



# ABSTRACT BOOK



**May  
08-10,  
2023**



**SUE**

زانكۆی سه‌لاحه‌دین - هه‌ولێر  
Salahaddin University - Erbil



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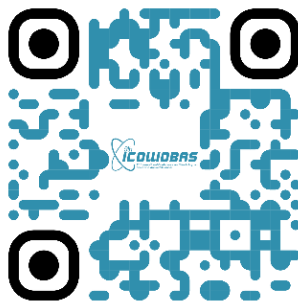
# Welcome to the ICOWOBAS-2023

Abstract Book of ICOWOBAS-2023

9<sup>th</sup> International Conference and Workshop on Basic and Applied  
Sciences

May 08-10<sup>th</sup>, 2023

Erbil, Kurdistan Regional Government, Iraq



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## FOREWORD

This book contains the abstracts of the 9<sup>th</sup> International Conference and Workshop on Basic and Applied Sciences organized by the Faculty of Education, Tishk International University.

The purpose of 9<sup>th</sup> ICOWOBAS-2023 is to Present and Exchange Innovative Viable Ideas Relating to the Basic and Applied Sciences and will focus on Pure and Applied Mathematics and Statistics, Biology and Biomedical Sciences, Pure and Applied Physics, Chemistry and Chemical Engineering, and Computer and Data Science, and Environmental Sciences

9<sup>th</sup> ICOWOBAS-2023 is aiming to gather novel scientific research, increase the volume of existing academic collaboration, and produce pure and applied science results that will rise the life standards of society. Moreover, 9<sup>th</sup> ICOWOBAS-2023 is also aiming to extend its usual scope to the new era of environmental sciences, including clean energy and alternative power resources, the global warming concerns, and challenges along with pollution mitigation.

9<sup>th</sup> ICOWOBAS-2023 received 177 abstract submissions from around 70 different universities and institutions. Each abstract submission was reviewed by scientific committee members of the conference.

The 9<sup>th</sup> ICOWOBAS-2023 has collaborated with the Jurnal Teknologi (indexed in ESCI, Scopus), MJFAS (indexed in ESCI, Scopus), IEEE (indexed in Scopus), EAJSE and Zanco Journal (indexed in DOAJ and has DOI number).

The 9<sup>th</sup> ICOWOBAS-2023 is dedicated to offering a unique opportunity and atmosphere for researchers in Kurdistan Region-Iraq to gather, share innovative ideas, discuss novel problems, and collaborate in possible fields academically with international participants as well as themselves.

To serve this purpose, conferences are organized along these lines of well-established and well-defined scientific disciplines. In addition, interdisciplinary conferences are also organized because they serve the mission statement of the university.

We would like to thank all the participants, the member of organizing and scientific committees and university administrative for putting this conference together.



Asst. Prof. Dr. Mehmet Ozdemir  
Conference Chairman

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# ICOWOBAS-2023

# Keynote Speakers

## Biotechnology Translational Research: Development of Socioeconomic Platform for Food Security, Human Health, and Environmental Sustainability.

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### Abstract

Biotechnology is one of the most growing research projects based on its applicability in nature which able to solve many socioeconomic problems. Therefore, Biotechnology Business is considered as one of the main drivers of knowledge-based economy (KBE) beside IT and material science. It has also been used as indicator for the country's development as the percentage of contribution of KBE in national GDP provides director indication of the country's innovation capability and competitiveness. However, beside much research done nowadays in many countries, small number of research were able to complete the innovation-industrialization cycle for the product development to be considered as an added value to the national economy. This needs to convert the scientific value to business value through the transfer of knowledge from research-discovery platform to techno-industrial platform. The success of translational research cycle in biotechnology is based on many internal and external factors. In addition, researchers need to understand the product/business development culture of biotechnology. This presentation will provide a comprehensive overview and road map for researchers in the field of biotechnology/bioprocessing for biotechnology-based product industrialization. In addition, it will also provide recommendations for top management and decision makers to develop a fruitful business-Ecosystem integrated platform and efficient a quadrate helix model including: (Government-Academia-Industry-Community) to improve the biotechnology translational research in national level to support socioeconomic sustainability in critical sectors such as food security, human health, and environmental sustainability.

