Yes	ses	24
2	always	male	Yes	soe	24
3	always	male	Yes	soe	26
4	always	male	Yes	soe	21

5	always	male	Yes	soe	23
6	always	male	Yes	soe	25

Table 9. Usage frequency of facemasks

Face	gender	socdist	school	Age
sometimes	female	yes	ses	24
Always	male	yes	soe	24
Always	male	yes	soe	26
Always	male	yes	soe	21
Always	male	yes	soe	23
Always	male	yes	soe	25

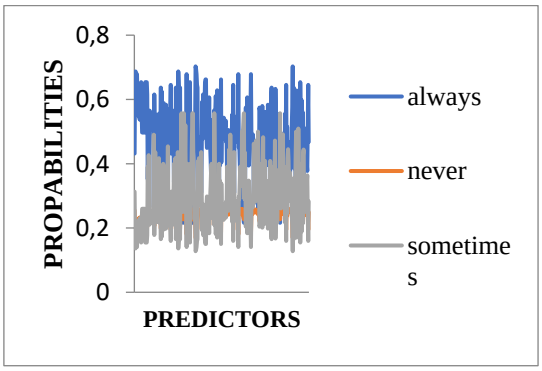

Figure 8. The graph above shows the predicted probabilities of the response.

ABSTRACT

To find out if there is impact of Covid-19 on education system in Nigeria.

Result on table 3 shows that 99% of the respondents are aware of covid-19 crisis in Nigeria, this shows that almost all the respondents are aware of Covid-19 crisis in Nigeria, while Table 5 shows that 91% of the respondents agreed that there is a negative impact of Covid-19 on education in Nigeria.

To find out if there is an effect of Covid-19 on education system in Nigeria

Table 6 disclosed that majority of the respondents strongly agreed and agreed that; covid-19 will lead to suspension of lectures and examination, Will affect the academic calendar, Suspension of all extra-curriculum activities of the school, Negative effect on student's performance in their studies, and that there will be decrease in population of student and staff are the effect of covid-19 on education system in Nigeria. From the table also, relative importance index (RII) tells that major effect of covid-19 on education in Nigeria is that Covid-19 Will affect the academic calendar of Nigeria institutions.

To find out if there exist ways to control the spread of Covid-19 in Nigeria.

Table 7 shows that majority of the respondents agreed that Public awareness to contain the spread of COVID-19, Provision of facemask and sanitizer for staff and student, Practicing social distance, Making use of facemask and sanitizer compulsory, and Collaboration of institutions on the research for COVID-

19 vaccine are the ways to contain the spread of Covid-19 in Nigeria. The table also shows that Public awareness to contain the spread of COVID-19 is the best way to control covid-19 in Nigeria.

To measure the usage of facemasks

The model predicts that students who tends to use facemasks always (predictor) has the highest probabilities than other predictors.

CONCLUSIONS

This research work focused on studying the effect of covid-19 on education in Nigeria and after the analysis and collations of the result, it is established that covid-19 have effect on education system in Nigeria. It is also established from the result that there is negative impact of Covid-19 on education system in Nigeria and that covid-19 will affect the academic calendar of schools in Nigeria. The result also established that covid-19 will leads to suspension of all lectures and examination in schools across Nigeria. It was gathered from the result that there should be public awareness that contain the spread of covid-19 all over the states in Nigeria, so as to let everyone know about the existence of covid -19 in Nigeria. Also that making provisions for facemask and sanitizer for both students and staffs is one the best ways to control the spread of covid-19 in Nigeria. Its also concluded that students use

Recommendations

Based on the finding, the research hereby recommends that;

- There should be public awareness to contain the spread of ccovid-19 across Nigeria.
- Institutions should make provisions for facemask and sanitizer for both students and staffs and also make the use of facemask and sanitizer compulsory.
- Nigeria institutions should collaborate and make vaccine for covid-19.
- There should be practice of social distances across Nigeria.

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THE THERAPEUTIC EFFECTS OF DENIPLANT NUTRACEUTICALS ON THE GUT MICROBIOME IN PATIENTS WITH PSORIASIS

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ABSTRACT

Background Psoriasis is a common and chronic dermatological disease considered as a systemic inflammatory disorder. A growing body of evidence highlights that intestinal dysbiosis is associated with the development of psoriasis. The gut-skin axis is the novel concept of the interaction between skin diseases and microbiome through inflammatory mediators, metabolites and the intestinal barrier. Restoration of the microbiome is a therapeutic strategy for psoriasis.

The objective of this study was to summarize the potential action of Deniplant nutraceuticals in psoriasis on inflammation.

Materials and methods We conducted a systematic review of studies investigating intestinal microbiome in psoriasis. To identify studies comparing gut microbiome composition in patients with psoriasis and normal healthy controls. The use of Deniplant nutraceuticals could be interesting in disease management**.**

Results However, the association of psoriasis with gut dysbiosis is mainly based on limited studies with small number of patients involved. All studies confirmed the association of psoriasis and gut microbiota dysbiosis. This paper provides a detailed and comprehensive systematic review regarding gut microbiome in patients with psoriasis. It is still not clear whether psoriasis is an effect or a cause of the observed disbalance between beneficial and pathogenic microbes.

Conclusion There is a significant association between alterations in gut microbial composition and psoriasis. More unified methodological standards in large-scale studies are needed to understand microbiota's contribution to psoriasis pathogenesis and its modulation as a potential therapeutic strategy. The changes in microbiome under psoriasis treatment can serve as a potential biomarker of positive response to the Deniplant nutraceuticals.

Keywords: microbiome, psoriasis, gut-skin axis, gut barrier, Deniplant nutraceuticals

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NANO PARTICLES OF NICKEL OXIDE- ACACIA NILOTICA LEAF EXTRACTS: GREEN SYNTHESIS AND THEIR BIOLOGICAL ACTIVITIES

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ABSTRACT

Green synthesis of nanoparticles (NPs) has attracted the researcher's attention due to its rapid, cost effective, sustainable and eco-friendly nature. Current studies were carried out to perform and investigate the green synthesis of NiO NPs with aqueous ($NiO_{(aqueous)}$) and ethanolic extracts ($NiO_{(ethanolic)}$) of *Acacia nilotica* leaves respectively in the basic medium. The NPs were characterized by spectroscopic, microscopic and thermometric techniques including Fourier transform infra-red (FTIR), Raman, x-ray diffraction (XRD), scanning electron microscopy (SEM), thermal gravimetric analysis (TGA) and differential scanning calorimetry (DSC) respectively. The electrochemical properties, antibacterial potential and hemolytic activities of the synthesized NPs were also examined. FTIR and Raman spectroscopies confirmed the presence of Ni-O vibrations in the synthesized NPs. XRD patterns revealed the face-centered cubic structures of NiO NPs and a high degree of crystallinity. The average crystallite size of $NiO_{(aqueous)}$ NPs was significantly smaller (16 nm) than that of $NiO_{(ethanolic)}$ NPs (28 nm). SEM images show that the shape of the NiO NPs is spherical. The prepared NPs demonstrate a good thermal stability up to 600 $^{\circ}$C temperature. Cyclic voltammetry (CV) measurements show a prominent oxidation and reduction peaks for $NiO_{(ethanolic)}$ at 0.19 V and 0.31 V and for $NiO_{(aqueous)}$ at 0.21 V and 0.36 V, respectively. The synthesized NiO NPs demonstrate good electrochemical stability at an operating potential of -0.5 to 0.5 V and thus can be used as electrode materials in supercapacitors. The inhibition effect of $NiO\ NPs_{(ethanol)}$ against *B. subtilis* ATCC 6051, was considerable and comparable to the ciprofloxacin with zone of inhibition of 18.30 ± 0.58 mm which was used as standard drug. NiO NPs have shown negligible toxic hemolytic effects as compared to Triton X-100.

Keywords: NiO nanoparticles, Green Synthesis; Spectroscopic; Electrochemical; Biological

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GREEN SYNTHESIS OF MAGNETIC IRON OXIDE NANOPARTICLES (Fe_3O_4 NPs) FOR IMAGING AND BRAIN CANCER TREATMENT

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ABSTRACT

Brain cancer disrupt specific properties of the vascular endothelia, even affecting the special blood-brain barrier, collectively known as the blood-brain tumor barrier. Green synthesis of magnetic Fe_3O_4 NPs using grape extract has become a promising nanomaterial as their magnetic properties have excellent potential against brain cancer treatment. The magnetic nanoparticles (Fe_3O_4 NPs) were synthesized by a Sol-gel method. The manifold characterization i.e., XRD, SEM, FTIR, UV-Visible and EDX were performed to confirm the crystalline structure, morphological analysis, functional group analysis, energy band gap and elementary composition to demonstrate the synthesis of green magnetic nanoparticles (Fe_3O_4 NPs). Several nanoparticles (such as NiO NPs, Gd NPs, and Au NPs etc.) have been used for biomedical application as well as for brain cancer treatment. The potent antibacterial inhibitory activities of Fe_3O_4 NPs have been examined by pathogenic bacterial strains studied against Gram-negative bacterial strain *Klebsiella pneumoniae* and Gram-positive bacterial strain *Staphylococcus aureus*. Finally, synthesized Fe_3O_4 NPs were tested for potential cytotoxicity against AMGM5 (human brain cancer) cell line. The Current development of therapeutic analysis like radiotherapy was led to comprehensive treatment of various malignant tumors. Future studies are underway to understand the excellent effects of Fe3O4 NPs in the treatment of brain cancer.

Keywords: Fe_3O_4 NPs, brain cancer, Gram-positive and negative bacteria

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IMPLICIT SURVEY ON THE USE OF GOOGLE DRIVE AS A TOOL FOR THE STORAGE AND RETRIEVAL OF SCHOOL RECORDS: A REVIEW ON EDUCATIONAL MANAGEMENT

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ABSTRACT

The advent and incorporation of cloud-based storage technology into education sector is increasingly enhancing and improving its record management system. Today, an innumerable amount of educational institutions have stated using Google drive applications for the storage and retrieval of their school records. Ijaiya (2015) state that there is an increasing need for improved methods of record keeping in schools as basis for safe file storage and utilization that could enhance effective school management. However, Google drive storage system is relatively an innovative and improved way of storing academic files and records. This paper discussion is based on the relevance of using Google drive for the storage and retrieval of school records. The paper outlined some of the roles of Google drive in the storage and retrieval of school records. The paper further highlights the benefits of using Google drive for the storage and retrieval of school records. In order to collect useful information for the purpose on this paper write-up, questionnaires were carefully drafted and administered to respondents using online Google form questionnaire instrument. The responses gathered were subjected to reliability analysis. Conclusively, recommendations were given.

Keywords: Technology, Google Drive, Academic Records, Educational Management.

INTRODUCTION

Schools are increasingly becoming complex in terms of programmes, activities as well as enrollment. Enrollment in schools is increasing becoming frightening as the availability of resources may become overstressed. Therefore, adequate record keeping of material and human resources is required to address the issue. School records are important files or documents containing essential information about the students, staff, facilities and school programmes. Most schools employ the use of traditional methods for the storage and retrieval of records which can easily be tampered with, damaged and sometimes misplaced. A better option for keeping school records is with the use of electronic storage system which involves the use of electronic or computing devices to ensure the safe keeping of files either in written or graphic form. Files or documents stored can be viewed/accessed, used and deleted or saved back if need be. Google drive cloud storage system is however the innovative method of storing and retrieving academic files and records. Google drive is a cloud-based storage service that works by uploading files to its own

remote server or the 'Cloud'. With the use of Google drive, academic records can be stored, accessed, edited and retrieved conveniently at will.

RELATED LITERATURE

It is evidential that technological developments have pivoted across enumerable industries. According to Marvin et al. (2018), advancements in technology have open new doors of opportunities in every field of life including education. Durosaro (2013) stated that school records are important tools for effective planning and administration of a school. Ijaiya (2015) denoted there is a growing need for improved methods of record keeping in schools to ensure safe file storage and utilization. Shehu (2017) stated that there are two basic methods of keeping school records including manual and electronic formats. Ibara (2010) outlined some of the attributes of good record management system in schools. Ogabi (2019) inferred that Google drive cloud storage system is a new but improved way of storing academic files and records. According to Akpan (2022), Google drive composes of Google DOCs, slidesand sheets, office suit that permits the editing of documents, spreadsheet, drawings, presentations, forms and many more.

Roles of Google drive in the storage and retrieval of school records

Google drive would supports and enhances the storage of academic records if schools and other educational institutions adopt it usage in the following ways. Viz:-

1. File and record storage:

   All academic records in school database can easily be uploaded into the Google drive without stress.

2. File and record retrieval:

   Academic records stored on Google drive can be easily accessed through online service using any computer or smart devices.

3. Editing:

   It is easy to update files and records stored on Google drive as all Microsoft Office documents are accommodated.

4. Sharing:

   Google drive offers three access levels thereby making it easy for records to be share among students, academic or administrative staff.

Benefits of using Google drive

The uses of Google drive to education are immense. Google drive allows remote access to files, documents and other records stored using its services. The major benefits of using Google drive listed as:-

1. Microsoft Office compatibility
2. Easy to use interface
3. Flexible File sharing with using custom link
4. Secured encryption
5. Stores PDFs, presentations, videos and photos
6. Documents and files are accessible from anywhere
7. Apps & templates with enumerable options

MATERIALS AND METHODS

The paper adopted a descriptive survey on the use of Google drive for the storage and retrieval of academic records. Simple random techniques were used for the purpose of equity representation of schools from different zones. Drafted copies of questionnaire were administered to respondents using online Google form questionnaire instrument containing alternative options using Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD). The responses obtained were collated and subjected to Cronbach's alpha reliability analysis. The result of 0.81 gave a good reliability index of the instrument. The entire exercise took place within the space of two and half ($2^1/_2$) weeks before completion.

RESULT AND DISCUSSION

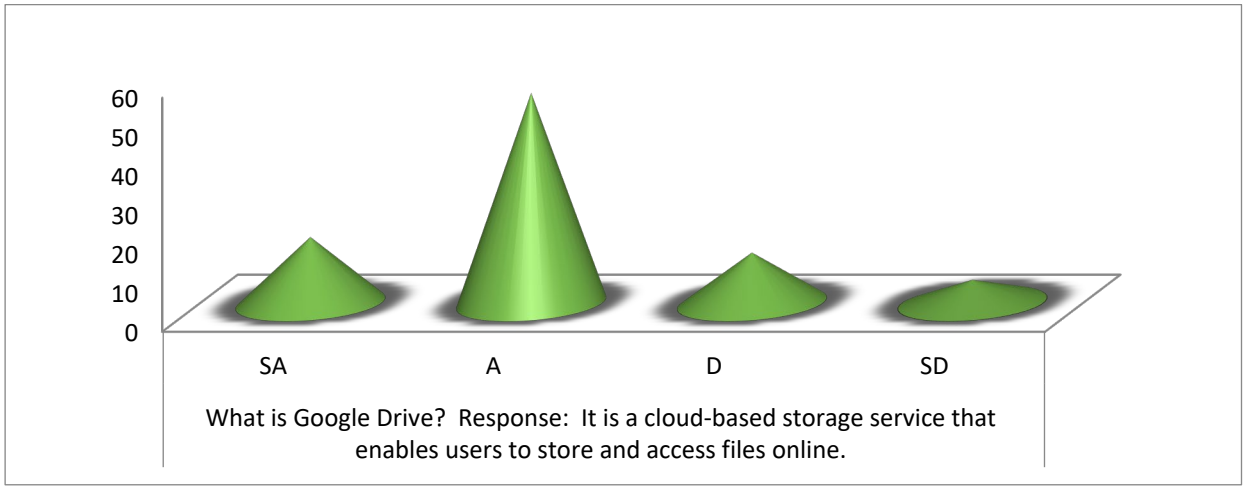

Fig.1. Chat Analysis

The chat in figure 1 above depicts that majority of the respondents fully understand what Google drive implies. According to the respondents, Google drive is a cloud based storage service that enables users to store and access files online. The respondents further stated that Google drive synchronizes stored files, documents, videos, photos and many more across it's user's devices which may include PCs and tablets.

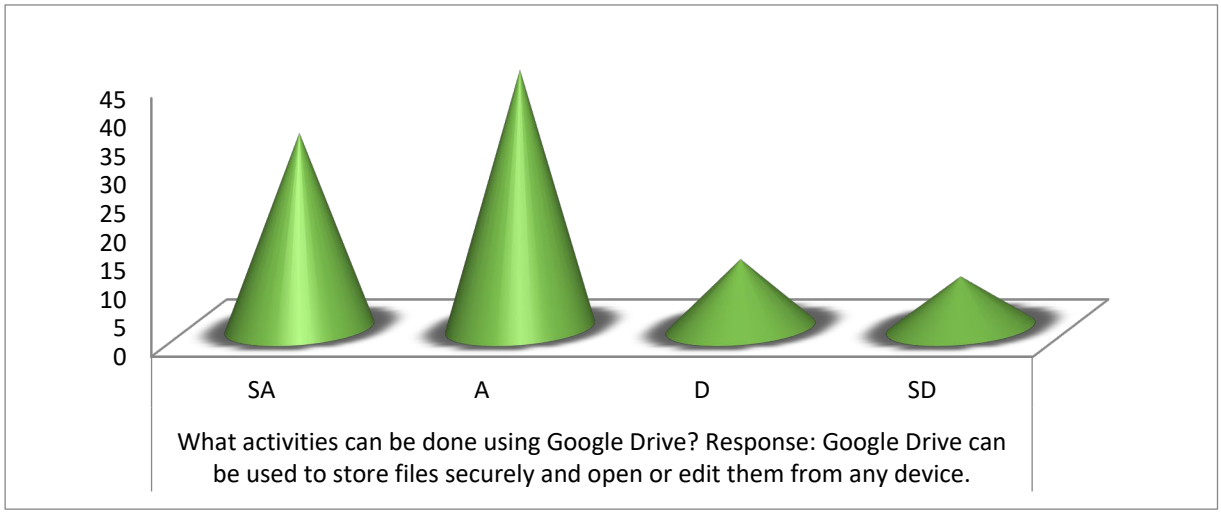

Fig.2. Chat Analysis

The graph plotted in figure 2 indicates that a significant number of the respondents support that

Google Drive can be used to store files securely and open or edit them from any device. According to the respondents, files that are created with Google apps can be open in the user's browser. The respondents explained further that other types of files in the user's drive folder can also be open in regular apps such as Adobe Reader for PDF files. More so, the respondents noted that when files are deleted in Google Drive, they are only deleted temporary at the first instance. The deleted files are sent to the trash and begin to pile up until the users finally decides to permanently delete the files.

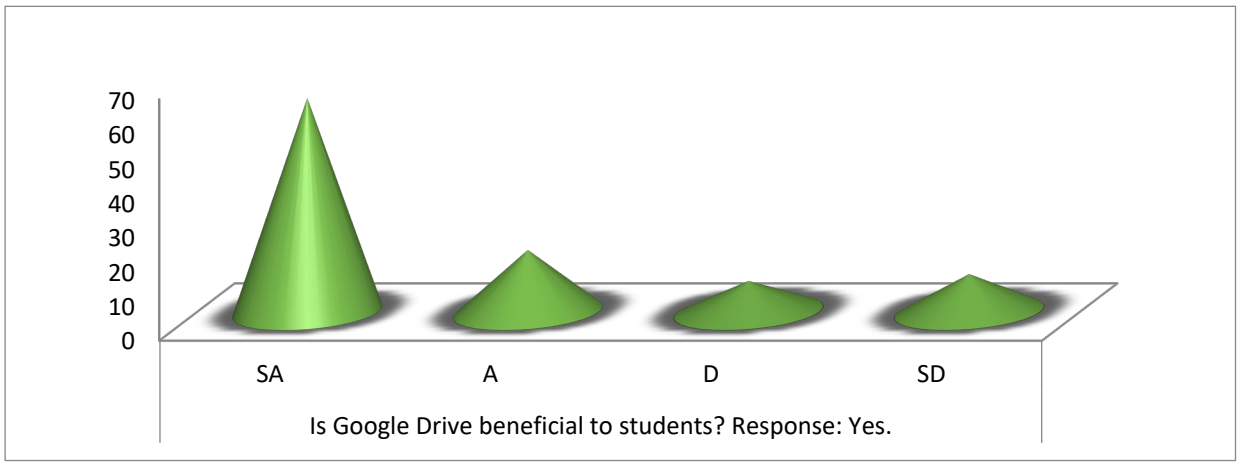

Fig.3. Chat Analysis

The chat seen in figure 3 shows that a substantial number of respondents agree with the statement that there are numerous benefits of the use of Google drive to students. The respondents stated that With Google Drive, students are able to make use of spreadsheet. word processing and presentation tools alongside with other Google applications such as Sites, Forms and Maps. The respondents noted that Google drive allows multiple users to concurrently edit their documents and invariably enhances real tool for students' collaboration and allows teachers to get almost immediate feedback.

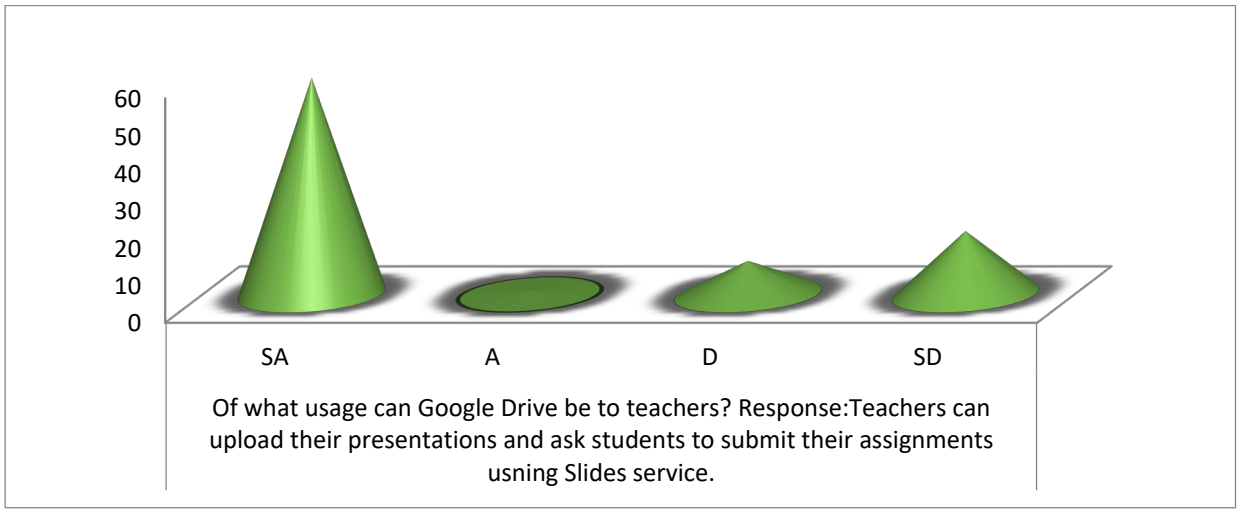

Fig.4. Chat Analysis

The graph plotted in figure 4 clearly suggest that a higher number of respondents agree with the statement that teachers make use of the Google drive in numerous ways. According to the respondents, teachers can upload their class presentations and arrange them in folders based on specific topics. More so, the respondent added that Google drive can be very useful for the submission of students' assignment as folders that are viewable only by teacher can be created.

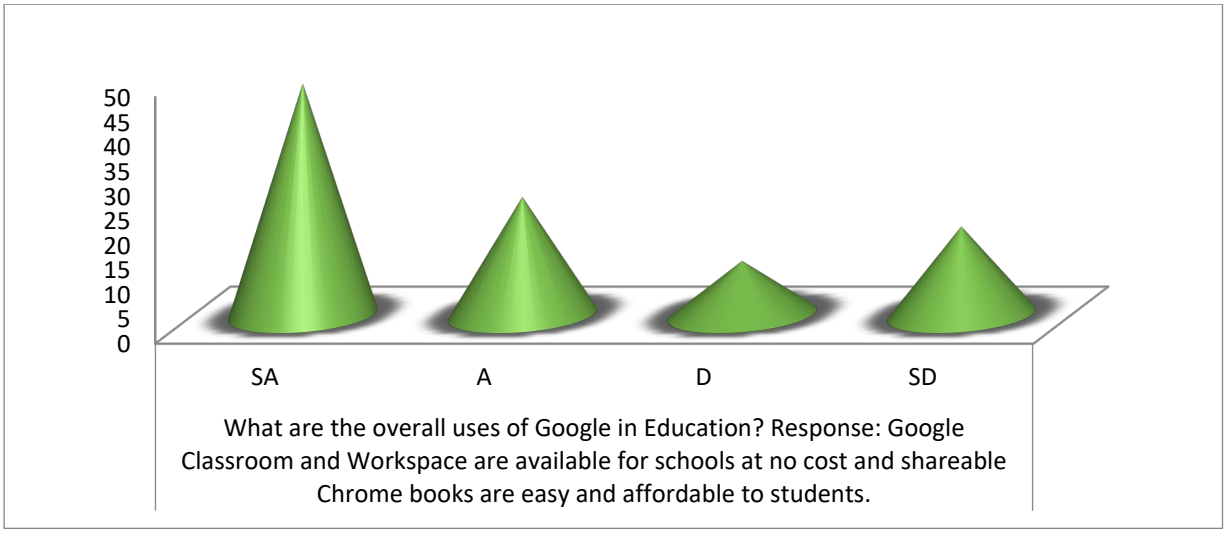

Fig.5. Chat Analysis

The chat shown in figure 5 indicated that a greater number of the respondents supported that there are immense uses of Google drive in the education sector. The respondents highlighted that schools can make use of Google workplace and Classroom at no cost. The respondents also added that shareable Chrome books are very easy to use and affordable to students at any time with an assurance of security facility that keep students and data safe.

CONCLUSION

This paper is focused on the use of Google drive for the storage and retrieval of academic records. The paper highlighted some of the roles and benefits of using Google drive for the storage and retrieval files and documents in schools and other educational institutions. The paper affirmed that Google drive offers numerous advantages over traditional methods of storing records. Google Drive is one of the *fullest-featured*, slickest and most generous cloud services that can be used to store documents, image files, Forms, Maps, Drawings, PDFs and more. When Google Drive is used to store academic documents or files, it can be easily accessed from wherever and at any time using any device with internet connectivity.

RECOMMENDATION

Based on this paper findings and conclusions, the following suggestions were made. Viz:-

1. School managers should endeavor to have a Google account that so as to have access to Google facilities or services.
2. Trained personnel should be employed in schools for effective electronic record keeping and updating.
3. Workshops and seminars should be regularly organized on trending Google services for students, academic and administrative staff to help them update their knowledge.

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CORRELATION BETWEEN THYROID GLAND ABNORMALITIES AND ACUTE AND CHRONIC URINARY INFECTIONS

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ABSTRACT

Disorders of the thyroid gland and hypothyroidism have recently been on the rise in both men and women, including different age groups as well as patients visited in the doctor's endocrinlog for thyroid gland echo controls and hormonal parameters analysisin serum of patient. The analyzed patients for the thyroid gland, urine and urine parameters were also analyzed to see the correlation and urine tests like biomarkers of urinary tract infections.

Our study aims to study the correlation between urine infection and thyroid disorders parameters of men and women in the Tetovo region with acute and chronic urinary infections.

From the patients investigated for the correlation between the results of thyroid hormones and acute and chronic urinary infections, we see a low significance of the correlation between these parameters.

Urine analyzes were performed by collecting urine in sterile cups and using the urine microscopy method and urine strip test using the chromatographic method, where these analyzes were performed according to the European guidelines standards manual.Thyroid analysis are measurement from serum of patient with sofisticet method imunnoassay fluorescent test with Vidas by Biomerie.

Result of patients with proteinuria , leukocyturia , epithelial Cells, hematuria , urine pH, granular casts , triplet phosphate , calcium oxalate , glycosuria , bacteria and mucous are present in patient with disorder thyroid gland . The obtained results show that the significance of this parametars of urine and urinary infections in man and women are the main indicators of urinary tract infections in patients with acute and chronic infections as well as asymptomatic patients who have had no clinical symptoms between thyroid disoreders.

Keywords*:* thyroid disorders, TSH,FT_4,FT_3,urine analysis, hematuria, leukocyturia, glycosuria, epithelial cells.

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ANTIBIOTIC SUSCEPTIBILITY PATTERN OF *SALMONELLA TYPHI* AND *SHIGELLA SPECIES* IN FAECAL SAMPLES AMONG CHILDREN UNDER FIVE YEARS IN NASSARAWA SPECIALIST HOSPITAL, KANO

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ABSTRACT

This study assessed the antibiotic susceptibility pattern of some antibiotics on *Salmonella typhi* and *Shigella spacies* in faecal samples of children less than five years attending paediatric clinic in Nassarawa Specialist Hospital, Kano. This is a baseline cross-sectional survey infants and young children aged 0 - 5 years were targeted. Samples were taken from consented participants in whom relevant laboratory glassware, reagents, antibiotic disc and other equipment were used for handling, transportation and processing of their collected faecal samples. The prevalence of *Salmonella* and *Shigella* was determined from the proportion of positive individuals in the total population under consideration and percentages were expressed. The study revealed that Chloramphenicol and Gentamycin are susceptible to *Salmonellosis* and *Shigellosis* for children of five years and below; and therefore recommended for treatment. The researchers further recommended that prevention of *Salmonellosis* and *Shigellosis* in children is better achieved when mothers do observe proper personal hygiene and environmental sanitation, with adequate cleaning of hands using soap and portable water immediately after defecation or after cleaning their children's bottom.

Keywords: Antibiotics, Salmonella Typhi, Shigella

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SIMULATION OF THE SUPERSONIC FLOWFIELD WITHIN THE DIVERGENT SECTION OF A PROPULSION NOZZLE

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ABSTRACT

A supersonic or de Laval nozzle is a convergent-divergent device that is positioned downstream of the combustion chamber. It accelerates the combustion gases to speeds higher than that of the sound and equips nowadays all aircraft and rocket engines. The gases are expanded as a result of the conversion of the thermal energy into kinetic energy. Almost all nozzle configurations had their contour designed using Method of Characteristics (MoC). The simulation of a propulsion nozzle operation is necessary to the understanding of the process that takes place within its configuration where the speed (and subsequently the Mach number) of the gas increases progressively while its pressure and temperature decrease.

The present investigation involves the simulation of an axisymmetric conical contour convergent-divergent nozzle. The convergent section has been designed using the Rao method that allows the design of the converging profile on the basis of the throat radius successfully, the divergent section being developed using the MoC procedure. The simulation was performed using the CFD solver based on the finite volume method applied by the "Ansys-Fluent" platform until a solution is reached within the optimal design conditions. Both the static pressure and Mach number were computed, and the results in terms of contours show a regular supersonic expansion (leading to a Mach of 1.26 at the exit section centerline) taking place downstream of the throat.

Keywords: Supersonic expansion, Divergent section, 2-D simulation, Ansys-Fluent.

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PARASITE DIVERSITY OF FISHES IN TÜRKİYE – III-ACANTHOCEPHALA

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ABSTRACT

Fish parasites are among the very diverse groups of living organisms in marine and freshwater environments worldwide, and their impacts on wild and cultured fish are considered significant according to their taxa. Members of the phylum Acanthocephala are endoparasites of fishes with about more than 1000 species. They are characterized by a retractable proboscis armed with rows of hooks used to attach to the intestines of fish. While adults mainly inhabit the intestine, some larval forms can be found in the viscera of the host fish. Infected fish may have some clinical signs such as emaciation in inflamed intestinal tracts and tissue necrosis in areas where worms are attached to the intestinal wall. These parasites require fish as the final host and microcrustaceans (amphipod, copepod, isopod, or ostracod) are generally the intermediate hosts. A number of acanthocephalan species from marine and freshwater fishes were previously described in Türkiye and this study provides details of their occurrences in different environments and hosts. To date, a total of 25 acanthocephalan species have been reported from fishes inhabited in marine, freshwater, and aquarium environments in Türkiye. Out of 25 species, 10 valid species and 4 species at the genus level in wild marine fish hosts, 10 valid species and 3 species at the genus level in wild freshwater fish hosts, and finally 1 valid species in cultured freshwater fish host have been reported. Moreover, 8, 6, 3, and 1 species were reported from the Aegean Sea, the Sea of Marmara, the Black Sea, and the Mediterranean Sea, respectively. *Acanthocephaloides propinquus* is the most common species by being recorded from 7 fish host species, followed by *Neoechinorhynchus agilis* from 5 and *Acanthocephalus lucii* from 3 host species. Two different acanthocephalans were reported from *Merluccius merluccius, Mugil cephalus, Platichthyes flesus, Scorpaena porcus, Solea solea,* and *Diplodus vulgaris,* and the rest of the fish species hosted only one species of Acanthocephala in the wild marine environment. On the other hand, *Neoechinorhynchus rutili* was the dominating acanthocephalan species reported from 24 different freshwater fish hosts, followed by Pomporhynchus laevis from 16 host species. *Esoc lucius* was the most specious host fish with 5 acanthocephalan species.

Keywords: Fish, Acanthocephala, Türkiye

INTRODUCTION

Acanthocephalans are a group of endoparasitic helminths commonly found in both marine and freshwater fishes worldwide (Sanil et al. 2011). The phylum Acanthocephala is comprised of more than 1000 species of pseudoceolomic helminths, which, as adults, occur exclusively in the vertebrate small intestine (Bhattacharya, 2007). Acanthocephalans are ‘thorny’ or ‘spiny-headed’ worms with aquatic complex life cycles; fish as final or paratenic hosts and crustaceans as intermediate hosts (Mehlhorn, 1988). Adults feed on the intestinal walls of vertebrates, especially freshwater and marine fishes. They are often encountered in the culture system as the majority of the broodstock fishes are sourced from the wild (Jithendran and Kannepan, 2010). The main structure of armed proboscis causes irreversible mechanical damage by its attachment and affects the architecture of the intestinal tissues leading to pathological changes (Sanil et al. 2011).

A number of acanthocephalan species from marine and freshwater fishes were previously described in Türkiye and, to date, a total of 25 acanthocephalan species have been reported from fishes inhabited in marine, freshwater, and aquarium environments in Türkiye. This study provides details of their occurrences in different environments and hosts based on the checklist book provided by Özer (2021).

RESEARCH AND FINDINGS

According to Özer (2021), a total of 25 acanthocephalan species were reported from all fish species in Türkiye and this makes up 3% of the total parasite species reported from fishes in Türkiye (Figure 1).

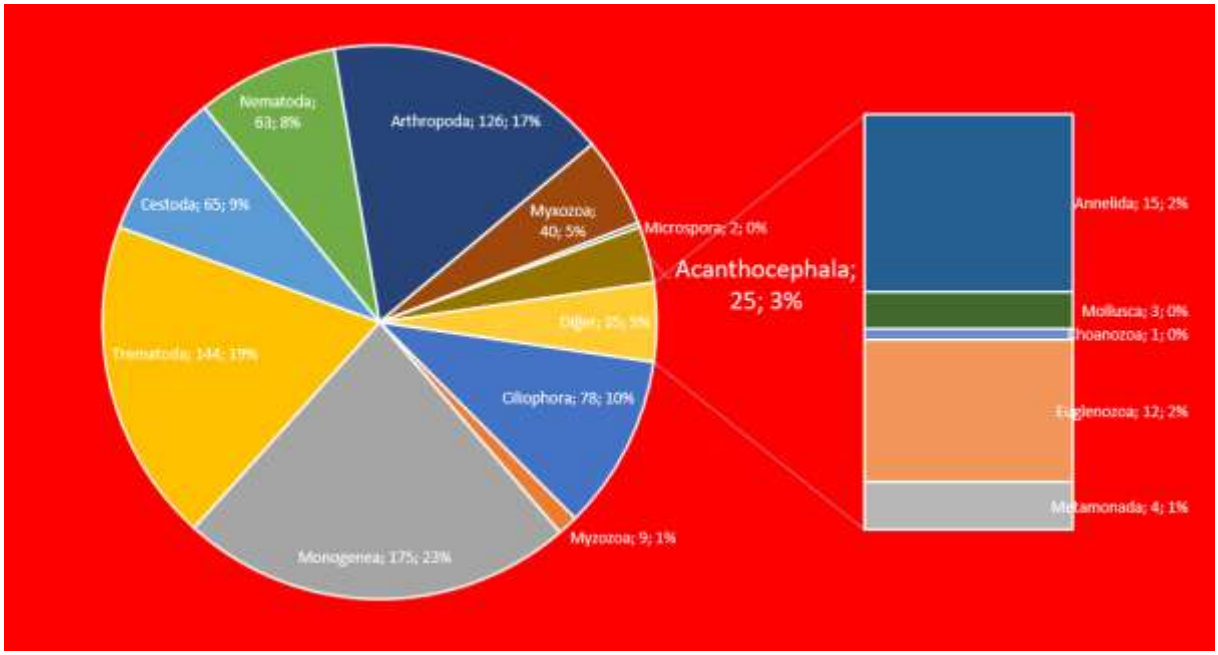

Figure 1. Total number and percentage of acanthocephalan parasites reported from fishes in Türkiye

Among reported 25 acanthocephalan species, wild marine, and wild freshwater fishes had higher numbers of parasites than the other groups and no cultured or aquarium fishes hosted any of them (Figure 2).

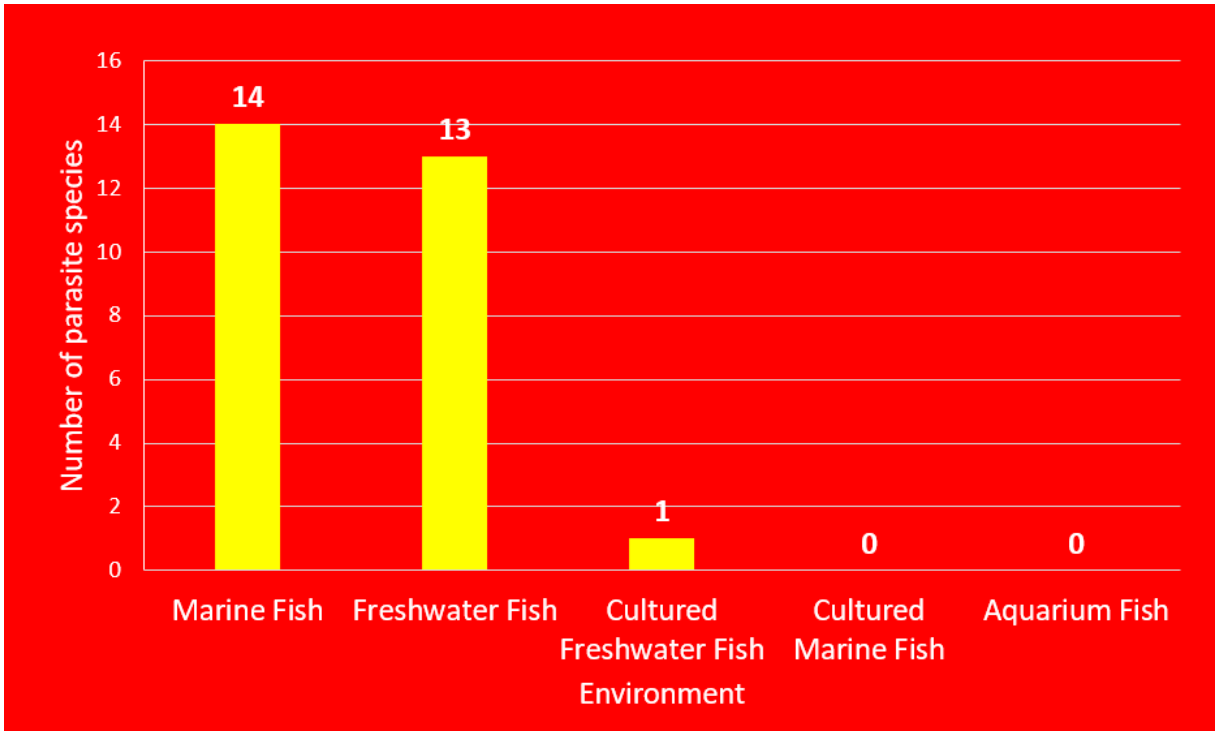

Figure 2. The total number of acanthocephalan parasite species reported from fishes in Türkiye

1. Acanthocephalan Parasite Diversity of Marine Fishes

Wild marine fishes inhabiting the surrounding seas of Türkiye were subjected to acanthocephalan investigations. Most of the species (14) were reported from fishes inhabiting the Aegean Sea, followed by the Sea of Marmara, the Black Sea, and the Mediterranean Sea (Figure 3).

Acanthocephalan parasites which were reported from wild marine fishes were dominated by *Acanthocephaloides propinquus* from 7 host fish species. This parasite was followed by *Neoechinorhynchus agilis* and *Acanthocephalus lucii* (Figure 4). Some other acanthocephalan species were also reported from 2 and a lesser number of fish species (see Özer, 2021 for details).

Wild marine fishes were reported to be the host for acanthocephalan parasites from the surrounding seas of Türkiye and a total of 6 different fish species including European hake *Merluccius merluccius*, grey mullet *Mugil cephalus*, flounder *Platichthyes flesus*, etc were reported to be infected by only 2 different parasite species, and the rest had only one parasite species (Figure 5).