## Molecular mechanism of the xanthophyll cycle in plants - the role of non-lamellar lipids

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### Abstract

Xanthophyll cycle is the universal mechanism which optimizes the amount of light energy reaching the reaction centers of the photosynthetic apparatus of plants. The key enzyme of the xanthophyll cycle, violaxanthin de-epoxidase (VDE), converts violaxanthin, via antheraxanthin, to zeaxanthin under strong light. Violaxanthin has an antenna function, while zeaxanthin plays a photoprotective role. An essential factor for the enzymatic activity of VDE is monogalactosyl-diacylglycerol (MGDG), a major component of the lipid fraction of the thylakoid membrane. In this lecture, the results of investigations on the molecular mechanism of the xanthophyll cycle will be presented, with particular emphasis on the role of MGDG. Studies using a range of biochemical, spectroscopic and microscopic methods have shown that the ability of MGDG to form inverted hexagonal structures is important for the activity of VDE in the de-epoxidation reaction. We have also shown that another non-lamellar lipid, phosphatidylethanolamine, also activates VDE. We demonstrated that the stimulatory effect of non-lamellar lipids on VDE activity is in part related to the greater solubility of violaxanthin in these lipids and the facilitated penetration of the enzyme into the hexagonal domain, where violaxanthin is localised. Microscale thermophoresis measurements allowed us to determine the association constants of VDE and the different types of lipids present in thylakoid membranes. Based on the results obtained, we propose a molecular mechanism of the xanthophyll cycle, and the role of non-lamellar lipids in its function and its regulation. In addition, a new family of enzyme proteins whose activity depends on the presence of lipids having the ability to form an inverted hexagonal phase will be presented.

**Keywords:** xanthophyll cycle, violaxanthin de-epoxidase, non-bilayer lipids, photoprotection.

## Phenolic Compounds from Indonesian Medicinal Plants: Small Molecules with Great Activities

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<sup>2</sup>Biotechnology of Tropical Medicinal Plants Research Group,  
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### Abstract

Phenolic compounds are chemically defined as compounds with an aromatic ring with one or more hydroxyl groups. This group of compounds is divided into phenolic acids, phenylpropanoids, flavonoids, coumarins, stilbenes, anthraquinones, tannins, and lignans. Based on their biological activities, this group of compounds shows antioxidant, antibacterial, anti-inflammatory, antimutagenic, and other activities. Therefore, exploration of this group of compounds is essential to do. In two decades (2000-2022), our research group has explored phenolic compounds from 25 species of tropical plants from Indonesia. Phenolic compounds were explored by isolating them using various chromatographic techniques. The pure isolates that have been obtained are then determined for their molecular structure using the spectroscopic method. Compounds with known molecular structures were tested for in vitro, invivo, and in silico activities to get a complete map of phenolic compounds with their biological activities. Compounds that are in sufficient quantity are also modified by semi-synthetic methods to obtain more potent activity. Efforts to increase this activity are also carried out by transferring these compounds into nano-sized using encapsulation techniques. We also used the encapsulation technique on methanol and ethyl acetate extracts from several samples of Indonesian herbal ingredients, which we converted from micro to nano. We are currently conducting trials to make several nano-cosmetic and nano-supplement products downstream of the product. Until all our work gets maximum results, strenuous effort, and hard work are still required. Hand in hand, together with collaborators is the most important to develop our research in the future.

## Revolutionizing Radiation Detection: The Wireless Transmission System for Portal Monitoring

S. Hashim<sup>1,2\*</sup>, N. Z. H. A. Hanifah<sup>1</sup>, R. S. Omar<sup>3</sup>, Y.J. Lee<sup>4</sup>,  
C.L Goh<sup>4</sup> K. Shafie<sup>5</sup> and R.M. Taha<sup>6</sup>

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### Abstract

Security experts have long been concerned about the potential for nuclear and radiological terrorism and improving security protocols for special nuclear material (SNM) and radiological sources is the first line of defense. However, these measures do not tackle the issue of nuclear material already in the possession of extremist groups or available on the black market. To detect and deter the smuggling of SNM and radiological sources, governments have been deploying radiation portal monitors (RPMs) at bottlenecks such as shipping ports, border crossings and high-profile events. The feasibility of using organic scintillation detectors in RPMs is being explored, with the potential to significantly reduce the number of radiation nuisance alarms and save time and resources for the Royal Malaysian Customs Department (RMCD). The MyRPM project aims to create a cloud platform for real-time monitoring of RPMs throughout Malaysia, allowing end-users to report faults and view service reports from a mobile application. Commercializing RPMs and those capable of distinguishing SNM sources from nuisance radiation sources could be a promising development. However, processing nuisance alarms is time and money intensive and distracts from the RPM operators' actual mission. Billion Prima Sdn. Bhd. & UTM are working to commercialize this product and certification from SIRIM is being sought by utilizing testing conditions and scenarios outlined in ANSI standard N42.35 and IAEA-TECDOC-1312. Improving the equipment used at security screening checkpoints could have a positive impact on the ability to detect prohibited objects and substances.

**Keywords:** Radiation Portal Monitor, Special Nuclear Material, Real-time monitoring.



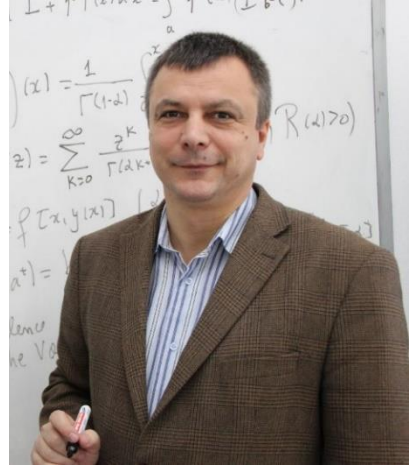
## Classification of the fractional operators: A point of view

Dumitru Baleanu<sup>1,2</sup>

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### Abstract

One of the most debated issue within fractional calculus field is the classification of the operators. So far, several different attempts to classify the fractional operators have been presented. In my talk I will provide some new results within this hot topic together with some important consequences arising from the applied viewpoint.



## Rapid Screening of Targets for Early Diagnosis of Lifestyle Diseases

Sook Mei Khor<sup>1\*</sup>, Wei Yin Lim<sup>1</sup>, Shu Hwang Ang<sup>1</sup>, Ying Yao Chia<sup>1</sup>, Joyce Siew Yong Low<sup>1</sup>, T. Malathi Theverajah<sup>2</sup>, Boon Tong Goh<sup>3</sup>, Yatimah Alias<sup>1</sup>

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### Abstract

A sensitive biosensor capable of detecting trace concentrations of several disease biomarkers in clinical samples is critical for the early detection of lifestyle disease because different disease biomarkers may be expressed at various stages since the onset of the disease. Due to the small sample size and extended assay time, multiplex studies utilizing microarrays or color-coded beads had restricted multiplex detection in a single well. Additionally, it was difficult to optimize and standardize the incubation settings for all tests conducted in separate wells. In this presentation, we demonstrate how low-cost paper-based and 3D porous calcium alginate bead technologies can be employed for early diagnosis and prognosis of Type II diabetes, acute myocardial infarction (AMI), breast cancer, and other lifestyle diseases. The detection is susceptible and selective, well below the clinical cut-off values. The goal was to expedite medical decisions for enhanced patient care.

**Keywords:** Early Diagnosis; Biosensor; Biomarker; Multiplexed Analysis; Lifestyle Diseases

## Shiga Toxin B Subunit as a targeting moiety for intracellular drug delivery

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### Abstract

In the course of the research focused on the potential application of the Stx protein as a tool capable of transferring cargo molecules into the interior of mammalian cells, the Escherichia coli Stx protein subunit B was tested.