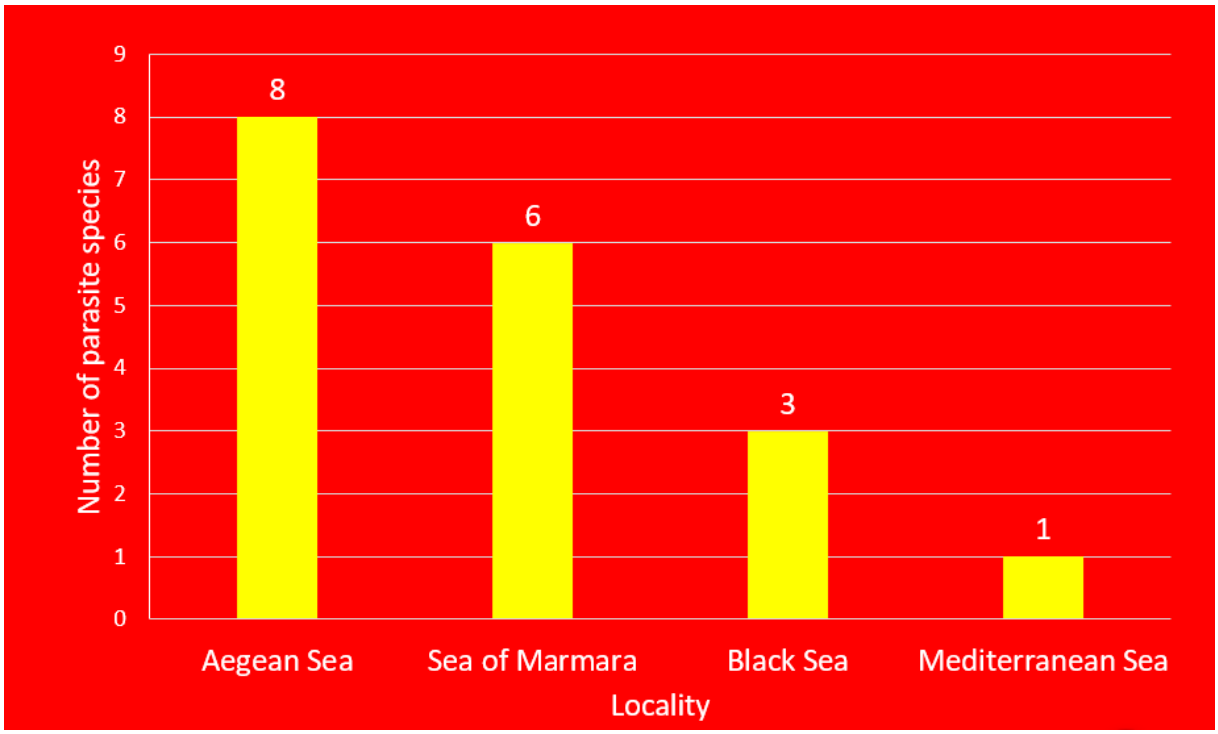

Figure 3. The number of acanthocephalan parasite species reported from wild marine fish species that inhabited the surrounding seas of Türkiye

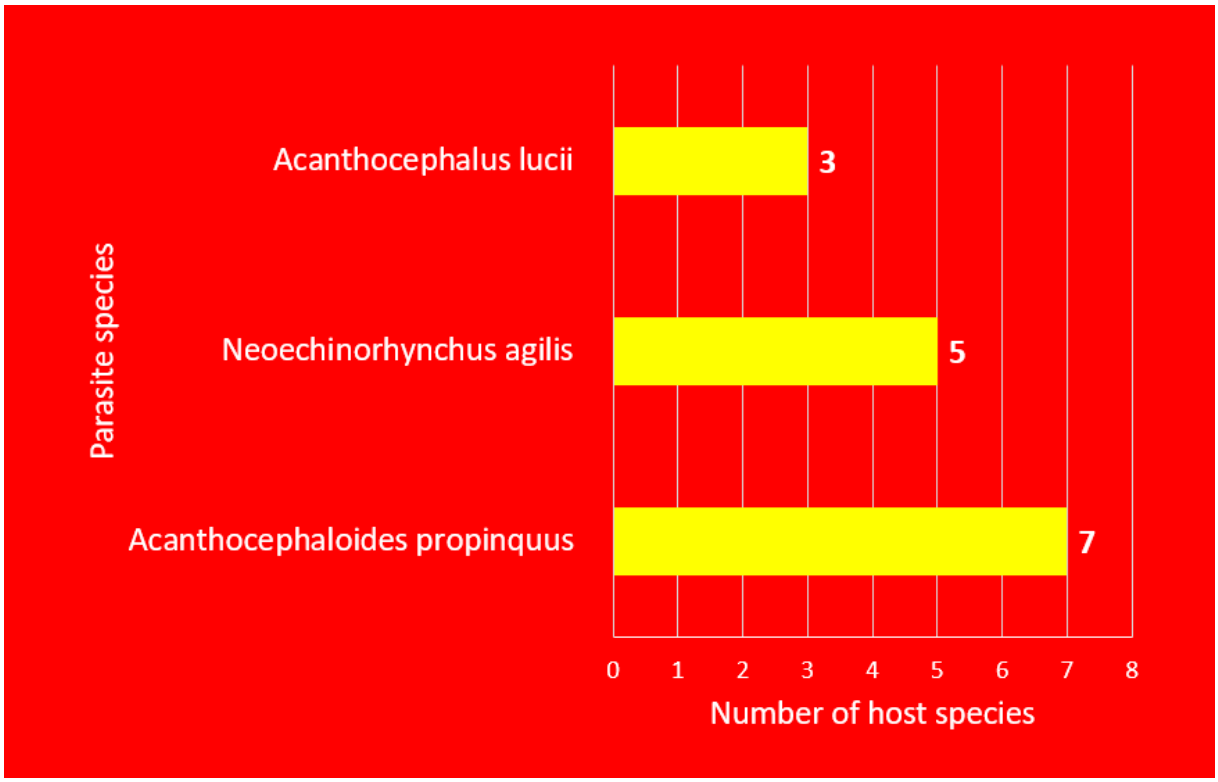

Figure 4. The number of acanthocephalan parasite species infecting ≥3 wild marine fish species in Türkiye

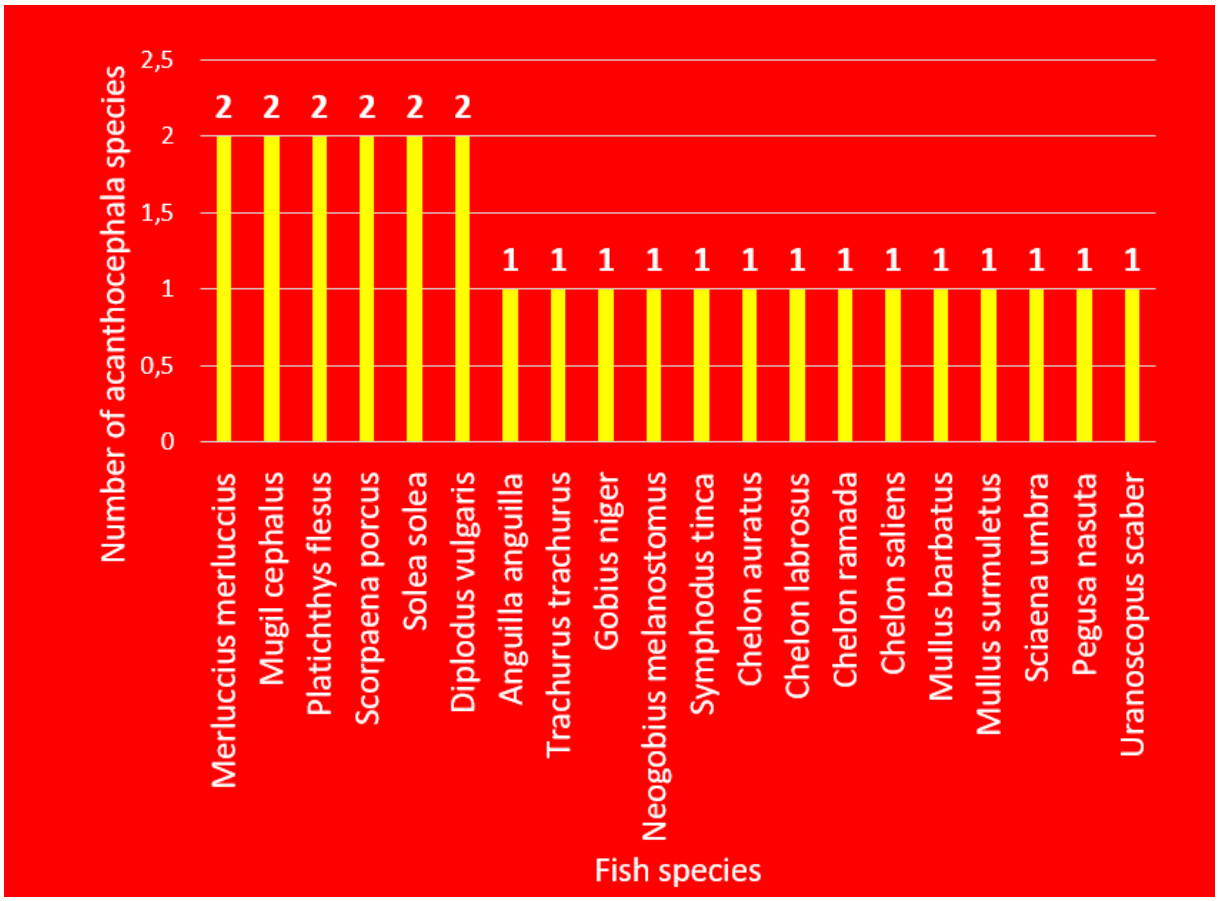

Figure 5. The number of acanthocephalan parasite species infesting the wild marine host fishes in Türkiye

2. Acanthocephalan Parasite Diversity of Wild Freshwater Fishes

The number of wild freshwater fish host species infected by acanthocephalan parasites in Türkiye is presented in Figure 6 and *Neoechinorhynchus (N.) rutili* and *Pomphorhynchus laevis* were the most common species infecting 24 and 16 host fish species, respectively. These parasites were followed by genus-level identified parasites and 2 more parasite species were reported from 5 and more fish host species (Figure 6). The rest of the reported acanthocephalan parasites and their host occurrences can be seen in Özer (2021).

Wild freshwater fishes subjected to acanthocephalan investigation yielded several numbers of acanthocephalan parasite species and the northern pike *Esox lucius* was reported to host the most number of parasite species of 5, followed by *Capoeta trutta* and the common carp *Cyprinus carpio* (4) and some fish species had lesser numbers of parasite species (Figure 7).

3. Acanthocephalan Parasite Diversity of Cultured Freshwater Fishes

The cultured freshwater fishes were also investigated for acanthocephalan parasites and only one species *Pomphorhynchus laevis* was reported from cultured rainbow trout *Oncorhynchus mykiss* from the Aegean region of Türkiye.

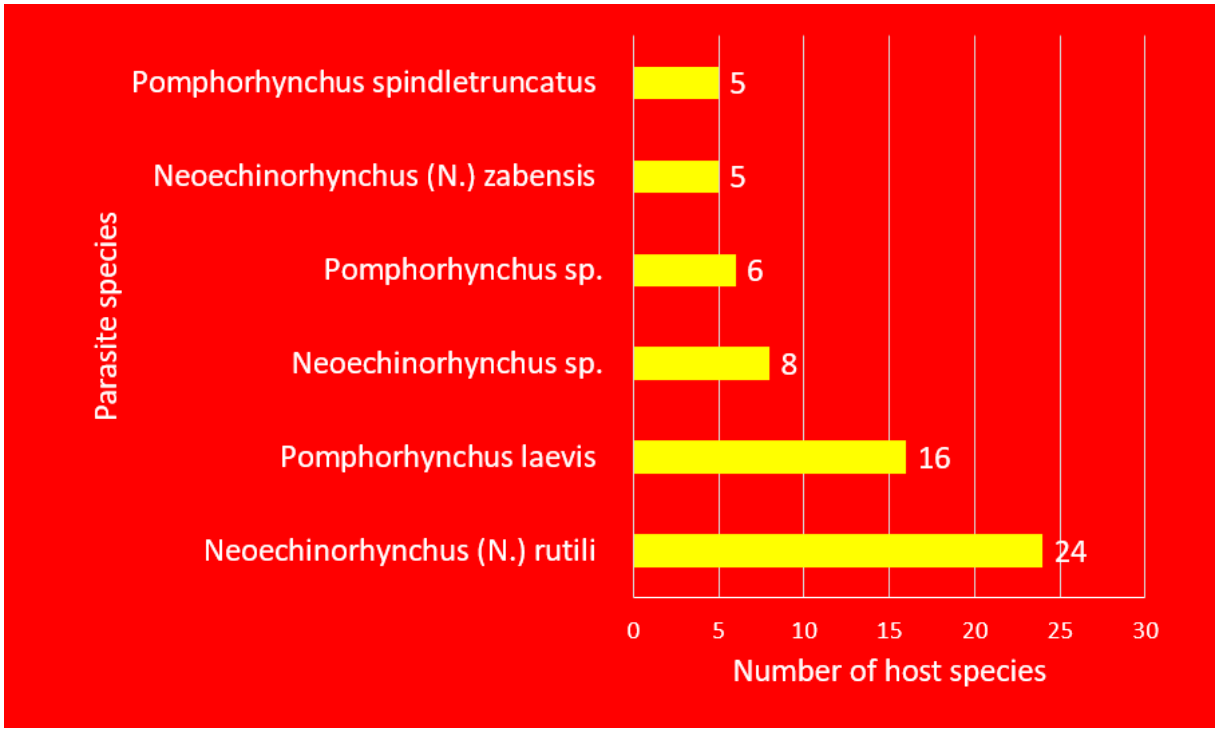

Figure 6. The number of acanthocephalan parasite species infecting ≥5 wild freshwater fish species in Türkiye

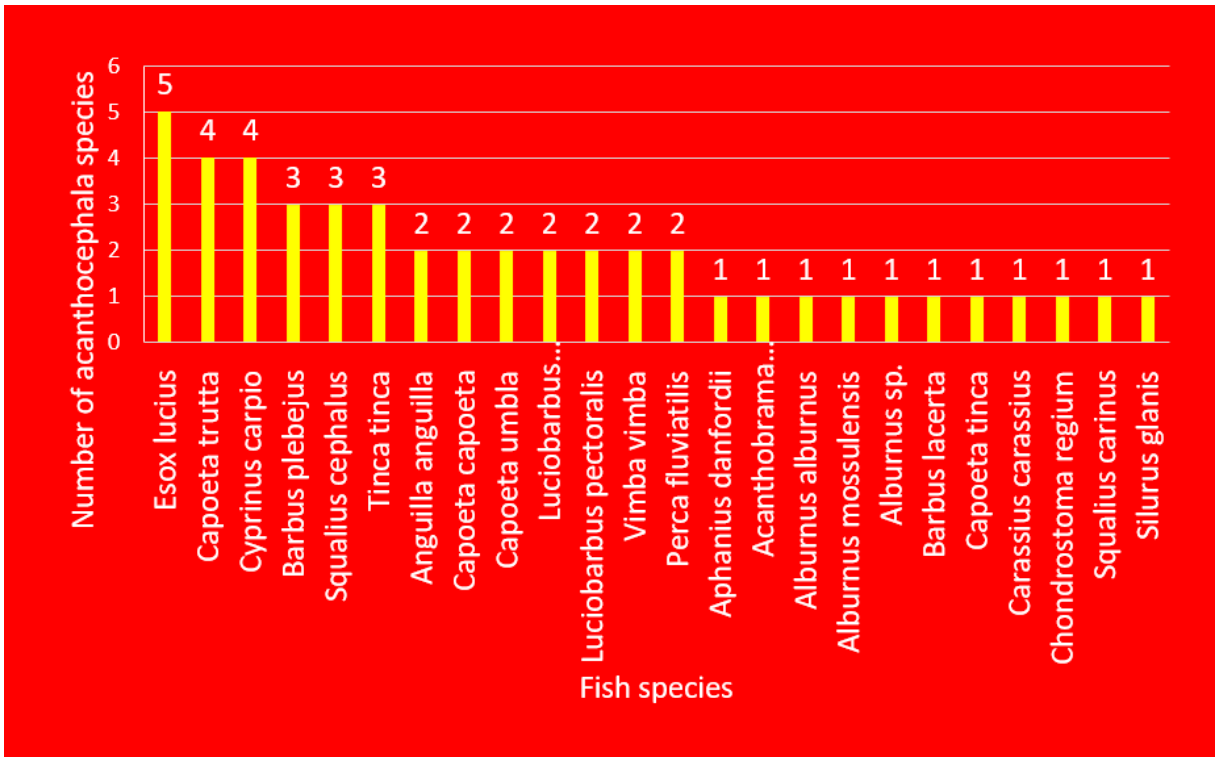

Figure 7. The number of acanthocephalan parasite species infecting the wild freshwater fishes in Türkiye

DISCUSSION

Acanthocephalan parasites of fishes are among the most pathogenic ones especially when they riched in high numbers in the intestine of their hosts. Thus, studies on these parasites are important and their numbers of over 1000 species show how they are common in marine and freshwater environments. This chapter provided all details on the current acanthocephalan parasite reports in wild and cultured host fishes in marine and freshwaters in Türkiye. It can clearly be said that the data on the occurrences and numbers of reported acanthocephalan parasite species in these environments and their host fish species are very low when compared with the other reported metazoan parasites (see Özer, 2021 for details). The total number of 25 species was mostly reported from wild marine and freshwater environments reflecting its rare occurrences in the current 561 marine and 401 freshwater fish species in Türkiye as reported by Froese & Pauly (2022). Thus, it is clear that more effort will yield more acanthocephalan species identification in a wide variety of water sources both marine and freshwater of Türkiye.

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PARASITE DIVERSITY OF FISHES IN TÜRKİYE – II-MYXOZOA

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ABSTRACT

Parasites are among the significant components of fish diseases worldwide, and their impact on wild and cultured fish is also significant. Myxozoans are one of the most specious taxa of fish parasites and they are very diverse microscopic metazoan parasites that infect a variety of hosts, especially fish living in marine, freshwater, and aquarium environments all around the world. Some members of myxozoans are reported to be the major pathogens both in wild and aquaculture environments. The identification of myxozoans is based primarily on spore morphology. It is known that some of these parasites are to be host and organ-specific, and they can be either coelozoic in organ cavities, or histozoic inter- or intracellularly. About 2500 valid myxospoean species have been reported worldwide and *Myxobolus*, *Henneguya*, and *Myxidium* are the most specious genera among myxozoa. Fish act as one host of the two-host life cycle. A number of myxozoan species from marine and freshwater fishes were previously described in Türkiye and this study provides details of their occurrences in different environments and hosts. To date, a total of 40 myxosporean species have been reported from fishes inhabited in marine, freshwater, and aquarium environments. Among 40 species, marine parasites dominated with 35 species, of which 29 is valid and 6 were at the genus level, in wild marine fish hosts, followed by 3 species in wild freshwater, and 1 species in aquarium fish host. Moreover, out of 35 myxosporean species reported from marine hosts, 33 were from the Black Sea, 3 from the Mediterranean Sea, and 1 from the Sea of Marmara. The most reported myxosporean species is *Myxobolus* sp. from 7 fish host species and followed by *Ceratomyxa* sp. and *Ortholinea orientalis* from 4 different fish hosts and finally *Sphaeromyxa sevastopoli* from 3 different fish host species. When the fish species is considered as the host, *Parablennius tentacularus* was the host for 5 myxosporean species and *Mugil cephalus* hosted 4 different *Myxobolus* species. Moreover, *Parablennius sanguinolentus*, *Neogobius melanostomus*, *Gaidropsarus mediterraneus*, *Chelon saliens*, and *Mullus barbatus* were reported as hosts for 3 myxosporean species. In wild freshwater hosts, *Cyprinus carpio* and *Tinca tinca* had 2 parasite species while *Myxobolus* spp were reported from 5 different host fish species.

Keywords: Fish, Myxozoa, Türkiye

INTRODUCTION

Members of Myxosporea are a group of parasites infecting mainly fish, as well as reptiles, amphibians, and lesser numbers of mammals, and their impact on wild and cultured fish is significant (Kent et al. 2001). To date, more than 2400 nominal myxosporean species have been reported from marine and freshwater environments worldwide. Myxozoans belonging to different genera have been identified from many organs and tissues including skeletal and smooth muscle, gills, brain, heart, kidney, spleen, ovary, gall bladder, urinary bladder, esophagus, intestine, and mesentery of fishes (Eiras, 2002, 2014, 2018, Pascual et al. 2012, Özer et al. 2018, Okkay et al. 2021, Özer et al. 2015, 2016, 2017, 2022, Özer and Yurakhno, 2013). Some species were reported to be highly pathogenic and, in the last decades, myxozoan parasites have been increasingly reported in cultured marine fish. They are characterized by a spore with one to several valves, one or more infective sporoplasms, and one to several polar capsules with a coiled polar filament inside (Lom and Dykova, 2006).

Studies on the myxozoan parasites of fishes in Türkiye have gained momentum in the last decade and Özer (2021) provided details on their host and tissue preferences as well as environmental occurrences

and, in the present study, it is aimed to reveal all details on the infections of myxozoan parasites in marine, freshwater, and aquarium environments in this reference study.

RESEARCH AND FINDINGS

According to Özer (2021), a total of 40 myxozoan species were reported from all fish species in Türkiye and this makes up 5% of the total parasite species reported from fishes in Türkiye (Figure 1).

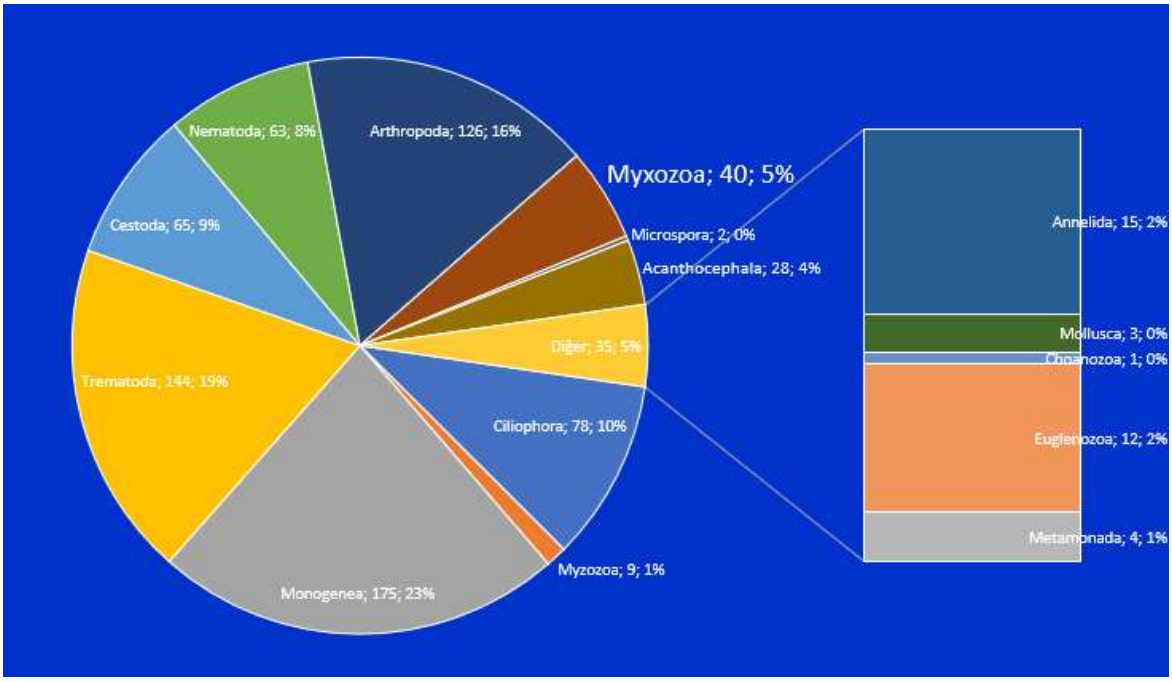

Figure 1. Total number and percentage of myxozoan parasites reported from fishes in Türkiye.

Among reported 40 myxozoan species, the most diverse parasitic group was from the marine fish hosts with 35 myxosporean species, followed by wild freshwater, cultured marine fish and aquarium fish (Figure 2).

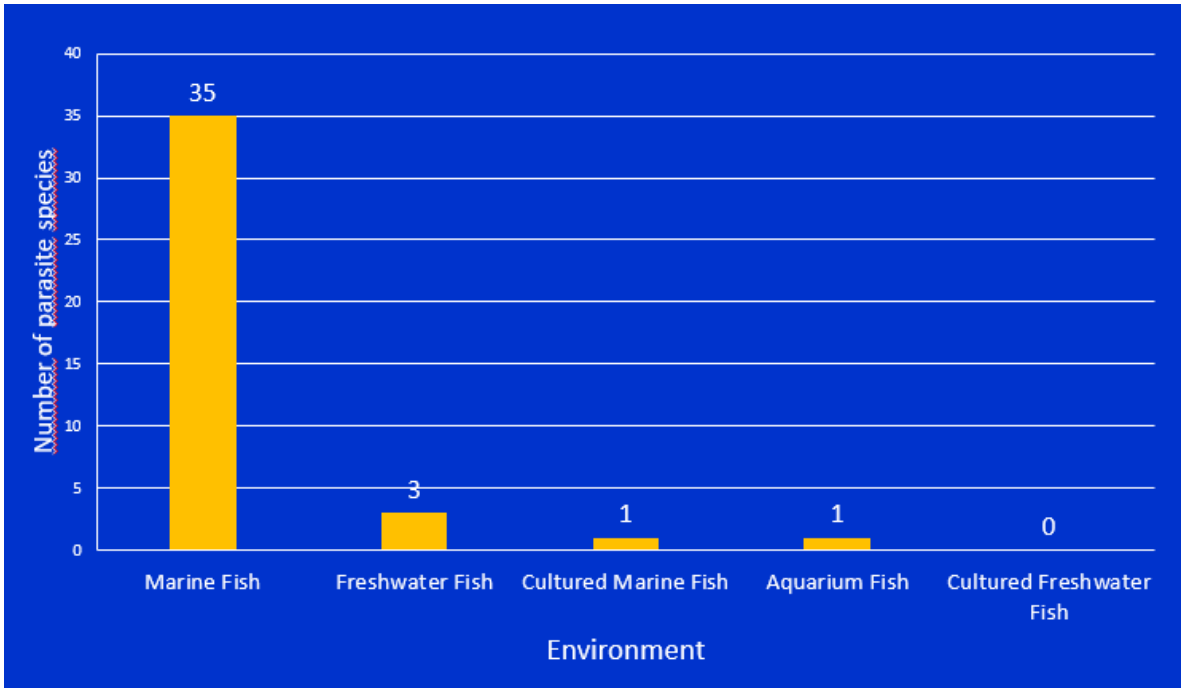

Figure 2. The total number of myxozoan parasite species reported from marine, freshwater, and aquarium fishes in Türkiye.

1. Myxosporean Parasite Diversity of Marine Fishes

Wild marine fishes inhabiting the surrounding seas of Türkiye were subjected to myxosporean investigations and most of the species were reported from fishes inhabiting the Black Sea and followed by the Mediterranean Sea and Sea of Marmara (Figure 3).

Myxosporean parasites which were reported from wild marine fishes were dominated by a genus level identified *Myxobolus* sp. from 9 host fish species. This parasite was followed by another genus level identified *Ceratomyxa* sp. and *Ortholinea orientalis* from 4 and *Sphaeromyxa sevastopoli* from 3 host fish species mostly inhabiting the Black Sea (Figure 4). Some other myxosporean species were also reported from 2 and a lesser number of fish species (see Özer, 2021 for details).

Wild marine fishes were reported to be the host for myxosporean parasites from the surrounding seas of Türkiye and tentacled blenny *Parablennius tentacularis* had 5 different parasite species, followed by grey mullet *Mugil cephalus* (4), rusty blenny *Parablennius sanguinolentus* (3), round goby *Neogobius melanostomus* (3) and some other fish species with different myxosporean parasites (Figure 5).

Only one myxosporean species was reported cultured fish species in marine environments.

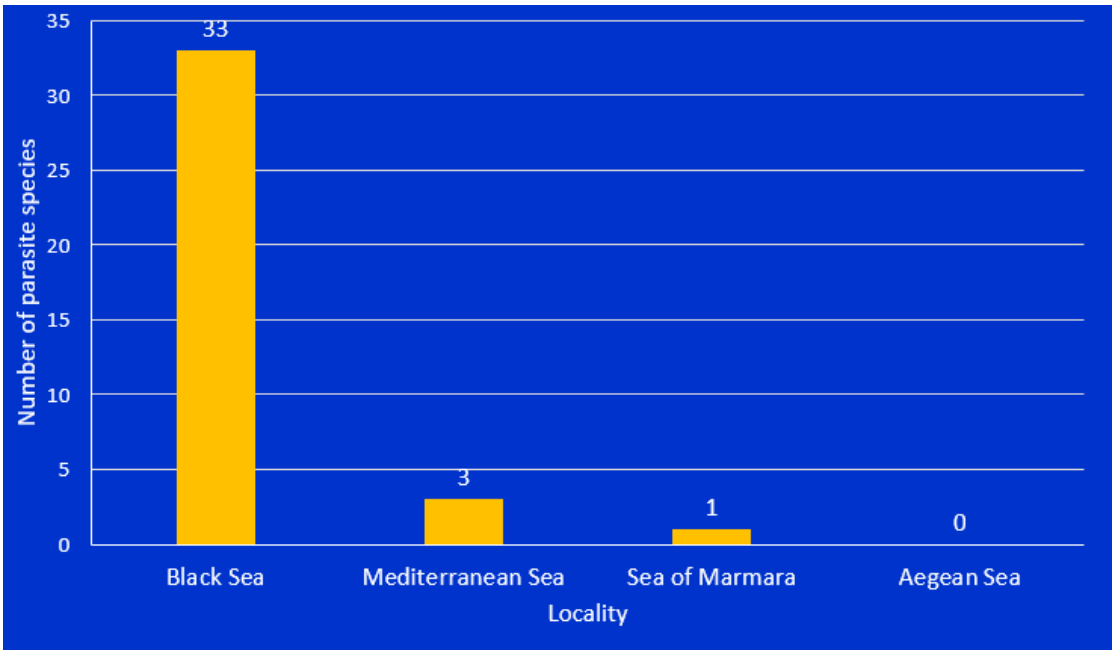

Figure 3. The number of myxozoan parasite species reported from marine fish species inhabited the surrounding seas of Türkiye.

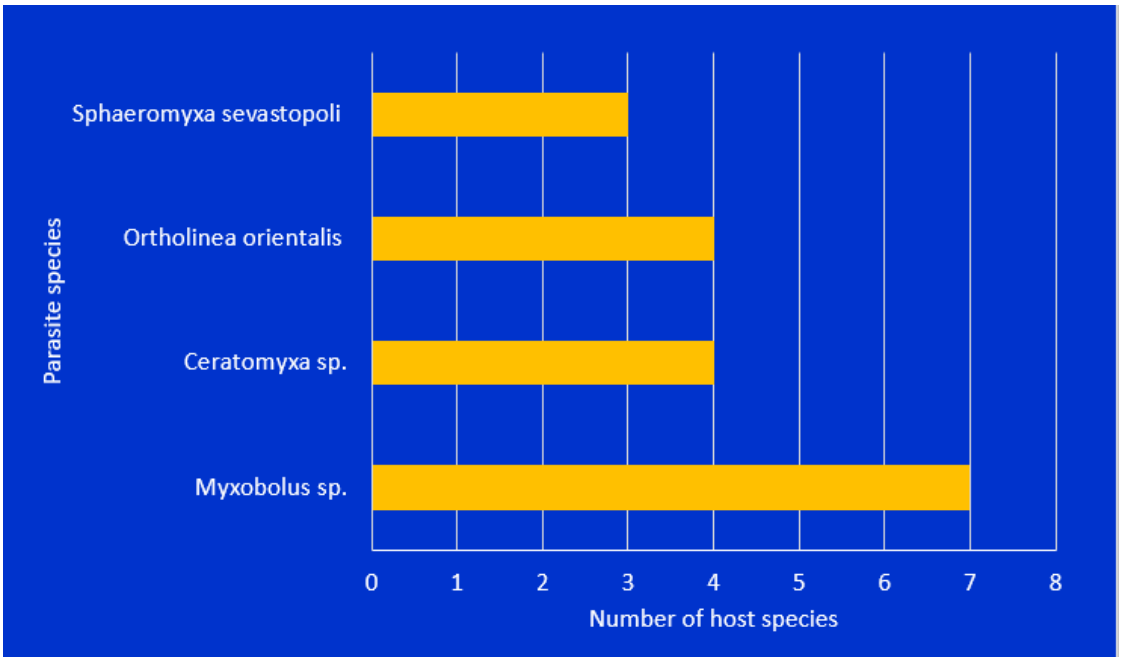

Figure 4. The number of myxozoan parasite species infecting ≥3 wild marine fish species in Türkiye.

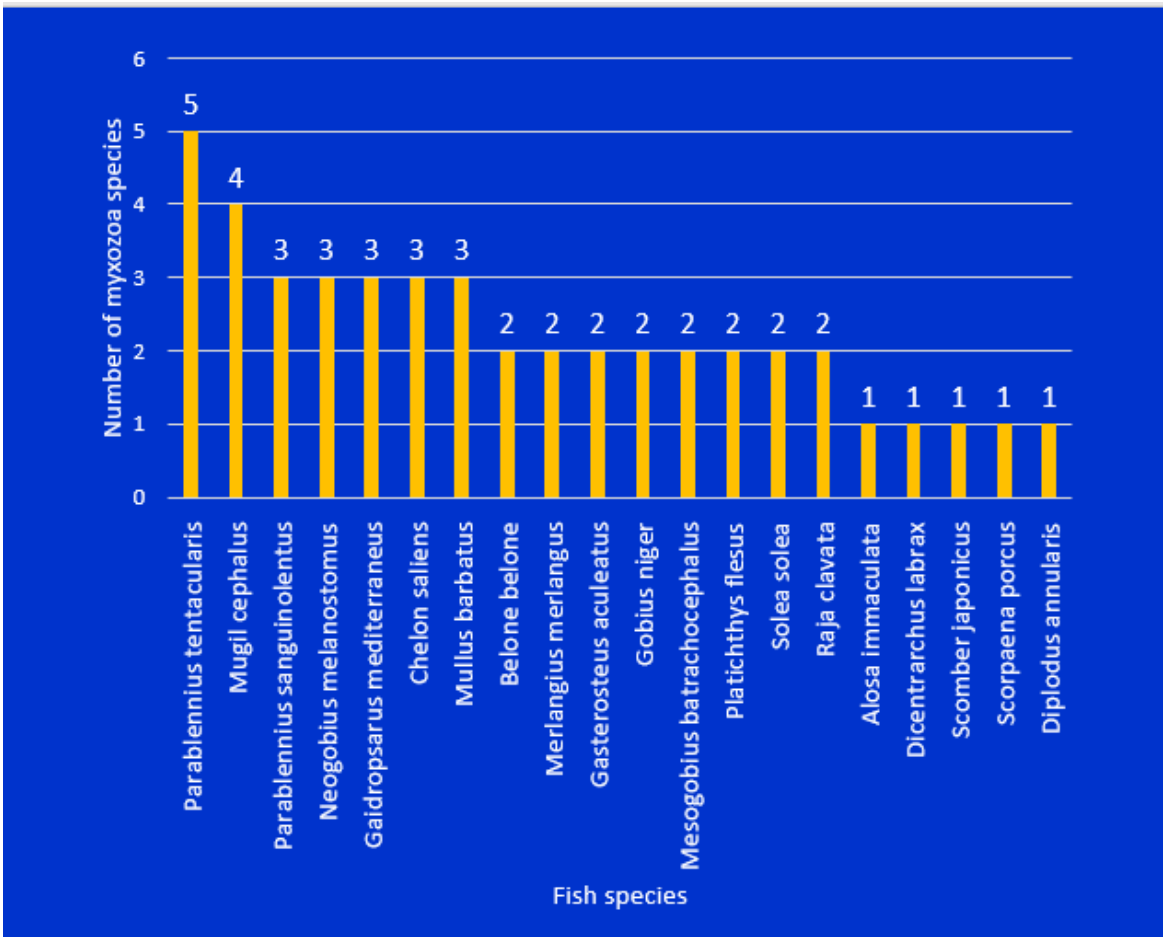

Figure 5. The number of myxozoan parasite species infesting the wild marine host fishes in Türkiye.

2. Myxosporean Parasite Diversity of Freshwater Fishes

The number of wild freshwater fish host species infected by myxosporean parasites in Türkiye is presented in Figure 6 and a genus level identified *Myxobolus* sp. was reported from 55 different host

fish species, followed by another genus level identified *Sphaerospora* sp. and *Myxobolus cyprinicola* from 2 host fish species.

Wild freshwater fishes subjected to myxosporean investigation yielded a limited number of myxosporean parasite species and the common carp *Cyprinus carpio* and tench *Tinca tinca* had only two myxosporean species while the rest had only 1 species (Figure 7).

3. Myxosporean Parasite Diversity of Aquarium Fishes

Parasitological surveys in ornamental fishes in Türkiye yielded only one genus level identified *Myxobolus* sp. from the gall bladder of *Carassius* sp, *Poecilia reticulata* and *Pterophyllum* sp.

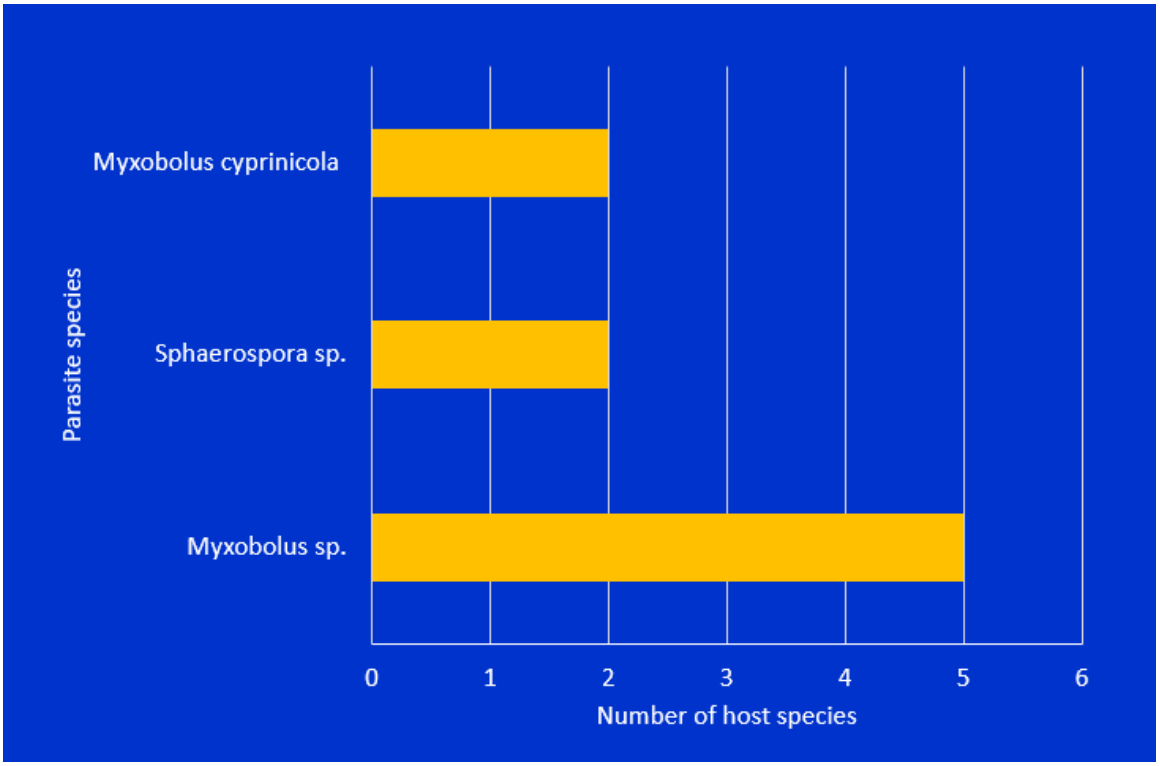

Figure 6. The number of myxozoan parasite species infecting ≥2 wild freshwater fish species in Türkiye

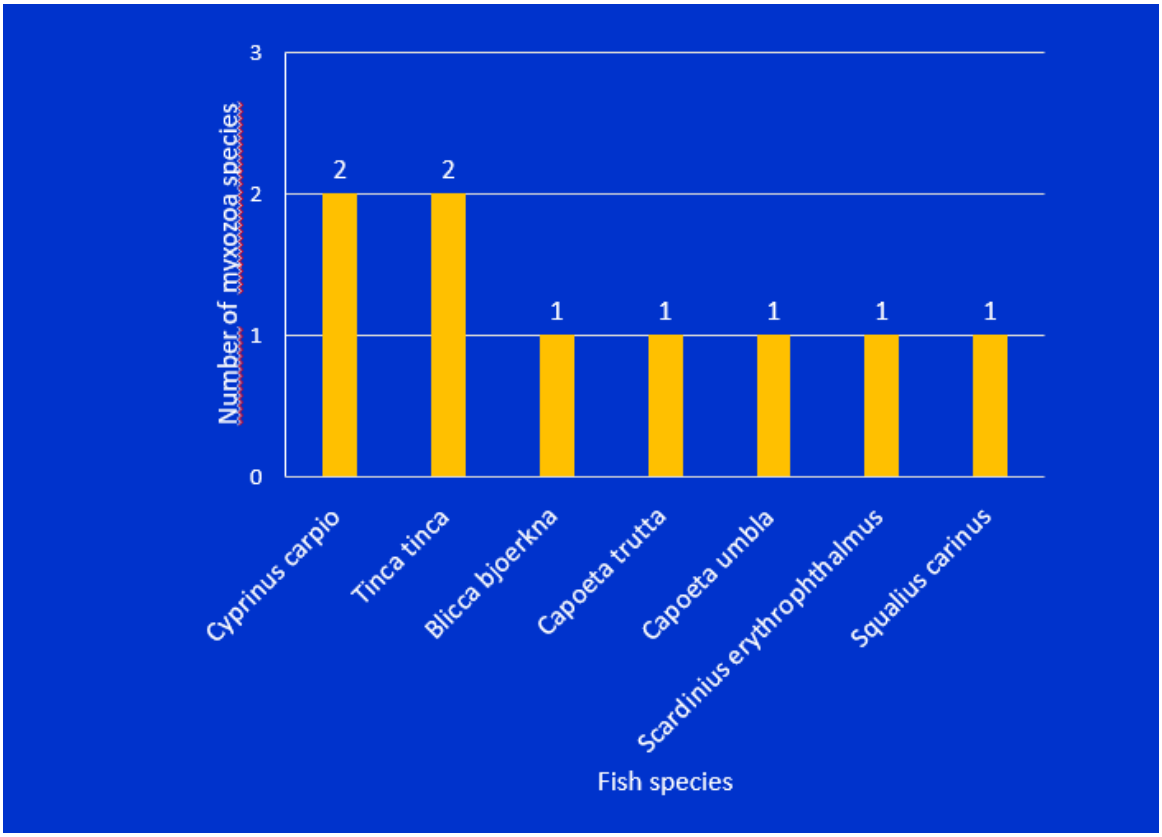

Figure 7. The number of myxozoan parasite species infecting the wild freshwater fishes in Türkiye.

DISCUSSION

This chapter provided details on the myxozoan parasites and their wild and cultured host fishes in marine, freshwater, and aquariums in Türkiye. It is clear from these data that the numbers of reported myxosporean parasite species in these environments and their host fish species are very low when compared with the other reported metazoan parasites (see Özer, 2021 for details). The total number of 40 myxosporean species was dominated by the Black Sea fishes and the rest had very limited species numbers. Froese & Pauly (2022) reported 561 marine and 401 freshwater fish species in Türkiye and it is clear that more effort will yield more myxosporean species identification. One piece of evidence can be the recent identification of *Ceratomyxa scophthalmi* sp. nov. infecting *Scophthalmus maeoticus* and the first report of *Myxidium finnmarchicum* in the Black Sea (Özer et al. 2022).

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BALIKLARDA STRES HORMONLARININ ÖNEMİ

THE IMPORTANCE OF STRESS HORMONES IN FISH

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ÖZET

Beslenme yönünden sağlıklı ve protein değeri yüksek olan su ürünleri, yıldan yıla büyüyen sektörlerden olup yetiştiricilik faaliyetleri de buna paralellik göstermektedir. Ancak hastalıklar, değişken su parametreleri, nakil, boylama, aşılama ve tedavi gibi her türlü uygulama sektörde gelişmeyi olumsuz etkilemektedir. Tüm bu olumsuzlukların ana kaynağı ise yaşadığı ortam ile sıkı bir ilişki içerisinde olan balıklar için strestir. Stres iç veya dış kaynaklı uyarıcılar ile canlının dinamik dengesini tehdit veya rahatsız eden bir durumdur. Herhangi bir uyarıcının stres faktörü olarak değerlendirilmesi için canlı açısından bir enerji maliyetinin olması gerekmektedir. Balıklar, stres yapıcı unsurlara (stresör) karşı oldukça duyarlıdır. Balık stresörleri kimyasal, fiziksel ve biyolojik olarak ayrılmakta, süregenlikte akut ve kronik olarak iki kısımda incelenmektedir. Kısa süreler (saniye ve dakikalar arasında) içerisinde oluşan, balığın ani ve şiddetli tepkiler göstermesine neden olan akut strestir. Uzun zamanda ve genelde sabit dozajda, kesintisiz uyarıcılar ise kronik strestir. Her iki stres türünde de balığın ortaya koyduğu fizyolojik değişimlerin toplamı ise strese verdiği yanıttır. Tüm canlılarda olduğu gibi balıklarda da stres yanıtının amacı stresörler karşısında hayatta kalma şansını artırma çabasıdır. Bu nedenle de stresörlere maruz kalan canlılarda, stres hormonlarındaki artış ile stresten kaçınmaya veya stresle başa çıkmaya çalışır ve non-sfesifik bir yanıt başlatırlar. İlk yanıt kortizolün sekresyonu ile saatler içinde kanda kortizol seviyelerindeki artışlardır. Bu hormonun salgılanma süresinin uzaması durumunda fizyolojik değişiklik hatta metabolik dengesizlik (protein yıkımında ve troid hormonları seviyesinde yükselme vb.) ile vücudun lökomotor aktivasyonunun aşırı attışı sonucu fiziksel tükenmeye neden olabilmektedir. Birincil yanıtla ortaya çıkan enerji sarfiyatının üstesinden gelebilmek için glikoz değerlerindeki artışlar(glikojenoliz ve glikoneogenez metabolizma aktivasyonları) ikincil yanıttır. Üçüncül ve son yanıt ise immün sistemde baskılanma ve kan fizyolojisindeki değişimlerdir ki bakteriyel, viral, mantar ve protozoon enfeksiyonlar gibi sekonder ajanlara fırsat verir ve neticede balık hastalanır. Stres ile ilk birkaç dakika içinde ve stres boyunca artan, stres sona erdiğinde ise normal değerlerinde dönen kortizol, glikoz gibi parametrelerin kandaki değişimlerinin izlenmesi stres hakkında önemli veriler sağlamaktadır. Stres boyunca kandaki değerlerinde ciddi değişimler gösteren ve stres indikatörleri olarak değerlendirilen stres hormonları, bu çalışmada mevcut literatür ışığında ele alınmıştır.

Anahtar kelimeler: Stres, balık hastalıkları, stres tepkisi, kortizol, glikoz

ABSTRACT

Aquaculture, which is nutritionally healthy and has high protein value, is one of the growing sectors from year to year. However, all kinds of practices such as disease, variable water parameters, transportation, grading, vaccination, treatment affect the development negatively. The main source of all these negativities is stress for the fish, which are in a close relationship with the environment. Sress is a situation in which is threatened or disturbed the dynamic and balance of an organism by internal or external stimuli. In order for a stimulant to be a stress factor, it must have an energy cost for the living

thing. Fish are very sensitive to stressors. Fish stressors are evaluated chemically, physically and biologically. It is examined in two parts as acute and chronic. It is acute stress that occurs in short periods (between seconds and minutes) and causes the fish to show sudden and severe reactions. Long-term and usually in constant dosage, continuous stimulants are chronic stress. In both types of stress, the sum of the physiological changes of the fish is the response to stress. As in all living things, the purpose of the stress response in fish is to increase the chance of survival in the face of stressors. Therefore, with the increase in stress hormones, they try to avoid or cope with stress and initiate a nonspecific response. The initial response is increases in blood cortisol levels within hours following secretion of cortisol. In the case of prolonged secretion of this hormone, physiological changes and even metabolic imbalance (increase in protein breakdown and thyroid hormones, etc.) may cause the body's desire to work excessively and cause physical exhaustion. Increases in glucose values are the secondary response to overcome the energy expenditure associated with the primary response. The third and final response is suppression of the immune system and changes in blood physiology that suitable environment is created for the entry of secondary agents such as bacterial, viral, fungal and protozoan infections, and as a result, the fish get sick. Monitoring the changes in blood parameters such as cortisol and glucose, which increase in the first few minutes during stress and return to normal values when the stress is over, provides important data about stress. Stress hormones, which show serious changes in blood values during stress and are evaluated as stress indicators, are discussed based on currently available literature.

Keywords: Stress, fish diseases, stress response, cortisol, glucose

1.GİRİŞ

Birçoğumuz hayatımızda stresten uzak durmaya çalışırız hatta zaman olur ki stres yaratan durumlar bile uykularımızın kaçması için yeterli olur. Fakat yine biliriz ki stressiz yaşam yani sıfır stres aslında ölüm demektir ki buda mümkün değildir. Stres, şiddetine ve süresine göre hastalık ve ölüm ile sonuçlanan durumlara kadar sebebiyet verebilen, bedensel reaksiyonlara neden olabilen fiziksel ve kimyasal faktörler olarak tanımlanır.