The StxB subunit (a homopentamer) containing an artificially introduced additional cysteine residue was cloned into E. coli expression vector, pET32 and the protein was efficiently expressed in the E. coli BL21(DE3) recombinant strain.

The protein was obtained from bacterial lysates (the cells were disrupted by sonication) through the use of IMAC (Immobilized metal affinity chromatography) and subsequently further purified with Size Exclusion chromatography.

In the first, preliminary approach, the obtained StxB protein bearing an additional cysteine residue was mixed with a Maleimide-based fluorescent labeling agent (bearing a fluorescein moiety). In the reaction, the maleimide moiety reacted with a cysteine residue leading to the formation of a stable C-S bond connecting the fluorescent molecule (fluorescein) with a protein.

The obtained labeled protein was added to the mammalian cell culture (Vero cell line; 12 – well plates, 100000 cells/well) incubated 3h and fixed to the glass microscopic plates. The capability of the labeled protein of entering the cells was checked through the use of confocal microscopy. The preliminary observations showed that the obtained fluorescent protein was capable of entering the mammalian cells' interior.

Next, fluorescent protein, namely GFP was chosen to be a cargo molecule to be transferred into the mammalian cells' cytosole. Here, the bifunctional crosslinkers were used. Crosslinkers contained two reactive moieties/molecule of crosslinker: maleimide directed towards cysteine residues and succinimydyl ester (NHS) reactive towards lysine residues. The cargo protein (GFP) was first reacted with a bifunctional crosslinker (few or no cysteines within these proteins ensured specific reaction of the crosslinker with the lysine residues only). After this reaction the chemically – modified proteins

were purified using gravity flow SEC columns in a miniature mode (PD10 columns, GE Healthcare) to remove the remains of the non – reacted crosslinker. The obtained chemically modified cargo molecules were subsequently mixed with StxB protein (containing additional cysteine residues to ensure a specific reaction of the chemically – modified cargo proteins with these cysteines). Upon reaction the protein chemical conjugates were visualized in SDS – PAGE and used for the cellular assays as described above.

In the course of the research work stable chemical conjugates of StxB protein with GFP were obtained. Such an approach allows connecting any cargo molecule containing reactive lysine residues with a carrier (StxB) molecule hence the need for genetic modification is avoided. Currently the project describing biotechnological production of the Stx-material can be used in biomedical applications for drug delivery.

## Natural Anti-infective: Toward a Sustainable New Strategy Against Microbial Pathogens

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### Abstract

Nowadays, antibiotics are widely used world wide for many sectors not only in human and animal health but extended to animal feed and plantation as well. Since the initial commercial production of antibiotics in 1930s starting with successful commercialization of penicillin's (as model  $\beta$ -lactam antibiotic) followed by the discovery of tetracyclines group (tetracycline, oxytetracycline, and chlorotetracycline), many antibiotics have been discovered by different groups of researches worldwide. For more almost 100 years for now antibiotics saved life of millions worldwide. For example: it was estimated that if antibiotics were not existed in treatment protocol, the number of deaths could be tripled during the World War II. However, the extensive use of antibiotics with miss-use and miss-dose in addition to the extensive uses of antibiotics in non-medical fields such agriculture, aquaculture, and animal feed, many problems have been created. Continuous exposure of human body to subclinical doses of antibiotics, lead to the development of new generation of microbes which are resist to many known antibiotics. In addition, extensive uses of antibiotics in human body can lead to the significant reduction of natural human microbiomes (probiotics) which play significant role in general human health. Therefore, the need of applying other natural anti-infectives which can not lead to microbial resistance over time without inhibition of natural microbiota is needed. In this presentation, new trends of anti-infective development will be presented, providing a futuristic view of novel antimicrobial bioactives of the future.