Bir canlı stres ile karşılaştığı zaman bu durumun üstesinden gelmek için birtakım reaksiyonlar gösterir işte bu reaksiyonlar o canlının stresi algılamasıyla alakalıdır. Bu algı her canlı için değişiklik göstermekle beraber aslında strese verilen tepkidir. Stresle başa çıkmada canlı genelde birçok yöntem kullanır. Bunlar stresi geçici olarak engellemekle birlikte, uzun süreçte de daha çok strese neden olurlar. Stres her zaman olumsuz bir durum kaynağı olarak bilinse de hayatın devamı için vücudun ürettiği bir savunma mekanizmasıdır.

Beslenmede önemli katkısı olan su ürünleri protein değeri yüksek olan ve sağlık yönünden sağlıklı kabul edilen gıda maddelerinden birisidir. Bundan dolayı ülkemizde de son yıllarda yetiştiriciliği önemle üzerinde durulan konuların başında gelmektedir. Her sektörde olduğu gibi su ürünleri sektörü içinde gelişmeyi sınırlayan faktörler bulunmaktadır. Bunların başında şüphesiz hastalık problemleri gelmektedir. Hastalıkların ana kaynağı ise yaşadığı ortam ile sıkı bir ilişki içerisinde olan balıklar için strestir. Bu nedenle suda oluşabilecek küçük değişimler bile balık tarafından hemen algılanır ve çoğunlukla da strese neden olur. Yetiştiricilik ortamlarındaki bazı zorunlu işlemler (rutin bakım, yemleme, hasat, aşılama, deneysel veya tedavi amaçlı ilaç uygulamaları vb.) balık tarafından stres kaynağı olarak algılanır. Doğadaki yaşam koşullarında da stres yaratabilecek olaylarla karşı karşıya kalan balıklar, kendilerini bu stres oluşturuculara karşı savunurlar. Bu savunmayı strese karşı gösterdikleri yanıtlarla belli ederler.

Balıklar, stres yapıcı unsurlara (stresör) karşı oldukça duyarlıdırlar. Balık stresörleri kimyasal, fiziksel ve biyolojik olarak tanımlanabilir. Kimyasal stresörlere düşük su kalitesi, optimum koşullardan sapmış pH, çözünmüş oksijen seviyesinin düşüşü örnek olarak verilebilirken; su kalitesindeki amonyak, sertlik, doymuş gazlar, kısmı basınç ve sıcaklık gibi parametrelerde aşırı değişimler balıklarda fiziksel strese

neden olur. Sudaki metaller (Cu, Cd, Zn ve Fe) ve kimyasallar (arsenik, Cl, siyanür ve çeşitli fenoller) balıklarda stres durumlarına neden olabilir ve hatta ölümlere sebebiyet verebilir. Diğer çevresel stres oluşturucular ise bitkilere ve hayvanlara karşı kullanılan ilaçlardır. Mikrobiyal ajanlar ve parazitler, istilacı balık türleri ve yoğun stok biyolojik stresörler arasında yer alır (Barton ve Iwama, 1991).

Balıklarda strese neden olan faktörler süreğenlik açısından akut ve kronik olarak adlandırılır. Akut stres balığın ani ve şiddetli olarak şoka sokulmasıdır. Bu stres saniyeler ile dakikalar arasındaki süreçler için kullanılır ve adaptif olan fizyolojik tepkilerle ilişkilendirilir. Yetiştiricilik ünitelerinde uygulanan her türlü rutin işlem akut strese örnek olarak verilebilir. Kronik stres ise uzun zaman zarfında, genelde sabit dozda, kesintisiz uyarıcılardır. Akut stresin uzun süre devam etmesi ise kronik stresin oluşumuna zemin hazırlar. Akut veya kronik olabilen fiziksel, kimyasal ve biyolojik tehditlere karşı balığın ortaya koyduğu fizyolojik değişimlerin toplamı "stres cevabı" olarak nitelendirilir (Wedemeyer ve ark., 1990).

Stres cevabı, canlının stres vericiler karşısında hayatta kalma şansını arttırmaktadır. İlk olarak non-spesifik bir yanıt gözlenir. Bu birincil yanıt olup kortizol sekresyonuna ve plazma seviyelerinde artışlara neden olur (Barton, 2002). Kortizol salgılanma süresi uzadığında ise birçok fizyolojik değişiklik hatta protein yıkımında artış, troid hormonlarında yükselme, vücutta aşırı çalışma isteği ve fiziksel tükenme gibi metabolik dengesizlik izlenir. İkincil yanıt çeşitli uygulamalar (yaralanma, deneysel işlemler ve anestezi uygulanımı vb.) eşliğinde oluşan stres uyaranlarıdır. Bu durumda kanda glikoz seviyesini arttırıcı hormonlar aktive edilir (Barton ve Iwama, 1991). Stres koşulları ortadan kalktığında ise bu hormonlar normal değerlerine geri döner. Baskılanmış immün sistem nedeniyle bakteriyel, viral, fungal ve protozoal enfeksiyonlar gibi sekonder ajanların girişine ortam hazırlanması ve neticede kan fizyolojilerinde beliren değişimler son yanıt olan üçüncül stres yanıtına sebep olur (Barton, 2002).

Stres koşulları altında balıkların fizyolojik durumlarını değerlendirmek için bazı serum metabolitlerinin seviyeleri ölçülmektedir. Serum endokrin hormonların ölçümü ile stresin direkt olarak ölçümü gerçekleştirilebilir. Aynı zamanda stres cevabından sonra kan ve dokularda oluşan fizyolojik değişimlerin tespiti ile de karşılaşılan stresin seviyesi hakkında fikir sahibi olunabilmektedir. Serumda doku veya organ zararının göstergesi olan enzimlerin ölçümü ve kanda glikoz seviyesi değişimlerinin ortaya konulması ile hormonal aktivitenin indirek göstergesi olarak stres etkisi belirlenmektedir. Özellikle serum kortizol hormonu ve glikoz seviyelerinin tespiti balıklarda stres indikatörü olarak görülmektedir.. Bu derlemede, literatür eşliğinde balıklarda stres durumunda hormonlarda gözlenen değişimler değerlendirilmiştir.

2. SU ÜRÜNLERİ YETİŞTİRİCİLİĞİNDE STRES

Su ürünleri, beslenmemize önemli katkı sağlayan gıda maddelerinden biridir. Dünya nüfusundaki artış göz önüne alındığında sınırlı gıda kaynaklarının daha kontrollü ve bilinçli kullanılması büyük önem taşımaktadır. Günümüzde sadece açlığın giderilmesi değil, aynı zamanda vücuda alınan gıda maddelerinin sahip oldukları içerikleri ve insan vücuduna sağladığı yararlar son yıllarda üzerinde oldukça fazla incelenen konuların başında gelmektedir.

Su ürünleri yetiştiriciliği şu anda dünyanın en hızlı büyüyen gıda üretim endüstrisi olup dünyadaki ilerlemeye paralel olarak Türkiye'de de öncül sektörlerden biri haline gelmiştir. Balık yetiştiriciliğinin başarıya ulaşabilmesi için sırasıyla balığın kültür sistemlerine adaptasyonunu, türe ait isteklerin ve yetiştiricilik yönteminin ve kültür sistemlerindeki temel verilerin ortaya çıkarılması gerekmektedir. Bunlara uyulmadığı takdirde ise hastalık problemleri ortaya çıkmakta ve su ürünleri üretiminde %30'a varan kayıplara neden olmaktadır. Hastalıkların su ürünleri yetiştirme alanlarında potansiyel olarak yayılması ve yaygın olarak kullanılan kimyasal ürünlerin olumsuz etkileri, balık popülasyonları açısından gerçek bir endişe kaynağıdır.

Su ürünleri yetiştiricilik ünitelerinde tüm önlemler alındığında balıklarda herhangi bir sorun ile karşılaşılmaz ve dolayısıyla istenen verim elde edilip sağlıklı balıklar tüketiciye sunulur. Ancak, balıklar için optimal şartlar bozulduğu zaman stres denilen durum ortaya çıkar ki bu da balığın fizyolojisi üzerinde önemli değişimlere sebep olmaktadır.

Doğal veya yetiştiricilik ortamında içinde yaşadıkları dinamik çevreden kaynaklanan değişikliklerle sürekli olarak uyarılan balıklar özellikle konakçı, çevre ve patojenler arasındaki üçlü dengenin bozulması durumunda ortaya çıkan hastalık problemleri ve buna bağlı stres koşullarının şiddeti ve süresi balık tarafından bir tepkinin verilip verilmemesinin belirlenmesinde önemli rol oynar. Bu uyarılar balıkların sağlıkları, büyümeleri, üremeleri ve hayatta kalmaları ile yakından ilişkilidir.

Hastalığa ve ölüme katkıda bulunabilecek bedensel reaksiyonlara neden olan fiziksel veya kimyasal faktörler olarak bilinen stres, Selye (1956)'ye göre canlıda tepki oluşturan çevresel uyarıcılara karşı gösterilen tepkidir. Su ürünleri yetiştiricilik ünitelerinde ise yoğun stok, düşük su kalitesi, yetersiz beslenme, sanitasyon vb. her türlü uygulama balık tarafından stres faktörü (stresör) olarak algılanmakta ve sonuçta dirençlerinin düşmesine neden olarak hastalıklara zemin hazırlamaktadır. Bu nedenle özellikle yetiştiricilik faaliyetlerinde üzerinde önemle durulmuş ve konu uzmanları birçok çalışmayla önemini vurgulamıştır (Ögüt, 2005; Küçükgül ve Şahan, 2008).

Doğaları gereği gerek doğal ortamlarında gerekse yetiştiricilik koşulları altında balıklar fiziksel, kimyasal ve biyolojik tehditlere karşı fizyolojilerinde birtakım değişimler ile bir stres yanıtı gösterirler (Wedemeyer ve ark., 1990). Stres kaynağının kronik yâda akut olması verilen yanıtta farklılaşmaya neden olsa da stres yanıtının amacı stresörlerle başa çıkmak için balıkta gerekli enerji ihtiyacının, bağışıklık durumunun ve endokrin mekanizmaların yeniden düzenlenmesidir (Flik ve ark., 2018).

3. BALIKLARDA STRES YANITI

Balıklarda strese verilen yanıt, hipotalamusun uyarılmasıyla karakterize edilir, bu da nöroendokrin sistemin aktivasyonuna ve ardından gelen metabolik ve fizyolojik değişikliklere neden olur. Bu değişiklikler, homeostazinin korunması için organizmanın çevresel değişimlere ve olumsuzluklara karşı toleransını arttırmaktadır.

Birincil tepki, merkezi sinir sistemi (CNS) tarafından değişen bir durumun algılanması ve endokrin sistem tarafından kan dolaşımına stres hormonları, kortizol ve katekolaminlerin (adrenalin ve epinefrin) salınmasıdır.

Balıklarda stres yanıtı birincil, ikincil ve üçüncül tepkiler olarak gruplandırılmıştır (Barton, 2002). Birincil düzeyde, herhangi bir stres kaynağı algılanır algılanmaz stres sinyali beyne iletilir ve nöroendokrin yanıt başlar ve saniyeler içinde katekolaminler (adrenalin ve noradrenalin) kromafin dokusundan kan dolaşımına salınır (vanWeerd ve Komen 1998). Daha sonra, hipotalamus-hipofiz-interrenal bez =ön böbrek (HPI) aksisi aktive edilir. Hipotalamus tarafından kortikotropin salan faktör (CRF), hipofiz tarafından ise adeno-kortiko-tropik (ACTH) hormon stimüle edilir. İnterrenal bezde, ACTH kortizol dâhil olmak üzere kortikosteroidlerin sentezi (kortizol) ve salınımı indüklenir (Wendelaar-Bonga 1997). İkincil tepkiler, salınan stres hormonlarının (Barton & Iwama 1991) bir sonucu olarak ortaya çıkar ve plazma glikozunda artış gibi kan ve doku kimyasında değişikliklere neden olur. İkincil stres tepkileri çoğunlukla tersine çevrilebilir ve balık sağlıklı bir stres öncesi durumuna dönebilir. Üçüncül seviye yüzme, üreme, iştah gibi hayvan performansı ve davranışı ile ilgili olup daha az enerji sarfiyatı gerektiren süreçler ve vücut fonksiyonları askıya alınır (Barton 2002; Stehfest ve ark., 2017). Gerekli enerji stres tepkisine doğru kullanılır. Stres yanıtının uzun sürmesi halinde ise iştah kaybı ve büyümede bozulma, üreme yetmezliği, kas erimesi, bağışıklık sisteminin baskılanması ve dolayısıyla patojenlere karşı direncin zayıflaması gibi durumlara sebebiyet verir (Huntingford ve ark. 2006).

4. BALIKLARDA STRES HORMONLARI

Yetiştiricilik koşullarında yâda doğal ortamlarında balıklar herhangi bir stres faktörü ile karşılaşması durumunda beyin hipofizi harekete geçirir ve hipofiz tarafından uygun hormonlar sentezlenmesi için interrenal doku uyarılır. Tüm bu mekanizma stres hormonları olarak adlandırılan katekolaminler ve glukokortikosteroidler stimüle edilir ve hormonlar kan dolaşımı ile tüm organlara iletilir. Akut veya kronik stres durumlarında salgılanan hormonların başında katekolaminlerden adrenalin, glukokortikosteroidlerden ise kortizol ve glikoz gelmektedir. Adrenalin, kan akışını kontrol etme, akut stres durumunda canlının direncini düzenleme vb. görevler üstlenir.

4.1.1. Adrenalin

Balıklar akut stres yaşadıklarında katekolaminler dolaşıma salınır (Randall ve Ferry, 1992). Böbrek üstü bezinin kromaffin hücrelerinden salgılanan adrenalin (epinefrin) çok çeşitli biyolojik ve çevresel stres faktörlerine (hipoksi, elle mudaele vb.) yanıt verebilir (Fiévet ve ark., 1990). Stres durumunda adrenalin hormonunun uyarılmasıyla oksijen alımında artış, kalp debisinde artış, dolayısıyla lamellerin artan perfüzyonuna bağlı olarak solungaç difüzyon kapasitesi artış gibi tüm doku ve organlarda olumlu etkileri de görülmektedir (Abelli ve ark., 1996). Ayrıca stresle uyarılan adrenalin seviyelerindeki artışlar, dalağın kasılmasıyla eritrositlerin kana karışmasını kolaylaştırmaktadır (Vosylienė, 1999).

4.1.2. Kortizol

Kortikosteroid hormonlardan olan kortizol, böbrek üstü bezinin interrenal hücrelerinden salgılanan başlıca glukokortikoiddir (Gamperl ve ark., 1994; Iwama ve ark. 1999**).** Bu hormon, HPI ekseni aktivasyonu ile salınır (Mommsen ve ark. 1999). Bir organizma stres koşullarına maruz kaldığında, hipotalamus kan dolaşımına doğru kortikotropin salma faktörü (CRF) salgılar. Bu polipeptit ayrıca ön hipofiz bezinden adrenokortikotropik hormonun (ACTH) salgılanmasını uyarır (Fryer ve Lederis 1986), bu da en sonunda interrenal doku tarafından kortizol salınımını aktive eder (Mommsen ve ark. 1999). Kortizolün salgılanması katekolaminlerden daha yavaş ancak etkileri daha uzundur (Gamperl et al. 1994). Yapılan çalışmalarda kortizolün etkileri çeşitli stresörler üzerinde denenmiş ve etkileri literatüre kazandırılmıştır. Bu çalışmalardan bazıları şunlardır:

Sakakura ve ark. (2002) tarafından yapılan bir çalışmada, sarıkuyruk (*Seriola quinqueradiata*)'nın larvadan jüvenil aşamasına geçişi sırasında immünoreaktif kortizol konsantrasyonlarında bir artış olduğunu bildirilmiştir. Bir araştırmada balıkların kortizol seviyesinin stresten 1 saat sonra en yüksek konsantrasyona ulaştığı 6 saat sonra ise bazal seviyelere döndüğü rapor edilmiştir (Iwama et al. 2006). Pottinger (1998) tarafından yapılan bir diğer çalışmada ise sazan balıkları kepçe ile strese maruz bırakılarak kortizol değerleri incelenmiştir. Stres anında kortizol değerlerindeki artışların 4 saat içerisinde bazal seviyelere döndüğü izlenmiştir. Stresten sonra balıkların kortizol seviyelerinin doku hasarını önlemek için bazal seviyelere döndüğü öne sürülmüştür (Wendelaar-Bonga 1997). Küçükgül ve Şahan (2008) ise akut stres çalışmalarında sazan (*Cyprinus carpio* L., 1758) balıklarını iki gruba ayırmış, bir grubu 24 ile 33^{o}C arasında değişen farklı su sıcaklıklarına; diğer grubu ise ağ ile yakalama-bırakma (deney süresinin 15-45 dakikasında 12-36 defa) tarzında strese maruz bırakmışlardır. Araştırıcıların sonuçlarına göre, ilk grupta su sıcaklığının 27^{o}C'ye kadar artması hemoglobin ve kortizol değerlerinde artış, glikoz miktarlarında azalmalar göstermiştir. Diğer grupta ise kortizol, glikoz ve hemoglobin düzeylerinde 2-3 saatte azalmalar izlenmiş pik seviyelerin ise 1 saat içerisinde gözlendiği bildirilmiştir. Yayın balıklarında kortizol seviyesi, büyüme ve üreme performansının değerlendirildiği bir çalışmada elle müdahale stresi uygulanmış kortizol değerlerinde artışlar belirlenmiştir (Pamungkas ve ark., 2021). Yapılan çalışmalarda özellikle akut stres durumlarında kortizol tepkisinin hızlı olduğu bir saat içinde pik değerlere ulaştığı daha sonrasında ise giderek yavaşlayarak bazal değerleri aldığı görülmektedir. (Davis ve McEntire 2006; Iwama et al. 2006; Pamungkas ve ark., 2021; Küçükgül ve Şahan, 2008). Pickering ve Pottinger (1987b) tarafından yapılan yoğun stok çalışmasında hücresel bileşimindeki değişikliklerin plazma kortizol değerlerinden daha iyi bir stres göstergesi olduğu bildirilmiştir.

4.1.3. Glikoz

Stres koşullarında salgılanan stres hormonları (kotizol, adrenalin gibi) bu stresin üstesinden gelebilmek için glukoneogenez ve glikojenoliz yollarıyla glikoz üretimini gerçekleştirir ve glikoz değeri yükselmeye başlar ve kan dolaşımına salınarak insülin etkisiyle hücrelere girer (Iwama ve ark., 1999; Martinez-Porchas ve ark., 2009). Başka bir ifade ile kortizolün glikojenoliz ve glukoneogenez süreçlerini aktive etmesiyle katekolaminlerin salınımında artışlar görülür, dolayısıyla hücresel solunum aktive edilir. Bu durumda balık yeterli enerjiyi üretmek için glikoz miktarını arttırır (Reid ve ark., 1998). Yapılan çalışmalarda tek başına glikozun stres parametresi olarak değerlendirilmesinin çok uygun olmadığı bildirilmiştir (Wedemeyer ve ark. 1990, Pottinger 1998). Aynı zamanda kortizol vb. hormonların fiziksel herhangi bir stres ile etkilenmesi durumunda kan şekerini arttırdığı ve doğal olarak indirek olarak glikoz değerlerinde değişimlerin mümkün olabileceği vurgulanmıştır (Reid ve ark., 1998). Bazı çalışmalarda glikoz değerlerinde herhangi bir değişim gözlenmezken, bazlarında 30 kat artış gözlenebildiği bildirilmiştir. Bununla birlikte, kronik strese maruz kalan balıkların, plazma glikozunda bir azalmaya sebep olabileceği de rapor edilmiştir. Diğer çalışmalardan bazı örnekler şu şekildedir:

Bir çalışmada Pottinger ve Carrick (1999), farklı ağırlıklarda 2 grup gökkuşağı alabalığını yoğun stok (kronik stres) ve havaya maruziyet (akut stres) tarzında strese tabi tutmuşlar, plazma kortizol ve glikoz yanıtlarının zıtlık gösterdiğini saptamışlardır. Vücut ağırlığı az veya fazla olan balıklarda, deney suresince kortizol ve glikoz değerlerinin birbirleriyle farklı şekilde etkilendiğini yine aynı çalışmayla rapor edilmiştir. Glikoz değerlerinde yükselmeler kaydedilen bir diğer çalışmada deniz biti ile enfestasyon koşulları altında olan balıklar değerlendirilmiştir (Burka ve ark., 200). Ottolenghi ve ark. (1995) ise siyah ve kanal kedi balıkları (Ictalurus melas ve I.punctatus) ile çalışmışlardır. Su sıcaklığını kademeli olarak 36 °C'ye yükseltmişler ve kan glikozu üzerinde yüksek sıcaklığın etkisini incelemişlerdir. Yüksek sıcaklık derecelerine kanal kedi balığı (I. punctatus)'nın siyah kedi balığı (I. melas)'ndan daha iyi tolerans sağladığını gözlemişlerdir. Bunun yanında I. punctatus üzerinde bir glikoz tolerans testi uygulamışlardır. Kontrol grubu ve 36°C'ye uyum sağlamış uygulama grubu balıklarındaki kan glikoz seviyelerinin ı dakika içinde pik seviyeye ulaştığını, 5 dakika sonra azalmaya başladığını ve 4 saat sonra şiddetli bir şekilde düştüğünü sonuç olarak 24 saat sonra başlangıç seviyelerine döndüğünü bildirmişlerdir. 36 °C'ye adapte olmuş balıkların kan glikoz seviyesi kontrol grubundan daha yüksek olsa da, iki grup arasında 24'üncü saate kadar önemli farklar bulamamışlardır.

5. SONUÇ

Genel olarak stresin tanımına ve etkilerine baktığımızda aslında stres her zaman balıklarda hastalıkla sonuçlanan bir olgu olmayıp hemaostatik dengeyi sürdürmek ve balığın normal durumunu devam ettirmek için stresörler ile mücadele etmesini sağlayan bir genel adaptasyon mekanizmasıdır. İşte bu noktada her zaman hastalıkla sonuçlanmayan stres olgusunun iyi bir şekilde tanımlanabilmesi ve işleyiş mekanizmasının anlaşılması bu etkenlerin hastalığa yol açmadan önlenebilmesinde oldukça önemlidir. Balıklar ani çevresel değişimlerin yol açacağı strese hızlı ve etkili bir şekilde adapte olabilme kabiliyetine de sahiptirler. Ancak, bu adaptasyon sürecinde büyümede kayıp olarak nitelenen enerji maliyeti söz konusudur. Adaptasyon kısa vadede etkili olup balığın hayatta kalma şansını artırmaktadır.

Doğal ortamlarında olduğu gibi yetiştiricilik koşullarında da stresi önlemek pek mümkün olmayabilir. Bu durumda özellikle yetiştiricilik koşullarında stresi en aza indirmek için balık türünün optimal istekleri rutin kontrollerle sağlanmalıdır. Balıklarda tüm önlemlere rağmen oluşabilecek herhangi bir stresörün etkisiyle balıklardaki stres durumunu kısa sürede en doğru ve iyi biçimde analiz etmek çok önemlidir. Birçok araştırıcı tarafından balıklardaki stres durumlarını değerlendirmek için kan plazma seviyelerindeki değişimleri izlemiş özellikle kortizol ve glikoz seviyelerinde ciddi değişimler bildirilmiştir. Bu nedenle balıklarda akut ve kronik stres durumlarının ortaya konması için kortizol ve glikoz gibi parametrelerin tespiti önem arz etmektedir.

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CHALKBROOD DISEASE IN HONEY BEES

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ABSTRACT

Chalkbrood disease is a fungal disease caused by *Ascosphaera apis*. Once in a hive, the spores are accidentally ingested by the larvae. Larvae that are three-to-four days old are particularly susceptible to infection. Once the fungal spores are eaten, they pass into the larval gut where they germinate and grow into adult organisms. If the spores are not eaten, they cannot germinate or infect the brood. After a spore germinates in the larval gut, it quickly grows a mycelium — an intertwined network of filaments that behave like roots. Each filament grows out from the main body of the fungus in search of water and nutrients that are used to fuel the organism and produce more spores. The *Ascosphaera apis* grows so many of these filaments (often called hyphae) that the brood cell becomes completely stuffed with them. The filaments steal all the nutrients from the larval host, killing it in the process. The mycelium grows so prolifically that it eventually forms a mummy, a hardened mass in the shape of the brood cell. The color of chalkbrood ranges from white to grey then starts to turn black when the fungus is producing spores or fruiting bodies and ready to reproduce. This is the most infectious stage of chalkbrood. The black looking mummies are often what you see on the bottom board, outside on the entrance or in front of the hive. At this point these mummies can spread spores to other colonies in the area. Infected cells are most often seen on the outer edges of the brood nest. The cell caps may be intact but flattened, they may have small holes, or they may be partially removed. If the disease is severe, the remaining brood may appeared scattered and sparse, due to the removal of so many mummies.

Keywords: chalkbrood disease, fungal disease, honey bee, *Ascosphaera apis*

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EFFECT OF TITANATE BASED COMPATIBILAZING AGENT ON WALNUT SHELL FILLED RIGID POLYURETHANE FOAM COMPOSITES

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ABSTRACT

This study aimed to obtain less costly and environmentally friendly polyurethane foam by reducing the petroleum-based chemicals used in the production of rigid polyurethane foam in the industry by adding walnut shell compatibilized with titanate as a filler. In this work, after a titanate based compatibilization of walnut shell particles (Ti_WS), polyurethane (PU) foam composites filled at different Ti_WS weight ratios (1 wt.%, 5 wt.%, 10 wt.%, 15 wt.%) were produced. Walnut shells to be used as filler were first powdered and then compatibilized with titanate based agent. After the polyol and filler were mixed using an ultrasonic homogenizer, isocyanate was added and the mixture was poured into the mold in order to obtain the polyurethane foam composite. The produced samples were subjected to microstructure and thermal tests. From the results, it can be depicted that PU foam composites showed a slight increase of the thermal conductivity with the augmentation of Ti_WS ratio and Ti_WS15 foam composite exhibited the higher thermal conductivity compared to the unfilled PU foam. Furthermore, as expected an increase of the filler content results in a reduction of the mean cell size of the foam. When scanning electron microscopy images were examined, it was observed that the cell sizes decreased as the filling ratio was increased. Due to these low cost production and improved properties, it can be stated that the use of walnut shell as natural filler in PU foam composites can promote a new application path in converting agricultural waste into useful resources for creating a new class of green materials.

Keywords: Rigid Polyurethane Foams, Titanate, Walnut Shells.

INTRODUCTION

Polyurethanes are a synthetic resin composed of urethane groups as a unit. Polyurethane is the formation of a polyol by reacting a diisocyanate or a polymeric isocyanate with suitable additives and catalysts. Polyurethane foams are used in many different areas because they are lightweight, durable and comfortable. These materials are used in various areas such as refrigerators, deep freezers, automotive, construction, electronics, furniture, shipping, medical fields. Polyurethane foams play a large market role in Europe and globally. The polyurethane market, which will increase from 77.6 billion dollars to 88.34 billion dollars in 2023 with an annual growth rate, covers developed and developing countries such as South America, China, France, Germany, India, Indonesia and Japan. The data indicates that the polyurethane market will increase in the coming years. With the increasing global warming and environmental pollution problems in recent years, the use of environmentally friendly and biodegradable products in the production of petroleum-based products has become an encouraging reason. Therefore, in this study, polyurethane foam was produced by mixing walnut shell, which is a natural additive which have been compatibilized using a titanate based coupling agent. Microstructure and thermal methods were performed to determine the properties of the foams produced.

The bio-based plastics additives market should have an annual growth rate of around 5%-10% globally over the coming period. In this study, it is aimed to reduce environmental pollution and production costs by producing polyurethane foams with natural additives. It has been predicted that the use of walnut shell particles as additives can improve the properties of polyurethane foam in mechanical and thermal

applications depending on their ratio. The purpose of using titanate as a coupling agent is to significantly increase the fracture toughness of the samples obtained after titanation. The additive ratio of walnut shell added into polyol was fixed as 1 wt.%, 5 wt.%, 10 wt.% and 15 wt.% and it was aimed to compare the results with pure polyurethane foam.

MATERIALS AND METHODS

Polyurethane foam production method

While producing polyurethane foam, first the walnut shell particles were pulverized using a vibrating cup mill (Pulverisette 9/Fritsch). Then the mixing process with the titanate based agent began. The additives were first dried using an oven at 100°C for 2 hours. The fillers and ethanol were added in the beaker. The blend was mixed with a magnetic stirrer for 10 minutes. Then 2.5 wt.% of titanate based coupling agent was added and mixed for 2 hours until a homogeneous mixture was obtained. Finally, the obtained compatibilized filler was dried in an oven (100°C). Then, polyol and compatibilized walnut shell additives were mixed with polyol using an ultrasonic homogenizer for 15 minutes. Afterwards, the blend was mixed at 2000 rpm with a mechanical stirrer and isocyanate was introduced in the mixture. Finally, the blend was poured into a mold and polyurethane foam was obtained. PU/Ti-WS foam composites were prepared at various filler content (1 wt.%, 5 wt.%, 10 wt.% and 15 wt.%).

Characterization Techniques

Fourier transform infrared spectroscopy. Fourier transform infrared spectroscopy (FTIR) is a type of vibrational spectroscopy (ThermoFisher Nicolet IS50). The functional groups in solid, liquid and solution organic compounds, whether the two compounds are similar, the presence of bonds in their content, bonding areas and whether the structure is aromatic or aliphatic can be measured.

Scanning Electron Microscopy (SEM) analysis (Carl Zeiss Gemini 300) provides a high-resolution imaging by testing a variety of samples for surface fractures, various defects, and corrosion. SEM images were obtained at 10 kV and various magnifications (×50 and ×250), from the cross-sectional area of these samples coated previously with gold/palladium.

Thermal conductivity measurements. Fox 314 (TA Instruments) heat flow meter was used for the characterization according to ASTM Standard C518.

RESULTS AND DISCUSSION

FTIR Results

The FTIR spectra of the Ti-WS doped PU foams are shown in Figure 1. The urethane portions of the polyurethane foams are confirmed by the main characteristic absorption bands (Członka et al. 2020). The characteristic (C=O) vibration zone (1700-1770 cm^{-1}) and (NH) flexural vibration zone (3200-3600 cm^{-1}) represent well PU (Hatchett et al. 2005). The location of the main characteristic bands in the functional groups in compatibilized filler added foams was similar to the results detected in the unfilled PU foam. This indicates that the existing mixture state remains unchanged.

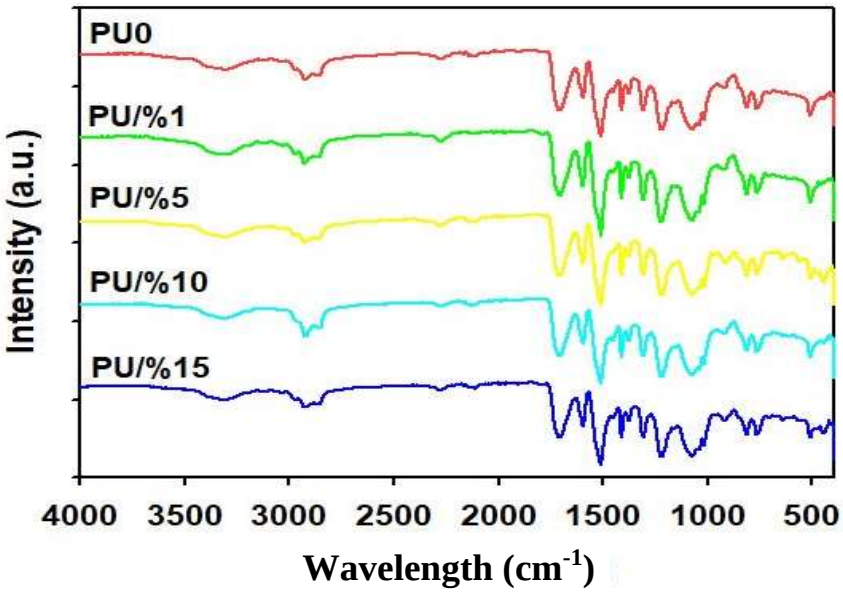

Figure 1. FTIR spectra of PU/Ti-WS foam composites.

SEM Results

From the Figures 2 and 3, it can be seen that the inclusion of Ti_WS in PU foams reduces the cell size as the amount of filler increases. Previous studies have shown that during the foaming process, micro and nano-sized particles can act as additional centers, affecting the rheological environment, and changing the nucleation mode from homogeneous to heterogeneous (Taki et al. 2004). The reduced energy of nucleation promotes the formation of smaller cell structures (Kelton 2001). A larger cell structure is observed in unfilled PU foam compared to Ti_WS filled foams. In Figures 2 and 3, SEM images of Ti_WS15 (a)), Ti_WS5 (b)) and unfilled PU (c)) foams are given. Morphologically, the cell size increases as the filler ratio decreases. From SEM images of foam samples, the mean cell diameters were detected using Image software. From the results presented in the Figure 4, the decrease of the cell size as a function of the filler content is more visible.

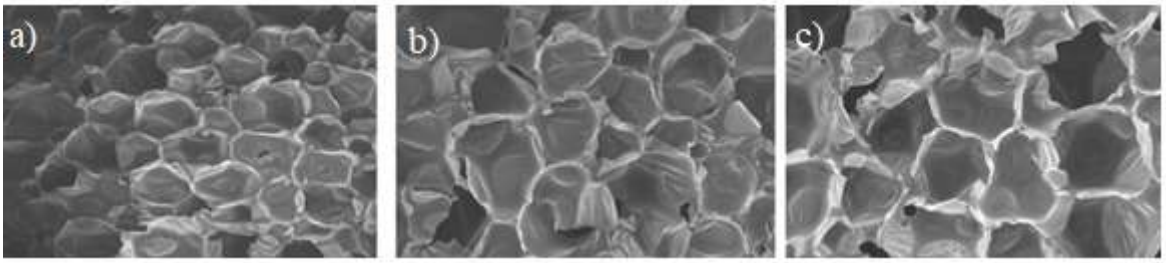

Figure 2. SEM images of foam samples: a) Ti_WS15 b) Ti_WS5 c) Unfilled PU.

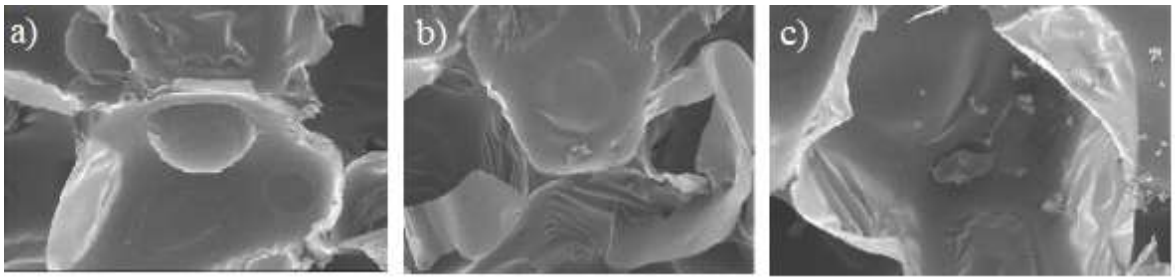

Figure 3. SEM images of foam samples: a) Ti_WS15 b) Ti_WS5 c) Unfilled PU.

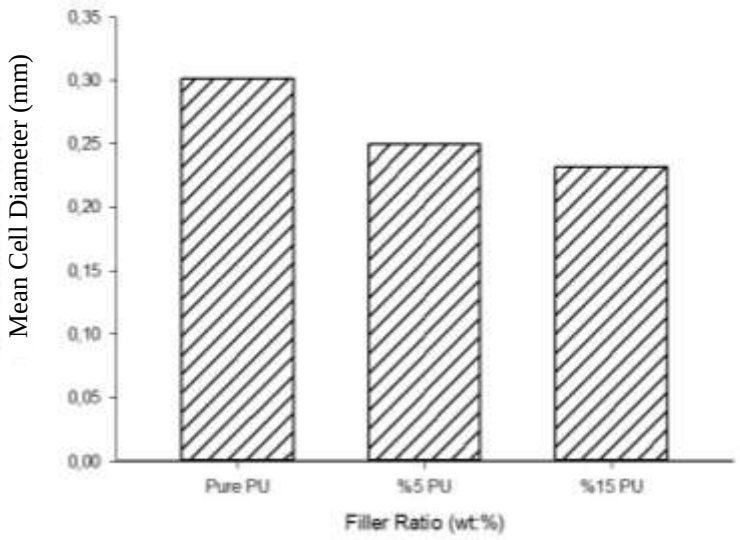

Figure 4. Mean cell diameter of the samples detected through SEM images.

Thermal Conductivity Measurement Results

According to theory, when the pore diameter of the material becomes less than the average free length of the path of gas molecules, the molecules only collide with pore surfaces without transferring energy. As a result, reducing cell sizes is a very effective way to reduce the thermal conductivity of insulating material (Kelton 2001). Considering the thermal conductivity values of the samples gathered in Table 1, it can be observed that the thermal conductivity increased as the additive ratio increased compared to the unfilled polyurethane foam. Ti_WS15 provided the higher value. An increase in thermal conductivity was observed in TiWS1, Ti_WS5 and Ti_WS10 compared to unfilled polyurethane. The results are given in Table 1.

Table 1. Thermal conductivity values of unfilled and Ti_WS filled PU foam samples.

Samples	Thermal conductivities (W/mK)
Polyurethane	0.02398
Ti_WS1 PU	0.06212
Ti_WS5 PU	0.04516
Ti_WS10 PU	0.05264
Ti_WS15 PU	0.09454

CONCLUSION

In this study, waste and almost costless compatibilized walnut shell particles were integrated into the rigid polyurethane foam and it has been demonstrated that the thermal and morphological structure of the samples were affected. From the results, it can be concluded that rigid polyurethane foam with more environmentally friendly properties can be produced. The increase of the additive ratio showed an increase of the thermal conductivity of PU foam composites. Furthermore, from SEM images, it was shown that the cell diameter of polyurethane foams decreased with an increase of the filler content.

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MECHANICAL AND MICROSTRUCTURE PROPERTIES OF POLYCARBONATE/ACRYLONITRILE-BUTADIENE-STYRENE FOAM COMPOSITES PREPARED USING CHEMICAL FOAMING AND INJECTION MOLDING METHODS

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ABSTRACT

The demand in the polymer industry for minimal capital investment and the need to cater to evolving applications has led to the concept of blending two or more different existing polymers, rather than synthesizing entirely new polymers. The main purpose of this project is the production of polycarbonate/acrylonitrile butadiene styrene (PC/ABS) based foam composites using plastic injection method and chemical blowing agent (CBA). For this purpose, it is aimed to produce and characterize PC/ABS foam composites prepared with various content of CBA (1 wt.%, 2 wt.% and 3 wt.%) at different temperatures (250°C, 260°C, 270°C) using plastic injection molding with a constant injection speed (40 m/s) in order to determine the optimum chemical foaming agent ratio and temperature. In the last stage, tensile test, 3-point bending test and scanning electron microscopy (SEM) analysis were performed to characterize the mechanical and microstructural properties of the foams. From the results, it can be stated that the mechanical properties of the parts obtained with PC/ABS mixtures can be improved using chemical foaming method. Especially when the tensile test results are examined, it can be seen that the tensile strength values reduce as the CBA ratio increases. Regarding the bending test, it is seen that the flexural strength values slightly increase and then decrease. Then, it can be mentioned that optimum properties were obtained for the sample with 1 wt.% CBA produced at 260°C. Furthermore, from SEM images it can be seen that the cell diameter and the cell density increase as the temperature or CBA ratio is augmented.

Keywords: Polycarbonate/Acrylonitrile Butadiene Styrene Foams, Chemical Blowing, Plastic Injection Molding.

INTRODUCTION

The demand in the polymer industry for minimal capital investment and the need to cater to evolving applications has led to the concept of blending two or more different existing polymers, rather than synthesizing entirely new polymers. Polymer blends are typically multi-phase systems due to thermodynamic reasons. In such cases, phase separation is carried out to obtain a heterogeneous mixture with a unique morphology. Designing and controlling such morphology has led to the development of mixtures with desired physical, mechanical, and/or rheological properties. PC/ABS blends have shown significant growth since their first commercialization. The popularity of PC/ABS blends stems from the combination of unique properties provided by the main polymers, making them attractive for polymer blending and obtaining new mixtures. This increasing popularity has encouraged further research in this field.

PC/ABS blends are well-known and widely used for commercial purposes. Their success in the market is attributed to the complementary properties of their components. Polycarbonate contributes to good

thermal and mechanical properties, while acrylonitrile-butadiene-styrene provides easy processability and reliable notched impact resistance. Studies have been conducted to take advantage of this compatibility, but physical foaming agents such as carbon dioxide (CO_2) are generally used in physical foaming methods (Bledzki and Kühn-Gajdzik, 2009; Yoon et al., 2017; Lee et al., 2005; Peng et al., 2012). There are very few studies available on the use of chemical foaming methods. Furthermore, there is no existing research on PC/ABS polymer foam composites obtained through compatibilization and chemical foaming methods.

In this study, in order to evaluate the effect of CCA content on the final properties, PC/ABS polymer foam composites were prepared at various CBA content and the tensile, flexural and microstructural properties of the samples were analyzed.

MATERIALS AND METHODS

PC/ABS Foam Composites Production Methods

The targeted application in this project is the interior trim parts of automobiles, which are typically composed of thin sheets. Therefore, in the production phase of this study, PC/ABS polymer foam materials were produced as rectangular parts, considering the characterization to be conducted. The parts in this study were produced using the plastic injection method. Additionally, PC/ABS blends with various CBA content were prepared. At this stage, the aim was to detect the optimum processing temperature of the CBA which have a lower decomposition temperature than the plastic injection process temperature in order to initiate foaming in the injected mixture. According to the literature, Hydrocerol HP40P CFA supplied from Avient was used for the production of PC/ABS blends (Bledzki and Kühn-Gajdzik, 2010). These productions are planned to be carried out using the "Engel" brand injection molding machine available at Demo Plastik Ürünleri San. Tic. A.Ş. company, which will enable prototype production work.

In this study, the planned production parameters, based on information found in the literature, are provided in Table 1 (Bledzki and Kühn-Gajdzik, 2010).

Table 1. Parameters used during the plastic injection process (Bledzki and Kühn-Gajdzik, 2010).

Parameters	Values
Processing temperatures	250°C, 260°C and 270°C
Mold temperature	80°C
Injection speed	40 cm^3/s

The aim of this study was to investigate the effect of the chemical foaming agent ratio and the processing temperature on the final properties of the foam composites. Unfoamed PC/ABS blends were also produced using the plastic injection method for comparison with the other samples and the optimization of production parameters was conducted at this stage. Finally, the microstructural and mechanical characterizations were performed on the produced foamed PC/ABS samples.

PC/ABS foams were prepared at various ratios (1 wt.%, 2 wt.%, and 3 wt.%). Additionally, as gathered in Table 2, productions were conducted at different temperatures to examine the effect of temperature variation on the chemical foaming in order to determine the foaming agent that would provide optimum mechanical and microstructural properties.

Table 2. Compositions and production parameters of PC/ABS-based polymer composites produced using plastic injection method.

Sample	CBA content (wt.%)	Temperature (°C)
1	1	250
2	1	260
3	1	270
4	2	250
5	2	260

6	2	270
7	3	250
8	3	260
9	3	270

Methods of Characterization

Tensile test. The tensile test was performed with a 10 N force tensile test device at a speed of 50 mm/min according to the ISO 527 standard.

Flexural Test. The 3-point bending test was performed with a tensile test device according to the ISO 178 standard, at a speed of 10 mm/min, with a force of 10 N until a dent of 15% occurred.

Scanning Electron microscopy Analysis. A Carl Zeiss Gemini 300 Scanning Electron Microscope (SEM) was used for the microstructural analysis of PC/ABS foam composites. SEM images were obtained at 10 kV and various magnifications (×250 and ×500), from the cross-sectional area of these samples coated previously with gold/palladium.

RESULTS AND DISCUSSION

Tensile Test Results

The tensile test results were gathered in Figures 2 and 3. The tensile strength values of CBA filled PC/ABS foam composites obtained at different temperatures are given in Figure 2. From the results, it can be seen that the tensile strength of the foam composites decreases as the CBA ratio increases due to the increase of the cell size with an increase of the CBA content as presented in the microstructure results part. In addition, the elongation at break values were given in Figure 3. According to these results, it can be concluded that the material breaks earlier for a higher CBA content and this result can also be explained with the increase of the cell size.

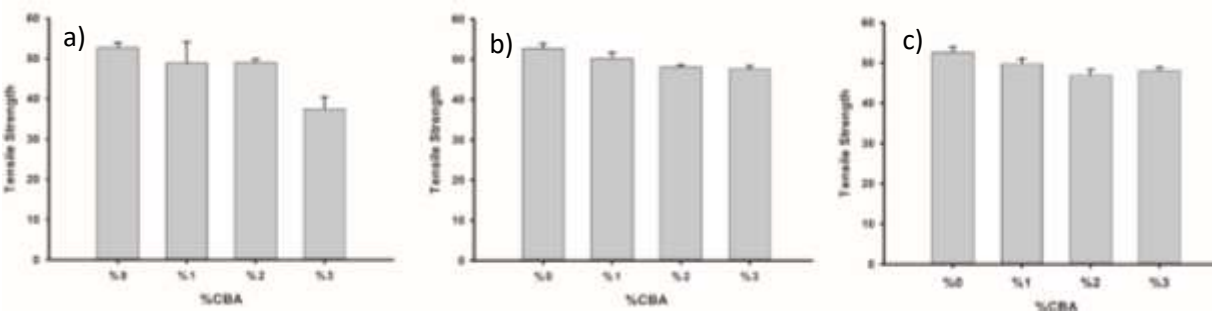

Figure 2. Tensile strength results of PC/ABS/CBA foam composites obtained at various CBA content (1 wt.%, 2 wt.% and 3 wt.%) and various temperatures: a) 250°C, b) 260°C and c) 270°C.