## Eutectic-based ionic liquids: A novel green medium for synthesizing metal and metal nanoparticles

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### Abstract

In the last decade, ionic liquids have attracted great interest both in scientific research world and amongst the most diverse technological and industrial sectors. This fact, together with the growing contribution of the industrial sector, is turning the ionic liquids into a key component for the most diverse fields of science, such as nanotechnology, electrochemistry, green chemistry, physics, materials science and engineering and many others. In general, ionic liquids are salts formed by very asymmetric and large ions, due to which they have attractive cation-anion forces weaker than those that occur in conventional ionic salts, such as table salt.

Therefore, ionic liquids have been used as solvents for nanoparticle synthesis with a wide variety of sizes and morphologies. On the other hand, eutectic-based ionic liquids are gaining popularity as a potential substitute for the traditional ionic liquids because of their lower cost and biodegradability. Eutectic-based ionic liquids have recently attracted a lot of interest in a variety of sectors, including nanotechnology, owing to their special qualities as innovative green solvents and large-scale media for synthesis of sophisticated functional nanomaterials.

Natural eutectic-based ionic liquids, as a new type of green solvent, are used for synthesizing nanoparticles, due to their properties, such as simple preparation, environmental friendliness, biocompatibility and multifunctionality. This workshop aims to provide insight into the applications of natural eutectic-based ionic liquids, specifically in nanotechnology processes. It focuses on the description of eutectic-based ionic liquids and how their physicochemical properties are used to obtain functional nanomaterials, including metals and metal oxides.



## Effect of the growth solution on optical properties of ZnO thin films grown by green method for the design ZnO/NiO junction

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### Abstract

In this study, thin films of Zinc Oxide (ZnO) and Nickel Oxide (NiO) were synthesized using green method with different zn solution concentration at 5, 10, and 15 ml to modify their optical properties. The optical characterization of the films indicated a decrease in bandgap and transparency of ZnO as the solution concentration increased. The highly transparent nature of the films makes them suitable for optoelectronic applications. Notably, NiO exhibits a lower growth rate than ZnO due to its larger bandgap. The obtained parameters for the films were used to simulate the electrical characteristics and responsivity of a NiO/ZnO PN Junction. The results showed an improvement in both the electrical characteristics with increasing solution concentration. These findings could aid in the optimization of optoelectronic devices for renewable energy.

## Classical Simulations of Sliding Interfaces: The Interplay of Structure and Dynamics

Nicola Manini<sup>1</sup>

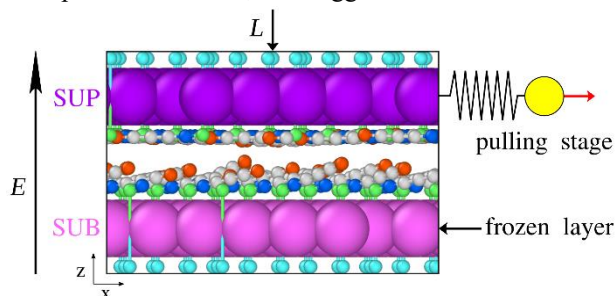
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### Abstract

Sliding friction results from surface-surface interactions which are strongly dependent on the involved materials and their microscopic structure. On a daily basis, significant amounts of power and resources are wasted to overcome sliding friction. The possibility to control, and hopefully reduce friction has an obvious practical relevance in view of engineering new greener mechanical devices. Phenomena related to sliding dissipation have been investigated extensively for centuries, in a science named *tribology*. Despite this prolonged effort, nature keeps surprising us: friction depends delicately on details such as surface roughness and the amount and chemical nature of contaminants/lubricants. Even in ideal conditions of ultraclean contacts between perfect flat crystalline surfaces, we currently cannot easily and reliably predict how friction depends on the main mechanical conditions, namely the loading force applied perpendicularly and the sliding velocity.

With the current availability of computer power, simulations can help a lot in this sense. I present a few examples of simulations which elucidate the dynamics of sliding interfaces, emphasizing the role of structural surface properties (and modifications thereof) for the frictional dynamics. I will also discuss the main limitations of computer simulations, and suggest routes to overcome these limitations which are currently being pursued.





## IoT Security: Emerging Security Challenges of Multiprotocol IoT Gateways

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### Abstract

IoT (Internet of Things) gateways are intermediary devices that connect IoT devices to the cloud or other network infrastructures. Due to their ability to communicate with multiple protocols and facilitate interoperability between various IoT devices and systems, multiprotocol IoT gateways are gaining popularity. Nonetheless, these gateways present a number of emerging security concerns, such as protocol vulnerabilities, data security, and the need for standardisation. The presentation provides an overview of the applications of multiprotocol for IoT gateways as well as the rising security challenges.

# ICOWOBAS-2023

# Abstracts

## PCR detection of antibiotic resistance genes of *E. faecalis* isolated from covid-19 with mild to moderate infection in Kirkuk city

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### Abstract

The purpose of this study is to collect data on the antibiotic resistance genes that were circulating in VRE isolates obtained from hospitalized patients in Iraq during the waves of COVID-19. Participants in the study comprised 104 individuals who were already infected with the Covid-19 virus and were hospitalized to the Al-Shifaa Epidemiological Hospital in Kirkuk city. These individuals were of both sexes and various age groups (less than 18 years old). Nasopharyngeal swabs) from patients. These samples were taken under medical supervision and molecular deremiantion of Van genes and Van B genes were done by real-time PCR. The study showed that most of patients with severer covid-19 infection was elderly (>57 year) and more than half of diabetic patient who suffered from COVID-19 infection. The study demonstrated most of covid-19 patients were with positive culture and *E. faecalis* represented the most isolated bacteria from by nasopharyngeal culture of covid-19 patients (39.74%), followed by *Klebsiella pneumoniae* 21.79% and *Staphylococcus aureus* especially in severe Covid-19 infection. Most of *E. faecalis* isolates were sensitive to cephalothin and imipenem, Ampicillin and Levofloxacin while most of them *E.* were resistant to Carbenicillin, Clindamycin and Vancomycin. The study showed that 64% of Vancomycin resistant *E. faecalis* isolated from covid-19 patients were positive for *Van A* gene (one of the genes responsible for vancomycin resistance), 28% with *Van B* gene.

**Keywords:** Covid-19, SARS-COV-2; *E. faecalis*, Vancomycin

## The Effect of Ozone Exposure to Extend The Shelf Life of Carrots (*Daucus carrota L.*) Against Vitamin C Levels and Hardness

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### Abstract

Agricultural production is influenced by the handling of post-harvest agricultural products. The handling should prevent factors that can lead to a decrease in the quality of agricultural products. Ozone exposure is done to find out the most effective shelf life of carrots. The sample consisted of 3 groups, namely the control group without ozone treatment (T0), the ozone exposure group through air/spray (T1), the ozone exposure group through immersion in water/soak (T2) and the spray and soak combination group (T3). Ozone exposure time is given for 10 minutes in a closed container, further observed organoleptic changes, pH, hardness and vitamin C levels contained in carrots after 1-5 days of storage. The research results showed that ozone treatment with various methods resulted in significant differences ( $p=0$ ) in mass loss, pH and hardness of carrots. Ozone treatment with spray and soak on day 1-5 resulted in the stability of mass loss, pH and hardness when compared to other treatment methods. The effect of ozone exposure on carrots by spray and soak can extend shelf life with the smallest percentage decrease based on the results of organoleptic tests, mass loss (58%), hardness (35%) and pH (22%) on the 5th day. So ozone treatment is able to extend the shelf life of carrots based on their organoleptic and physical parameters.