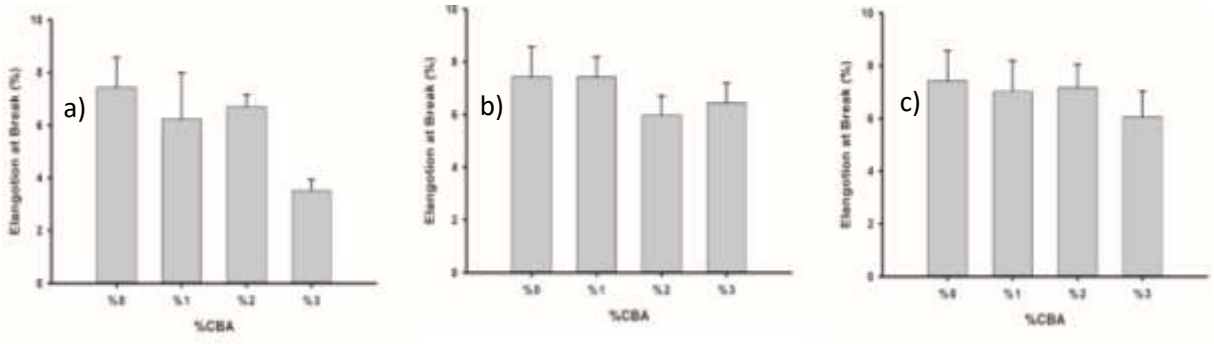

Figure 3. Elongation at break results of PC/ABS/CBA foam composites obtained at various CBA content (1 wt.%, 2 wt.% and 3 wt.%) and various temperatures: a) 250°C, b) 260°C and c) 270°C.

Flexural Test Results

The flexural test results were presented in Figures 4 and 5. The flexural strength values of CBA filled PC/ABS foam composites obtained at different temperatures are given in Figure 4. From the results, it can be observed that as the CBA ratio increases, the flexural strength of the material increases up to a certain point and then a decrease is observed. In addition, the elongation at break values were presented in Figure 5. According to these results, it can be concluded that the material becomes more flexible for a higher CBA content and this result can be explained by the increase of the cell size with an increase of the CBA content as presented in the microstructure results part.

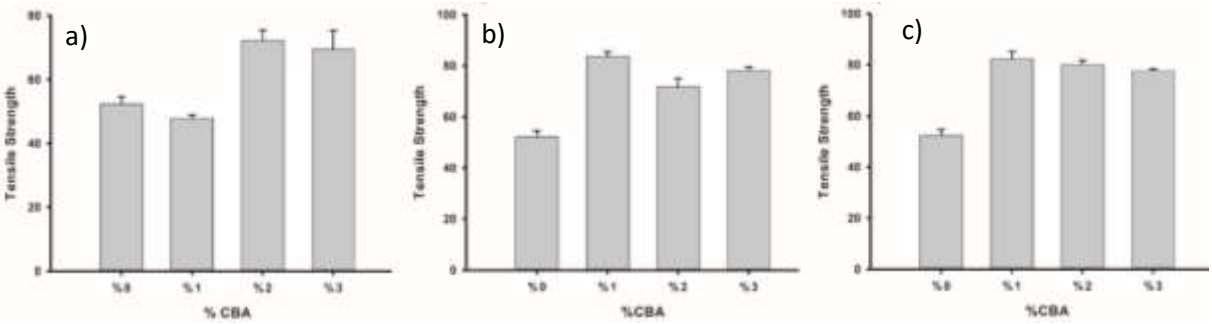

Figure 4. Flexural strength results of PC/ABS/CBA foam composites obtained at various CBA content (1 wt.%, 2 wt.% and 3 wt.%) and various temperatures: a) 250°C, b) 260°C and c) 270°C.

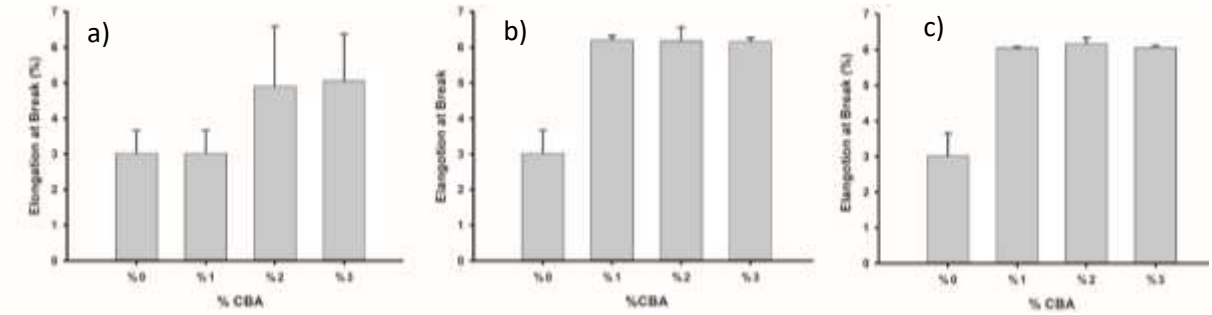

Figure 5. Elongation at break results of PC/ABS/CBA foam composites obtained at various CBA content (1 wt.%, 2 wt.% and 3 wt.%) and various temperatures: a) 250°C, b) 260°C and c) 270°C.

SEM Results

SEM images obtained for PC/ABS/CBA foam composites were given in the Figures 6, 7 and 8. From the results, it can be seen that the cell diameter and the foam density is increased as the temperature increases. In addition, as the CBA ratio increases, the foam density in the sample increases with a rise of the cell diameter. SEM images show the cellular structures of the foam sections obtained at different temperatures. When the morphologies are compared for the different samples, a continuous increase in cell size with increasing temperature can be noticed. The results also exhibit an increased number of cell wall ruptures at higher temperature, which can be explained by the lower stiffness of the polymer matrix and thus the less resistance of the bubble walls to deformation (Zirkel et al. 2009).

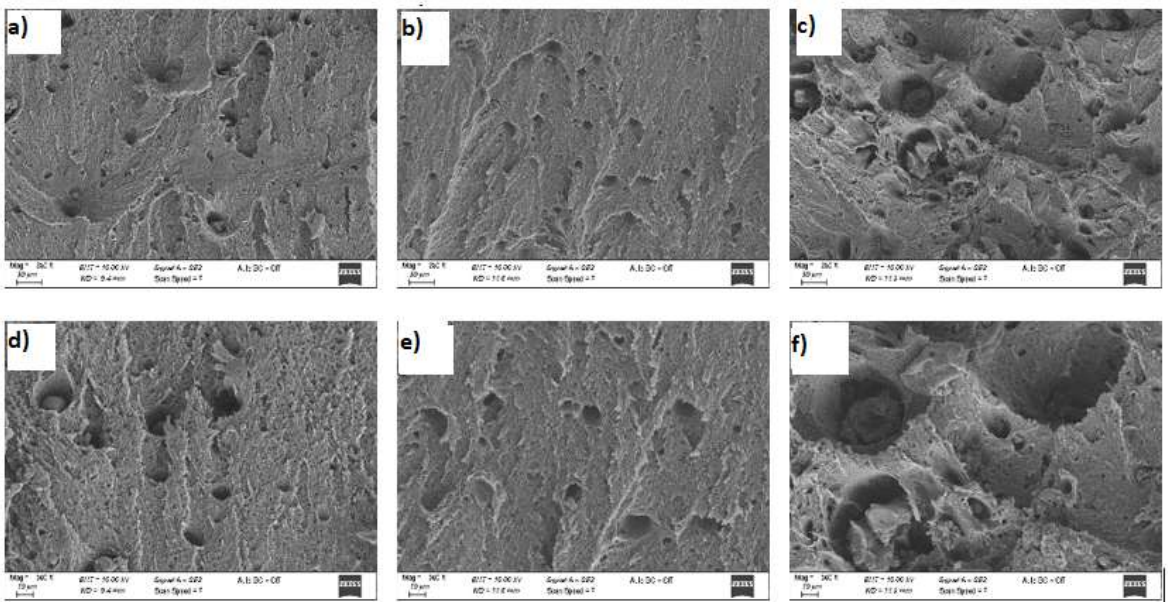

Figure 6. SEM images of PC/ABS foam composites produced at 250°C for different CBA ratios and different magnifications (a, b and c : ×250 and d, e, f: ×500): a) and d) 1 wt.% b) and e) 2 wt.% c) and f) 3 wt.%.

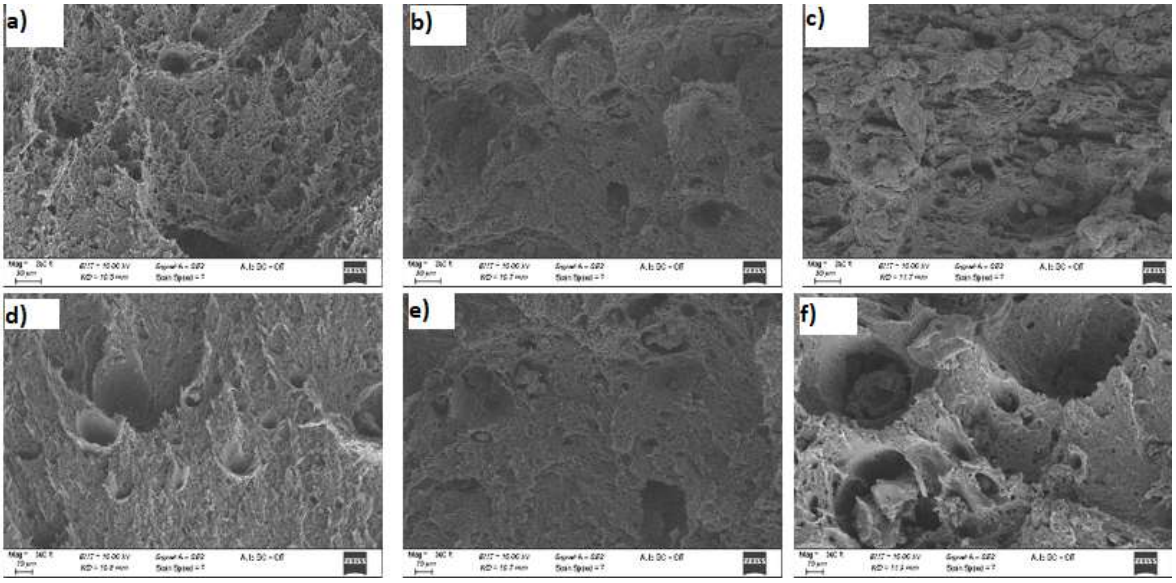

Figure 7. SEM images of PC/ABS foam composites produced at 260°C for different CBA ratios and different magnifications (a, b and c : ×250 and d, e, f: ×500): a) and d) 1 wt.% b) and e) 2 wt.% c) and f) 3 wt.%.

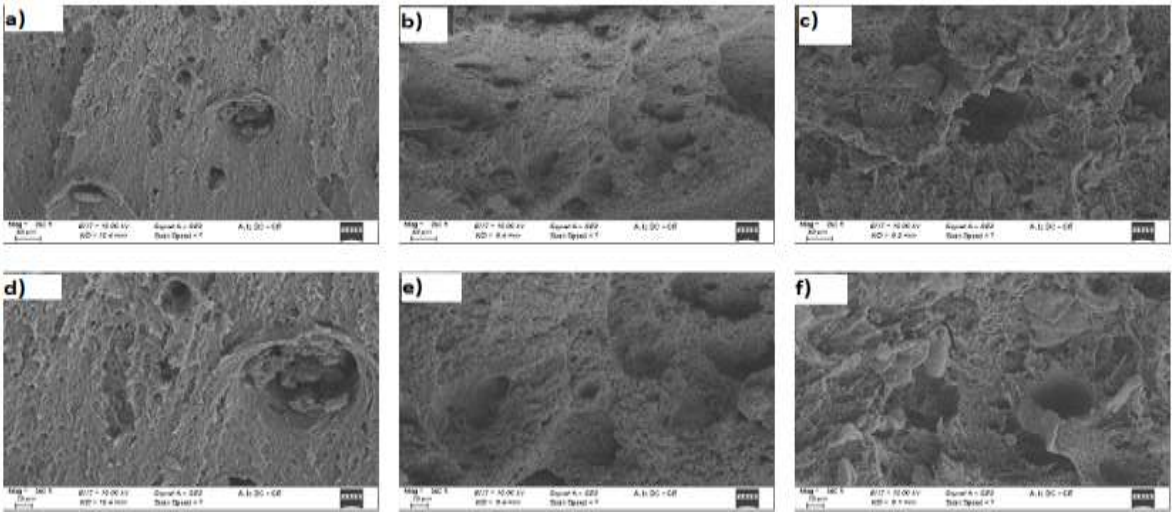

Figure 8. SEM images of PC/ABS foam composites produced at 270°C for different CBA ratios and different magnifications (a, b and c : ×250 and d, e, f: ×500): a) and d) 1 wt.% b) and e) 2 wt.% c) and f) 3 wt.%.

CONCLUSION

In this study, CBA added PC/ABS foam composites prepared at different temperatures and at different rates were produced by chemical foaming method and plastic injection method and the mechanical and microstructural properties were investigated. It was found that the mechanical properties of the parts could be increased by using the chemical foaming method of PC/ABS mixtures. In particular, when the tensile test results are examined, it is observed that the tensile strength value decreases as the CBA ratio increases. Concerning the flexural test, it can be seen that the flexural strength values increase to a certain extent and then decrease, and it is observed that the sample with optimum properties is detected as the 2 wt.% CBA added sample produced at 260°C. In addition, from SEM images, it was observed that the cell diameter and then the cell density is increased as the temperature or CBA ratio increases in PC/ABS samples.

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EXTRACTION OF PHENOLIC COMPOUNDS FROM LEAVES OF *CYDONIA OBLONGA MILLER* AND STUDY OF THEIR ANTIOXIDANT PROPERTIES

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ABSTRACT

Phenolic compounds were isolated from the leaves of the *Cydonia oblonga Mill.* plant in the saline areas of the Republic of Uzbekistan using traditional methods. Phenolic compounds were isolated using methods known in the literature. Plant leaves were dried at room temperature to bring them to a constant mass. 100 grams were taken and extracted in an aqueous solution of 70% acetone. The extraction process is repeated 3 times. All extracts were solvent stripped. The aqueous fraction was treated with chloroform to remove lipophilic compounds.

This process was also repeated three times. The aqueous part and the chloroform part were separated from each other using a separatory funnel. Then, the aqueous part was treated with ethyl acetate. This process was repeated three times. The aqueous part of the prepared ethyl acetate extract was separated using a separatory funnel. The ethyl acetate portion was concentrated by removing the excess solvent. the extract was precipitated with 2:1 pure hexane in a Buchner funnel. 1.25% of total polyphenols precipitated from 100 grams of sample.

The biological activity of the total polyphenols obtained was studied *in vitro*.

Low concentrations (1 μg/ml to 30 μg/ml) of PF-4 extract isolated from the leaves of Cydonia oblonga showed a corrective effect on mitochondrial contraction induced by Fe^{2+} ascorbate and Ca^{2+}. The observed effective effect of PF-4 extract on the membranes was observed according to the concentrations added to their incubation media. These obtained results indicate that the PF-4 extract isolated from the leaves of *Cydonia oblonga Mill.* is a bioactive substance with membrane-active properties, and this extract can be used to create new drugs with antioxidant and antiradical properties in the future.

Keywords: Cydonia oblonga Miller, extraction, membrane, in vitro, lipophilic compound, chloroform, antioxidant, incubation, Buchner funnel

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KATI HAL SÜRÜCÜLERİNİ SOĞUTMAK İÇİN ALÜMİNYUM KANAT-BAKIR YÜN ISI EMİCİNİN TERMAL PERFORMANSI

THERMAL PERFORMANCE OF THE ALUMINUM FIN-COPPER WOOL HEAT SINK FOR COOLING SOLID-STATE DRIVES

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ABSTRACT

Almost any consumer-grade Solid State Drive's (SSD's) average working temperature range is between 0 and 70 °C (32 and 158 °F). This temperature range must be maintained for the SSD to work at its best and last a long time. In addition, there are SSDs manufactured for industrial use that can withstand temperatures of up to 90 °C. However, excessive temperatures can result in thermal throttling, which can lower SSD performance and eventually risk damaging the drive's components. Therefore, SSD cards need to be cooled to keep the SSD chip temperature in the safe zone. In this context, this study aims to convert an SSD heat sink (SSDHS) designed for 2280 M.2 solid state drive (SSD) into copper wool SSDHS (CWSSDHS) and analyze it thermally with COB LED. To simulate condensed heat in the controller region of an SSD that is regularly running, the CWSSDHS was tested under natural and forced conditions using an LED package that delivered 10 W of power to COB LED. In comparison to the experiment conducted under natural conditions, a 7.6% decrease in the junction temperature of the LED was seen under forced conditions. The thermal resistance that was measured under forced conditions was significantly better by 9.43% when compared to the experiment that was carried out under natural conditions. The measured light flux was 10% more under forced conditions than under natural ones. Comparing the experiment under forced conditions to the experiment under natural conditions, the observed cooling time for the LED in the LED-off condition was drastically reduced by 59.34%. When comparing CWSSDHS with and without fans that have the same thermal performance, the former may lower the mass by up to 10%. Consequently, the CWSSDHS offered superior thermal conductivity thanks to its increased surface area for heat dissipation and lightweight copper structure.

Keywords: Solid-State Drive (SSD), SSD cooling, LED, copper wool, performance analysis

ÖZET

Neredeyse tüm tüketici sınıfı Katı Hal Sürücülerinin (SSD'ler) ortalama çalışma sıcaklığı aralığı 0 ile 70 °C (32 ile 158 °F) arasındadır. SSD'nin en iyi şekilde çalışması ve uzun süre dayanması için bu sıcaklık aralığı korunmalıdır. Ayrıca endüstriyel kullanım için üretilmiş ve 90 °C'ye kadar sıcaklıklara dayanabilen SSD'ler bulunmaktadır. Bununla birlikte, aşırı sıcaklıklar, SSD performansını düşürebilen ve sonuç olarak sürücünün bileşenlerine zarar verme riski taşıyan termal kısma ile sonuçlanabilir. Bu nedenle, SSD çip sıcaklığını güvenli bölgede tutmak için SSD kartların soğutulması gerekir. Bu bağlamda, bu çalışma 2280 M.2 katı hal sürücüsü (SSD) için tasarlanmış SSD ısı emiciyi (SSDHS) bakır yünü SSDHS'ye (CWSSDHS) dönüştürmek ve COB LED ile termal olarak analiz etmeyi amaçlamaktadır. Düzenli olarak çalışan bir SSD'nin denetleyici bölgesinde yoğunlaşan ısıyı simüle etmek için CWSSDHS, COB LED'e 10 W güç sağlayan bir LED paketi kullanılarak doğal ve zorlamalı koşullar altında test edildi. Doğal koşullar altında yapılan deneyle karşılaştırıldığında, zorunlu koşullar altında LED'in bağlantı sıcaklığında %7.6'lık bir azalma görülmüştür. Zorlanmış koşullar altında ölçülen termal direnç, doğal koşullar altında gerçekleştirilen deneye kıyasla %9.43 oranında önemli ölçüde daha iyi olmuştur. Ölçülen ışık akısı, zorunlu koşullar altında doğal olanlara göre %10 daha fazlaydı. Zorunlu koşullar altındaki deney ile doğal koşullar altındaki deney karşılaştırıldığında, LED'in kapalı durumdayken gözlemlenen soğuma süresi %59.34 oranında önemli ölçüde azaldı. Aynı termal performansa sahip fanlı ve fansız CWSSDHS karşılaştırıldığında, ilki kütleyi %10'a kadar azaltabilir.

Sonuç olarak CWSSDHS, ısı dağılımı için artırılmış yüzey alanı ve hafif bakır yapısı sayesinde üstün termal iletkenlik sundu.

Anahtar kelimeler: Katı Hal Sürücüsü (SSD), SSD soğutma, LED, bakır yün, performans analizi

1. INTRODUCTION

Solid State Drive (SSD) cards, like other heat-generating electronics, may lose performance or even deteriorate when exposed to excessive heat, causing data loss. For this, the majority of SSDs use thermal throttling as a safety measure in case a disk overheats. The likelihood that your drive will begin slowing down to avoid failure increases as they approach the 70 °C limit set by the majority of manufacturers. Up until the temperatures return to an acceptable range (about 50 °C), the drive will substantially slow down. Then, it can be returned to normal operating speed. Meanwhile, the M.2 type SSD works much more powerfully and generates heat energy, despite being significantly smaller than the 2.5-inch SSD. For this reason, to avoid reaching the maximum levels, it is crucial to make sure that the driver runs at a stable average value, which may be accomplished with a suitable cooler.

Zhang et al. [1] performed a transient thermal analysis for M.2 SSD thermal throttling using CFD Model and Network-Based Model. The temperature of the SSD reached 97 °C in full performance mode in 111 s before entering throttling mode. An ASIC package, a DRAM package, and numerous NAND packages are common components of M.2 SSDs. In a study by Ye et al. [2], in which different simulations were performed with different combinations at an ambient temperature of 45 °C, the maximum junction temperature (ASIC temperature) was reduced from 102 °C to below 90 °C. Thus, it was found that the addition of thermal interface material (TIM) can delay the pre-throttling time by about 150 s. Lee et al. [3] developed the thermal simulation model of the M.2 Non-volatile memory express (NVMe) SSD and analyzed the heat dissipation mechanism of the M.2 NVMe SSD with experiments and thermal simulations under vacuum and atmospheric conditions. While the SSD's power consumption dropped by 50% in the steady state, the temperature of the sensor inside the controller rose by 3 °C. They claimed that the SSD is more sensitive in a vacuum environment that is analogous to space. In a vacuum, an increase of 11.4% in conduction and 3.3% in radiation occurred compared to that in the atmospheric environment. In another study by Lee et al. [4], the power required by the BGA SSD was lowered by 29.8% at steady operating circumstances at high-vacuum conditions, which is a severe environment without convection. Several studies use dynamic thermal management (DTM), which lowers performance, to lower the operating temperature of the SSD [2,4,5]. This is done because data retention failure of NAND packages in an SSD increases as temperature increases during reading and writing data [4].

In literature, cooling electronic equipment has been accomplished using a variety of technologies, including natural convection heatsink (HS) [6], forced convection HS [7], single-phase/two-phase cold plate HS [8], vapor chamber HS [9], thermosyphon [10] and heat pipe (HP) HS [11]. Although HSs with thin HP are ideal for high heat transfer and the structure of the SSDs, HSs like those employed in this study are typically used for cooling SSDs. Yuan et al. [12] examined heat transfer and start-up performance, evaporator temperature, and overall thermal resistance for single and double heat pipes at various input powers ranging from 5 W to 50 W, and placement angles between 0° and 90°. As expected, the new dual thin heat pipes (THP) angled at 90° have been found to have a major advantage in the heat transfer performance of SSDs. Shen et al. [13] conducted tests using various air velocities on a copper foam heat pipe radiator with 15 pores per inch (15 PPI). They claimed that at 4.3 m/s and 150 W, copper fins can lower the junction temperature by 0.7 °C, whereas copper foam can do likewise by 6.0 °C under the same circumstances. In comparison to conventional finned heat pipe radiators, their analysis indicated that the added metal foam greatly lowers the overall thermal resistance by 25.5%.

This work aims to develop a copper wool SSD card heat sink to replace a traditional SSD card heat sink. In this context, the effect of copper wool on the performance of the SSD card heat sink will be examined. For the purpose of preventing overheating in their SSDs, many SSD manufacturers employ a feature referred to as Thermal Throttling or "thermal-induced throttling". For this reason, performance loss occurs and it will be determined whether the product created in this study reduces this performance loss.

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2. MATERIAL AND METHOD

In this study, it is desired to design an SSD cooler compatible with M.2 2280 SSD. Putting the heatsink on the SSD is often an issue as most motherboards have a "design flow". However, the tested heat sink can also be used with SSD cards such as the M.2 2280 SSD (3.3 V input, T_{case} operating temp.: 0 °C to 70 °C, Power Consumption: from 1 to 10 W). A 150 g weight of copper wool is placed between the fins of a plate fin air-cooled heat sink to increase the surface area and enhance the heat transfer. Fig. 1 shows SSDHS with copper wool.

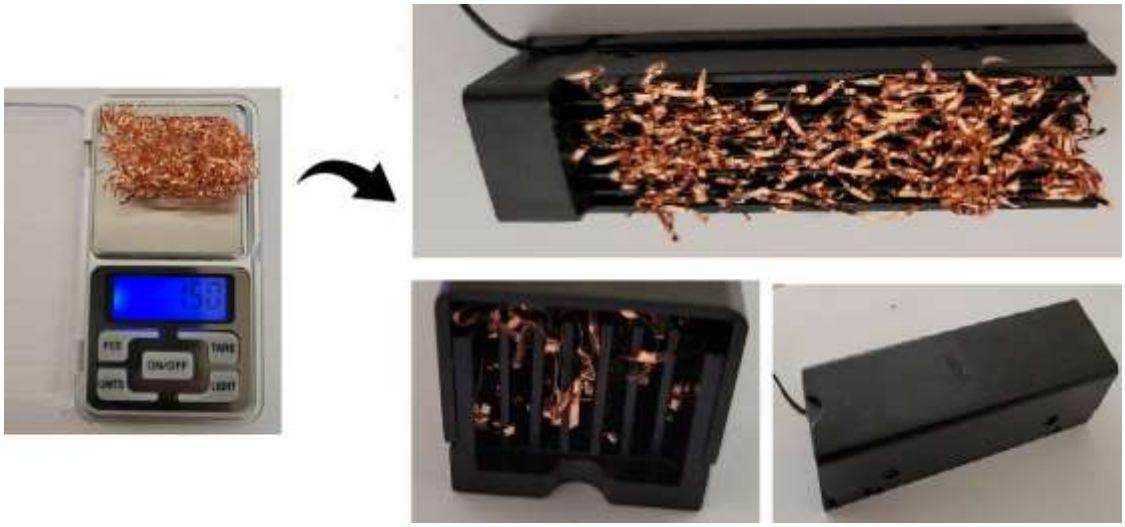


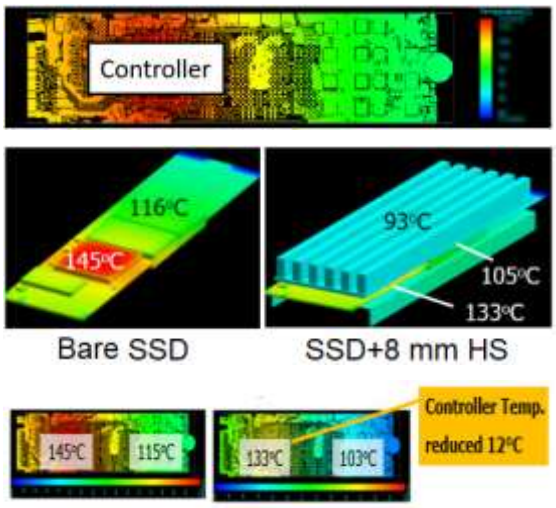
Fig. 1. Photographs of the SSDHS with copper wool

The experimental apparatus used in this work are shown in Fig. 2. A computer, a data acquisition system, thermocouples, a COB LED (10W), a test cabinet, SSDHS with copper wool, and thermal imaging equipment are among the parts of the experimental setup. The LED junction temperature ($T_{j,LED}$), fin-copper wool temperature ($T_{fcw,HS}$), the case top temperature ($T_{top,case}$), and ambient air temperature (T_{aa}), are taken through K-type thermocouples. In the experiments, the temperature data are taken every 5 s.

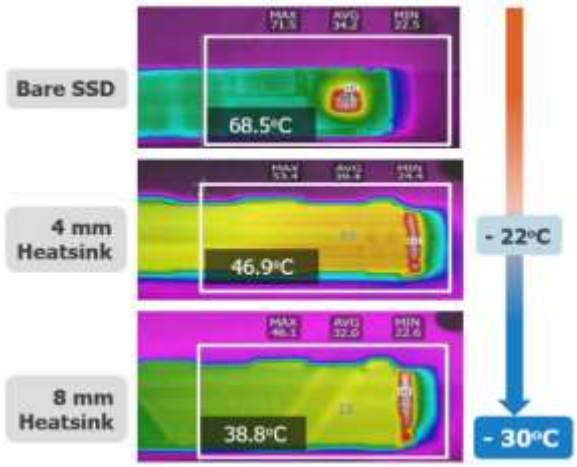
Fig. 2. Experimental setup

The results of the temperature distributions derived from the representative temperature distributions of SSD cards and printed circuit board (PCB) top layers reported in the literature [14–20] demonstrate that SSD cards show that heat accumulates on the controller (Fig. 3). Therefore, a COB LED of the

appropriate size for the controller region is preferable rather than dissipating the heat throughout the entire heat sink, or to put it another way, preferring the LED over the complete heat sink layer size.



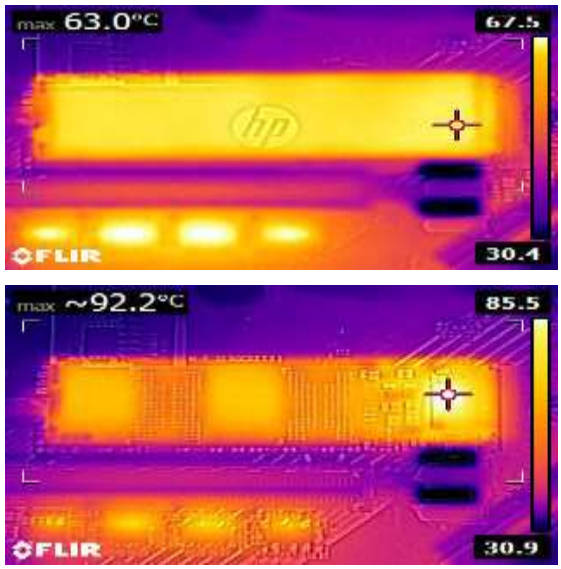
Note1: This test is a pure hardware simulation in full operation mode (the worst case). The environmental conditions are 70 °C and 1200 ft/m [14].



Note2: At the 30th minute of the test, these photos were obtained at room temperature with 450 LFM of minimum airflow and 100% sequential write [14].

The thermal image & hot spot of Crucial P5 1 TB M.2 NVMe SSD at fixed write speed. [17].

Note4: It provides a thermal image of the working SSD while the write test is being completed. The hottest part reached 106°C, which almost exactly matches the drive's thermal reporting.

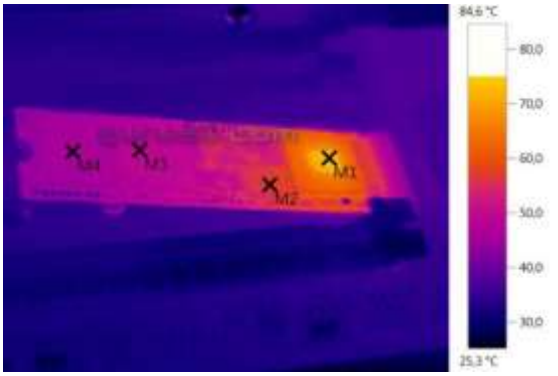


The thermal image & hot spot of HP FX900 1 TB M.2 NVMe SSD [18].

Note5: The hottest part of the drive reached 63°C with the heatsink installed, whereas it reached 92 °C without the heatsink installed.

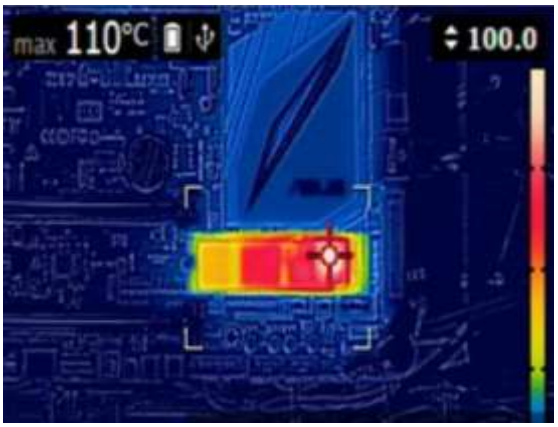
The thermal image of CRUCIAL P5 2TB M.2 NVME SSD under load [15].

Note3: SSD temperature of over 74 °C was measured under load.

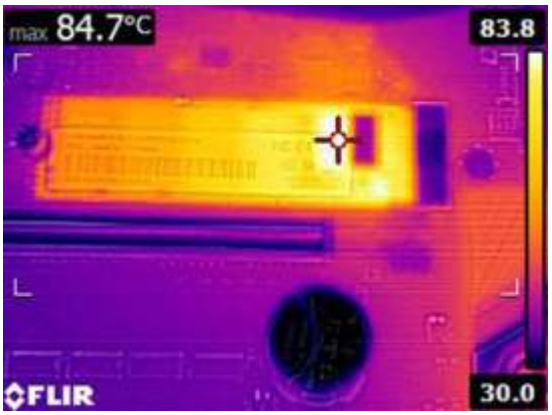


The thermal image of Samsung 950 PRO M.2 SSD under load [19].

Note6: The temperature in the controller core (M1) of the SSD was measured as 75 °C. It is 57 °C in the M2, 49 °C in the M3, and 46 °C in the M4.



The heat generation of PCI-E M.2 under load [16].



The heat generation of Intel SSD 660p [20].

Note7: The temperature of the Intel 660 has been reduced from 80 to 52 °C using the heat sink.

Fig. 3. Images displaying heat accumulation on the controller and heat dissipation on SSD cards [14–20].

Fig. 4 shows the heat dissipation in 950 Pro and 960 Pro SSD cards. The tested 950 Pro SSD card reached 175 F (79.44 °C). The tested 960 Pro SSD card reached 166 F (74.44 °C). As a result, there is a difference between SSD cards of roughly 5 °C. Similar to Fig. 3, the heat density in Fig. 4 was realized in the region of the controllers.

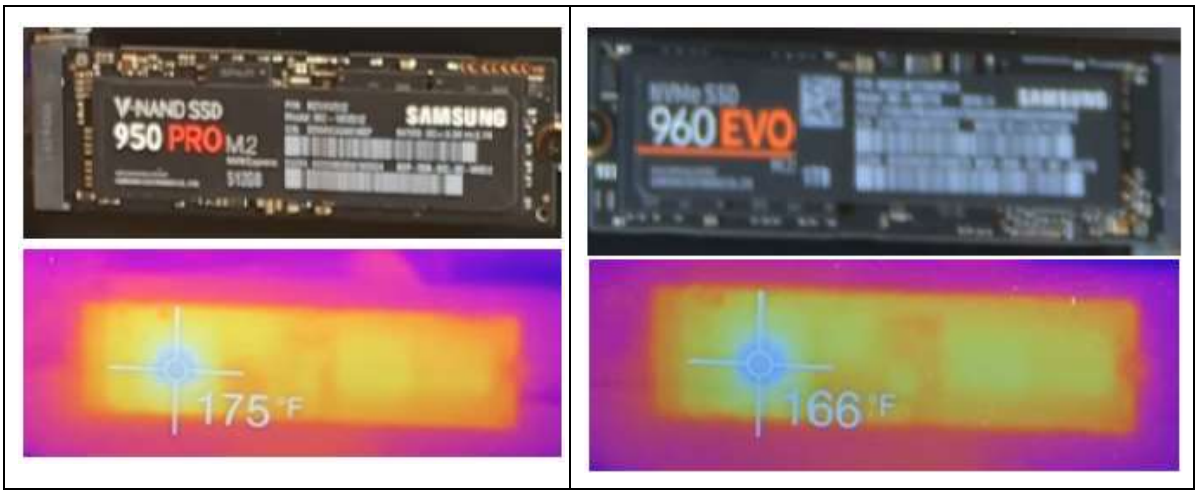


Fig. 4. Heat dissipation in 950 Pro and 960 Pro SSD cards

The ALCBHS-LED's thermal resistance (R_{th}) is calculated as follows:

$$R_{th} = \frac{T_j - T_{aa}}{q_{heat}} \quad (1)$$

where R_{th} is the thermal resistance (°C/W), q_{heat} is heat power applied to the baseplate (heat input) (W), Tj is the junction temperature (°C), and T_{aa} is the ambient air temperature (°C).

In the experimental setup, measurements were made utilizing a power supply (accuracy: 0.2%, uncertainly: ±0.5), K-type thermocouples (accuracy: 0.4%, uncertainly: ±0.5), a data logger (accuracy: 0.1%, uncertainly: ±0.1) and multi-meter (accuracy: 0.1, uncertainly: ±0.05). The maximum uncertainty of R_{th} ($R_{th,max}$) is found as ±2.0% from the formula below.

$$WR_{th} = \sqrt{\left(\frac{\partial R_{LED}}{\partial T_j}\Delta T_j\right)^2 + \left(\frac{\partial R_{aa}}{\partial T_{aa}}\Delta T_{aa}\right)^2 + \left(\frac{\partial R_{LED}}{\partial T_q}\Delta q\right)^2} \quad (2)$$

3. RESULT AND DISCUSSION

As the heat to which the SSD is exposed, permanent damage can occur, which can shorten its lifespan. Therefore, in this study, a new design SSD card cooler was tested with an LED package. Fig. 5 depicts the temperature variations at different points that were measured during the CWSSDHS's testing utilizing the COB LED. In the experiment conducted in natural conditions, the temperature T_j has increased continuously and continues to increase even before the LED is turned off. However, in the experiment under forced conditions, the temperature T_j remained almost constant after 300 s. In experiments, the COB LED exhibited a significant drop in junction temperature, reaching T_{jmax}=113.1 °C under forced conditions, in contrast to T_{jmax}=122.4 °C observed under natural conditions. This indicated a 7.6% improvement in T_{jmax}. This means improved thermal dissipation and faster heat transfer characteristics in the LED system. In a study by Lee et al. [4], the BGA SSD stabilized in 126 s after the sequential reading at a temperature of roughly 90 °C in the controller and 80.9 °C at the top of the BGA SSD. Note that the average total power is measured at 1.98 W. In a study by Yuan et al. [12], THP HS, with a 10% deionized water filling rate, has been tested using a 70*20 mm band heater by applying power from 5 W to 50 W. On the other hand, in the current study, 10 W electrical power was applied only to the controller area, thus higher power was applied to a smaller area. In the natural condition experiment, the LED lamp was left on for 670 s before being turned off and allowed to cool naturally. In the forced state experiment, the LED was left on for 670 s before the lamp was turned off, then the LED was turned off but the fan continued to run. While the reported cooling time for an LED was 1525 s under natural circumstances, it was 620 s under forced circumstances, which resulted in a 59.34% reduction in cooling time. These numbers indicate the impact of various situations on the device's thermal behavior and provide quantitative information about the cooling characteristics of the CWSSDHS.

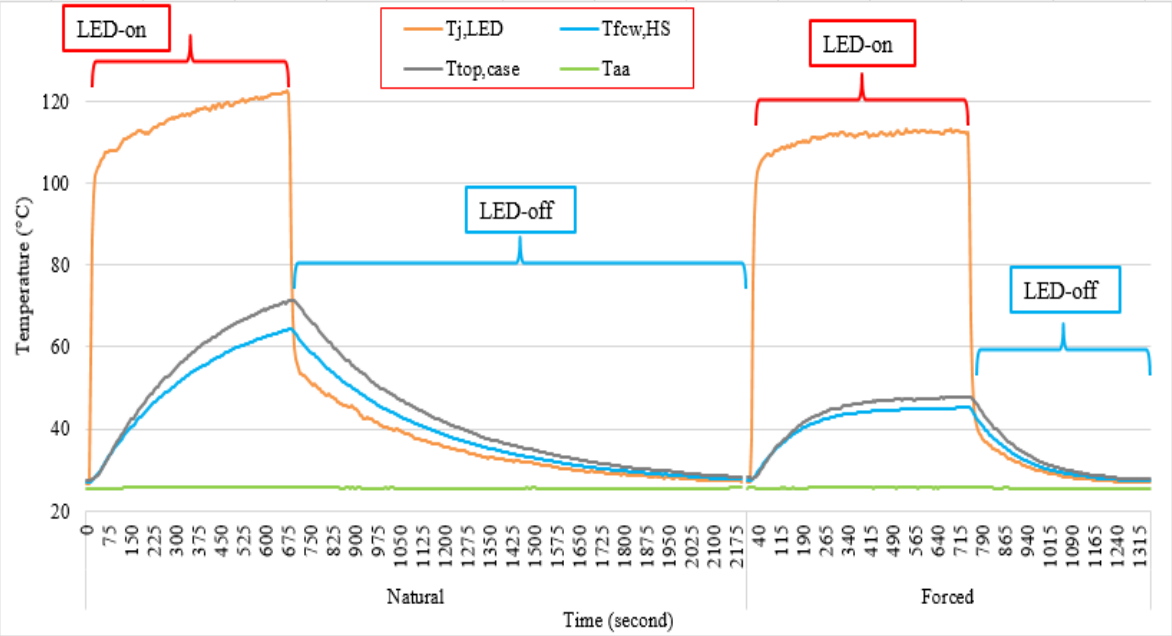
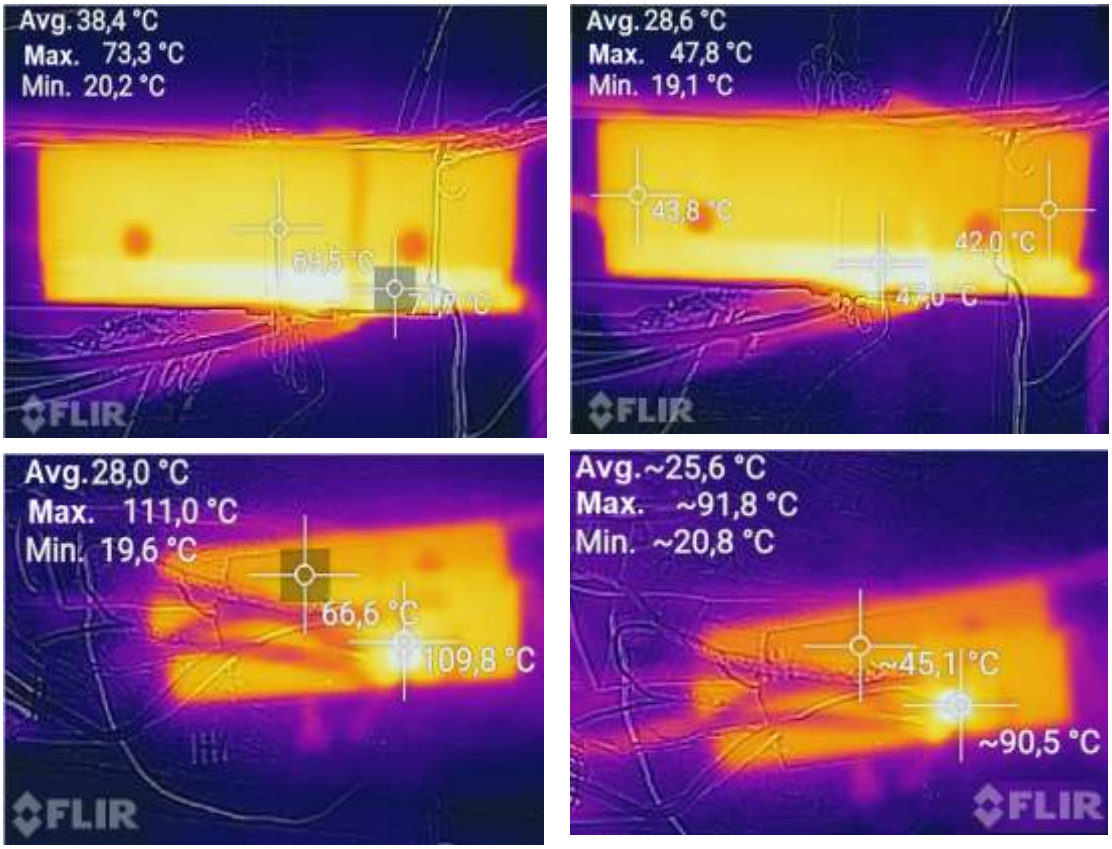
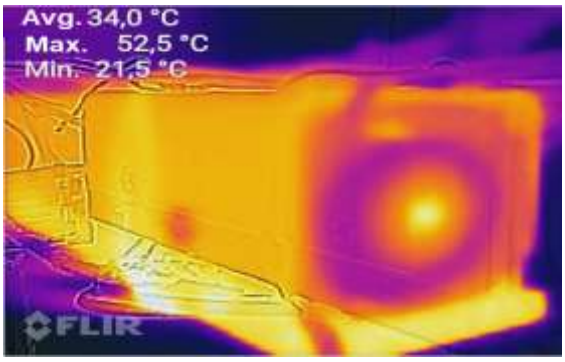


Fig. 5. The temperature variations during the CWSSDHS's testing utilizing the COB LED

Fig. 6 shows the thermal images captured by a thermal camera in CWSSD-LED under natural and forced conditions. The images show how efficiently heat dissipation was accomplished in both cases. The surface temperature data of the IR Thermal Imager and the temperature data from the thermocouples were compared. It should be noted that the temperature data obtained using these temperature readings, thermal imager, and thermocouple will differ slightly from the internal temperature data. However, there is consistency between the data. The findings demonstrate that heat dissipation systems can be used successfully in both natural and forced environments, improving thermal management and overall performance.