**Keywords:** shelf life of carrots, ozone, organoleptic, pH, hardness, vitamin c

## Anti-Metastatic Effect of Nanodiamond-conjugated Quercetin Against Colon Cancer: In Vivo Study

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### Abstract

Quercetin is a compound that can inhibit the growth of cancer cells in the colon but requires high doses, so it requires a drug delivery system to target cancer cells directly. This study aims to investigate the potency of nanodiamond-conjugated quercetin as anticancer towards colon cancer in *Rattus norvegicus* induced by *N-Methyl N-Nitrosourea* (MNU). This study is experimental-based and designed into six cohorts treatment, namely KN (not treated by MNU, nanodiamond, and quercetin); K- (treated by MNU); K+ (treated by MNU and capecitabine); ND (treated by MNU and nanodiamond); Q (treated by MNU and quercetin); NDQ (treated by MNU and nanodiamond-conjugated quercetin). To induce colon cancer in rats, MNU (10 mg/Kg BW) was administered intrarectally 3 times a week for four weeks. Treatment was given by administering capecitabine (12.5 mg/Kg BW) intraorally; ND (2 mg/Kg BW), Q (40 mg/Kg BW), or NDQ (40 mg/Kg BW) intraperitoneally twice a week for six weeks. Cancer progression of all cohorts was evaluated by performing body and colon weight measurement; ELISA assay-specific to MMP-9, CEA, HIF1 $\alpha$ , VEGF, and p53 on both blood serum and colon tumor tissue extract. Observation of cancer metastasis to lung and hepar was also performed. In this regard, NDQ had significantly inhibited cancer aggressiveness since it caused an increment of body weight gain and growth rate as well as reduced colon weight compared to the K- group. Moreover, decreased level of MMP-9, CEA, VEGF, HIF-1 $\alpha$  and increased level of p53 was significantly reported in NDQ compared to the K- group. The number of tumor metastasis to lung and hepar in NDQ is significantly less than tumors reported in K-. In conclusion, the conjugation of quercetin with nanodiamonds increased the anticancer activity of quercetin, suggesting an effective drug delivery property of nanodiamonds.

**Keywords:** Anticancer, quercetin, nanodiamond, colon cancer, metastasis.

## Antimicrobial Activity of *Hibiscus sadbariffa* var. *sadbariffa* L. and *Brassica oleracea* var. *italica* L. Extracts Against Bacteria Which Isolated from Different Sources

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### Abstract.

The world the battle of diseases started since the advent of humans on earth and it will continue. The discovery of antibiotics in the 1950s has turned the result of this war in favor of humans, but years later microbes returned with mutant strains, resistant to almost all antibiotics. Scientists are forced to search for new alternatives to be used against these adaptable microorganisms. The antimicrobial activities of plant extracts were investigated against different bacteria such as (*Enterococcus gallinarum*, *Enterococcus Faecium*, *Staphylococcus lentus*, *Pantoea* spp.).

**Objectives:** To pharmacologically evaluate the effectiveness of the *Hibiscus sadbariffa* var. *sadbariffa* L. and *Brassica oleracea* var. *italica* L. aqueous extracts against bacteria. Samples of bacteria were collected from the hospital and external laboratories in Babil Governorate and preserved in the private media until use, and the powder of dried *H.sadbariffa* var. *sadbariffa* and *Brassica oleracea* var. *italica* flowers were extracted comprehensively by dissolving in boiling water, and the required concentrations were prepared which are 100, 50 and 25 mg/ml, as well as 100mg/ml concentration of *Brassica oleracea* according to Harborne's method. This study exhibited strong antibacterial activity of the aqueous extract of *H. sadbariffa* L. in comparison to *B.oleracea* L. flower aqueous extracts. results uncovered that bacteria such as *Enterococcus gallinarum* sensitive to the *Hibiscus sadbariffa* aqueous extract showed large diameter at (50mg/ml) gives 30 mm, (25mg/ml) concentration give 27 mm and It gives the lower inhibition diameter 100mg/ml concentration gives 25mm and it gave the lowest inhibition diameter 100mg/ml concentration in *Brassica oleracea* extract gives 17mm, comparative with an antibiotic that gives (30 mm) in inhibition zone. Also, the results obtained from the effectiveness of *Hibiscus sadbariffa* aqueous extract for *Enterococcus faecium* it sensitive to all concentration that gives (25mm) at(50mg/ml) concentration and (22mm) at (25mg/ml) and lower inhibition zone in high concentration 100mg/ml, In *Brassica oleracea* extract gives 18 mm in 100mg/ml. The results showed the efficacy of the aqueous extracts of *H.sadbariffa* var. and *Brassica oleracea* are against bacteria which can be used as an antibiotic