Note: *The fan is attached to the heat sink under natural conditions, but it is inactive. The fan is run under forced circumstances. The heat sink case is attached to the heat sink in both situations. The warmest zone is indicated by the color white, followed by the warm zone by yellow, and the coldest zone by blue.*



a) Natural conditions b) Forced conditions

Fig. 6. The thermal images captured by a thermal camera in CWSSD-LED

The thermal resistance (R_{th}) values recorded under forced and natural conditions are depicted in Fig. 7. It is feasible to assess and contrast the thermal resistances between the forced and natural settings by looking at the data shown in Fig. 7. When the thermal resistance values obtained for CWSSDHS are examined, under natural conditions, reaches $R_{ja,max}$=12.9 °C/W, while under forced conditions it reaches $R_{ja,max}$=11.7 °C/W, which corresponds to an improvement of 9.43%. These empirical results offer solid proof of the improved thermal performance attained under forced conditions, which led to lower thermal resistance values and better heat dissipation capacities for both the CWSSDHS and the LED. These values are a little high, which is thought to be due to too much power concentration in a small area and the placement of the LED in the controller area of the SSD to simulate the SSD card. In a study by Yuan et al. [12], the thermal resistance values are quite low, the reason the current study has high thermal resistances is that the power is applied to a small area (controller area). The thermal resistance for 0-15 W and 0° decreased by approximately 42.7% and 57.5% for single and double THPs, respectively. Also, a lower thermal resistance of 46.4% and 36.7% was obtained for the dual THP heatsink at 0 and 90° at 50 W, respectively.

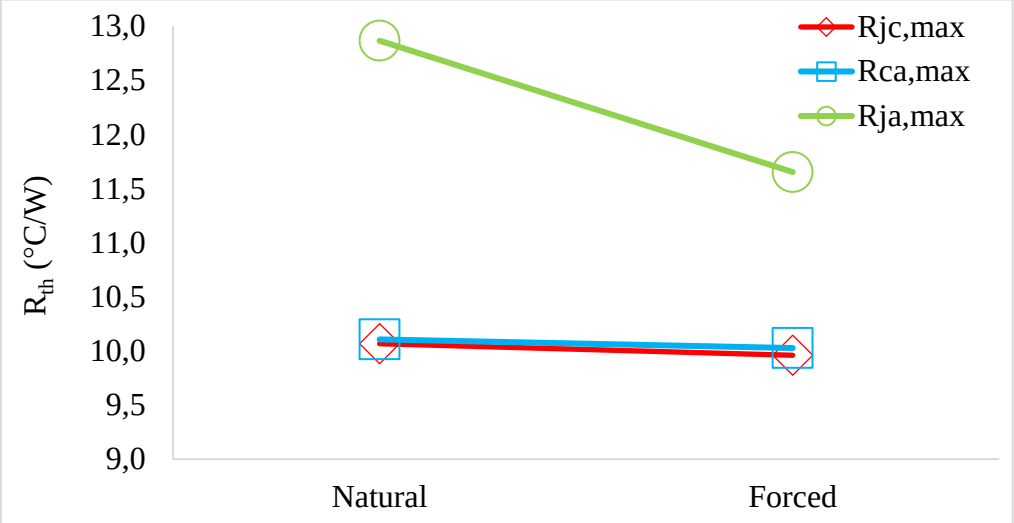


Fig. 7. The variations of thermal resistances (R_{th})

The entire amount of visible light released by a light source or absorbed on a surface is measured by luminance flux, which is given in lux (lx). These measurements were taken using the lux meter, which was set up consistently 45 cm away from the light source. For larger or more diffused light sources, for instance, a distance of 1 m could occasionally be advised to get representative readings. However, a closer distance of 45 cm might be preferable for smaller and more concentrated light sources like LEDs. The luminous flux for CWSSDHS-LED is depicted in Fig. 8. When comparing the obtained average values, it is clear that the natural conditions (1268 lux) and the forced settings (1320 lux) produced somewhat different luminous flux levels. Data show that compared to the natural conditions, the lighting

setup or light source utilized in the experiment under forced conditions produced a significantly higher amount of visible light. As can be seen from the graph, the luminous lux values decreased continuously as the *Tj* increased from the beginning of the experiment. In the experiment under forced conditions, luminous lux values decreased by about 5.5%, while in the experiment under natural conditions, they decreased by about 12.5%. When the values formed at the last moment of the experiments, that is, just before the LED is turned off, are compared, the difference was determined as 7.36%.

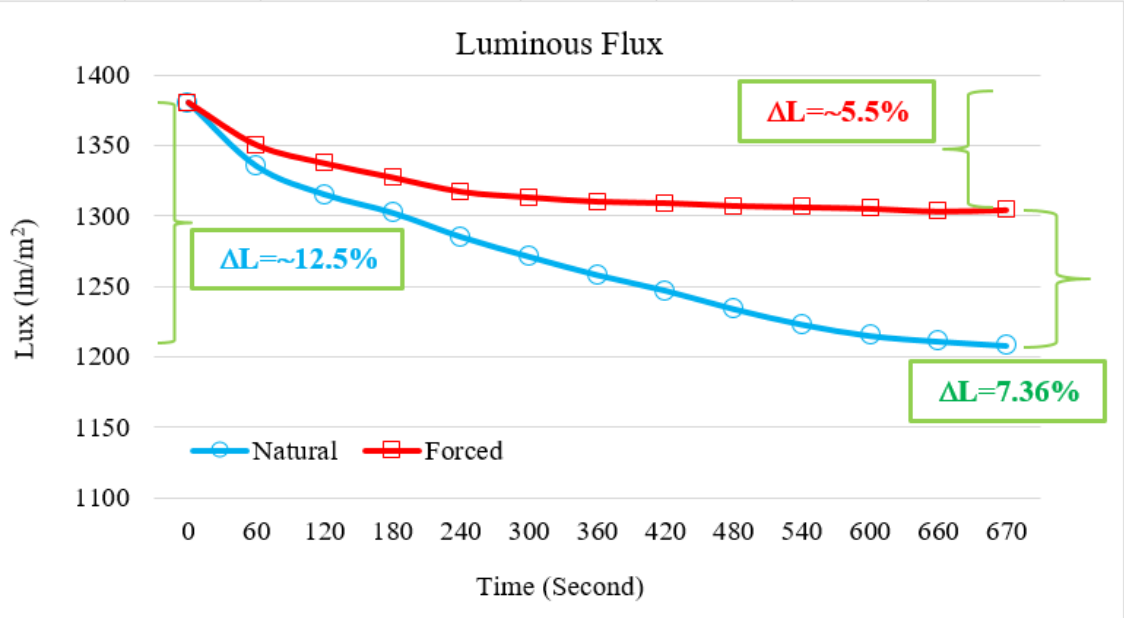


Fig. 8. The variations of luminous flux for CWSSDHS-LED

4. CONCLUSION

In this study, CWSSDHS compatible with M.2 2280 SSD was designed and its cooling performance was tested by applying 10W power to the COB LED.

- The experimental findings show that copper wool and an SSDHS combination can successfully cool a 10 W COB LED.
- In the experiments carried out, a decrease of 7.6% was observed in the junction temperature of the LED under forced conditions, compared to the experiment carried out under natural conditions.
- In comparison to the experiment conducted under natural conditions, the thermal resistance that was recorded under forced conditions was significantly improved by 9.43%.
- Compared to natural conditions, the recorded luminous flux was 10% better under forced conditions, which is extremely crucial for both the light quality and the safety of the LED.
- In the experiment conducted under forced conditions, the observed cooling time for the LED in the LED-off condition was dramatically shortened by 59.34% when compared to the experiment carried out under natural conditions.
- A CWSSDHS with a fan can reduce mass by up to 10% compared to CWSSDHS without a fan with the same thermal performance.

Although they may be simpler to fabricate and offer greater structural integrity, thicker fins add weight at the expense of reduced thermal resistance. Therefore, lighter and thinner copper wool SSDHS can be considered as an alternative product.

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ALÜMİNYUM SIVI SOĞUTMA BLOĞU ISI EMİCİNİN YÜKSEK GÜÇLÜ LED DİZİSİ SOĞUTMA PERFORMANSININ DENEYSEL İNCELENMESİ

EXPERIMENTAL INVESTIGATION OF HIGH-POWER LED ARRAY COOLING PERFORMANCE OF ALUMINUM LIQUID COOLING BLOCK HEAT SINK

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ABSTRACT

Light-emitting diodes (LEDs) are energy-efficient light sources, but without effective temperature management, their performance may be negatively compromised. For LEDs to function better and have a longer lifespan, it is essential to effectively manage heat generation and dissipation. Therefore, LEDs must be operated in a safe temperature range, which requires effective thermal management. This study reveals the triangular relationship between light-emitting diode (LED) performance, temperature, and usage by testing the aluminum liquid cooling block heat sink (ALCBHS) in LED cooling. The main objectives in this study can be listed as testing the usability of an ALCBHS in LED cooling, evaluating the LED cooling performance of the ALCBHS, keeping the junction temperature of the LED in the safe zone, and comparing the performance with and without water conditions. In the experiment conducted using water, the LED's junction temperature dropped by 15% compared to the experiment without water (only heat sink). In the comparison conducted by considering the average values of the measured luminous flux, the data of the experiment using water was 5.63% more than the experiment without water. In parallel, the loss of LED power in the waterless system reached 13.11%. With the LED off, the cool-down time of the aqueous system was significantly less by 93%. As a result, ALCBHS is a perfect heatsink for heat dissipation, and because of its design and functionality, it offers a simple solution for liquid-based LED cooling.

Keywords: Aluminum liquid cooling block heat sink, high-power LED, liquid cooling, performance analysis

ÖZET

Işık yayan diyotlar (LED'ler) enerji açısından verimli ışık kaynaklarıdır, ancak etkili sıcaklık yönetimi olmadan performansları olumsuz yönde etkilenebilir. LED'lerin daha iyi çalışması ve daha uzun bir kullanım ömrüne sahip olması için, ısı üretimini ve dağılımını etkili bir şekilde yönetmek çok önemlidir. Bu nedenle LED'ler, etkin termal yönetim gerektiren güvenli bir sıcaklık aralığında çalıştırılmalıdır. Bu çalışma, LED soğutmada alüminyum sıvı soğutma bloğu ısı emicisini (ALCBHS) test ederek ışık yayan diyot (LED) performansı, sıcaklık ve kullanım arasındaki üçgen ilişkiyi ortaya koymaktadır. Bu çalışmadaki ana hedefler, bir ALCBHS'nin LED soğutmada kullanılabilirliğinin test edilmesi, ALCBHS'nin LED soğutma performansının değerlendirilmesi, LED bağlantı noktası sıcaklığının güvenli bölgede tutulması ve sulu ve susuz performanslarının karşılaştırılması olarak sıralanabilir. Su kullanılarak gerçekleştirilen deneyde LED'in bağlantı sıcaklığı, su kullanılmadan yapılan deneye (yalnızca soğutucu) kıyasla %15 oranında düştü. Ölçülen ışık akısının ortalama değerleri dikkate alınarak yapılan karşılaştırmada, su kullanılan deneyin verileri susuz deneye göre %5.63 daha fazla çıktı. Buna paralel olarak susuz sistemdeki LED güç kaybı da %13.11'e ulaştı. LED kapalıyken, sulu sistemin soğuma süresi %93 oranında önemli ölçüde azaldı. Sonuç olarak, ALCBHS ısı dağılımı için mükemmel bir soğutucudur ve tasarımı ve işlevselliği nedeniyle sıvı bazlı LED soğutma için basit bir çözüm sunar.

Anahtar kelimeler: Alüminyum sıvı soğutma bloğu ısı emicisi, yüksek güçlü LED, sıvı soğutma, performans analizi

1. INTRODUCTION

Light-emitting diodes (LEDs) are energy-efficient sources of light, but without proper thermal management, their performance can be severely impacted. Controlling heat generation and dissipation through efficient thermal management is vital for enhancing LED performance and ensuring a longer lifespan. For instance, the efficiency of LEDs can drop from a theoretical 90% to levels as low as 20% in the absence of proper thermal management [1-2]. The operating temperature range of LEDs is limited, and exceeding this range can impact performance and energy efficiency significantly. Thus, to ensure the safe operation of LEDs, the junction temperature (*Tj)* is an essential criterion to follow. Depending on the product, the maximum *Tj* values can vary between 100-150 °C, which LED manufacturers provide *Tj* values in their datasheets. When the junction temperature is below 130 °C, according to a study by Christensen and Graham [3], reliable operation can be attained. Active cooling methods involve the use of fans, liquid cooling systems, and other thermal management mechanisms to control the temperature of LEDs. Passive cooling involves using heat sinks and thermal interface materials to dissipate heat away from the LED. It would require thousands of times less volumetric water flow compared to airflow to remove 1000 W of heat with a 10 °C increase in temperature. Therefore, active cooling and liquid cooling techniques can be quite effective in controlling temperature and maximizing LED efficiency. It's vital to remember that liquid cooling can remove heat from systems significantly faster and with far smaller flow volumes. Because the liquid cooling medium's thermal conductivity is 15 to 25 times greater than that of air and it has a specific heat capacity that is 1000 to 3500 times greater than air's, it can dissipate heat more quickly and with larger heat flux [4]. In principle, air has a weak thermal conductivity of about 0.0262−0.0676 W/mK between 300 and 900 K, while water has a strong thermal conductivity of about 0.556−0.677 W/mK between 273 and 375 K compared to air.

While air cooling of heat-generating electronic components is widely preferred [5-6] because it is simple and risk-free, liquid-cooled applications [2, 4, 7-10] are preferred in applications that require high heat transfer. Ramos-Alvarado et al. [2] tested the usability of microjet and mini-channel heatsinks for cooling high-power LEDs using 3D numerical simulations and noted that the mini-channel design showed better thermal performance than the microjet design. Naphon et al. [8] experimentally and numerically investigated the performances of three different heatsink configurations, 120x40x10 mm in size, with integrated thermoelectric cooling modules (40x40 mm). It has been seen that the water block (Model C), where the liquid inlet and outlet mouths are opposite and the liquid flow path progresses by drawing an "S", gives the highest cooling performance when compared to other models. Pan et al. [9] developed a micro-channel liquid cooling heat sink (HS) integrated vapor chamber for cooling high-power insulated gate bipolar transistor (IGBT) chips. They stated that the cooling limit of the air cooling heat dissipation is typically 50 W/cm^2. They also stated that their finished products, which they ranked from best to worst in terms of heat transfer efficiency and thermal resistance characteristics, were basic micro-channel HS, vapor chamber integrated HS and vapor chamber separate HS. Hu et al. [10] tested roll bond liquid cooling plates (RBLCPs) for server chip heat dissipation by bending them into a "Z" and "N" shape. Compared with Z-type RBLCP, they reported that N-type RBLCP has better comprehensive performance due to minimal thermal resistance.

The purpose of this study is to determine whether or not an aluminum liquid cooling block heat sink (ALCBHS) can be utilized to cool LEDs. During experiments conducted with and without water cooling in this work, the thermal behavior of LED and ALCBHS is also monitored.

2. EXPERIMENTAL SETUP

As the CFL.i, LFL and cold cathode fluorescent lamps (CCFL), and external electrode fluorescent lamps (EEFL) will be phased out and LEDs will quickly replace them. Indeed, the Commission Delegation aimed to phase out T5 and T8 fluorescent lamps with the EU 2022/276 Directive published on 13 December 2021 [11]. Therefore, the use of LEDs will become more widespread, their power will increase, and management problems will often be encountered in their thermal distribution. As a result, LED cooling and heat management will be increasingly crucial. The efficiency with which a heat sink dissipates heat away from the LED depends on its shape and size thus, the key to obtaining efficient thermal management is a well-designed heat sink. Fig. 1 shows the schematic view of the aluminum liquid cooling block heat sink. The aluminum liquid cooling block heat sink (ALCBHS) is manufactured

from aluminum with dimensions of 10x40x160xmm. A water pump is employed to circulate distilled water that flows through the water blocks.

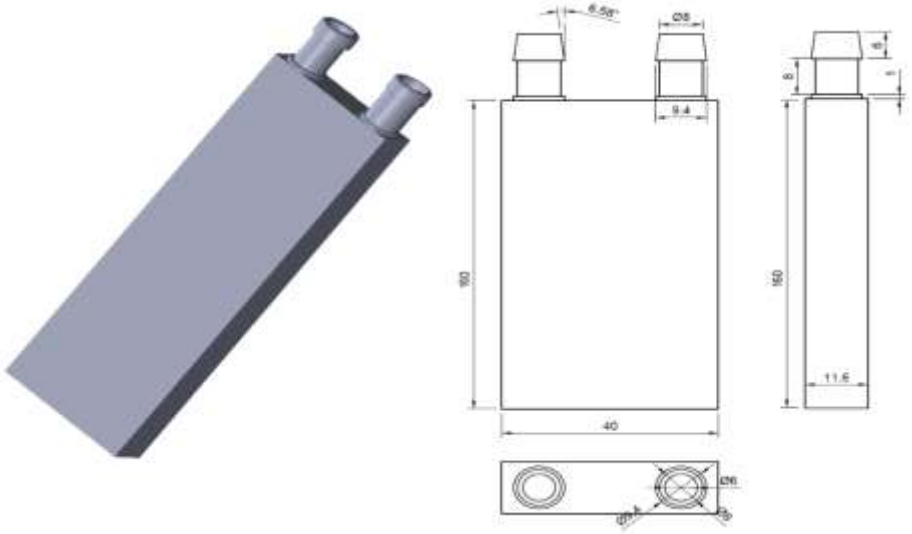


Fig. 1. Schematic view of the aluminum liquid cooling block heat sink

Fig. 2 shows the experimental design used in this study. An array of parts make up the experimental setup, including a computer, a power supply, a data collection system, thermocouples, a COB LED (1.2A, 12V), a test cabinet, ALCBHS, and a thermal imaging device.

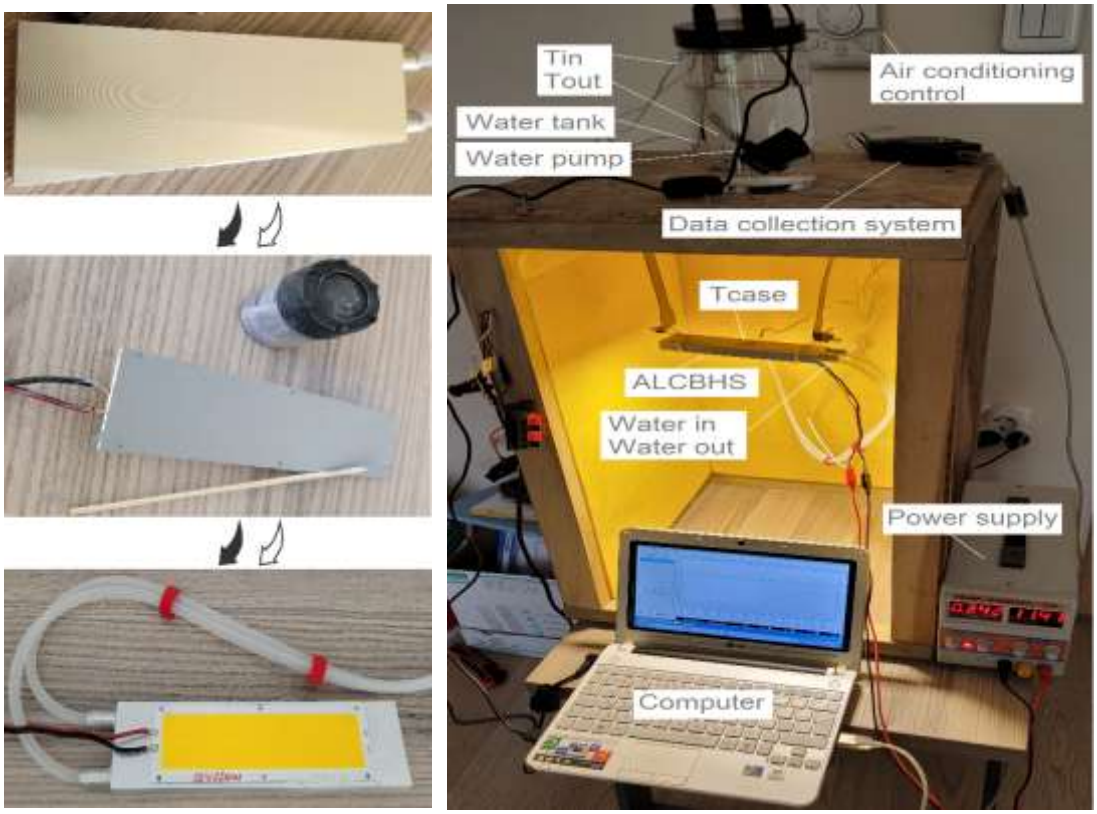


Fig. 2. Experimental setup.

The inlet water temperature (T_{in}), outlet water temperature (T_{out}), ambient air temperature (T_{aa}), and LED junction temperature (Tj) are taken through K-type thermocouples. Water quality is assessed using a TDS meter, which has a measurement range of 0-9990 ppm, a precision of 1 ppm, and a reading accuracy of +/- 2 %. The experiments employed distilled water with a 14 ppm concentration as the cooler liquid.

In the experiments, the water mass flow rate was kept constant at 0.05 kg/s and the temperature data are taken every 5 s.

Thermal resistance in LED packages, their interfaces, and heat sinks can impact their thermal performance thus lower thermal resistance leads to better energy efficiency. The ALCBHS-LED's thermal resistance (R_{th}) is calculated as follows:

$$R_{th} = \frac{T_j - T_{in}}{q_{heat}} \quad (1)$$

where R_{th} is the thermal resistance (°C/W), q_{heat} is heat power applied to the baseplate (heat input) (W), Tj is the junction temperature (°C), and T_{in} is the inlet water temperature (°C).

$$R_{th} = \frac{T_j - T_{in}}{\dot{m} c_p \Delta T} \quad (2)$$

where m is the mass flow rate (kg/s) and c_p is the specific heat of water (kj/kgK).

In the experimental setup, measurements were made utilizing a power supply (accuracy: 0.2%, uncertainly: ±0.5), K-type thermocouples (accuracy: 0.4%, uncertainly: ±0.5), a data logger (accuracy: 0.1%, uncertainly: ±0.1) and multi-meter (accuracy: 0.1, uncertainly: ±0.05).

The maximum uncertainty of the R_{th};

$$WR_{th} = \sqrt{\left(\frac{\partial R_{hs}}{\partial T_{base}} \Delta T_{base}\right)^2 + \left(\frac{\partial R_{hs}}{\partial T_{in}} \Delta T_{in}\right)^2 + \left(\frac{\partial R_{hs}}{\partial m} \Delta m\right)^2 + \left(\frac{\partial R_{hs}}{\partial T_{out}} \Delta T_{out}\right)^2} \quad (3)$$

where WR_{th} is the total uncertainty (%) and R is the function uncertainty. The maximum uncertainty of the R_{th} is calculated as ±4.0% from the relevant parameters.

3. RESULT AND DISCUSSION

Fig. 3 shows the temperature changes at the measuring points and thus the time-dependent effect of water. The LED lamp was turned on for 1625 s during the experimentation, after which it was switched off. The Tj values had very low values as a result of the low applied power and the sizable heat sink employed. For LED lamps, a remarkably low Tj temperature was attained—a maximum of 33 °C. As the power applied to the LED increases, Tj will increase and move out of safe operating conditions. Indeed, Ramos-Alvarado et al. [2] in a microjet cooling application, when 5 W was applied to each LED, the Tj reached approximately 155 °C and exceeded the safe operating range. In the current study, when comparing the highest Tj values, the ALCBHS-LED system with water outperformed the system without water by 15%.

As the tank water temperature and the temperature of the water in contact with the hot source increased, the Tj value climbed accordingly. Similar results were found in Pan et al. [9]'s investigation, where the average temperature of the heat source increased by about 10 °C as the temperature of the cooling water climbed from 25 °C to 35 °C.

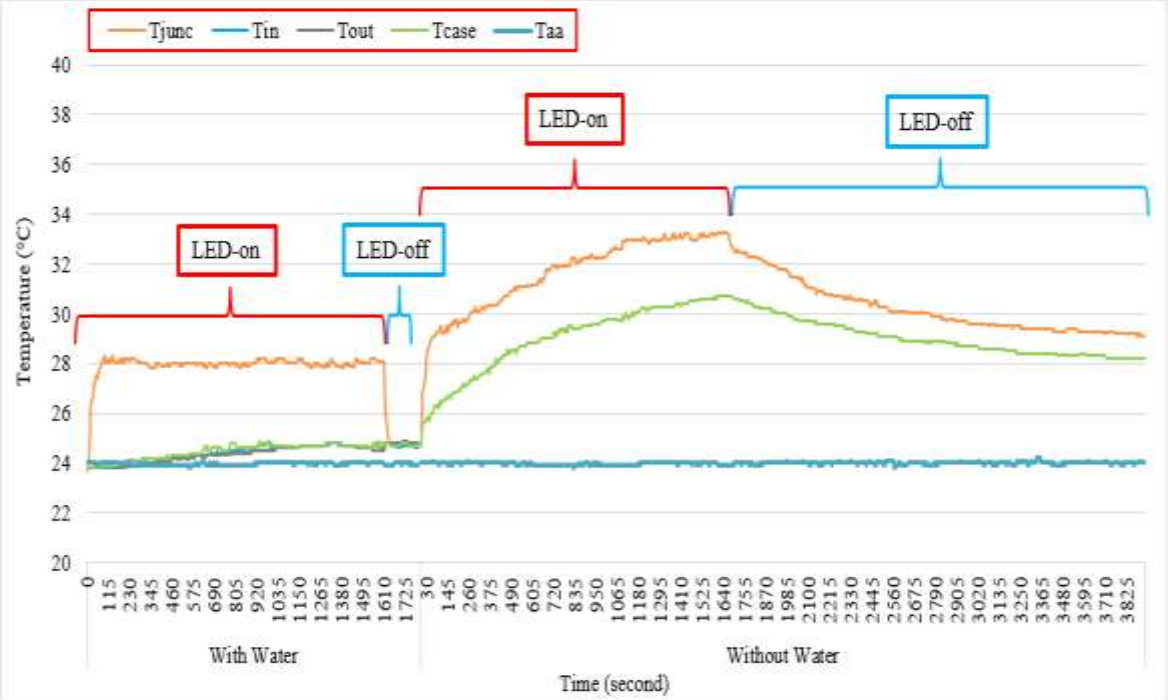
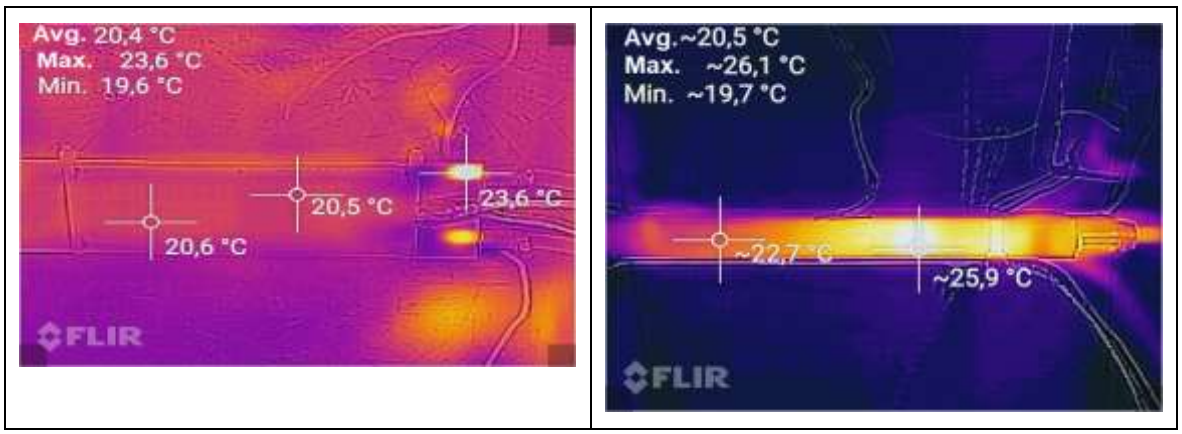
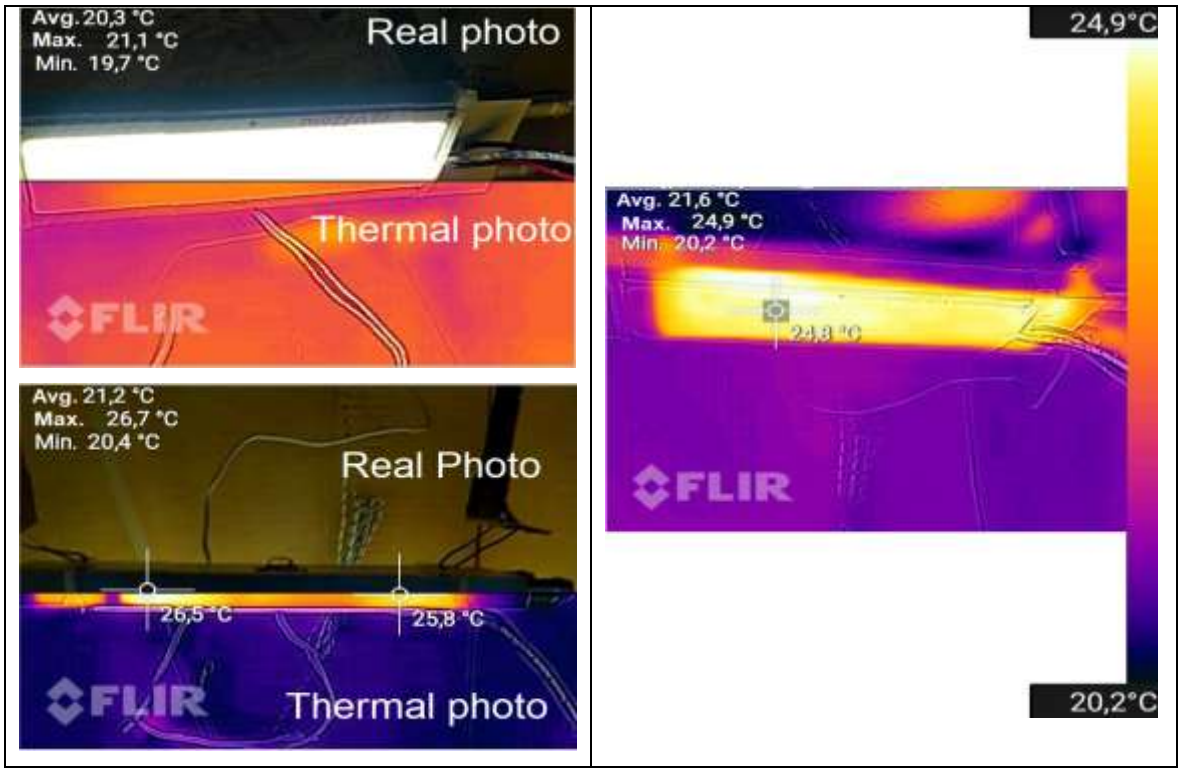


Fig. 3. Temperature variations over time at measuring locations on LED and HS

The thermal resistance was between 1.2 and 1.7 °C/W. Thermal resistance values were slightly higher. Whereas, in the study of Pan et al. [9], the thermal resistance of the best-performing micro-channel HS decreased from 0.072 °C/W to 0.063 °C/W when the cooling water flow rate increased from 30 to 70 l/h. Similarly, Hu et al. [10] state that the RBLCP should not be operated at low flow to ensure the temperature of the heat source is low. They achieved a minimum *Rth* of 0.0613 °C/W of N-type RBLCP when the heating power was 100 W and the flow rate was 35 l/h.

Fig. 4 demonstrates real and thermal photos taken at various periods and viewing angles. These images were captured while a performance test of a brand-new aluminum liquid cooling block for LED cooling was being conducted. On the ALCBHS, notably in the water-using system, a uniform temperature distribution was seen. The block was found to be capable of maintaining a constant surface temperature, suggesting that it would work well as a cooling solution for high-performance LED applications. The block is a highly effective material that allows heat to be dispersed quickly and evenly, preventing hot spots from forming and potentially damaging the LEDs. Therefore, the aluminum liquid cooling block can be used to dissipate heat generated by high-performance LEDs, which can generate a great deal of heat in a short amount of time.





a) with water b) without water

Fig. 4. Real-thermal images of ALCBHS-LED.

Fig. 5 shows the variation of luminous flux. From the start of the experiment, until the LED was turned off, the luminous flux showed a continuous downward trend. While ΔLw=19% in the system using water, ΔLww=28% in the system that does not use water. In the comparison conducted by considering the average values of the measured luminous flux, the data of the experiment using water was 5.63% more than the experiment without water.

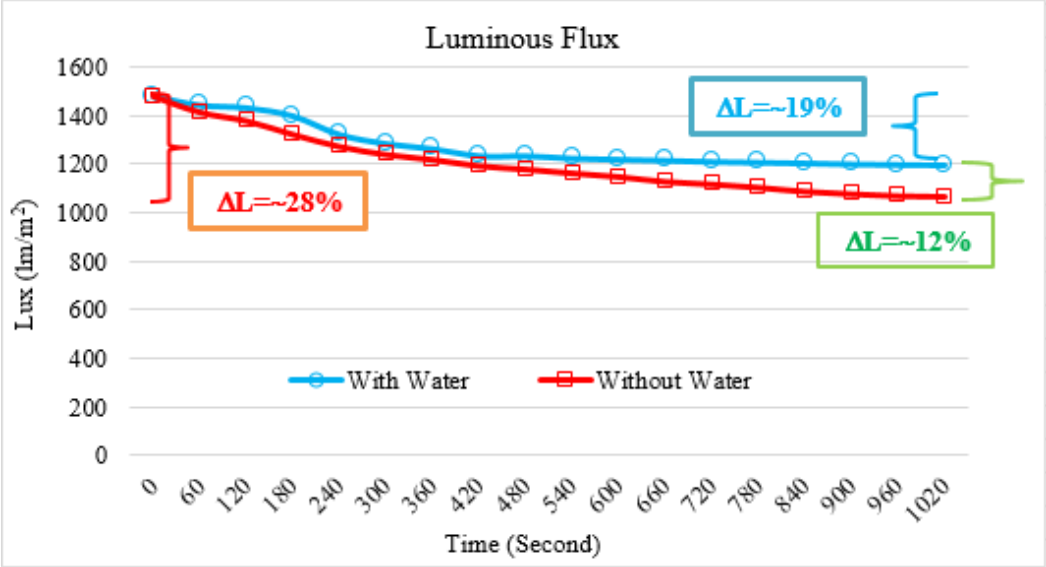


Fig. 5. Variation of luminous flux

Fig. 6 illustrates how current and voltage values changed throughout the experiments, or more specifically, how cooling type affected current and voltage values. A COB LED's label values are 1.2A and 12V, but for the sake of this study, the power supply is adjusted to 12V, and the LED's energy consumption values are revealed. The current and voltage values tended to steadily decline as the *Tj*

temperature rose, as shown in Fig. 6. When the power values are compared with the initial value, 20%, and 30% decrease were observed in the with and without water systems, respectively. The difference between the power values just before the LED is turned off is 13.11 %.

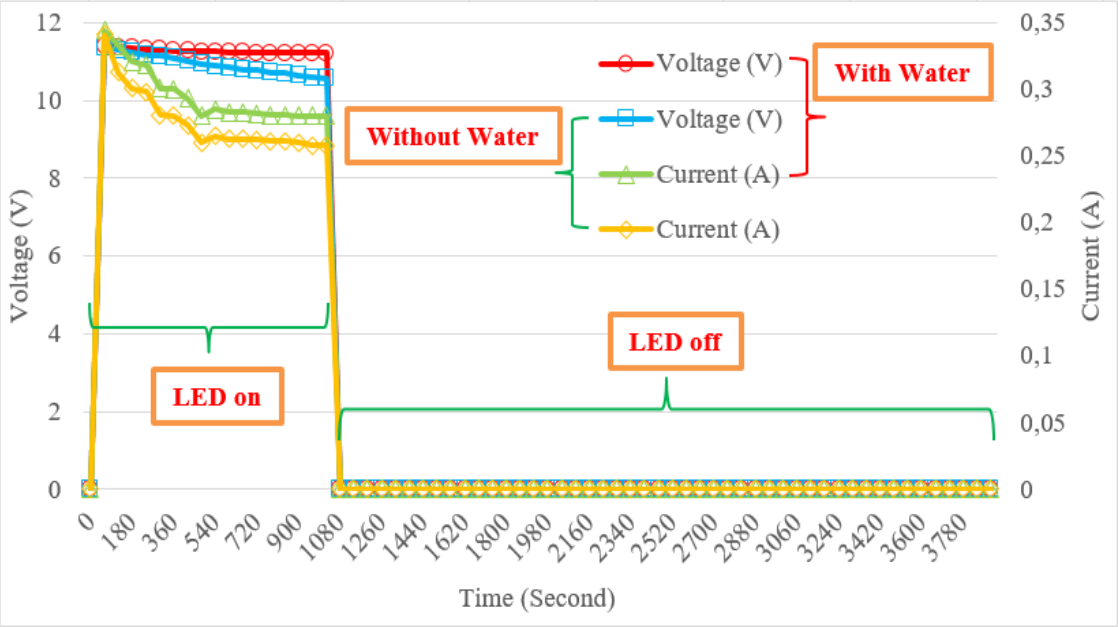


Fig. 6. Impact of cooling type on current and voltage values

4. CONCLUSION

This study revealed the triangular relationship between LED performance, temperature, and usage by testing the ALCBHS in LED cooling. An ALCBHS was tested for usability in LED cooling. The LED cooling performance of ALCBHS has been evaluated. The performances of the with and without water systems were compared. Accordingly, the following findings were obtained;

- The junction temperature (Tj) of the LED was kept in the safe zone.
- The ALCBHS-LED system with water outperformed the system without water by 15% when comparing the highest Tj values.
- The temperature resistance ranged from 1.2 to 1.7 °C/W.
- Before the LED turned off, there was a 13.11% difference in power values.
- The results of the experiment with water were 5.63% higher than the results of the experiment without water in the comparison that took into account the average values of the measured luminous flux.

Aluminum liquid heatsink heat sinks can maximize LED's efficiency and lifespan, reduce maintenance and replacement costs, and enhance the quality of light output. Also, they can have a positive impact on the design flexibility, aesthetics, and reliability of LED products. By improving cooling efficiency, the ALCBHS could help to extend the lifespan of high-performance chips and reduce the risk of LED failure.

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GƏNC NƏSLİN TƏRBİYƏSİNDƏ AİLƏNİN ROLU

THE ROLE OF THE FAMILY IN UPBRINGING OF THE YOUNG GENERATION

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ÖZET

Ailə tərbiyəsi məsələləri qədim zamanlardan bəri araşdırılır və bu gün də tədqiqat obyektinə çevrilməkdədir. Bu onun müasir dövr üçün öz aktuallığının qoruduğunun göstəricisidir. Uşağın şəxiyyətinin formalaşması kimi ailə tərbiyəsi lap qədim zamanlardan əsas vaitələrdən olmuşdur. Azərbaycanın görkəmli mütəfəkkirlərindən olan Nizami Gəncəvi qeyd etmişdir ki, uşaqların həyatda düzgün mövqe tutması üçün ailə tərbiyəsi xüsusi rol oynayır.

Uşaq şəxsiyyətinin formalaşmasında ailə uzun müddət ərzində əsas rol oynayır. Məlumdur ki, insanın xarakterinin, əməyə, mənəvi, ideya və mədəniyyət sərvətlərinə münasibətinin əsasları ailədə formalaşır. Ailənin tərbiyə mühitini şərtləndirən amilləri 2 tipə ayırmaq olar:

- Ana - ata, ana/ata - uşaqlar, bacı - qardaş arasındakı münasibətlər, onların şəxsi keyfiyyətləri və s.

- Ailənin maddi vəziyyəti, mənzil şəraiti və s.

Ailə həyatı şəxsiyyətin inkişafına bütövlükdə təsir göstərir. Bu cəhət birinci növbədə uşağın emosional aləmində əks olunur. Ana uşaq aləminin effektiv mərkəzidir. Uşağın xarici aləmə bütün münasibətləri ana vasitəsilə reallaşır. Bu münsibətlər sisteminə tədricən ata, bacı, qardaş və d. daxil olur.

Uşağın gələcək kişi və qadın kimi formalaşmasının əsasları da ailədə qoyulur. Uşaqların kişi və qadın rollarını mənimsəməsində valideynlərin davranışı mühümdür. Atanın bir kişi, ananın isə bir qadın kimi nümunəsi uşaqların oğlan və qıztək formalaşmasında eyni dərəcədə zəruridir.

Bildiyimiz kimi, gənclik dövrü özünüdərketmə meylinin inkişaf etdiyi bir dövrdür. Bunun sayəsində gənc özünün şəxsiyyətini daha dərindən tanıyır, özünün müsbət və mənfi cəhətlərini görür və onları düzgün idarəni öyrənir. Məhz bunun sayəsində gənc özünütəyinetmə, özünüidarəetmə, özünütərbiyəni öyrənir.

Bütün bu yuxarıda sadalanan amillər düzgün tədbiq oıunmazsa uşaq böyüyüb gənclik yaşına çatanda artıq bir sıra problemlərlə qarşılaşacaqdır. Buraya:

- özünü aşağı qiymətləmdirmə;
- özünü tanımama;
- öz duyğularını ifadə edə bilməmə;
- başqa insanlarla münasibət qurmaqda çətinlik və s. kimi problemləri aid etmək olar.

Ona görə də valideynlər bu məsələdə diqqətli olmalıdırlar və öz üzərilərində çalışmalı, maariflənməlidirlər.

Açar sözlər: ailə, gənc, tərbiyə, şəxsiyyət,uşaq, yaş, rol

ABSTRACT

Problems of family upbringing are investigated her in ancident times and turned to the investigation object today too. İt is the indicator its guard of urgency for modern time. The family plays the basic part of the child personality during the long time. The possible factors of causing the upbringing environment of the family separate to 2 types:

- Attitudes between mother - father, mother/father - children, sister - brother, their private quality etcs.

- The material situation of the family, flat condition etcs

The family life influences development of the personality completely. In the first place this side is reflected in the emotional world of the child. The bases of the forming as men and women in future are put in the family. As that we know youth period is the time developing self - awareness. Thanks to this young know his (her) personality more deep, he (she) sees his (her) positive and negative sides and learns them correct office.

When insufficiencies were in the attitudes in the family the young arises a few of problems:

- Yourself bottom (low) price
- Not knowing yourself
- Can not express senses
- The difficulties building attitudes with another people and etc.

The parents must be therefore in these problems attentive and must work yourselfers, must give educations.

Keywords: family, young, upbringing, personality, child, age, role

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MƏKTƏB VƏ BULLİNQ

SCHOOL AND BULLYING

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ÖZET

Müasir dövrün psixologiyası bir çox məsələləri araşdırır ki, onlardan biri də bullinq problemidir. Gəlin ilk öncə bullinqin nə olduğuna aydınlıq gətirək. UNICEF - ə görə bullinq uşaqların incidilməsinə səbəb olan ixtiyari və təkrar olaraq törədilmiş aqressiv davranışdır. Bullinq - qarşı tərəfin alçaldılmasıdır, təhqir olunmasıdır, ona qarşı yönəlmiş hər cür aqressiv davranışdır.Burada həm fiziki, həm psixoloji, emosional sferada təsir edəcək az öncə qeyd etdiyim davranış nümunələri aiddir. Bullinqin bir çox növləri vardır. Onlara aiddir: kiber bullinq, fiziki bullinq, şifahi bullinq, psixoloji bullinq, sosial bullinq və s.

Bullinqə biz hər yerdə rastlaşırıq: evdə, məktəbdə, avtobusda, parkda, yolda və s. Bu zaman yaşlıların həmin vəziyyətə etinasız yanaşmasının şahidi oluruq. Bunun bir çox səbəbləri olur. Onlardan biri və ən vacib olanı yaşlıların bu barədə məlumatsızlığıdır.

Bullinqdən danışarkən biz mütləq şəkildə onun üç tərəfinin olduğunu qeyd etməliyik.

- ✓ Bullinqi törədən
- ✓ Bullinqin qurbanı
- ✓ Bullinqin şahidləri

Bütün uşaqlar bullinqlə rastlaşırlar: ya qurban, ya törədən ya da şahid qismində. Bullerlər əsasən özlərini təsdiq etməyə, şəxsi üstünlüyünü sübut etməyə çalışırlar. Bullinqin şahidləri isə çox zaman qorxurlar ki, əgər kömək edərsə, özlərini də həmin aqibət gözləyir. Qrupdan təcrid olunmaqdan, tək qalmaqdan qorxurlar. Bullinqin qurbanı istənilən uşaq ola bilər. Lakin bu cür davranışın qurbanı olan uşalar digərlərindən daha çox seçilən olurlar. Hansı uşaqlar bullinqə məruz qalırlar:

- ✓ cavab qaytara bilməyən uşaqlara;
- ✓ fiziki cəhətdən güzsüz olan uşaqlar;
- ✓ ümumi qaydalara tabe olmayan uşaqlar;
- ✓ davranışlarında və xarici görünüşlərində fərqlilik olan uşaqlar;
- ✓ qapalı uşaqlar və s.

Müəllimlər də öz siniflərində bu cür halların baş verməməsi üçün bütün şagirdlərinə fərdi yanaşmalı, onlarda baş verən kiçik dəyişikliyi sezməlidir. Bu cür halların qarşısı alınmasa uşağı intahara belə sövq edə bilər. Ona görə də həm valideyn, həm müəllimlər, həm uşaqlar, bir sözlə bütün cəmiyyət birgə çalışmalıdır. Yəni cəmiyyətdə hər hansı bir hadısə baş verirsə ona biganə qalmamalıdır. Ancaq o zaman istədiyimiz nəticəni ala bilərik.

Açar sözlər: bullinq, məktəb, uşaq, davranış, müəllim, valideyn

ABSTRACT

The modern psychology investigates some problems, that one of them is bullying. Bullying is unwanted and aggressive behavior. This behavior is repeated, or has the potential to be repeated, over time.

When we are speaking about the bullying we must note that it is has three sides

- creator of the bullying (who bullied others)
- victims of the bullying (who are bullied)
- witnesses of the bullying (bystanders)

Bullying can affect everyone - those who are bully, who are bullied, and who witness bullying. Bullying is linked to many negative outcomes including impacts on mental health.

Kids who are bullied are feels: depression, anxiety, sadness, loneliness, loss to interest in activities, problems in sleeping and eating, health complaints, do not want to go to school and etc.

Kids who bully are more likely to abuse alcohol and another drugs in adolescence, get into fights, they may come from the family where there is bulling, aggression, or violence at home ant etc.

Kids who witness bullying are more likely to have increased mental health problems, including depression, anxiety, the faith to yourself being down, and etc.

We may say some ways for helping to the kids: tell an adult to teachers or parents, avoid the bully and use the buddy system, hold the anger, talk about it and etc.

In school the teacher must feel little change happening in his or her pupils. Although kids who are bullied at risk the suicide. For this everybody must be preoccupied.

Keywords: bullying, school, child, behavior, teacher, parent

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SAĞLIK HİZMETLERİNDE KALİTE YÖNETİMİNİ ETKİLEYEN FAKTÖRLER

FACTORS AFFECTING QUALITY MANAGEMENT IN HEALTH SERVICES

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ABSTRACT

Quality management practice in health institutions is more difficult than in other sectors. Human resources in healthcare institutions are extremely diverse. In line with the total participation principle of total quality management, it is necessary to bring together the human resources in many different segments on the same plane. The high level of specialization, which is especially valid for the health sector, causes the late training of health personnel. Implementation of total quality is both more difficult and more necessary in health institutions, which have high functional dependency and are complex by nature. Because it's about human life. In this context, the zero defect approach within the total quality management philosophy meets this requirement. We can examine the factors that affect the total quality in health services under two headings as external and internal factors. Total quality management direct competition in healthcare institutions does not provide an advantage. State hospitals are in a competition for quality certification, which improves service delivery. Competitive advantage in the public sector manifests itself in service delivery. From the point of view of the service user, when the reasons for choosing the hospital are examined, there are priorities such as private health insurance/SGK contracted hospital, the quality of the physician, being a reference physician, and being close to transportation. Implementation of total quality management in the health sector does not increase job stress. The same is true for the health sector, the service is a whole, so the service is evaluated together with the service provider. This is why work-related stress is increasing in service industries. However, when the TQM philosophy is not fully understood, documentation processes increase the workload and can create stress. It is emphasized that the philosophy of continuous improvement known as kaizen in the literature causes the control and supervision over the employees to increase and accelerates the already intense work tempo. Total quality management does not provide a direct competitive advantage in health institutions. From another point of view, it is a fact that it increases supervision and control, but it should be emphasized that it is not the management that performs the control. Service providers monitor each other during the process, which allows for immediate intervention and to prevent irreversible consequences, which are especially true for the health sector. Supervision of the administration can cause stress and low motivation. For this reason, it is ideal for the units to inspect themselves during the process and for the administration to detect its presence only when necessary.

Keywords: Health services, Total quality management, Administration, Health worker

ÖZET

Sağlık kurumlarında kalite yönetimi uygulaması diğer sektörlere göre daha zordur. Sağlık kurumlarında insan kaynağı son derece çeşitlilik gösterir. Toplam kalite yönetiminin toplam katılım ilkesi doğrultusunda çok farklı segmentteki insan kaynağını aynı düzlemde buluşturmak gereklidir. Özellikle sağlık sektörü için geçerli olan yüksek uzmanlaşma seviyesi sağlık personelinin geç yetişmesine neden olur. Fonksiyonel bağımlılığı yüksek ve yapısı gereği karmaşık kurumlar olan sağlık kurumlarında toplam kalite uygulaması hem daha güçtür hem de daha gereklidir. Çünkü söz konusu insan hayatıdır. Bu bağlamda toplam kalite yönetim felsefesi içerisinde yer alan sıfır hata yaklaşımı bu gerekliliği karşılar niteliktedir. Sağlık hizmetlerinde toplam kaliteyi ektileyen faktörleri dış ve iç faktörler olarak iki başlıkta inceleyebiliriz. Toplam kalite yönetimi sağlık kurumlarında doğrudan rekabet avantajı sağlamaz. Devlet hastaneleri kalite belgesi almak için bir rekabet içerisindedir bu da hizmet sunumunda

iyileşmeyi sağlar. Kamu sektöründe rekabet avantajı hizmet sunumunda kendini gösterir. Hizmeti kullanan açısından ise hastaların hastane tercih sebeplerini incelendiğinde önceliğin özel sağlık sigortası/sgk anlaşmalı hastane olması, hekimin kalitesi ve referans bir hekim olması, ulaşımın yakın olması gibi öncelikler yer almaktadır. Toplam kalite yönetiminin sağlık sektöründe uygulanması iş stresini artırmaz. Sağlık sektörü için de aynı durum geçerlidir hizmet bir bütündür bu yüzden hizmet, hizmeti sunanla birlikte değerlendirilir. Hizmet sektörlerindeki işe bağlı stresin artış nedeni budur. Ancak TKY felsefesi tam olarak kavranamadığında dokümantasyon işlemleri iş yükünü artırır ve buna bağlı stres oluşturabilir. Literatürde kaizen olarak bilinen sürekli gelişim felsefesinin çalışanların üzerindeki kontrolün ve denetimin artırılmasına neden olduğu, zaten yoğun olan iş temposunu daha da hızlandırdığı üzerinde durulmaktadır. Toplam kalite yönetimi sağlık kurumlarında doğrudan bir rekabet avantajı sağlamaz. Bir diğer açıdan denetimi ve kontrolü artırdığı bir gerçektir fakat burada denetimi yapanın yönetim olmadığı üzerinde durulması gerekir. Hizmet sunucuları süreç içerisinde birbirini denetler bu durum anında müdahaleye ve özellikle sağlık sektörü için geçerli olan geri dönüşü olmayan sonuçları engellemeye olanak sağlar. İdarenin denetimi strese ve motivasyon düşüklüğüne neden olabilir. Bu yüzden süreç içerisinde birimlerin kendi kendini denetlemesi idarenin sadece gerekli durumlarda varlığını sezdirmesi ideal olandır.

Anahtar kelimeler: Sağlık Hizmetleri, Toplam Kalite Yönetimi, Yönetim, Sağlık çalışanı

GİRİŞ

Kalitenin önemini, genellikle gerek sağlık kurumları ve gerekse hastalar onun yokluğundan kaynaklanan hayal kırıklıklarına düştüklerinde, gereksiz zaman kaybına uğradıklarında ve lüzumsuz maliyetlerle karşı karşıya geldiklerinde daha iyi anlarlar. Kalite, günümüzde sağlık kurumlarının temel gündem maddelerinden biridir. Sağlık hizmeti sunan kuruluşlardan gittikçe daha kaliteli ve daha ucuz hizmet sunmaları talep edilmektedir. Sağlık bakım endüstrisindeki değişiklikler, yeni düzenlemeler, artan rekabet ve tüketicilerin baskısı karşısında sağlık kuruluşları daha maliyet-etkili, daha yüksek kaliteli hizmet sunmanın yollarını aramaktadır (Anadolu Üniversitesi Yayınları, 2013).

Kalitenin iyileştirilmesi ve geliştirilmesi hastaneler açısından önemli bir görev haline gelmiştir. Kalitenin çekici özelliklerinden birisi onun pozitif yönlü olmasıdır. Gerçekte hiç kimse kaliteye karşı değildir, herkes kalite ister. Ancak kaliteden ne kastedildiği o kadar açık ifade edilmez. Kaliteden söz etmek her türden firmada ve örgütlerde cazibe taşır ve sık kullanılan onur verici bir terimdir. En geniş anlamda kalite, ürün ya da hizmetin bir özelliğidir.

Toplam kalite yönetiminin sağlık sektöründe uygulanması iş stresini artırmaz. Emek yoğun sektörlerde çalışanlar direkt olarak tüketicilerin denetimi altındadır. Sağlık sektörü için de aynı durum geçerlidir hizmet bir bütündür bu yüzden hizmet, hizmeti sunanla birlikte değerlendirilir. Hizmet sektörlerindeki işe bağlı stresin artış nedeni budur. Ancak TKY felsefesi tam olarak kavranamadığında dokümantasyon işlemleri iş yükünü artırır ve buna bağlı stres oluşturabilir.

Toplam kalite yönetimi sağlık kurumlarında doğrudan bir rekabet avantajı sağlamaz. Toplam kalite yönetimi uygulamasının sağladığı rekabet avantajı kamu ve özel sektörde farklılık gösterir. Kamu hizmetlerindeki nicelik-nitelik ikilemi uygulamanın farklılık göstermesindeki temel nedendir. Kamu sektöründeki sağlık hizmetlerinde talep fazlası bulunmaktadır ve bu talep sürekli artmaktadır. Oluşan bu talep fazlası hizmeti kullananların istediği kalitede hizmet almasını güçleştirmektedir. Sağlık personeli sayısındaki artış ile nüfus artışı arasındaki dengesizlik var olduğu sürece bu kaliteli hizmet ihtiyacının karşılanması güçtür. Kamu sektöründe rekabet avantajı hizmet sunumunda kendini gösterir. Devlet hastaneleri kalite belgesi almak için bir rekabet içerisindedir bu da hizmet sunumunda iyileşmeyi sağlar. Hizmeti kullanan açısından ise hastaların hastane tercih sebeplerini incelendiğinde önceliğin özel sağlık sigortası/sgk anlaşmalı hastane olması, hekimin kalitesi ve referans bir hekim olması, ulaşımın yakın olması gibi öncelikler yer almaktadır. Kalite hastanın hastane seçiminde ön sıralarda yer alan bir kriter değildir. Bir hastanenin akredite olması ya da toplam kalite yönetimini mükemmel şekilde uygulaması hastaneye doğrudan bir rekabet avantajı sağlamaz. Toplam Kalite uygulamasında işletmenin misyonu, vizyonu ve politikasını belirlemek yöneticinin ve liderin en önemli görevlerinden biridir. Bazı kuruluşlarda üst yönetimin hedef, misyon ve vizyon yetersizliği TKY uygulamalarında başarısızlığa neden olan en önemli faktörlerden biridir (Yatkın, 2003).

KALİTE KAVRAMI

Kalitenin evrensel olarak kabul edilen bir tanımı bulunmamakla birlikte, çeşitli tanımların ortak ögeleri vardır:

- Kalite, müşteri beklentilerini karşılamayı veya aşmayı içerir,
- Kalite dinamiktir,
- Kalite iyileştirilebilir.

Kalite kavramı zaman içinde sürekli gelişmektedir. İş hayatında kalmak ve varlığını sürdürmek için, üretim ve hizmet endüstrileri uzun zamandır müşteri beklentilerini karşılamanın daha iyi yollarını bulmaya uğraşmaktadır. Sağlık bakım profesyonelleri "öncelikle zarar verme" ilkesine göre çalışmaktadır. Bunu gerçekleştirmek için, hasta bakımının yeni ve daha iyi yollarını bulmak hep bir öncelik olmuştur. Amaç –kaliteli ürünler ve hizmetler- bütün endüstrilerde aynı olmakla beraber, sağlık hizmetlerinde bu amacın gerçekleştirilmesinde kullanılan yöntemler, diğer endüstrilerden biraz farklı şekilde gelişmiştir. Bu bağlamda; Donabedian, Maxwell, Ovretveit, Amerikan Tabipler Birliği, ABD Tıp Enstitüsü tarafından yapılan tanımlar ve endüstriyel kalite tanımı incelenmektedir. Daha sonra, endüstriyel kalitenin gelişiminde öncü yazarlar ve düşünürler olarak kabul edilen Shewhart, Deming, Feigenbaum, Juran, Crosby ve Ishikawa'nın katkıları açıklanmaktadır. Sağlık hizmetlerinde kalitenin gelişimi de açıklandıktan sonra kalite iyileştirmede yöneticinin rolü üzerinde durulmaktadır (Anadolu Üniversitesi Yayınları, 2013). Modern kalite anlayışının kalite kontrolünden, toplam kalite yönetimine geçirdiği evrimler, aslında yönetim biliminde yaşanan evrimler ile paralel bir seyir izlemektedir. TKY'de "Müşteri Odaklılığı", "Müşteri Tatmini" kavramları ön plana çıkmıştır (Yürütücü, 2003).

SAĞLIK HİZMETLERİNDE KALİTE YÖNETİMİNİ ETKİLEYEN FAKTÖRLER

1. Dış Faktörler

- **Teknolojik Değişim ve Yönetim - Çevre İlişkisi**

Küreselleşmekte olan dünyada teknoloji alanında yaşanan akıl almaz gelişmeler yeni yönetim anlayışlarına, yeni tüketici profillerine, pazar alanlarına dek pek çok alan üzerinde etkisini göstermiştir. Teknoloji alanında yaşanan gelişmelere paralel olarak insanların bulundukları yerden başka bir yere oldukça kısa bir zaman diliminde ve kolaylıkla ulaşabilmeleri sağlanmış olup bu duruma paralel olarak daha önce ulaşamadıkları yerleri de yaşam alanı haline getirmelerini sağlamıştır. Belirtilen bu hususlar sağlık bakımında bulaşıcı hastalıklarını yayılmasına da zemin hazırlamıştır. Doğal yaşam alanlarına yerleşilen çeşitli hayvanlar ara konak olarak farklı organizmalara ev sahipliği yapmakta olup bunlar da mikrop türlerinin farklılaşarak yeni hastalıklara davetiye çıkarmaktadır. Hayvan ve İnsanda ayrı ayrı bulunan virüsler birleşip değişim geçirdiğinde hayvanların isimlerine göre adlandırılmakta olup bunlar İnsanlar için öldürücü hale gelebilmektedir.

Yakın zamanda yaşanmış olan domuz gribi, kuş gribi gibi salgın hastalıkların dünya genelinde çok sayıda kişinin yaşamını yitirmesine yol açtığı bilinen bir gerçektir. Bu tarz salgın hastalıkların hızlı bir şekilde yayılması DSÖ'yü harekete geçirmiştir. Bilim adamları ortaya çıkabilecek olan tablolar için gelişmekte olan teknolojiyle laboratuvar ortamında çeşitli testler yapmakta ve bütün durumları dikkate almaktadır. Hizmet sektöründe, bilhassa da sağlıkta teknoloji son derece hassas değerler üzerine inşa edilmiştir. Tanı ve yeni tedavi yöntemlerinin 01UŞturulmasında her ne kadar teknoloji son derece önemli bir rol oynasa da teknoloji kullananın İnsan olduğu akıldan çıkarılmamalıdır. Bu durum sağlık kurum ve kuruluşlarında yönetici konumundakiler tarafından dikkate alınmalı ve bu bağlamda da çalışanlara yönelik hizmet içi eğitimler verilmelidir (Kıraç, 2016).

- **Ekonomik Şartlar, Mali Kaynaklar**

Ekonomi sosyal belirleyicilerin büyük bölümünü etkilemekte olup bunlar sağlık kurum ve kuruluşlarında maddi sıkıntılar, kamuda sağlık için ayrılan payda düşüş şeklinde örneklendirilebilir. Kişiler üzerinde ise bu etki sosyal belirleyicilerin neden olduğu fiziksel ve psikolojik sorunlar şeklinde ortaya çıkmaktadır (Belek, 2010).

Anayasa ile belirlenen eğitim, sağlık, konut hakkı gibi görevlerin devlet tarafından uygun öncelikleri dikkate alınarak mali kaynakların yeterliliği noktasında yerine getirmekte olup bu nedenle de ekonomik koşullar son derece önemlidir. Buna karşın özel sektörde ise ekonomi, enflasyon ve işsizlik gibi hususlar piyasa üzerinde doğrudan etkiye sahip olup bu durum hastaneye müracaat sayısını etkilemektedir. Ekonomik ve sağlık birbirlerini karşılıklı olarak etkilemektedir. İyi ekonomi beraberinde sağlıklı bireyleri getirir. Sağlıklı bireyler sağlıksız olanlardan daha verimli ve etkin çalışmakta, stres ile çok daha iyi başa çıkmaktadır. Buna karşın kötü ekonomiye bağlı olarak kişilerin ruhsal sağlıkları bozulmakta olup bu da özellikle tütün, alkol ve madde bağımlılığında artışa yol açarak sağlığı tehdit etmektedir (Karadağ vd. 2009).

Maddi sıkıntı içerisinde olanlar tedavi edici, özellikle de koruyucu sağlık hizmeti almayı erteleme eğiliminde olmaktadırlar. Bu durum da uzun dönemde son derece önemli sağlık problemlerine yol açmaktadır.

- **Hükümet ve Altyapı**

Sağlık hizmetlerinin adil ve sürdürülebilir olmasında diğer sosyal haklardaki gibi siyasal bir taraf söz konusudur. Sağlık politikaları bu amaçlara paralel olarak işlev görmektedir. Bununla birlikte politika ve kalite birbirleriyle ters düşen kavramlardır. Politika çabuk sonuç almayı ve önce ideolojinin isteklerini karşılamayı ön görür. Kalite ise, yavaş ama süreklilik ve rasyonel-bilimsellik ister (Yolcuoğlu, 2001).

TKY'nin uygulanmasında siyasi oluşumun yanı sıra kültür belirleyici olarak rol oynar. Özel ve kamu sektörlerinin her ikisi için hükümetler tarafından gerekli olan altyapı oluşturulmak durumundadır. Kamuda siyasal oluşum özel sektöre kıyasla kendini çok daha fazla göstermektedir. Fakat özel sektörün siyasal özgürlük alanı her kadar çok geniş olsa da hükümetler kanun ve düzenlemeler ile vatandaşları koruyacak olan kuralları belirlerler.

2. İç Faktörler

- **Personelin Motivasyonu ve Örgüt Kültürü**

TKY'nin hizmet sektöründe uygulanması hizmetlerin emek yoğun olmaları ve stoklanamamaları gibi sebeplerden ötürü diğer sektörler ile karşılaştırıldığında çok daha güçtür. Sağlık kurumlarındaysa işlerin kompleks olması, çalışanların her birisine düşen kalite payının artmasına yol açmaktadır. Emek-yoğun firmalarda hizmetlerin sunumu ve alınan hizmetler bir bütün olarak değerlendirildiğinden bilhassa özel sağlık kuruluşlarının karlılık amaçlarını gerçekleştirebilmek adına ise yönetimin çalışanlarının memnuniyet düzeylerini artırmaları gerekir. Konuyla ilgili olarak gerçekleştirilen bazı çalışmalarda maddi ödül verilmesinin yanı sıra çalışanların yönetime dahil olmaları, takdir edilmeleri ve kendilerini çalışmakta oldukları işletmeye ait hissetmelerinin de önemli motivasyon kaynaklarından olduğu belirtilmiştir (Kıraç, 2016). TKY, çalışanların üzerinde durdukları önemli konular arasında yer alan iş güvencesini de sağlar. Geçmiş yıllarda gerçekleştirilen pek çok verimlilik çalışması bilhassa sendikalara bağlı olarak çalışanların işten atılmalarına yol açmıştır (Şimşek, 2007).

Çalışılan işletmenin kültürü, işletme bünyesinde çalışmakta olanların ortak amaç, tutum-davranış ve değer yargıları gibi pek çok faktörün birleşimiyle ortaya çıkmaktadır. Örgüt kültürünün belirlenmesinde kişilerin kendisi doğrudan etkiye sahip Olduğundan oluşturdukları kurallara bağlı davranırlar. Bu nedenle de TKY ilkeleri arasında yer alan liderlik işletmelerde daha etkin olarak kullanıldığında işletmelerin Performansı da doğal olarak artar. Örgüt kültürü, kişilerin örgüt bünyesinde üstlenmiş Oldukları rollerini açıkça belirlemelerine katkıda bulunur. Örgüt kültürünün doğru bir şekilde oluşturulması halinde örgütsel bağlılık, örgütsel güven ve kuvvetli iletişim de sağlanmış olur (Kıraç, 2016).

- **Makine ve Teçhizat**

Kaliteye dair beklenti artışı ve yaşanan hızlı değişim farklı teçhizat ve makine üretilmesine ve kullanılmasına sevk etmektedir. Makineleşme beraberinde verimliliği getirirken üretim maliyetlerinde de düşüş sağlar. Günümüzde hastanelerde MIR, ultrason tekniklerinin daha ileri aşaması olan renkli doppler, anjiografi ve röntgen gibi pek çok makine söz konusudur (Kıraç, 2016).

- **Modern İş Metotları ve Yönetim Biçimleri**

Hastalıkların tedavisinde kullanılmakta olan yöntemlerde yaşanan değişimler ve yenilikler ve bunlara bağlı olarak hastaların talep ve beklentilerinde meydana gelen hızlı değişime uyum sağlama, zorlu rekabete uyum sağlayabilme, teknolojinin sağlık alanında etkisini göstermesinin bir sonucudur. Sağlık kurum ve kuruluşları yaşanan hızlı değişime uyum sağlayabilmek adına mevcut kaynaklarını en verimli ve etkin olarak kullanabilmelerini sağlayan yönetim tekniklerine gerek duyarlar. Modem iş yöntemleri çalışanların çalışma düzenlerini, sergilemiş oldukları hareketlerini, işyeri düzenini, makinelerin kullanım şekillerini, etkililik ve verimlilik çerçevesinde oldukça geniş bir yelpazede ele alarak gerçekleştirilmekte olan işlerin kalitesinde artışı hedeflemektedir. Modern iş yöntemleri süreci incelemek suretiyle işler için gerekli olan zamanı belirlemekte, bu bağlamda da gereksiz olan işlemlerin süreçten çıkarılmalarını sağlamaktadır. Modem iş yöntemleri TKY'deki süreç kontrolüyle aynı amacı gütmektedir. Gereksiz olan işlerin süreçten uzaklaştırılıp maliyetlerin düşürülmesini ve verimlilik artışını sağlar. Bu yöntem sağlık kurum ve kuruluşlarında bekleme süresinin uzunluğuna dair incelemelerde de kullanılabilir. Aynı zamanda çoğunlukla özel hastaneler gibi laboratuvar ve radyoloji verimlerinin birbirine yakın olduğu kurum ve kuruluşlarda dikkat çeken bir yöntemdir. Hastalıkların tanısında çoğunlukla birlikte istenmekte olan tetkiklerin hastaları hastanede dolaştırmamak için son derece güzel bir Şekilde tasarlandığı düşünülebilir. TKY düşüncesinin diğer yönetim yaklaşımlarına kıyasla daha katılımcı ve demokratik olması da kalitenin artırılmasında son derece önemli rol oynar (Kıraç, 2016).

Yönetim tarzı ve uygulamaları, örgütsel tasarım, personel politikası, iş tasarımı işlemlerin planlanması ve kontrolü, bakım ve satın alma politikaları, sermaye maliyetler, sermaye kaynakları, bütçe sistemleri ve maliyet kontrol teknikleri üzerinde etkilidir. Bu düşünceden hareketle TKY'nin entegre bir faaliyet olduğu yargısına ulaşılabilir. Kamu sektöründe var olan bürokrasi çalışanların görev ve sorumluluklarını en ince ayrıntısına kadar belirlemiştir. Kamudaki iş güvencesi bu bürokrasi nedeniyle süreç içerisindeki çalışanların görev ve sorumluluktan kaçma davranışı olarak kendini gösterir. Bürokratik organizasyon içerisinde yer alan çalışanların gerekli yasal düzenlemeler ve güçlü bir siyasi irade ile yenilenmesi ve toplam kalite yönetimine uygun yapıya getirilmesi gerekir (Kıraç, 2016).

SONUÇ

Sağlık kurumlarında kalite yönetimi uygulaması diğer sektörlere göre daha zordur. Sağlık kurumlarında insan kaynağı son derece çeşitlilik gösterir. Toplam kalite yönetiminin toplam katılım ilkesi doğrultusunda çok farklı segmentteki insan kaynağını aynı düzlemde buluşturmak gereklidir. Özellikle sağlık sektörü için geçerli olan yüksek uzmanlaşma seviyesi sağlık personelinin geç yetişmesine neden olur. Fonksiyonel bağımlılığı yüksek ve yapısı gereği karmaşık kurumlar olan sağlık kurumlarında toplam kalite uygulaması hem daha güçtür hem de daha gereklidir. Çünkü söz konusu insan hayatıdır. Bu bağlamda toplam kalite yönetim felsefesi içerisinde yer alan sıfır hata yaklaşımı bu gerekliliği karşılar niteliktedir. Literatürde kaizen olarak bilinen sürekli gelişim felsefesinin çalışanların üzerindeki kontrolün ve denetimin artırılmasına neden olduğu, zaten yoğun olan iş temposunu daha da hızlandırdığı üzerinde durulmaktadır. Toplam kalite yönetimi uzun vadede etkili bir yönetim felsefesidir küçük küçük adımlarla sürekli gelişmeyi ön görür. Gelişmeler sıçrama şeklinde olmadığı için iş temposuna artırmaya yönelik stres yaratabilmesi pek mümkün değildir. Bir diğer açıdan denetimi ve kontrolü artırdığı bir gerçektir fakat burada denetimi yapanın yönetim olmadığı üzerinde durulması gerekir. Hizmet sunucuları süreç içerisinde birbirini denetler bu durum anında müdahaleye ve özellikle sağlık sektörü için geçerli olan geri dönüşü olmayan sonuçları engellemeye olanak sağlar. idarenin denetimi strese ve motivasyon düşüklüğüne neden olabilir. Bu yüzden süreç içerisinde birimlerin kendi kendini denetlemesi idarenin sadece gerekli durumlarda varlığını sezdirmesi ideal olandır.

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TÜRKİYE'DE TOPLAM KALİTE YÖNETİMİ

TOTAL QUALITY MANAGEMENT IN TURKEY

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ABSTRACT

Having overcome the War of Independence with limited resources, realized the secular structuring of the republican order, the transition to democracy, in one of the geopolitical and difficult regions of the globe, and internalized Atatürk's revolutions, Turkey is a nation that has passed the test of change. At this point, the source of raising the quality of life of the society should be seen in the synergy of contemporary Total Quality Management. Total Quality Management applications are the resources we can benefit from while determining our place in the new world order. Significant changes have emerged in the management structure of large-scale industrial establishments in Turkey with the years 1990-111. It is seen that the modern management approach has started to be widely used instead of the traditional management approach in industrial establishments. In this modern management approach, the concepts of "quality" and "human resources" have been used prominently instead of the concepts of "profit" and "production resources". Modern management methods emphasize the importance of human resources as well as physical resources in achieving certain goals of the enterprise. With the 1980s, the opening of the economy through liberal policies in Turkey made it a necessity for industrial organizations to adapt to the competitive conditions in international markets. Turkey's entry into the customs union in 1996 further accelerated this process. Modern management methods have become so popular in the second half of the 1990s that they are not only limited to private sector organizations, but also started to become widespread in the public sector, especially in municipalities, hospitals and educational institutions. Quality is not a technical issue; It is the job of loving people, loving employees, loving your customers, loving what you do. When emotion is involved, attachment and dedication also come into play, so Total Quality Management. is more of a people-oriented approach than being customer-oriented. In the 1990s, human resources management departments began to replace the existing personnel directorates in large companies in Turkey. This new generation of managers has the knowledge to closely follow international developments, communication tools such as the web, and information resources such as benefiting from national and international consultancy firms that are experts in the education and training of modern management methods. As a technical term, the concept of "quality" covers all the processes related to the relations of the companies with the suppliers, in-house production processes, group-intensive improvement studies, research and development activities, marketing channels, sales dealers, after-sales services and determination of customer demands. Today, our country is facing a political and social reform process. We are at a crossroads opening up to renewal and restructuring in every field by reviewing the old ways of working and management. The entry of Total Quality Management into the Budget Law and the acceptance of Total Quality Management. as a guide by the Ministry of National Education and the Ministry of Labor are the leading reflections of the reform process that started in the public sphere in Turkey. If we can disseminate and sustain the examples of change Turkey needs, the reform process in question will be successful.

Keywords: Total quality management, Management style, Reform

ÖZET

Kurtuluş Savaşını sınırlı kaynaklarla aşan, Cumhuriyet düzeninin laik yapılanmasını, demokrasiye geçişi, yerkürenin jeopolitik, zor bölgelerinden birinde gerçekleştiren, Atatürk devrimlerini özümseyen Türkiye, değişim sınavları vermiş bir ulustur. Bu noktada sonra, toplumun yaşam kalitesini

yükseltmenin kaynağı, çağdaş Toplam Kalite Yönetiminin sinerjisinde görülmelidir. Yeni dünya düzenindeki yerimizi tayin ederken yararlanabileceğimiz kaynak TKY uygulamalarıdır. Türkiye'de 1990 111 yıllar ile birlikte büyük ölçekli sanayi kuruluşlarının yönetim yapısında önemli değişiklikler ortaya çıkmıştır. Sanayi kuruluşlarında geleneksel yönetim anlayışının yerine modem yönetim anlayışının yaygın bir şekilde kullanılmaya başlandığı görülmektedir. Bu modem yönetim anlayışında, "kar" ve "üretim kaynakları" kavramları yerine "kalite" ve "İnsan kaynakları" kavramları belirgin bir şekilde kullanılmaya başlanmıştır. Modem yönetim metotları işletmenin belirli hedeflere ulaşmasında fiziksel kaynaklar kadar insan kaynaklarının da önemini vurgulamaktadır. 1980'li yıllar ile birlikte Türkiye'de liberal politikalar yoluyla ekonominin dışarıya açılması sanayi kuruluşlarının uluslararası piyasalardaki rekabet koşullarına uyum sağlamasını bir zorunluluk haline getirmiştir. 1996 yılında Türkiye'nin gümrük birliğine girmesi bu süreci daha da hızlandırmıştır. Modem yönetim metotları 1990'lı yılların ikinci yarısı itibarıyla o kadar çok popüler hale gelmiştir ki yalnızca özel sektör kuruluşları ile sınırlı kalmamış başta belediyeler, hastaneler ve eğitim kurumları olmak üzere kamu sektöründe de yaygınlaşmaya başlamıştır. Kalite teknik bir konu değildir; İnsanı sevme, çalışanı sevme, müşterini sevme, yaptığın işi sevme işidir. İşin içine duygu girdiği zaman, bağlanma ve adanma da girer, bu nedenle TKY, müşteri odaklı olmaktan öte, insan odaklı bir anlayıştır. 1990'lı yıllarda Türkiye'de büyük firmalarda daha önce var olan personel müdürlüklerinin yerini insan kaynakları yönetimi bölümleri almaya başlamıştır. Bu yeni yönetici kuşak uluslararası gelişmeleri yakından takip edebilecek bilgi donanımına, web gibi iletişim araçlarına ve modem yönetim metotlarının eğitimi ve öğretimi konusunda uzman olan ulusal ve uluslararası danışmanlık firmalarından yararlanma gibi bilgi kaynaklarına sahiptir. Teknik bir terim olarak "kalite" kavramı firmaların geri bağlantılarını yaptığı tedarikçilerle ilişkilerini, firma içi üretim süreçlerini, grup yoğunluklu iyileştirme Çalışmalarını, araştırma geliştirme faaliyetlerini, pazarlama kanallarını, satış bayilerini, satış sonrası hizmetleri ve müşteri taleplerinin belirlenmesi ile ilgili süreçlerin tümünü kapsamaktadır. Bugün, ülkemiz siyasal ve sosyal bir reform süreciyle karşı karşıya durumdadır. Eski Çalışma ve yönetim biçimlerini gözden geçirerek her alanda yenilenmeye, yeniden yapılanmaya açılan bir kavşak noktasındayız. Toplam Kalite Yönetiminin Bütçe Kanunu'na girişi, Milli Eğitim Bakanlığı'nın ve Çalışma Bakanlığının TKY'yi rehber olarak kabul etmesi, Türkiye'de kamusal alanda başlayan reform sürecinin öncü yansımalarıdır. Türkiye'nin ihtiyaç duyduğu değişim örneklerini yaygınlaştırabilir ve sürdürülebilir hale getirirsek söz konusu reform süreci başarıya ulaşacaktır.

Anahtar kelimeler: Toplam kalite yönetimi, Yönetim şekli, Reform

GİRİŞ

Toplam kalite yönetimi (TKY) örgütlerde kalitenin artırılmasına yönelik bir yönetim anlayışıdır. TKY, dünya genelinde en geniş küresel tırmanışı meydana getirmekte olup bu kadar önemli bir yönetim anlayışıyla ilgili çok sayıda farklı görüş ve tanım söz konusudur. Bu farklılıkların da genel olarak sektör farklılıklarından ileri geldiği söylenebilir (Kaygın, 2012).

TKY'deki temel amaç tüketici ihtiyaçlarının belirlenmesi ve bu yönde hatasız çıktı sağlanarak memnuniyetin sağlanmasıdır. TKY ile tüketici talep ve ihtiyaçları belirlenirken yalnızca içerisinde bulunulan zamanı değil gelecekte tüketicilerin ne tür ihtiyaçları olacağını da belirlenmeye çalışılmaktadır. Diğer bir açıdan ele alınacak olursa TKY düşüncesinde müşteri memnuniyetini sağlamaya ilişkin kaliteli ürün ve hizmet yaratma çabasını birkaç kişinin omuzlarına yüklemekten ziyade herkesle Paylaşmaya çalışılır. Bu nedenle de bireysel olarak gerçekleştirilmez, bir grup etkinliğidir (Yaş, 2009).

Toplam kalite yönetimi uzun dönemde tüketicilerin tatmin olmalarını başarmayı, kendi çalışanı ve aynı zamanda toplum için avantajlar elde edilmesini amaçlayan bir yönetim anlayışı olup adından da anlaşılacağı üzere kalite üretimine yoğunlaşmakta ve bütün çalışanların katılımı esasına dayanmaktadır (Efil, 2003). TKY çalışanlar, müşteriler tedarikçiler, ortaklar, bayiler vb. pek çok paydaşın memnun olmalarını baz alan, ürün veya hizmetin örgütsel proses, sistemlerin tasarımı ve her daim iyileştirilerek beklentilerin üstünde olmasını amaçlayan bir yönetim anlayışıdır (Wilkison, 1992).

TKY bir işletmede gerçekleşmekte olan bütün süreçlerin, faaliyetlerin her daim iyileştirilmesi ve örgüt bünyesindeki bütün çalışanların aktif katılımı ile müşteriler, çalışanlar ve toplumun memnun edilmek suretiyle kar elde edilmesi şeklinde ifade edilebilir (Ören, 2002).

TKY'yi; insana değer veren, motivasyonun para dışında yollar ile de sağlanabileceği düşüncesine sahip olan, insanları birbiriyle yarıştırmayıp takım ruhunu tesis eden, ücretlendirme hususunda yaşam boyu istihdamı sağlayacak biçimde, kıdemiyle daha fazla ücret temeline göre maaş veren ve aynı işte uzmanlaşmaktan ziyade rotasyonla iş zenginleştirilmesini öne çıkaran bir sistem olarak tanımlamaktadır. TKY ile alakalı olarak yapılan tanımlamalar ve açıklamalar dikkate alındığında TKY'nin son derece kapsamlı bir kavram olduğu görülmektedir. Bu durum TKY ile ilgili ortak bir tanımın yapılmasını güçleştirmektedir (Doğan vd., 2000).

Günümüz zorlu rekabet ortamı ve küresel ölçekli ekonomik krizler işletmelerin varlıklarını devam ettirmelerini oldukça güçleştirmiş olup TKY bu durumla ilgili olarak işletmelere en fazla katkıyı sağlayan anlayışların başında yer almaktadır. Günümüz dünyasında değişime hızlı bir şekilde adapte olan işletmeler rakiplerinden daha avantajlı işletmeler olup TKY hızlı ve kolay adaptasyonu sağladığından işletmelerin üzerinde en fazla durdukları yönetim anlayışlarından birisi haline gelmiştir (Yıldız, 2011).

TOPLAM KALİTE YÖNETİMİ

Toplam kalite yönetimi kavramı daha önce bahsedilen kalite ve toplam kalite basamaklarının oluşmasının ardından ortaya çıkmış olan bir yönetim düşüncesidir. 1900'lerde gelişmeye başlamış olan bu yeni yönetim felsefesinde müşterilere sunulmakta olan ürün ve hizmetlerin kaliteli olma anlayışı yatmaktadır. Toplam kalite yönetimi herhangi bir örgüt bünyesinde yapılmakta olan bütün faaliyetlerde tüketici istek ve taleplerinin karşılanabilmesi için gerekli olan insan, yönetim, yapılan iş, ürün ve hizmet kalitelerinin sistem dahilinde, örgüt bünyesindeki bütün çalışanların katılımları, hedef ve düşünce birlikleri sağlanmak suretiyle ele alınmasını ve geliştirilmesini ifade etmektedir (Şimşek, 2002). İngiliz standardı BS7850 toplam kalite yönetimini; bir örgütün önceden belirlemiş olduğu amaç ve hedeflerine ulaşabilmek adına örgüt bünyesindeki insan ve malzeme kaynaklarını en verimli biçimde kullanmasını amaçlayan yönetim anlayışı olarak tanımlamıştır (Maliye Bakanlığı Yayınları, 2004).

Toplam kalite yönetimi genel bir yönetim felsefesidir organizasyonların yapısına, amaçlarına göre değişkenlik ve uyum gösterir. Sistemde çalışan her birey, önceden belirlenen ortak hedefleri paylaşarak üretilen malı ya da hizmeti müşterilerin beklentilerine en yakın düzeyde sunmalıdır. Toplam kalite yönetimi, müşteri memnuniyetini işletmelerin varlığının belki de en önemli sebebi olan "kâr" olgusundan dahi önce gören bir yönetim felsefesidir (Paşaoğlu, 2011).

Toplam kalite, maliyetleri sürekli düşürürken müşteri memnuniyetini kalıcı şekilde artırmayı hedefleyen insan odaklı bir yönetim sistemidir. Toplam kalite bir örgütün başarısında anahtar rol üstlenen sürekli değişim sürecine uyum ve eğitimi ön plana çıkaran bir yönetim felsefesidir Toplam kalite yönetimi bir felsefe olduğu kadar örgütlerin yönetimlerinde kullanılabilecek etkili, basit ve uygulanabilir kural ve yönergelerdir (Şimşek, 2007).

Yeni bir yönetim anlayışı olan bu kavram, önce sanayide, üretim sektöründe ortaya çıkmış; üretilen malın kalitesinde artış sağlamının yanı sıra kayıpları ve maliyetleri en aza indirmesi özelliği nedeniyle hızla diğer sektörlere yayılmıştır. TKY, diğer yönetim anlayışlarından farklı olarak mekanik bir yaklaşım olmayıp; çalışanların tümünün beyin gücü, yaratıcılık ve deneyimlerinden yararlanma şeklinde bir iş ahlakı anlayışına dayanmaktadır. Bu çerçevede TKY, kurumlarda üretim süreci, tedarik, yönetim, tanıtım, çalışanlar, müşteriler, toplumsal etkiler gibi ekonomik unsurların tümü üzerinde özenle duran ve bütünsel anlayışa sahip çağdaş bir yönetim anlayışı olarak tanımlanabilmektedir. TKY, sistematik, bütünsel ve kurumun ilerlemesi için kullanılan kurumsal bir yaşam biçimi olmaktadır. Başka bir ifadeyle, TKY dünya çapında kurumlarda başarıyla kullanılan ve bu başarısı kanıtlanmış bir yönetim biçimidir (Yaş, 2009).

TOPLAM KALİTE YÖNETİMİNİN BAŞLICA ÖZELLİKLERİ VE AMAÇLARI

Toplam kalite yönetiminin başlıca özellikleri;

- Kalite odaklı olmak

- Müşteri odaklı olmak
- Süreç odaklı olmak
- Kalite maliyetlerini hesaplamak
- Deming döngüsünü bir yönetim modeli olarak kullanmak
- Gerçek istatistikleri kullanarak karar vermek
- Sürekli gelişme (Kaizen)
- Hedeflerle yönetim
- Günlük yönetime ağırlık vermek
- Katılımcı yönetim ve grup çalışması
- Her girdi ve kaynağın kontrolü
- İç müşteri kavramı (bir sonraki süreç müşterinizdir) ve
- Önlemeye dönük yaklaşımdır (Gül, 2011).

Toplam kalite yönetiminin amacı organizasyonda çalışanların, yöneticilerin, faaliyetlerin, süreçlerin, mal ve hizmetlerin kalitesinin sürekli olarak iyileştirilmesini sağlayarak müşteri memnuniyetini gerçekleştirmektir. Organizasyonda toplam kalite yönetiminin amacı ise müşterilerin isteklerine en uygun mal ve hizmeti üretmektir. Nitekim Japon Endüstri Standartları adlı kuruluş, toplam kalite yönetimini "müşteri ihtiyaçlarına cevap verebilecek ürün ve hizmetleri ekonomik olarak üretme sistemi" tanımlamaktadır (Şahin, 2007).

TKY, organizasyonlarda kalitenin artırılmasını amaçlayan bir yönetim felsefesidir. Bu yönetim anlayışında müşterilerin istek ve beklentileri doğrultusunda ürün ve hizmetlerin kalitesinin yükseltilmesi ve verimliliğin artırılması hedefleniyor. Toplam kalite felsefesinde kalite ve verimliliğin artırılması için çalışanların memnuniyeti, motivasyonu ve ödüllendirilmesi, performans değerlendirme ve ölçme yöntemlerinin kullanılması, organizasyondaki hataların ve yanlışların ortadan kaldırılması, ekip çalışmasına ağırlık verilmesi, başarılı organizasyonların tecrübelerinden yararlanılması, stratejik planlamanın yapılması ve benzeri hedefler üzerinde durulması gereken önemli unsurlardır (Coşkun, 2000).

TÜRKİYE'DE TOPLAM KALİTE YÖNETİMİ

Edwards Deming, "Ulusların yoksulluğu yapay ve gereksizdir. Doğal kaynakları olmayan Japonya, ekonomik iyi yönetime borçludur. Ülkenin tümüne bileşkelerinin katkıda bulunduğu bir sistem olarak bakmasını ve sorunlara bütünsel çözümler aramasını, Japon üst yöneticileri 1950'lerde öğrendiler." mesajını vermiştir (Ata Gökçe'yle Son Söyleşi, 1997).

Kalite, belirli insani değerlerin, duyguların üstüne oturmadığı zaman yaşamda hak ettiği yerini bulamayacaktır. Bir insanın eğitilmesi için ihtiyaç duyması ve bu ihtiyacı fark etmesi gereklidir, insanlar yeniliklere korku ve çekincelerle yaklaşırlar; ancak sevgi ve saygıyla bütün bunlar aşılabilir (Arat, 2002).

Kurtuluş Savaşını sınırlı kaynaklarla aşan, Cumhuriyet düzeninin laik yapılanmasını, demokrasiye geçişi, yerkürenin jeopolitik, zor bölgelerinden birinde gerçekleştiren, Atatürk devrimlerini özümseyen Türkiye, değişim sınavları vermiş bir ulustur. Bu noktada sonra, toplumun yaşam kalitesini yükseltmenin kaynağı, çağdaş Toplam Kalite Yönetiminin sinerjisinde görülmelidir. Yeni dünya düzenindeki yerimizi tayin ederken yararlanabileceğimiz kaynak TKY uygulamalarıdır. Türkiye'de 1990'lı yıllar ile birlikte büyük ölçekli sanayi kuruluşlarının yönetim yapısında önemli değişiklikler ortaya çıkmıştır. Sanayi kuruluşlarında geleneksel yönetim anlayışının yerine modem yönetim anlayışının yaygın bir şekilde kullanılmaya başlandığı görülmektedir. Bu modem yönetim anlayışında, "kar" ve "üretim kaynakları" kavramları yerine "kalite" ve "İnsan kaynakları" kavramları belirgin bir şekilde kullanılmaya başlanmıştır. Modem yönetim metotları işletmenin belirli hedeflere ulaşmasında fiziksel kaynaklar kadar insan kaynaklarının da önemini vurgulamaktadır. 1980'li yıllar ile birlikte Türkiye'de liberal politikalar yoluyla ekonominin dışarıya açılması sanayi kuruluşlarının uluslararası

piyasalardaki rekabet koşullarına uyum sağlamasını bir zorunluluk haline getirmiştir. 1996 yılında Türkiye'nin gümrük birliğine girmesi bu süreci daha da hızlandırmıştır. Modem yönetim metotları 1990'lı yılların ikinci yarısı itibarıyla o kadar çok popüler hale gelmiştir ki yalnızca özel sektör kuruluşları ile sınırlı kalmamış başta belediyeler, hastaneler ve eğitim kurumları olmak üzere kamu sektöründe de yaygınlaşmaya başlamıştır. Teknik bir terim olarak "kalite" kavramı firmaların geri bağlantılarını yaptığı tedarikçilerle ilişkilerini, firma içi üretim süreçlerini, grup yoğunluklu iyileştirme Çalışmalarını, araştırma geliştirme faaliyetlerini, pazarlama kanallarını, satış bayilerini, satış sonrası hizmetleri ve müşteri taleplerinin belirlenmesi ile ilgili süreçlerin tümünü kapsamaktadır (Ata Gökçe'yle Son Söyleşi, 1997).

Sağlık hizmetleri genellikle kamuya ait bir hizmet türü olarak algılandığından toplam kalite yönetiminin kamu sektöründe de uygulanabilmesi gerekir. Bu konuda, kamu sektörünün yapısından kaynaklanan bir dizi uygulama güçlüğü söz konusudur. Bu güçlükler şu başlıklar altında toplanabilir:

- Toplam Kalite Yönetimi anlayışı, doğası gereği kamu sektörüne uygun değildir: TKY esas olarak sanayi ve üretim sektöründe ortaya çıkmıştır. Pazar için üretilen fiziksel ürünlerin nitelikli olması temeline dayanmaktadır. Oysa kamu sektörü fiziksel ürün üretmek yerine ağırlıklı olarak hizmet sunmaktadır ve pazar kavramı bu sektör için oldukça yenidir. Pazara mal olarak verilecek olan bir ürün sanayide üretilirken saptanmış bazı standartlara uygun olması sağlanabilir. Oysa kamunun sunduğu hizmetler, hizmeti alan müşterilerin beklentilerine göre farklılık gösterebilmektedir.

- Kamu sektörü, doğası gereği TKY uygulamalarına uygun değildir: Bu görüşü savunanlara göre, kamu sektörü, değişime dirençli olması, sabit bütçesi nedeniyle performansa değer vermemesi, kamu yöneticilerinin performans nedeniyle ödüllendirilmemesi ve yöneticilerin yönetsel kararlarda özel sektör kadar özgür olmaması gibi yapısal özellikleri nedeniyle TKY uygulamalarına elverişli değildir.

- Kamu sektöründeki meslek gruplarının iş kültürü TKY'ne aykırıdır: Kamu sektöründe iş tanımları yapılmış, yetki ve sorumlulukları düzenlenmiş çok sayıda meslek mensubu yer almakta ve her meslek kendi yetki alanını koruma konusunda tutucu davranmaktadır. Öte yandan, sağlık, eğitim gibi bazı kamu hizmetlerinin sunumu birebir ilişki gerektirdiğinden bireycilik ön plana çıkmakta ve TKY için gereken kolektivizmi gerçekleştirmek güçleşmektedir. Ayrıca, geleneksel hiyerarşik yapılanmaya bağlı olarak statü olarak daha yukarda ya da daha kıdemli olanların daha yetkili ve baskın olmaları, statüyü korumak için TKY'nin gerektirdiği değişimlere kapalı olmaları söz konusudur.

- Kamu sektörünün müşterisi daha sorunludur: Kamunun sunduğu hizmetlerden yararlanan müşteri yelpazesi çok geniş olup birbirinden farklı, hatta birbirine ters düşebilen beklentilere sahiptir. Bu tür bir müşteri grubunun tatmini konusunda güçlüklerin olması kaçınılmazdır.

- Kamu sektörü yapı olarak daha karmaşıktır: Kamu sektörünce sunulan hizmetlerde maliyeti arttırmadan kaliteyi iyileştirmenin mümkün olmadığı ileri sürülmektedir. Bu görüşü savunanlara göre, politik etkilerle atanan kamu yöneticilerinin rekabetten ve ödüllendirmeden yoksun olarak, çoğu zaman kendi görüşleri dışında belirlenmiş bir bütçe ile beklentileri birbirinden oldukça farklı olan insan gruplarına kaliteli hizmet sunması oldukça güçtür (Uz, 2023).

Bugün, ülkemiz siyasal ve sosyal bir reform süreciyle karşı karşıya durumdadır. Eski Çalışma ve yönetim biçimlerini gözden geçirerek her alanda yenilenmeye, yeniden yapılanmaya açılan bir kavşak noktasındayız. Bu noktada, kuruluşları verimli çalışan, kurumlara güven katsayısı yüksek, etik değerleri rehber edinmiş, temiz bir topluma götürecek yola girersek, ülke olarak hak ettiğimiz, uluslararası topluluğun saygın, müreffeh ve güçlü bir üyesi konumuna gelebileceğiz. Toplam Kalite Yönetiminin Bütçe Kanunu'na girişi, Milli Eğitim Bakanlığı'nın ve Çalışma Bakanlığının TKY'yi rehber olarak kabul etmesi, Türkiye'de kamusal alanda başlayan reform sürecinin öncü yansımalarıdır. Türkiye'nin ihtiyaç duyduğu değişim örneklerini yaygınlaştırabilir ve sürdürülebilir hale getirirsek söz konusu reform süreci başarıya ulaşacaktır. Gerek ürün ve hizmetlerin tüketicisi kimliğiyle, gerekse yurttaş kimliğiyle bireyin mutluluğu ve toplam yaşam kalitesinin yükselmesi özel sektörün, gönüllü kuruluşların ve kamu yönetiminin böyle bir anlayışla hareket etmesine bağlıdır (Arat, 2002). TKY uygulamasına geçişte karşılaşılan sorunların en önemlisi işletmelerin yeterli sayıda nitelikli işgücü ve yönetici bulamamasıdır. Günümüzün en iyi bir yönetim şekli olan toplam Kalite Yönetiminin uygulanması için her yönüyle gelişmiş bir insan kaynakları planlamasına ihtiyaç bulunmaktadır (Tekin, 1999).

SONUÇ

BRİSA, NETAŞ, TEİ, BEKSA gibi bazı yabancı ortaklı işletmeler ve ARÇELİK, ECZACIBAŞI gibi işletmeler Türkiye'de TKY'ni başarıyla uygulayan işletmelerdir. Türkiye'deki kalite yönetimi uygulamalarıyla kurum ve kuruluşların verimlilik ve etkinliklerinin arttırılması amaçlanmaktadır. Bu yaklaşımda bir işletmenin/kurumun çeşitli bölümlerinin kalitenin yaratılması, yaşatılması ve geliştirilmesi amacıyla harcadıkları çabaların birleştirilip eşgüdümü sağlanır. Bu anlamda müşteri-çalışan memnuniyeti, pazar payı ve kar artacak, maliyet azalacaktır.

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AX_1 POLİMERİNE ASİT ORANGE 8 ADSORPSİYONUNUN pH ETKİSİNİN ARAŞTIRILMASI

INVESTIGATION OF THE pH EFFECT OF ACID ORANGE 8 ADSORPTION TO AX_1 POLYMER

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ABSTRACT

With the development of the industrial sector, there is a significant increase in both the production of industrial products and industrial product waste. The release of wastes into the nature poses a serious danger to living things. The textile industry is one of the areas that cause this the most. Acid orange 8 dyestuff, which is especially used in the coloring of textile products, is one of the chemicals that harm biodiversity if released into nature and was preferred for use in the experiment. Polymers, on the other hand, are in a remarkable position because they are found in many different areas and can be used for many different puposes and have been preferred for use in the experiment. The purpose of the experiment is to investigate the pH effect of acid orange 8 adsorption on AX_1 polymer, a newly synthesized polymer, and to carry out preliminary investigations on the polymer. The adsorption process was preferred for this experiment because it is more convenient in terms of applicability and does not have difficulty in application. While examining the pH effect of the polymer, time, temperature, dyestuff concentration, and the amount of AX_1 polymer were kept constant throughout the experiment. Investigations were conducted at pH 3, 5, 7 and 9. As a result of the trials, it was found that pH 3 was the optimum value that provided the maximum removal. When the polymer microspheres were kept at a constant temperature of 25 C, in 10 ppm dyestuff solution, at pH 3, with 0,01 grams of polymer, the adsorption capacity was determined to be maximum 89,89 mg/g. In terms of efficiency and convenience, it is seen that the AX_1 polymer removes the dyestuff from aqueous solution is high.

Keywords: Adsorption capacity, pH, polymer.

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2023'DE LİPAZ İMMOBİLİZASYONU İLE İLGİLİ Q1 DERGİLERDE YAYINLANAN 10 MAKALEYE DAİR BİR İNCELEME

A REVIEW OF TEN ARTICLES PUBLISHED IN Q1 JOURNALS ON LIPAS IMMOBILIZATION IN 2023

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ÖZET

Enzimler, biyolojik tepkimeleri katalizleyen biyokatalizörler olarak görev yaparlar. Literatüre bakıldığı zaman lipaz enziminin son yıllarda oldukça popülerlik kazanmış olduğu görülmektedir. Lipazlar, gıda teknolojisinde, klinik ve endüstriyel kimya alanında, biyopolimerik malzeme üretiminde, biyodizel gibi çeşitli endüstriyel ve biyoteknolojik uygulamalarda kullanılmaktadır. Endüstiyel alanlarda kullanılan lipazların kaynağı çoğunlukla funguslardır. Bu enzimler, ticari olarak satışa uygun hale getirilmek için saflaştırılıp immobilize edilir. Enzimlerin yaygınlaşmasıyla birlikte, az maliyetle yüksek performans elde etmek için çeşitli immobilizasyon teknikleri geliştirilmiştir. Lipazların immobilizasyonu, biyoproses uygulamalarında önemli gelişmelere katkıda bulunmuş olup, bu alanda yapılan bilimsel çalışmaların yaygınlaşmasına sebep olmuştur. Farklı akademik disiplinlerden pekçok veri tabanına erişim sağlayan bir web sitesi olan Web of Science (WOS)'da "lipase immobilization" basit anahtar kelimesi ile arama yapıldığında, 2023'ün ilk yarısında bile Science Citation Index'de taranan dergilerde basılan 104 makaleye ulaşılmaktadır (24.06.2023).

Bu derlemede, lipaz enziminin immobilizasyonu ile ilgili, 2023'de, etki değeri en yüksek (Q1) dergilerde yayınlanan on tane makale incelenmiştir. Çalışma, lisans bitirme ödevi kapsamında yapılmıştır. Makaleler, immobilizasyonda kullanılan destek malzemeleri, kullanılan lipaz türü, enzimin destek malzemeye tutturulma şekli ve hazırlanan immobilize enzimin kullanım alanı açısından değerlendirilmiştir. İmmobilizasyonda tekrar kullanılabilirlik, çeşitli endüstriyel proseslerde maliyeti düşüren en önemli parametredir. İncelenen makalelere bu parametre açısından karşılaştırmalı ve eleştirel olarak ele alınmıştır.

Anahtar kelimeler: Lipaz, immobilizasyon, derleme

ABSTRACT

Enzymes act as biocatalysts that catalyze biological reactions. When the literature is examined, it is seen that the lipase enzyme has gained a lot of popularity in recent years. Lipases are used in food technology, clinical and industrial chemistry, bio-polymeric materials production, and various industrial and biotechnological applications such as biodiesel. The source of lipases used in industrial areas is primarily fungi. These enzymes are purified and immobilized to make them commercially available. With the widespread use of enzymes, various immobilization techniques have been developed to achieve high performance at low cost. The immobilization of lipases has contributed to significant developments in bioprocess applications and has led to the spread of scientific studies in this field. A search with the simple keyword "lipase immobilization" on the Web of Science (WOS), a website that provides access to many databases from different academic disciplines, yields 104 articles published in journals scanned in the Science Citation Index even in the first half of 2023 (June 23).

In this review, ten articles on the immobilization of the lipase enzyme published in journals with the highest impact factor (Q1) in 2023 were reviewed. The study was carried out within the scope of

undergraduate graduation homework. The articles were evaluated in terms of the support materials used in immobilization, the type of lipase used, the way the enzyme was attached to the support material, and the usage area of the prepared immobilized enzyme. Reusability in immobilization is the most important parameter that reduces costs in various industrial processes. The reviewed articles were approached comparatively and critically in terms of this parameter.

Keywords: Lipase, immobilization, review

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THE USAGE OF MEDICINAL PLANTS IN FISH PARASITIC DISEASES

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ÖZET

Balık hastalıkları, balıkçılık ve su ürünleri kaynaklarının insan tüketimini en çok sınırlayan faktörlerin başında gelmektedir. Doğal balıkçılık kaynaklarının sınırlı olması nedeniyle, su ürünleri sektörü son on yıllarda dünya çapında azalan miktarlarını telafi etmek için yüksek bir ivme kazanmıştır. Bununla birlikte, balık patojenleri, kültür balıklarının kısmen veya tamamen kaybı nedeniyle önemli ekonomik kayıplardan sorumlu olabilir. Protozoanlar, monogeneanlar ve miksozolar tarafından oluşturulan bazı paraziter hastalıkların, kültür tesislerinde bu tür kayıplara neden olan enfeksiyöz ajanlar olduğu bildirilmiştir. Parazitler, konakçı dokularında çeşitli hasarlara neden olabilir ve mekanik hasarlar solungaç lamellerinin füzyonunu ve doku değişimini içerirken, fizyolojik hasarlar arasında hücre proliferasyonu, immünomodülasyon, zararlı davranış tepkileri ve değişen büyüme yer alır ve üreme hasarları arasında düşük sayıda yumurta üretimi ve düşük döllenme oranları su ürünleri yetiştiriciliğinde paraziter hastalıkları kontrol altına almak için bazı kimyasal maddeler yaygın olarak kullanılmaktadır. Ancak bu kimyasal maddelerin ortak kullanım yaşı hem balık organizmaları, hem çevre hem de insan sağlığı üzerinde bazı olumsuz etkilere sahiptir. Böylece tıbbi bitkiler gibi bazı alternatif ve etkili tedavi yöntemleri, kolay biyobozunurlukları ve çevre dostu olmaları nedeniyle tedavi uygulamalarında kullanılmaya başlanmıştır. Su ürünleri yetiştiriciliğinde üç yöntemle uygulanabilirler; besleme, banyo ve intraperitoneal enjeksiyona takviye. Bu amaçla şifalı bitkilerin yaprakları ve bütün bitkiler uçucu yağ, toz veya ekstrakt olarak kullanılır. Uçucu yağlar (ör. Lippia türleri, Ocimum türleri) ve bitki özleri (ör. Allium sativum ve Zingiber officinale) gibi birçok bitki kaynaklı bileşik, çeşitli su ürünleri yetiştiriciliği sistemlerinde parazitleri kontrol etmek için etkili bir tedavi olarak kullanılmıştır. Protozoan parazitler arasında, *Ichthyopithirius multifiliis*, monogeneans Gyrodactylus spp. ve Dactylogyrus spp. ve miksozoan parazitler Myxobolus spp., Enteromyxum spp.'nin bitki kaynaklı bileşikler yoluyla tedavi edildiği bildirilmiştir. Bu çalışma, mevcut literatüre dayalı olarak balık parazit hastalıkları için tıbbi bitki tedavi uygulamalarına odaklanmıştır.

Anahtar kelimeler: Şifalı bitkiler, balık hastalıkları, balık parazitleri, tedavi

ABSTRACT

Fish diseases are among the most limiting factors of fisheries and aquaculture sources for human consumption. Due to limitations in natural fishing sources, the aquaculture sector has gained a high momentum to compensate for the reduction in their amounts world wide in the last decades. However, fish pathogens can be responsible for significant economic losses due to either partial or complete loss of cultured fish. Some parasitic diseases caused by protozoans, monogeneans, and myxozo an shave been reported to be infectious agents that cause such losses in culture facilities. Parasites can cause several damages to their host tissues and while mechanical damages include fusion of gill lamellae and tissue replacement, physiological damages include cell proliferation, immunomodulation, detrimental behavioral responses, and altered growth, and reproductive damages include the low number of egg production and low fertilization rates. To control parasitic diseases in aquaculture, some chemical

substances are widely used. However, the commonus age of these chemical substances has some negative impacts both on fish organisms, environments as well as human health. Thus, some alternative and effective treatment methods such as medicinal plants have been started to be used in treatment applications due to their easy biodegradability and environmental friendliness. They can be applied in aquaculture through three methods; supplementation to the feed, bath, and intraperitoneal injection. For this purpose, leaves of medicinal plants and whole plants as essential oil, powder, or extractare used. Many plant-derived compounds such as essential oils (e.g. *Lippia* spp., *Ocimum* spp.) and plant extracts (e.g. *Allium sativum* and *Zingiber officinale*) have been used as an efficient treatment to control parasites in various aquaculture systems. Among protozoan parasites, *Ichthyopithirius multifiliis*, monogeneans *Gyrodactylus* spp. and *Dactylogyrus* spp., and myxozoan parasites *Myxobolus* spp., *Enteromyxum* spp., have been reported to be cured via plant-derived compounds. This study has focused on medicinal plant treatment applications for fish parasitic diseases based on currently available literature.

Keywords: Medicinal plants, fish diseases, fish parasites, treatment

1. GİRİŞ

Yetiştiricilik sistemlerinde balık hastalıkları, işletmenin üretimi, gelişmesi, büyümesini olumsuz şekilde etkilemektedir ve çevresel faktörlerin hastalıklar üzerine etkisi, doğal ortamlara nazaran daha baskındır. Yetiştiriciliği yapılan balıklar, içinde bulundukları ortam şartları gereği çok hassastırlar. Çevresel faktörlerin olumsuzluğu ve patojenin durumu hastalığın ortaya çıkmasına sebep olur. Bir balık populasyonunda hastalıkların oluşabilmesi için üç faktörün, yani konakçı-patojen-çevre arasındaki ilişkinin bozulması gerekmektedir. Böylece fırsatçı patojenler için konakçı vücudunda uygun portantreler oluşacak ve hastalık ortaya çıkacaktır.

Bu mikroorganizmalar akuatik ortamda havadan çok daha kolay yayılabilmekte, hastalıklar kısa sürede salgınlara ve büyük ekonomik kayıplara neden olabilmektedirler. Klinik semptom gösteren veya latent enfekte balıkların ekskretlerinden ve deri lezyonlarından atılan etkenler, diğer balıklara ağızdan, solungaçlardan ya da direk temas ile bulaşabilmektedirler (Noga, 2010).

Su Ürünleri yetiştiriciliği ünitelerinde çok sayıda balığın bir arada ve yakın temas durumunda olması, doğada (dere, göl, deniz vb.) serbest yaşayanlara oranla daha sıklıkla hastalığa yakalanma riski taşımaktadır. Çünkü bir havuzda çıkan herhangi bir enfeksiyon diğer havuzlara da bulaşabilmekte ve kısa zaman içinde hastalık yayılarak gelişebilmektedir. Balıkların içinde yaşadıkları akuatik ortam genellikle sınırlı olan besleyici, fiziksel, kimyasal, biyotik ve abiyotik optimal yaşam koşullarının olumsuz yönde değişmesi, bunların kısa süre içinde düzelmemesi ve devam etmesi, özellikle birçok enfeksiyöz hastalığın (mikroorganizmalardan ileri gelen hastalıklar) çıkmasına yardımcı olmaktadır. Çünkü bu olumsuz faktörler balıkların bağışıklık sistemlerini zayıflatarak kolayca enfekte olmalarına sebep olabilmektedir. Ayrıca, bu zararlı etkiler, birer hazırlayıcı (predispoze edici) faktör oluştururlar (Arda ve ark., 2005).

Ölümcül enfeksiyonlara yol açan infeksiyöz hastalıklar, mikroorganizmalardan (bakteri, mantar, virüs, parazit) ileri gelirler. Balık parazitleri tarafından oluşturulan hastalıklar infeksiyöz hastalıklar içinde görüldüğü zaman sıklıkla takibe alınması gereken önemli nedenlerdir. Balıklarda pekçok paraziter etken bulunmakta, bazen bunlar doğal koşullarda gerçek anlamda zarar meydana getirmezken, balık yetiştiriciliğinde popülasyon yoğunluğuna bağlı olarak önemli hastalıklara ve ekonomik kayıplara yol açabilmektedir. Parazitler balığın besinine ortak olarak beslenme üzerinde olumsuz tablolar (balıklarda zayıflama, metabolik bozukluklar, hastalıklara hassasiyet vb.) gösterebilirler. Bazı parazitler ise kas ve iç organlarda yırtıklar oluşturarak zarar verebilirler, ayrıca kan dokusuna yerleşen parazitler ise damarlarda tıkanma yaratabilirler. Solungaç parazitleri solunum güçlüğüne sebep olabilirler. Tüm bu durumlar gösteriyor ki paraziter hastalıklar balıklar için önemli tehlikeler arz edebilirler.

Yetiştiricilik sistemlerinde geçmişten bugüne balıkların büyüme ve üremesini geliştirmek, paraziter hastalıklardan korumak veya sağaltımını sağlamak adına çeşitli uygulamalar yapılmaktadır. Yapılan uygulamalar arasında yemlere çeşitli katkı maddelerinin eklenmesi, bağışıklık güçlendirici olarak immünostimulan uygulamaları, çeşitli işlemler için anestezi uygulamaları veya tedavi amacıyla antiparaziter ajanların kullanımı yer almaktadır (Çelikkale ve ark, 1999; Olatoye ve Afisu 2013)

Bu sentetik ürünlere ve kimyasallara karşın son yıllarda balık paraziter hastalıklarında sıklıkla alternatif tedavi olarak medikal bitkilerin kullanımı tercih edilmektedir. Medikal ürünlerin tercih edilme nedenleri arasında ucuz olmaları, kolay temin edilebilmeleri, düşük dozlarda etki göstermeleri, biyolojik olarak parçalanabilmeleri, patojenlere karşı etkili ve çevre dostu olmaları yer almaktadır. Bunun yanında birçok literatür ile bitkilerden elde edilen esansiyel yağ, hidrozol, ekstrat vb. kullanımları paraziter hastalıklar üzerinde de denenmiş içermiş oldukları çeşitli etken maddeler sayesinde olumlu sonuçlar alındığı bildirilmiştir. Bu bildiride, infeksiyöz kaynaklı etkenler içerisinde ciddi sorunlar oluşturabilen paraziter hastalıklarda kullanılan medikal bitkilerin önemi üzerinde durulacaktır.

2. PARAZİTER BALIK HASTALIKLARI

Balıkların infeksiyöz hastalıklarından birisi olan parazitler, ciddi enfeksiyonlarda yüksek mortalite, büyüme performansı üzerinde azalma, işetme için kar-zarar dengesinde bozulma gibi sorunlara neden olması ile üzerinde önemle durulması gerekli konuların başında gelmektedir. Parazitler doğal ortamda balık için tehlike oluşturmazken, kültür balıkçılığı için önemli hastalıklar ve beraberinde ekonomik kayıplar doğurabilmektedir. Aynı zamanda paraziter enfeksiyonlar ile ilgili patojenik oluşumlar diğer bakteri, virüs, mantar enfeksiyonları için zemin hazırlamaktadır.

Balıklar üzerindeki parazitik enfeksiyonlar özellikle monogenean parazitler, balıkların deri, solungaç ve gözlerine yerleşen yassı kurtlardır. *Dactylogyrus, Gyrodactylus* ve *Neobenedenia* çok sayıda kültür balığını etkileyen ve dünya çapında büyük ekonomik kayıplara sebep olan yaygın monogenean parazit türleridir (Deveney ve ark., 2001, Woo ve ark., 2002).

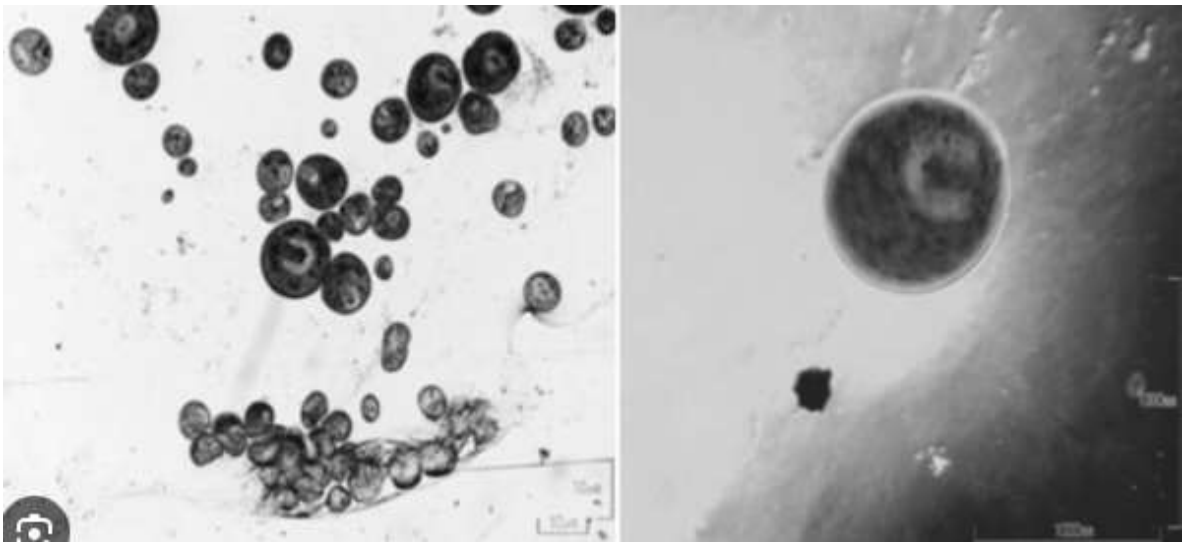
Dactylogyrus ve Gyrodactylus gibi Monogenea cinslerine ait türler çok küçük olmaları ile teşhisi zor olan canlılardır. Dactylogyrus'un en karakteristik özellikleri ise baş bölgesinde iki çift göz lekesinin bulunmasıdır (Rogers, 1967). Bu türler bulundukları ortama sıkı bir şekilde tutunur ve kancaları ile konağına ciddi zararlar verirler ve hemarojik zedelenmelere neden olurlar (Koyun ve Altunel, 2007) (Resim 1A). Gyrodactyluslar ise balıkların solungaç, yüzgeç ve vücut yüzeylerinde yaşar, balıkların epitel hücreleri ve mukusu ile beslenirler. Yüksek üreme potansiyeline sahip olduklarında ölümlere neden olduğu rapor edilmiştir (Bakke ve ark., 2007; Malmberg, 1993) (Resim 1B).

Resim 1. A: Dactylogyrus spp. B:Gyrodactylus spp. (Bakke ve ark., 2007)

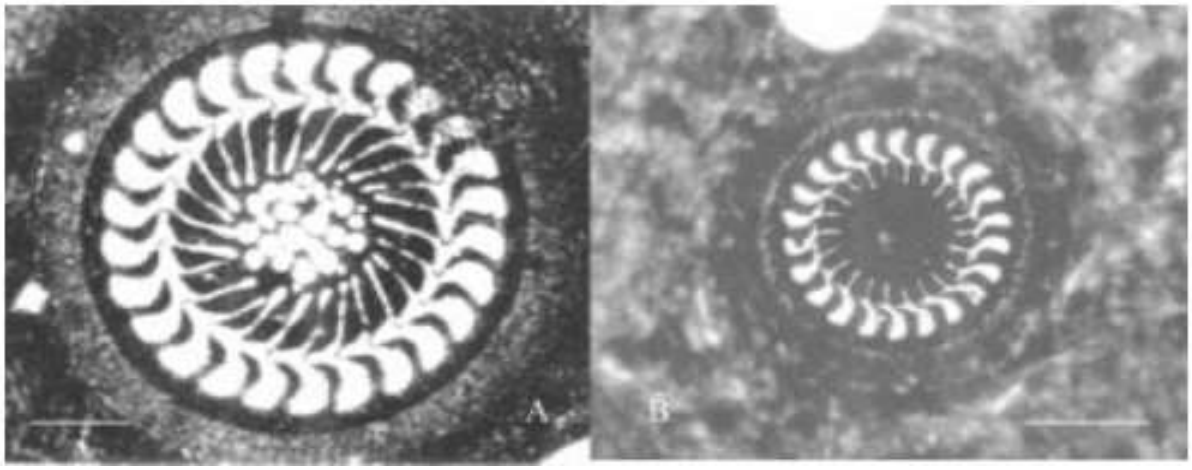
Protozoan parazitler balık popülasyonlarında kısa zaman içerisinde sayıca büyük boyutlara ulaşması nedeniyle önemli olan önemli diğer paraziter hastalıklarındandır (Tigin ve ark., 1992). Patojen protoozonlar balıklarda daha çok solungaçlara yerleşip sayılarının artmasıyla epitel doku üzerinde büyük tahribatlara neden olurlar. Hatta bazılarının solungaçları tıkaması ile balık ölümlerine neden olduğu bildirilmiştir (Chubb, 1984). Bunlardan en önemlileri beyaz benek hastalığı etkeni *Ichthyophthirius multifilis* ve blue slime hastalığına neden olan Costia ve Trichodina türleridir (Ekingen, 1983).

Alabalıklarda görülen en önemli paraziter hastalıklardan biri olan Ichthyophthiriosis etkeni *I. multifilis* silli bir parazittir (Nigrelli ve ark., 1976). Su parametrelerinin uygun olmadığı durumlarda, yoğun stok, stres faktörlerinin mevcudiyeti, düşük kliteli yemleme gbi durumlarda balıkların özellikle solungaç ve derileri üzerine yerleşmekte ve sayıca artması durumunda %100'lere varan mortalitelere sebep olabilmektedir (Resim 2). Trichodina türleri

de balıklarının deri ve solungaçlarına yerleşip balıkların büyüme performansları üzerine olumsuz etki yaparak önemli zararlar verirler (Iqbal ve Haroon 2013) (Resim 3).



Resim 2. *Ichthyophthirius multifilis* (Koyuncu, 2012).



Resim 3. Trichodina spp. (Özer ve Öztürk, 2004)

3. PARAZİTER HASTALIKLARDA KULLANILAN MEDİKAL BİTKİLER

Tedavi maliyetini en aza indirmek, kimyasallara karşı doğada daha iyi parçalanmaları suretiyle çevre için daha dost olan, aynı zamanda kimyasal içeriğinde yer alan etken bileşenlerin parazitler üzerinde daha az direnç oluşumu gibi birçok durum göz önüne alındığında bitkisel ürünlerin kullanımı alternatif tedavi olarak birçok araştırıcı tarafından değerlendirilmiştir (Blumenthal ve ark., 2000, Logambal ve ark., 2000, Olusola ve ark., 2013). Bu nedenle, çeşitli bitkilerden elde edilen özler, uçucu yağlar ve bioaktif metabolitlerin parazitik enfeksiyonlara karşı alternatif tedavi potansiyelleri çalışılmıştır.

Antiparazitik ilaç olarak kullanılan bitkilerin bazıları, sarımsak (*Allium sativum*), yavşan (*Artemisia capillaries*), yeşil çay (*Camellia sinensis*), nane (*Mentha piperita*), kekik (*Origanum vulgare*), acı pelin (*Artemisia absinthium*), biberiye (*Rosmarinus officinalis*) olarak bildirilmiştir (Chitmanat ve ark., 2005; Ekanem ve Brisibe, 2010; Sutzuki ve ark., 2006). Bitkisel ilaçlar genellikle çeşitli ekstraksiyon prosedürleri ve farklı sulu veya organik çözücüler (etanol, metanol, etil asetat, hekzan, bütan kullanılarak elde edilen ekstraktlar dahil) bitki materyali (tohumlar, soğanlar, yapraklar) veya bitki kökenli ürünler olarak (aseton, benzen, petrol eteri, vb.) veya uçucu yağlar, karışımlar ve kaynatma maddeleri gibi diğer terkipler halinde kullanılmaktadır. Su ürünleri sektöründe bitkisel kaynakların farklı bölümlerinden farklı amaçlar için yararlanılmaktadır. Su ürünleri yetiştiriciliğinde şifalı bitkilerin kullanımı üzerine yapılan çalışmaların çoğunda bitki yaprakları (% 37) kullanılırken, % 22'si bütün bitkiyi toz olarak, bitki esansiyel yağı veya özü olarak kullanmıştır. Bitkiler ayrıca kök (% 18) olarak

da sık sık kullanılmıştır. Bunların ardından tohumlar (% 8), kabuklar (% 6), meyveler (% 6) ve son olarak da çiçekler (% 4) kullanılmıştır (Reverter ve ark., 2017).

Teleost balıkların yaygın yassı kurt ektoparazitlerinden olan Gyrodactylus spp. tatlısu balıklarında (özellikle alabalıklar) üretimi olumsuz etkilediği için üzerinde en çok çalışılmış konuların başında gelmektedir (Bakke ve ark., 2007). Bu parazitler, yüksek bulaşma hızları ve kısa üreme süreleri nedeniyle tüm balık stoklarını enfekte edebilir ve yüksek enfeksiyon yoğunluklarına hızla ulaşabilir (Cable ve ark., 2000). Ayrıca, kancalar yoluyla konağın epitelyumuna bağlanıp mukus ve epitel hücreleri ile beslenerek balık dokusuna zarar verirler (Bakke ve ark., 2007). Su ürünleri yetiştiriciliğinde bu parazitleri kontrol etmek için mebendazol, formalin, hidrojen peroksit ve prazikuantel dâhil olmak üzere çeşitli kimyasal maddeler yaygın olarak kullanılmaktadır (Schelkle ve ark., 2009; Pietrak ve ark., 2018). Ancak bu kimyasal maddelerin sık kullanımı ilaçlara karşı direnç gelişmesine, çevresel kontaminasyona ve ayrıca insan sağlığına yönelik risklerde beraberinde getirmektedir. Bu nedenle, tedavide bitkisel ilaçlar, biyolojik olarak parçalanabilirlikleri ve çevre dostu olmaları nedeniyle alternatif seçenekler olarak kabul edilmiştir (Van Doan ve ark., 2020). Yapılan bir çalışmada, Gyrodactylosis tedavisinde etkili bir ajan bulmak için 36 bitkisel ilaç elde edildi ve bunların ham ekstraktlarının antiparaziter etkinliği değerlendirildi. Yüksek antiparaziter aktiviteye sahip iki tür bitkisel ilaç (*D. collettii* var. hypoglauca ve *S. nigrum*) farklı polariteli çözücülerle fraksiyonlara ayrıldı ve daha sonra *Gyrodactylus kobayashii*'ye karşı antiparaziter aktiviteleri ve konakçısı olan akvaryum balığına (*Carassius auratus*) karşı akut toksisite açısından araştırıldı. Yapılan bu çalışmada araştırıcılar bu bitkisel ilaçların *G. kobayashii*'yi tamamen öldürmediğini ama konak dokudan geçici olarak uzaklaştırdığını bildirmişlerdir (Zhou ve ark., 2021). Bir diğer çalışmada, sarımsak yeme katılarak Neobenedenia sp. monogenean parazit enfeksiyonuna karşı antiparazitik ilaç olarak değerlendirilmiştir. İki konsantrasyonda *A. sativum* (sarımsak) katkılı yem ve kontrol olmak üzere çalışma düzeneği hazırlanarak 30 günlük yemleme programı uygulanmıştır. Süre sonunda parazit bulaştırılan balıklar 5 gün daha aynı yem ile beslenerek sonuçlar incelenmiştir. Sarımsak katkılı yem verilen grupta her iki konsantrasyonda %70'e kadar kontrol gruba göre enfeksiyona karşı başarı izlendiği rapor edilmiştir (Militz ve ark. 2013). Yıldız ve Bekcan (2020) ise sarımsak (*A. sativum*) ve soğan (*A. cepa*) ekstrelerinin sazan balıklarındaki *G. elegans* (Monogenea)'a karşı *invivo* ve *invitro* aktivitesini değerlendirmişlerdir. *İn vitro* uygulamada yeme karıştırılan çeşitli konsatrasyonlardaki ekstrelerde 6 dk'da %100'e ulaşan kümülatif mortalite elde etmişleridir. *İnvivo* deneylerde 3 dk boyunca banyo tarzında uygulanan konsatrasyonlarda *G. elegans* ortalama yoğunluğunun sarımsakta %14,40, soğan ekstresinde %9,79 oranında düştüğü kaydedilmiştir. Nil tilapiaları üzerinde enfekte olan monogen parazitlerinin antiparazitik etkileri biberiye ve nane uçucu yağları kullanılarak *in vivo* ve *in vitro* olarak çalışılmış ve söz konusu parazitler üzerinde etkin oldukları bildirilmiştir. Aynı zamanda bu bitkisel uçucu yağların balıklarda güvenilir olduğu rapor edilmiştir (Hashimoto ve ark., 2016).

3. SONUÇ

Yapılan çalışmalar göstermiştir ki; balıkların paraziter enfeksiyonlarıyla mücadelede, organik maddelerden oluştukları için kimyasallarla tedaviye göre balık, insan ve çevreye çok daha az yan etkisi olacak bu bitkisel uçucu yağlarla tedavinin alternatif bir antiparazitik tedavi olarak kullanılabileceği düşünülmektedir. Tüm balık üretim sistemlerinde kimyasal olmayan, bitkisel ürünlerle parazit tedavisi üzerine yoğunlaşmak gerekliliği açıktır. Balıklarda toksisite veya olumsuz yan etkiye sebep olmaksızın maksimum parazit mortalitesini verecek optimum doz ve süreyi tespit edecek yeni araştırmalar gereklidir.

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GENÇLER VE YETİŞKİNLERDE SİBER ZORBALIK
CYBERBULLYING IN YOUTH AND ADULTS

Remzi BAŞAR

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ÖZET

Çalışma kapsamında gerek dünya ve gerekse ülkemiz açısından her geçen gün daha ciddi bir sorun haline gelen siber zorbalık konusu ele alınmaktadır. Siber zorbalığın tanımı ile siber zorbalığa yol açan sebepler ve çeşitli eğitim düzeylerinde farklı yaş gruplarından öğrenci gençler ile iş hayatındaki yetişkinlere yönelik etkileri incelenmektedir.

Zorbalığın en güncel biçimi olan siber zorbalık, özellikle siber zorbalığa maruz kalan muhatabın genç kuşaktan olduğu durumlarda hem siber mağdur ve hem de süreci yönetmek durumunda olan ebeveyn ve eğitimciler için çeşitli zorlukları beraberinde getirmektedir. Literatür incelemesi sonucu siber zorbalıkla ile ilgili çok sayıda çeşitli çalışmalar olduğu görülmektedir. Çalışmada Türkiye genelinde çeşitli illerde yaşayan ilkokul çağındaki çocuklardan, lise ve üniversite düzeyindeki gençlere ve 40 yaş üzerindeki yetişkinlere kadar farklı yaş gruplarındaki bireyler arasından sadece siber zorbalık kavramına aşina olanlar kolayda örneklem yöntemi ile ulaşılarak 97 kişiden anket yöntemiyle siber zorbalık etkilerinin değerlendirilmesine dair veriler toplanmıştır.

Çalışmadan elde edilen sonuçlara göre; anket katılımcılarının %93'ü teknoloji alanındaki hızlı gelişmelerin siber zorbalığı etkilediğini düşünmektedir ve siber zorbalık mağdurlarının yaşadığı en yaygın psikolojik sorunların başında kızgınlık ve öfke duygusunun geldiği sonrasında sırasıyla; üzüntü ve endişe duygularına sıklıkla rastlanıldığı görülmektedir. Ayrıca fiziksel yorgunluk ve dikkat dağınıklığı ile kendini toplumdan dışlama isteği de siber zorbalığa maruz kalanlarda görülen diğer etkiler olarak öne çıkmaktadır.

Anahtar kelimeler: Siber Zorbalık, Siber Zorba, Siber Mağdur.

ABSTRACT

The study focuses on the increasingly serious issue of cyberbullying, both globally and in our country. The study examines the definition of cyberbullying, the factors that contribute to cyberbullying, and the effects on student youth, as well as adults in the workplace, from different educational levels.

Cyberbullying, which is the most current form of bullying, poses various challenges for both the cyberbullying victims, especially when they belong to the younger generation, and for parents and educators who are responsible for managing the situation. A literature review reveals that there are numerous studies on cyberbullying. The study collected data on evaluating the effects of cyberbullying through a survey method from 97 individuals representing different age groups, including elementary school children residing in various cities across Turkey, young people at the high school and university levels, and adults aged 40 and above. The participants were selected using convenience sampling method, specifically targeting those who were familiar with the concept of cyberbullying.

According to the results obtained from the study, 93% of the survey participants believe that the rapid developments in technology have influenced cyberbullying. The most common psychological problems experienced by cyberbullying victims were found to be anger and rage, followed by frequent feelings of sadness and anxiety. Additionally, physical fatigue, lack of concentration, and a desire to isolate oneself from society were identified as other notable effects observed among those who have experienced cyberbullying.

Keywords: ; Cyberbullying, Cyberbully, Cybervictim.

1. GİRİŞ

Baş döndürücü bir hızla gelişen teknoloji çağında yaşayan bireyler istisnasız olarak akıllı telefon, tablet veya bilgisayar gibi teknolojik cihazların en azından bir tanesine mutlaka sahip olmakta ve gencinden yaşlısına kadar her yaş grubundaki bireyler ortalama 2 saatini bu teknolojik cihazlar ile geçirmektedir.

ITU'ya (2022) göre 2021'de gelişmiş ve gelişmekte olan ülkelerden yaklaşık 4,9 milyar insan internet kullanmaktadır (Wong, 2010: 33).

Siber zorbalık, bir birey veya grubun bilişim teknolojilerini başka bireylere zarar vermek amacı ile kullanması olarak tanımlanmaktadır. Siber zorbalık, elektronik zorbalık ve elektronik iletişim zorbalığı olarak ikiye ayrılmaktadır. Elektronik zorbalık, başkalarının şifrelerini ele geçirmek, web sitelerini hacklemek, sistemleri devre dışı bırakmak için zararlı e-postalar göndermek gibi teknik beceriler gerektirir. Elektronik iletişim zorbalığı ise bilişim teknolojilerini kullanarak sadece temel bilgiler ile özel bir teknik bilgiye ihtiyaç duyulmadan; sanal ortamlarda sürekli rahatsız etmek, alay etmek, dedikodu yaymak, internet üzerinden hakaret etmek veya kişinin onayı alınmaksızın kişisel bilgi veya resimlerini sanal ortamlarda yayınlamaya yönelik eylemleri ihtiva etmektedir (Arıcak, 2009 & Belsey 2007 akt. Çimen, 2018: 398).

İnternet erişiminin sağladığı sonsuz seçenekler ve özellikle genç kuşağın elektronik bir iletişim aracı olarak sosyal medya platformlarını sıklıkla kullanması iletişim odaklı olarak bireylerin hayatlarını oldukça kolaylaştırmakta, gündelik işlerin pratik şekilde yerine getirilmesini sağlamaktadır. Hayata birçok olumlu katkılar sunmasına rağmen başta sosyal medya platformları ve çeşitli web siteleri olmak üzere sanal mecralar fiziksel zorbalığın sanal biçimi olarak özetlenen siber zorbalık olgusu ile karşılaşmamıza da sebep olmaktadır. Sanal ortam kullanıcılarının internet sayesinde zaman ve mekân bağımlılıklarını ortadan kaldırarak özgür davranabilmesi, istediği her an, her türlü ortamda istediği her şeye erişebilmesi ve etkileşimli paylaşımlar yapabilmesi sanal mecralar ve sosyal ağları siber zorbalığın çok rahat gerçekleştirilebildiği sanal ortamlar hâline dönüştürmektedir.

Çalışma internet ortamındaki en önemli tehlikelerden biri durumunda olan siber zorbalık olgusuna dair bilinç ve etki seviyesini ölçmek amacı ile yapılan bir araştırmadır. Türkiye genelinde çeşitli illerde yaşayan ve siber zorbalık kavramına aşina olan ilkokul çağındaki çocuklar, lise ve üniversite düzeyindeki gençler ile çeşitli yaşlardaki yetişkinlere kolayda örneklem yöntemi ile ulaşılarak 97 kişiden çevrimiçi anket yöntemiyle siber zorbalık hakkındaki görüşleri alınmış ve toplanan veriler analiz edilmiştir.

Gerçekleştirilen çevrimiçi anket dâhilindeki sorular, siber zorbalık kavramına dair internet web sayfaları ve sosyal medya platformlarında kullanıcılar tarafından en çok yöneltilen sorulardan derlenmiş ve bu yolla ortalama internet kullanıcılarının siber zorbalık hakkındaki fikir ve görüşleri anlaşılmaya çalışılmıştır. Anket soruları ile verilen cevaplar ve yüzdelik oranları Tablo 2 ve 3'de sunulmuştur.

2. TEORİK ÇERÇEVE

2.1. Siber Zorbalık

Zorbalık, bir birey veya grup tarafından, savunmasız olan bir kişiye karşı yapılan, fiziksel veya psikolojik sonuçları olan ve süreklilik arz eden bir saldırganlık türüdür. Zorbalığa maruz kalan kişi genelde "kurban" olarak adlandırılmakta ve saldırganın davranışları karşısında kendini korumakta güçlük çekmektedir. Zorbalık genellikle mağduru öfke, çaresizlik, utanç ve yetersizlik gibi olumsuz duygulara boğan bir saldırganlık türü olarak oldukça karmaşık bir olgudur (Türktan, 2013: 3). Zorbalık çoğunlukla fiziksel, sözel ve ilişkisel olarak adlandırılan birçok şekilde kendini gösterir (Berger, 2007: 94).

Zorbalık sürecini başlatan kişiye zorba denilmektedir. Zorbalık sürecini başlatmayan ancak bu sürece aktif katılan bireyler zorbanın izleyicileridir. Zorbanın destekçileri davranışı onaylayan fakat aktif şekilde yer almayan taraftadırlar. Zorbalığın pasif destekçileri ise açıktan destek vermeyip zorbalığa gizliden destek vermektedir. İzleyip karışmayanlar ise zorbalık içeren davranışı sadece izler ve asla

karışmazlar. Mağdurun pasif savunucuları ise mağdura yardım edilmesi düşünürler ancak yardım etmezler. Mağdurun savunucuları ise zorbalıktan hoşlanmazlar ve mağdura yardım ederler (Olweus, 2003 akt. Fidancı, 2022: 8).

Bilgi ve iletişim teknolojilerinde yaşanan hızlı gelişmeye pararlel olarak dünya genelinde internetin kullanımı çok yaygınlaşmıştır. İnternet ve iletişim teknolojilerinin kullanıcılara sunduğu imkânlar, hayata kazandırdığı kolaylıklar sürekli olarak artmaya devam etmektedir. Özellikle internet hayata sunduğu çevrimiçi teknolojiler sayesinde dünya çapındaki en popüler iletişim kanalı haline gelmiştir (Hong vd. 2007 akt. Akçin, 2021: 1).

Siber zorbalık; internet veya çeşitli iletişim teknolojileri aracılığı ile başka bireylere zararlı içerikleri göndermek veya yaymak olarak tanımlanmaktadır (Willard, 2005 akt. Fidancı, 2022: 5). Günümüzün gelişmiş mobil iletişim teknolojileri sayesinde özellikle üniversite öğrencileri ile genç yetişkinler elektronik iletişimin müdavim kullanıcıları haline gelmiş ve yeni teknolojileri hayatın yeni pratikleri olarak uyarlamanın önünü açmışlardır. Gençlerin internet ve iletişim teknolojilerini yoğun ve yüksek seviyede kullanma yaklaşımları her ne kadar hayatı büyük ölçüde kolaylaştırsa da bazen onları pornografi, uyuşturucu, zorbalık ve siber zorbalık gibi çeşitli art niyetli faaliyetlerin hedefi haline getirmektedir (Arıcak, 2009 akt. Akçin, 2021: 1). Diğer bir deyiş ile internetin yasaksız ve denetimsiz kullanılması istenmeyen çeşitli durumların ortaya çıkmasına yol açmaktadır. Bu olumsuzluklardan birisi olan siber zorbalık için literatürde üç önemli tanım ortaya çıkmıştır. Belsey'e göre siber zorbalık; başkalarına zarar vermeyi amaçlayan bir kişi veya grup tarafından kasıtlı, tekrarlanan ve düşmanca davranışları desteklemek için bilgi ve iletişim teknolojilerinin kullanılmasıdır. Willard ise internet veya diğer dijital teknolojileri kullanarak zararlı materyaller gönderip yayınlayarak veya diğer sosyal saldırganlık biçimleriyle uğraşarak başkalarına karşı zalim olmanın bir yolu olarak açıklamaktadır. Son olarak Strom ve Strom ise siber zorbalığı akran tacizinin elektronik bir şekli olarak tanımlamaktadır (Belsey, 2008: 1; Willard, 2007: 1, Strom ve Strom, 2005: 21 akt. Akçin, 2021: 10).

Ybarra (2004) araştırmasında, siber zorbalığın günümüzde gençleri etkileyen önemli bir halk ve ruh sağlığı sorunu olduğunu ve internete rutin şekilde düzenli olarak bağlanan kullanıcıların siber zorbalığa maruz kalma olasılığının ciddi ölçüde yükseldiği sonucuna ulaşmıştır. Rigby (2011), siber zorbalıkta en önemli sorunu siber zorbalık davranışında bulunan kişinin empati yapmaması olarak özetlemiş ve siber zorbalık davranışları gösteren kişi veya kişilerin internet ortamında zarar verdikleri kişinin yüzünü görme, gözüne bakma veya neden oldukları zararı görerek kendilerini kontrol etme imkânından mahrum kaldıkları için çok daha rahat hareket etmekte oldukları gerçeğine dikkat çekmiştir. Ek olarak yetişkinler ve gençlerin, siber zorbalığın sonuçlarını ciddiye almadıkları için siber zorbalık olgusunu önemsiz ve etkisiz olarak algılamakta olduklarını da ortaya koymuştur (Ybarra, 2004: 247; Rigby, 2011: 277; akt. Akçin, 2021: 11).

2.2. Siber Zorbalığın Türleri

Bilgi ve iletişim teknolojileri kullanılarak gerçekleştirilen siber zorbalık bireylerin karşısına çok çeşitli biçimlerde çıkabilmektedir. Siber zorbalık davranışları Willard (2007) tarafından eylem tarzlarına göre; kızdırma, kışkırtma, çevrimiçi taciz, siber tehdit, iftira, farklı birisi gibi davranma ile ifşa etme ve dışlama olarak yedi başlığa ayrılmıştır.

Kızdırma/kışkırtma: Çevrimiçi ortamda, asgari iki birey arasında ortaya çıkan anlaşmazlık sonrası kızgınlık, düşmanlık, tehdit ve hakaret içerikli ifadelerin kullanılmasıdır. Bu durumlar genellikle sohbet odaları, tartışma sayfaları, e-oyunlar gibi herkese açık ortamlarda görülmektedir.

Çevrimiçi taciz: Kişinin sürekli olarak aşağılayıcı, saldırgan ve onur kırıcı ifadeler içeren mesajlara mahkûm edilmesidir. Çevrimiçi taciz, kızdırma/kışkırtma ile kıyaslandığında genellikle tek taraflı olması ve daha uzun sürmesi ile ayrışmaktadır (Kowalski vd. 2014; Walker, 2009; Willard, 2007; Pekşen ve Süslü, 2016 akt. Türk ve Şenyuva, 2021: 467).

Siber taciz: Korku oluşturmak amacıyla sürekli tekrar eden tehdit, iftira ve abartılı taciz uygulanmasıdır. Siber taciz, çevrimiçi tacize çok benzeyen ancak çok daha şiddetli halidir. Devamlı surette tehdit ve tacize uğrama mağdurun güvenlik endişelerine kapılmasına sebep olmaktadır (Kowalski vd., 2014; Willard, 2007).

İftira ve karalama: Bir kişiyi itibarsızlaştırmak için sanal mecralarda hakaret içerikli yalan söylentiler çıkarma eylemidir (Willard, 2007).

Farklı birisi gibi davranma: Bir kişinin sahip olduğu hesapların parolasını ele geçirmek ve hesabını oymuş gibi kullanmak suretiyle uygunsuz mesajları oymuş gibi göndermeyi içeren bir siber zorbalık türüdür. Bu yolla asıl hesap sahibi başkalarına karşı sıkıntıya düşmekte, saygınlığını kaybedip kendisini kötü hissetmektedir (Kowalski vd., 2014; Willard, 2007).

İfşa etme: Mağdurun utanmasına yol açacak mahrem bir resmin veya videonun, ya da gizli bir bilginin yahut kişisel bir görüşmeye ait içeriğin diğer insanlara gönderilmesi veya herkese açık çevrimiçi mecralarda paylaşılmasıdır (Kowalski vd., 2007; Willard, 2007).

Dışlama: Kişinin çevrimiçi bir gruba veya gruplara alınmaması yahut üyesi olduğu çevrimiçi gruptan çeşitli şekillerde atılmasıdır. Bu durum genellikle sosyal medya platformlarında arkadaşlıktan çıkarılmak şeklinde ortaya çıkarken çevrimiçi oyunlarda ise yenen kişinin yenilen kişi ve arkadaşları tarafından oyundaki hareketlerinin kısıtlanması ve hatta oyuna katılmasının engellemesi şeklinde görülmektedir (Willard, 2007).

Siber zorbalığın sanal mecralarda bu kadar çok ve çeşitli şekillerde görülmesi, her zaman ve her ortamda uygulanabilecek nitelikte olmasını kolaylaştırmaktadır. Teknolojide yaşanan gelişmelere paralel olarak siber zorbalık türlerinin de hem sayısal olarak artış gösterebileceği ve hem de zamanla tarz olarak değişebileceği öngörülmektedir (Türk ve Şenyuva, 2021: 468).

2.3. Siber Zorbalığın Etkileri

Yapılan çeşitli bilimsel çalışmalarda siber zorbalık mağduriyeti yaşayan gençlerde depresyon, düşük benlik saygısı, korku, üzüntü, hayal kırıklığı, utanç gibi farklı ve çeşitli duyguların oldukça yoğun şekilde yaşanabildiği görülmektedir (Patchin ve Hinduja, 2006).

Siber zorbalığa uğrayan genç mağdurlarda kendini savunma yetersizliği ve siber zorbalığın kapsamına göre üzüntü ve öfke gibi olumsuz hisler, güvenlik endişesi, birçok farklı kişilik ve ilişki sorunları gözlenebilmektedir (Spears vd., 2009). Bu tür problemler yaşayan öğrencilerin okula gitme veya görünmeye karşı korku geliştirdikleri (Hinduja ve Patchin, 2010; Kowalski vd., 2007; Morales, 2011), tekrar siber zorbalığa uğrama ihtimalinin verdiği şiddetli baskı nedeniyle ev yahut okuldaki meselelere odaklanmada sorunlar yaşadıkları ortaya çıkmaktadır. Bu ve benzeri sebeplerle duygusal problemlere ek olarak akademik başarı noktasında da çeşitli problemlerin yaşandığı tespit edilmektedir (Mason, 2008; Wong-Lo vd., 2011).

Siber zorbalığa uğramış kişilerde aşırı üzüntü ve depresyon, intihara eğilim, korku, utanç ve endişe hisleri, yoğun gerginlik ve aşırı tepkisellik, internet mecraları ve çevrimiçi platformlara gösterilen alakanın düşüş kaydetmesi, birçok farklı davranış sorunları, eğitim ve okula dair sorumluluklardan kaçma, bağımlılık yapıcı çeşitli maddeleri kullanmaya başlama ya da meyil gösterme gibi çok çeşitli problemlerin yaşanan siber zorbalık vakaları nedeniyle ortaya çıktığını göstermektedir (Mason, 2008; Morales, 2011; Schneider vd., 2012).

Başka bir araştırmada siber zorbalığa maruz kalan öğrencilerin %78'i özgüven kaybı ve %70'i özsaygı kaybı yaşamıştır. Bu öğrencilerin %42'si arkadaşlık ilişkilerinde bozulma, %35'i okul başarısında düşüş ile %28'i için okul etkinliklerine katılmada isteksizlik ve %19'unda aile ilişkilerinde bozulma olduğu ve ayrıca siber zorbalığın kadın öğrencileri erkek öğrencilere göre daha fazla etkilediği gerçeği de ortaya çıkmıştır. Sözkonusu çalışmada siber mağdurlarda % 75 üzülme, % 54 yoğun keder ve üzüntü, % 72 kızgınlık ve öfke, % 58 endişe ve hüsrana uğrama, % 48 korku ve utanç ile % 29 için ise dehşete düşme gibi son derece olumsuz duygusal etkiler olduğu belirlenmiştir (Price ve Dalgleish, 2010).

Hinduja ve Patchin'e göre siber zorbalık mağduriyeti yaşayan kişilerde ortaya çıkabilecek en büyük etki intihar etme eğilimidir. Siber zorbalığa uğramış kişilerde geleneksel zorbalık yaşayanlara kıyasla çok daha yüksek oranda intihar düşüncesi görülmektedir (Hinduja ve Patchin, 2010).

Diğer bir çalışmada siber zorbalığa maruz kalan kişilerde madde kullanma ihtimalinin 2,5 kat, depresyon ihtimalinin 2 kat, intihar girişiminin kadınlarda 3,2 kat, ve erkeklerde ise 4,5 kat daha yüksek olduğu gerçeğini ortaya koymaktadır. Siber zorbalık aktivitelerinin yetişkinler tarafından gençler ve çocuklara

yapıldığı durumlarda karşılaşılan sonuçların ise çok daha tehlikeli olduğu gözlenmektedir (Anderson, 2010; Goebert vd., 2011).

Siber zorbalığa uğrayan mağdur kişilerin giderek artan bir sıklıkla başka bireylere zorbaca davranışlar sergilemeye başladığı da anlaşılmaktadır. Siber zorbalıkla ilgili yürütülen çalışmalar birçok siber zorbanın kendilerinin de daha önce bu tür zorbalığa maruz kaldığını ortaya çıkarmıştır (Katzer vd., 2009; Schneider vd., 2012; Vandebosch ve Van Cleemput, 2009; Yilmaz, 2011 akt. Kınay, 2012: 36-37).

Diğer bir bilimsel çalışmada siber zorbalığın sosyal, duygusal ve akademik etkileri nedeniyle siber zorbalığa uğrayan kişilerin hayatta başarısızlık ve istikrarsızlık yaşadıkları tespit edilmiştir. Bu araştırmada mağdur kişilerde depresif belirtilere rastlandığı, kaygı düzeylerinin yüksek ve benlik saygı düzeylerinin düşük olduğu, intikam alma duygusu ile öfke, üzüntü ve yalnızlık gibi duyguların yoğun yaşandığı gözlenmiştir (Pekşen Süslü, 2016; akt. Akçin, 2021: 25).

Toplamda 25 makale ile 11.506 çocuk ve genç bireyi ele alan kapsamlı bir metaanaliz çalışmasına göre, siber zorbalıktan dolayı mağduriyete uğrayan gençlerde intihara meyilli olma, intihar girişiminde bulunma ve intihar etme sıklığının yaklaşık olarak 2 kat daha fazla olduğu sonucuna ulaşılmıştır (John vd., 2018 akt. Türk ve Şenyuva, 2021: 471).

Siber zorbalığın sebep olduğu olumsuz sosyal, duygusal ve akademik etkilerin yaşanmaması ve siber zorbalık aktivitelerine karşı azami düzeyde koruma sağlanması için özellikle çocuk ve gençlerin internet kullanma süresi ile sıklığını azaltmaya yönelik çalışmalar yapılması gerekmektedir. Özellikle çocukların ve gençlerin sosyal medya kullanımlarının kontrol edilmesi, kişisel bilgisayar, tablet ve akıllı telefon gibi araçlara filtre programları kurulması, ebeveyn ve öğretmenlerin siber zorbalık mağdurlarını daha erken fark etmelerine yardımcı olacak bilgilerle desteklenmeleri gerekmektedir. (Akçin, 2021: 25)

3. YÖNTEM

3.1. Araştırmanın Modeli

Araştırma modeli, araştırmanın amacı doğrultusunda gerekli verilerin toplanması ve toplanan verilerin betimsel analizler ile yorumlanarak sonuçların elde edilmesidir.

3.2. Çalışma Grubu

Çalışmanın örneklem grubunu Türkiye'nin çeşitli il ve ilçelerinde ikamet eden yaşları 9-18 arasında değişen ilk ve orta öğretim öğrencileri, 19-29 yaş aralığındaki üniversite gençleri ve çalışanlar ile 30-40 yaş grubundaki ve 40 yaş üstündeki yetişkin bireyler oluşturmaktadır.

Araştırmanın örneklemi ise araştırmanın amacı doğrultusunda kolayda örnekleme yöntemi ile seçilmiştir. Kolayda örnekleme yönteminde katılımcılar ulaşılması kolay, araştırmanın kapsamına uygun ve gönüllü kişilerden seçilmektedir. Buna uygun olarak farklı yaş gruplarından siber zorbalık olgusuna aşina, bizzat kendisi veya çevresinden birileri siber zorbalığa uğramış yani kısmen de olsa konu hakkında bilgi sahibi bireylerin çalışmaya dâhil edilmesiyle araştırmanın örneklemi oluşturulmuştur. Örneklem büyüklüğü olarak 1.000.000 kişiyi temsil eden 400 katılımcıya sahip bir örneklem ile çalışılması hedeflenmiş fakat katılımcıların siber zorbalık olgusuna aşina olma ön şartı nedeniyle çalışmanın yürütüldüğü dönemde ancak 97 katılımcı sayısına ulaşılabilmiştir. Toplanan verilerin gerekli yorum ve çıkarımlar için yeterli olduğu düşünülmektedir.

3.3. Verilerin Toplanması ve Analizi

Araştırma amacına uygun verilerin toplanması ve yorumlanması için nicel araştırma yöntemlerinden anket yöntemi kullanılmıştır. Anket için internet web siteleri ve sosyal medya platformlarında siber zorbalıkla ilgili kullanıcıların ilgilendiği ve merak ettiği başlıklar üzerinden en çok sorduğu sorular derlenerek ikisi demografik özellik olmak üzere toplam 15 maddeden oluşan bir soru seti oluşturulmuştur. Bu soruların Google Forms platformuna aktarılmasıyla hazırlanan çevrimiçi anket formu e-posta ve çeşitli sosyal medya kanallarında paylaşılan Google Forms anket bağlantısı üzerinden katılımcılara ulaştırılarak gerekli veriler toplanmıştır.

4. BULGULAR VE YORUM

Yürütülen anket çalışmasının bulguları frekans tabloları, KMO Bartlett testi ve betimleyici analizler ile yorumlanmıştır.

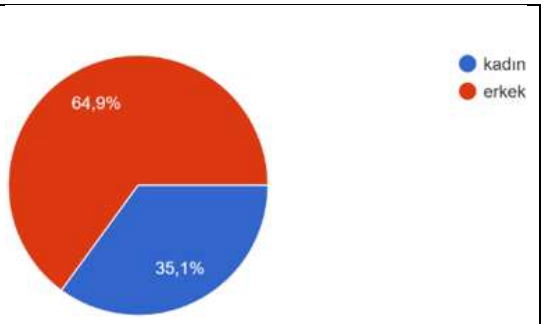
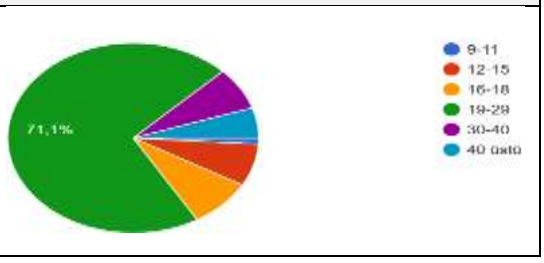
Tablo 1. Güvenirlik Analizi

KMO Bartlett Testi		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,646
Bartlett's Test of Sphericity	Approx. Chi-Square	337,627
	df	78
	Sig.	<,001

Analiz sonucunda verilen bilgilerin güvenirlik ve uygunluğundan emin olmak için KMO>0.6 ve Bartlett sig<0.05 ön şartı aranmıştır. Tablo 1'de görüldüğü üzere KMO 0,646 ve p<0.05 olduğundan veriler analiz için uygundur.

Araştırmaya dâhil olan katılımcıların demografik özelliklerini tespit etmek amacıyla sorulan iki soru anketin ilk bölümünde yer almaktadır. Ankete katılan çocuk, genç ve yetişkinlerin demografik özelliklerine ait frekans ve yüzde dağılımları Tablo 2'de gösterilmektedir.

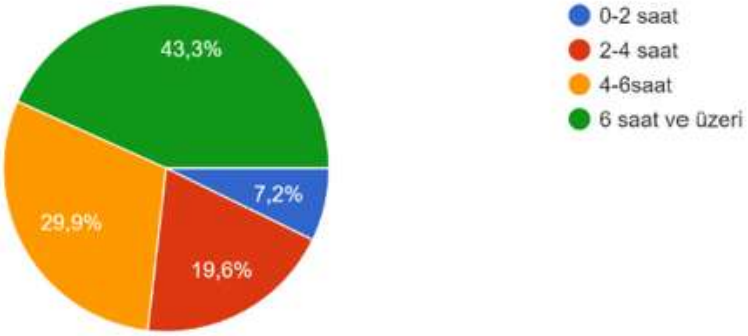
Tablo 2. Demografik Özellikler

		Frekans	Yüzde	
Cinsiyet	Erkek	63	64,9	
	Kadın	934	35,1	
Yaş	9-11	1	1	
	12-15	7	7,2	
	16-18	8	8,2	
	19-29	69	71,1	
	30-40	7	7,2	
	40 üstü	5	5,2	

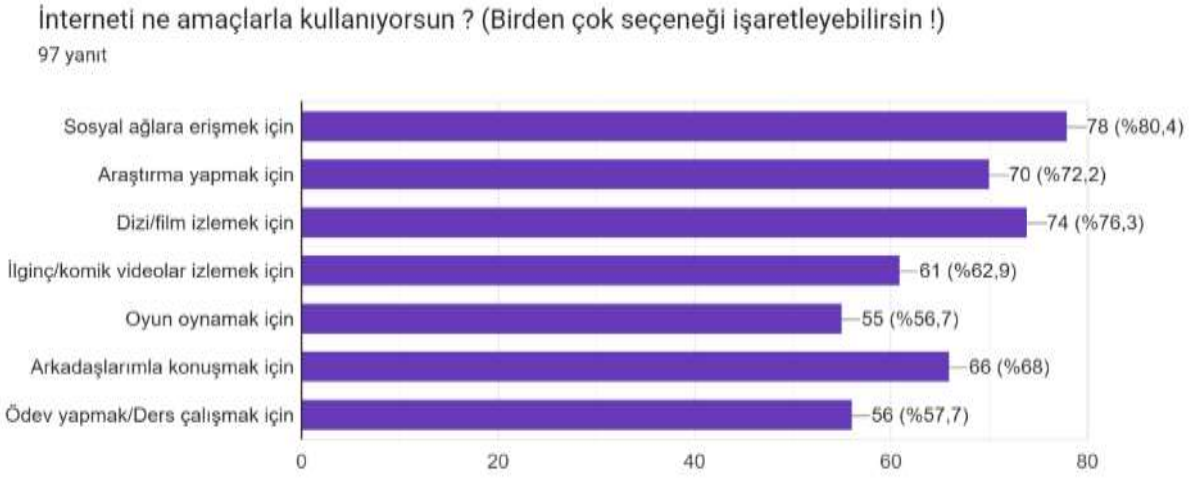
Katılımcıların siber zorbalık olgusuna aşina olma ön şartı nedeniyle araştırmaya 97 kişi katılmıştır. Tablo 2'de görüldüğü üzere araştırmaya katılanların %65'i erkek, %35'i ise kadındır. Yaş dağılımı olarak %71'i 19-29 ve %8'i 16-18 yaş aralığındadır. Yaşı 30-40 arasında olan %7 ve 40 yaş üstü olan kişiler ise %5 civarıdır.

Tablo 3. Siber zorbalık etkileri değerlendirme anketi frekans ve yüzde değerleri

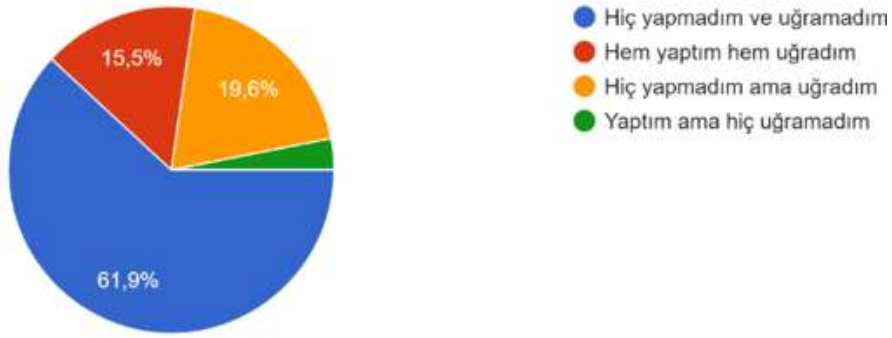
1) Gün içerisinde ne kadar süre ile internete bağlısınız?		
0-2 saat	7	%7,2
2-4 saat	19	%19,6
4-6 saat	29	%29,9
6 saat ve üstü	42	%43,3



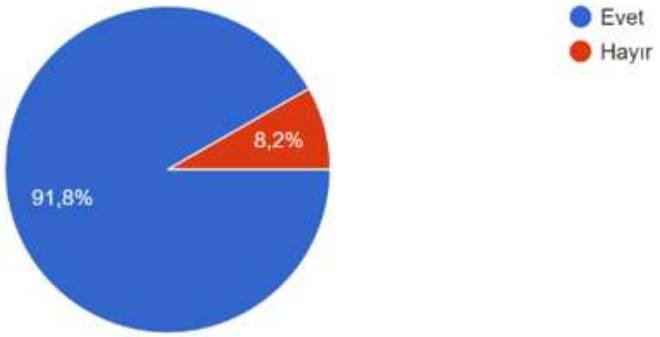
2) İnterneti hangi amaçla kullanıyorsunuz? (birden fazla seçenek seçilebilir)		
Sosyal ağlara erişmek için	78	%80,4
Araştırma yapmak için	70	%72,2
Dizi/Film izlemek için	74	%76,3
İlginç/Komik videolar izlemek için	61	%62,9
Oyun oynamak için	55	%56,7
Arkadaşlarımla konuşmak için	66	%68
Ödev yapmak/Ders çalışmak için	56	%57,7



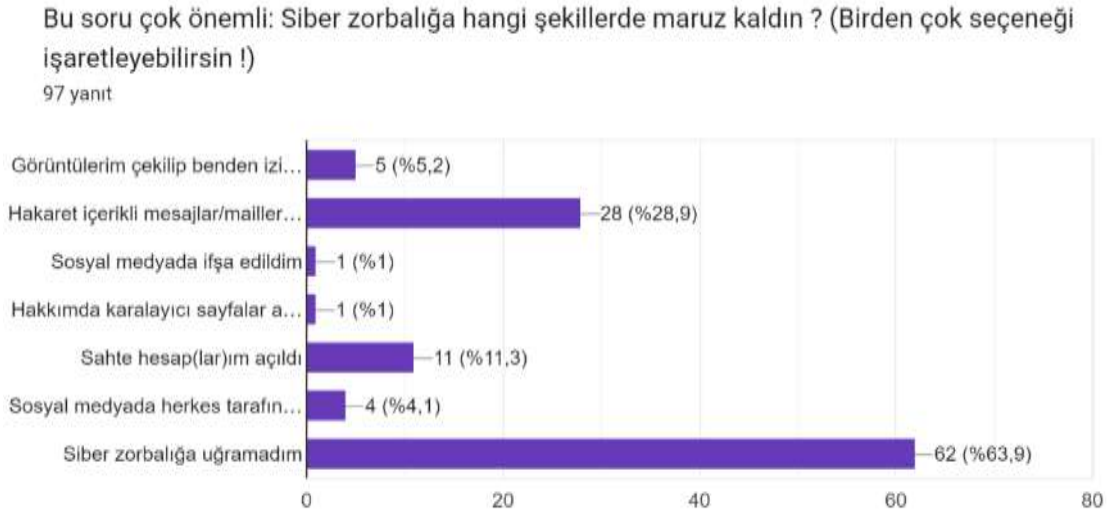
3) Hiç siber zorbalık yaptınız mı veya siber zorbalığa uğradınız mı?		
Hiç yapmadım ve uğramadım	60	%61,9
Hem yaptım hem de uğradım	15	%15,5
Hiç yapmadım ama uğradım	19	%19,6
Yaptım ama hiç uğramadım	3	%3,1



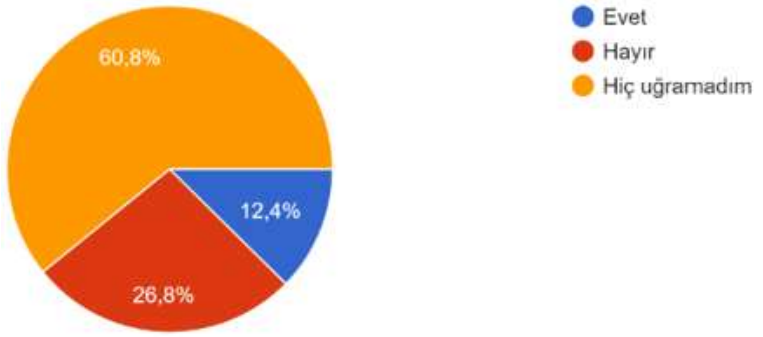
4) Siber zorbalığın suç olduğunu biliyor musunuz?		
Evet	89	%91,8
Hayır	8	%8,2



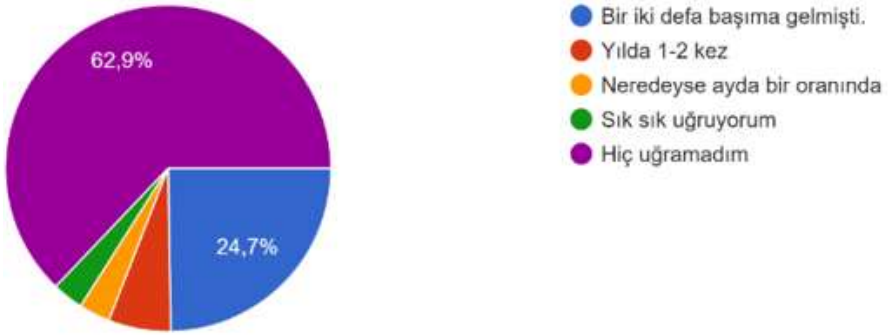
5) Siber zorbalığa hangi şekillerde maruz kaldınız? (birden fazla seçenek seçilebilir)		
Görüntülerim çekilip benden izinsiz paylaşıldı	5	%5,2
Hakaret içerikli mesajlar/mailler aldım	28	%28,9
Sosyal medyada ifşa edildim	1	%1
Hakkımda karalayıcı sayfalar açıldı	1	%1
Sahte hesap(lar)ım açıldı	11	%11,3
Sosyal medyada herkes tarafından bloke edilip dışlandım	4	%4,1
Siber zorbalığa uğramadım	62	%63,9



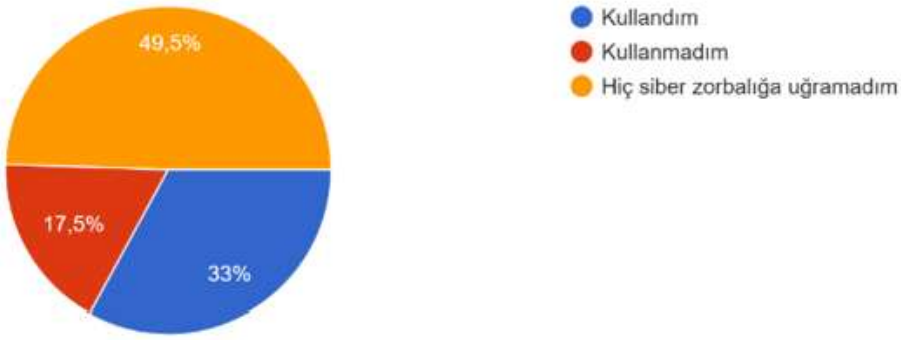
6) Siber zorbalığa uğradıysanız psikolojiniz kötü etkilendi mi?		
Evet	12	%12,4
Hayır	26	%26,8
Hiç uğramadım	59	%60,8



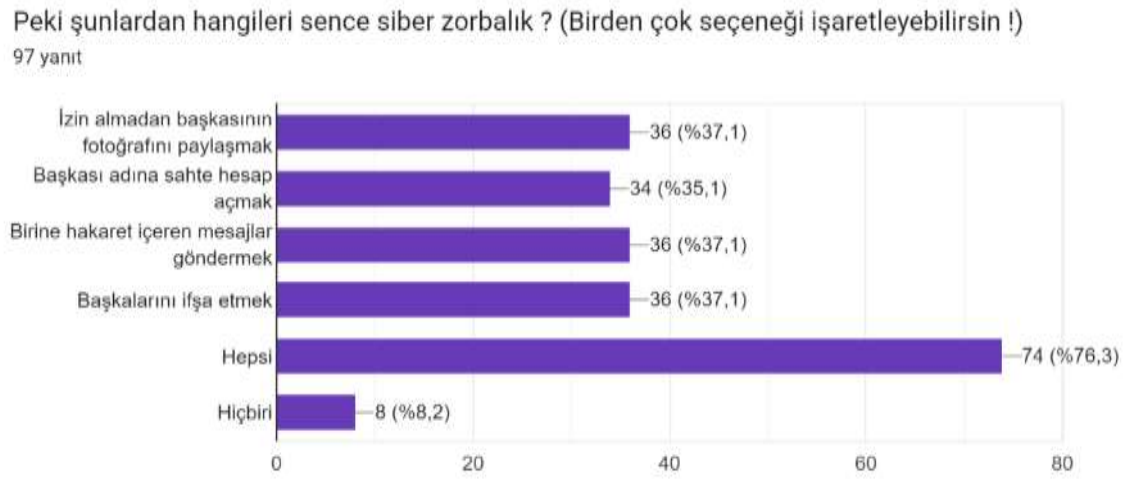
7) Ne sıklıkla siber zorbalığa uğradınız / uğruyorsunuz?		
Bir iki defa başıma gelmişti	24	%24,7
Yılda 1-2 kez	6	%6,2
Neredeyse ayda 1 oranında	3	%3,1
Sık sık uğruyorum	3	%3,1
Hiç uğramadım	61	%62,9



8) İnternet sitelerinde bulunan şikâyet et / bildir özelliğini hiç kullandınız mı?		
Kullandım	32	%33
Kullanmadım	17	%17,5
Hiç siber zorbalığa uğramadım	48	%49,5



9) Size göre aşağıdakilerden hangileri siber zorbalıktır? (birden fazla seçenek seçilebilir)		
İzin almadan başkasının fotoğrafını paylaşmak	36	%37,1
Başkasının adına sahte hesap açmak	34	%35,1
Birine hakaret içeren mesajlar göndermek	36	%37,1
Başkalarını ifşa etmek	36	%37,1
Hepsi	74	%76,3
Hiçbiri	8	%8,2



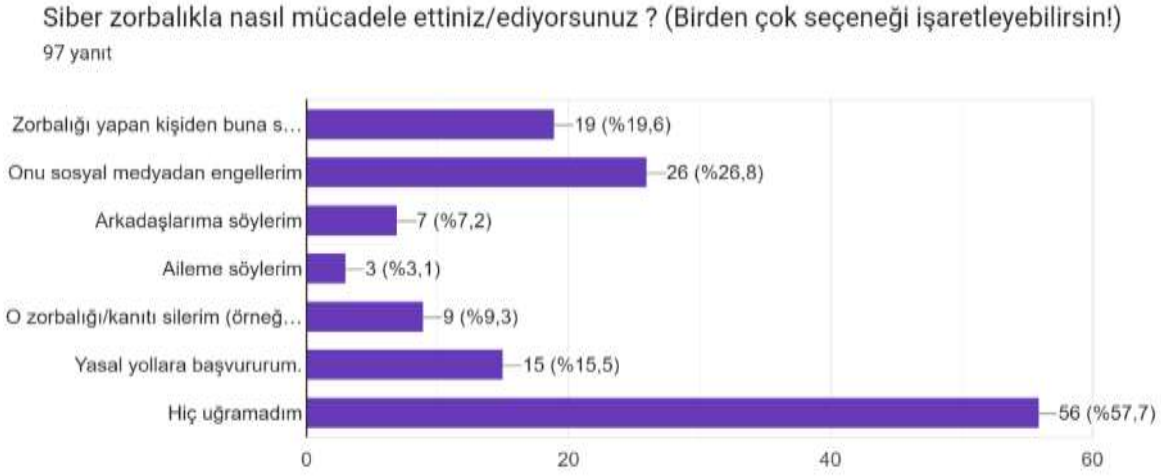
10) Siber zorbalığa uğradığınızda hangil duyguları yaşamaya başladınız? (birden fazla seçenek seçilebilir)

Endişe	19	%19,6
Dikkat dağınıklığı	8	%8,2
Okuldan/İşten uzaklaşma isteği	9	%9,3
Kızgınlık/Öfke	33	%34
Üzüntü	20	%20,6
Fiziksel olarak kötü hissetme	17	%17,5
Yalnızlık	5	%5,2
Hiçbiri	59	%60,8

11) Siber zorbalıkla nasıl mücadele ettiniz/ediyorsunuz? (birden fazla seçenek seçilebilir)

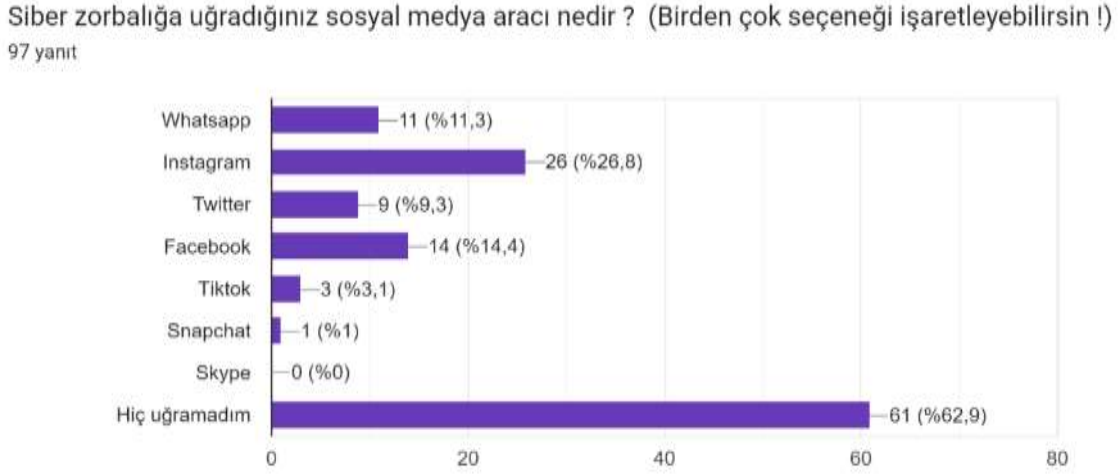
Zorbalık yapan kişiden buna son vermesini isterim	19	%19,6
Onu sosyal medyamda engellerim	26	%26,8
Arkadaşlarıma söylerim	7	%7,2
Aileme söylerim	3	%3,1
O zorbalığı/kanıtı silerim	9	%9,3
Yasal yollara başvururum	15	%15,5

Hiç uğramadım	56	%57,7



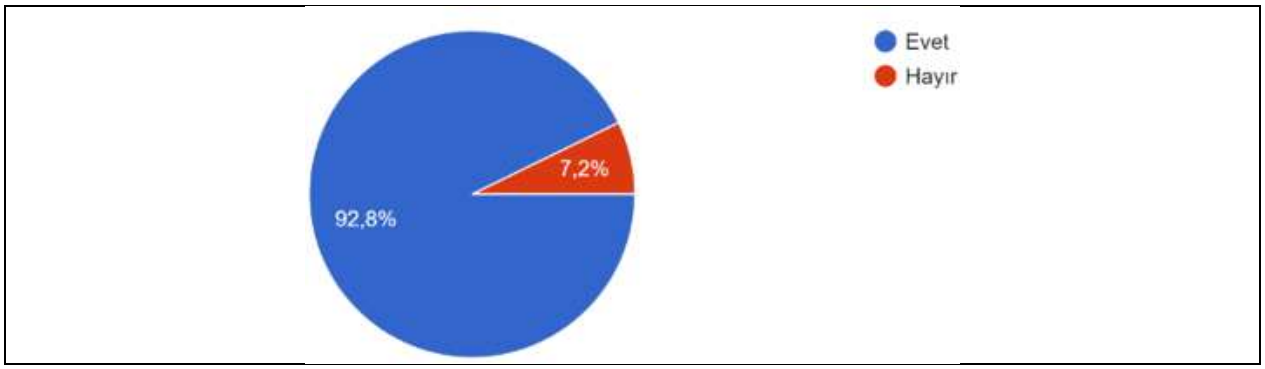
12) Siber zorbalığa uğradığınız sosyal medya platformu hangisidir? (birden fazla seçenek seçilebilir)

WhatsApp	11	%11,3
Instagram	26	%26,8
Twitter	9	%9,3
Facebook	14	%14,4
TikTok	3	%3,1
Snapchat	1	%1
Skype	0	%0
Hiç uğramadım	61	%62,9



13) Sizce teknolojideki hızlı gelişme siber zorbalığı etkiledi mi / etkiliyor mu?

Evet	90	%92.8
Hayır	7	%7,2



Katılımcıların yaklaşık %30'u günlük 4-6 saat, %43'ü ise 6 saattten fazla internete bağlı kalmaktadır. İnterneti kullanma amacında %80'i sosyal ağlara erişim ve %76'sı dizi/film izlemek için kullanmaktadır. Siber zorbalığa en çok maruz kalınan sosyal medya platformu için yaklaşık %27'si Instagram ve % 14'ü Facebook cevabını vermiştir. Katılımcıların yaklaşık % 93'ü teknolojideki hızlı gelişmenin siber zorbalığı etkilediğini düşünmektedir.

5. SONUÇ VE ÖNERİLER

Amacı farklı yaş aralıklarındaki gençler ve yetişkinler arasında giderek daha fazla görülen siber zorbalık olaylarından dolayı ortaya çıkan etkileri irdelemek olan araştırmada yapılan betimsel analizlerde öne çıkan en önemli hususlar arasında;

- Katılımcıların %43'ü günlük 6 saat ve üzeri internete bağlanmakta olduğu, 4-6 saatlik %30'luk dilimi de ilave edince ankete katılan kişilerin %73'lük kısmının günde 4 saatten fazla interneti kullandığı,
- İnternetin en çok %80 sosyal medya ve %76 dizi/film izleme amaçlı kullanıldığı,
- Katılımcıların yaklaşık %20'si siber zorbalığa maruz kalan ve %15'i ise hem mağdur hem de siber zorba konumundaki kişiler olduğu,
- Katılımcıların yaklaşık %29'u hakaret içerikli mesajlar/e-postalar alarak ve %11'i ise kendileri adına sahte hesap(lar) açılmak suretiyle siber zorbalığa maruz kaldığı,
- Katılımcıların %40'a yakını siber zorbalık mağduriyeti yaşarken bunların sadece %12'sinin psikolojik olarak kötü etkilendiği, diğer %27'lik kısmın yaşananlardan kötü etkilenmediği,
- Siber zorbalığa uğrama sıklığında katılımcıların yaklaşık %25'lik kısmının hayatında 1-2 sefer ve %6'lık kesimin ise yılda 1-2 defa bu olumsuz durumu yaşadığı,
- Katılımcıların %8'lik bölümünün "İzin almadan başkasının fotoğrafını paylaşmak" ve "Başkalarının adına sahte hesap açmak" dâhil hiçbir eylemi siber zorbalık olarak görmediği, (aslında bu üzerinde ciddi olarak düşünülmesi gereken bir aykırılık)
- Siber zorbalığa uğrayan kişilerde en sık ve yoğun olarak öne çıkan duyguların sırasıyla yaklaşık %34 ile Kızgınlık/Öfke, %21 ile Üzüntü ve %20 ile Endişe duyguları olduğu,
- Siber zorbalıkla mücadele şeklinde en çok tercih edilen yöntem olarak katılımcıların yaklaşık %27'si siber zorbayı sosyal medya hesaplarında engellemeyi tercih ederken, %20'si siber zorbadan buna son vermesini istemekte ve sadece %15'i yasal yollara başvurmayı yeğlemektedir,
- En fazla siber zorbalığa uğranılan Sosyal medya platformları %27 Instagram, %14 Facebook ve %11 Whatsapp olarak ifade edilmiştir,
- Ayrıca siber zorbalığa maruz kalan mağdurların yaşadıkları çeşitli psikolojik sorunların başında gelen kızgınlık/öfke (%34) duygusu aniden ortaya çıkma özelliği nedeniyle olumsuz durumlarda en çok görülen duygulardan biri olmaktadır.

- %21 kitlenin yaşadığı üzüntü duygusunun sebepleri arasında siber zorbanın mağdura kırıcı ve kaba sözler söylemesi, onu ifşa etmesi olduğu düşünülebilir.
- %20'lik katılımcı grubunda görülen endişe duygusunun sebepleri arasında mağdurun başına ilk defa böyle bir olay gelmesi veya siber zorbanın mağduru tehdit etmesi gibi durumlar olabilmektedir.
- Siber zorbalık sonrası kendini fiziksel olarak kötü hisseden katılımcıların düştüğü durumun nedeni olarak literatürde de yoğun şekilde işlenen psikolojik travma durumlarının fiziksel bitkinlik ile birlikte yorgunluğu da beraberinde getirmesi sayılabilir.
- %9'luk kesimde görülen okuldan/işten uzaklaşma isteğinin en temel sebebi olarak mağdurların siber zorbalık sonrasında belirgin bir şekilde kendilerini fiziksel olarak kötü hissetmeye başlaması ve ek olarak siber zorbalığa şahit olan kişinin yakın çevresinin bu zorbalığı gerçek hayata taşıması mümkün olabilmektedir.
- %8'lik bir kesim tarafından siber zorbalık sonrası yaşanan dikkat dağınıklığı ise zorbalığa kendini kaptırma veya günlük yaşantıda bu konuyu aşırı şekilde düşünme kaynaklı sorunlarla ilgili olabilmektedir.
- Son olarak katılımcıların %5'inin yalnızlık yaşadığını belirtmesinin nedeni ise sanal mecralarda yaşadığı zorbalık nedeniyle çevresi tarafından alay konusu haline geldiğini düşünerek kendini toplumdan dışlamak istemesi şeklinde yorumlanabilir.

6. TARTIŞMA

Araştırmanın daha anlamlı ve etkin olması için benzer çalışmaların ağırlıkla daha yüksek yaş grupları arasında ve çok daha fazla sayıda katılımcı içerecek şekilde yapılması gerektiği düşünülmektedir. Diğer yandan kişilerin siber zorba veya mağdur olmasının arkasında yatan sebeplerin çok karmaşık ve çeşitli olması siber zorbalık konusunun çok daha ayrıntılı incelenmesi gerektiğine işaret etmektedir. Ayrıca çeşitli bölgelerde ve farklı gelir seviyelerindeki kişilere dair karşılaştırmaların yapılması ve çalışmanın bölgesel açıdan bir farklılığa neden olup olmadığı da araştırılması gereken önemli konular arasında yer almaktadır.

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