**Keyword:** Antimicrobial activity, *Brassica oleracea*, Inhibition zone, *Hibiscus sadbariffa*.

## ***Gynura procumbens* adventitious roots extract on oxidative stress management**

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### **Abstract**

*Gynura procumbens* is widely used as a natural medicinal plant in Indonesian society. Our previous study showed that the adventitious root of *G. procumbens* (ARGp) contains phenolic and flavonoid compounds which act as antioxidants. It is expected to reduce oxidative stress due to lead (Pb) toxicity. The purpose of this study was to determine the effect of adventitious root extract of *G. procumbens* on changes in malondialdehyde (MDA) levels and hematological assay in mice organs treated with Pb. This study used 25 male mice and divided them into: P1 (control), P2 (Pb-100 mg/L), P3 (ARGp-100 mg/L + Pb-100 mg/L), P4 (ARGp-200 mg/L + Pb-100 mg/L), P5 (ARGp-300 mg/L + Pb-100 mg/L). The treatment was given for 30 days. At the end of the treatment, mice were anesthetized and dissected. Their organs such as liver, kidney and blood were taken. Furthermore, they were analyzed for MDA levels (liver, kidney and blood) and hematological profile (hematocrit/HCT, mean corpuscular volume/MCV, mean corpuscular hemoglobin/MCH, mean corpuscular hemoglobin concentration/MCHC and white blood cells/WBC). Based on the results, it was found that administration of Pb significantly increased MDA levels (liver and kidney) and WBC, but reduced the hematological assay (HCT, MCV and MCHC). In addition, administration of *G. procumbens* adventitious root extract significantly reduced MDA levels and WBC, but increased the hematological profiles (except level of MDA blood and MCH). This indicated that the adventitious root extract of *G. procumbens* can reduce oxidative stress due to Pb toxicity.

**Keywords:** *Gynura procumbens* adventitious roots, Hematological assay, Lead, MDA, Oxidative stress



## Histopathological Examination of Autopsy from Human Lung Infected by Coronavirus Disease 19

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### Abstract

The human Coronavirus (hCoV) family belongs to a well-recognized bat-borne family of viruses that infects humans causing predominant damage to the respiratory system strictly connected with the development of ARD. The disease was designated as COVID-19 by the WHO in February 2020, and the pathogen caused by SARS-CoV-2 has spread out in the world (Feng et al., 2020). COVID-19 mostly affects the respiratory system, ranging from mild flu-like symptoms to severe pneumonia, but extra-respiratory multi-systemic involvement has also been reported. Investigation the morphological findings of a patient who died I by severe infection with SARS-CoV-2, in the complete forensic autopsy of a three cases ignoring previous medical treatment, and comparison with normal lung histology. n formal contact with Medico Legal Institute –Erbil, prepared slides were borrowed and used in this study. Slides were prepared by routine histopathological methods. The samples were autopsy from lung of those dead by COVID-19. Three autopsy were used, brief information about dead person were, female and two males, aged 65,51 and 48, respectively. Gross examination for first one, autopsy received from a left lobe totally exercised weight 1050gm measured 20\*15\*10cm, second one, lung weight 270 gm and measured 15\*15\*7cm, the last one, his lung weight 100gm and measured 12\*12\*3cm. The histopathological presentation will be through digital microscope using (AM scope) software, at scientific research centre, Erbil Polytechnic university. by severe infection with SARS-CoV-2, in the complete forensic autopsy of a three cases ignoring previous medical treatment, and comparison with normal lung histology. And the results (showing normal histology of lung autopsy, others sowing lung histology of Covid-19 autopsy and another one Diffuse alveolar damage with desquamative interstitial pneumonia pattern and alveolar fibrin deposits and Lymphocytic infiltration of alveolar septae, indicating endothelitis and in another sample showing diffuse alveolar damage). Depending on the H&E investigations we concluded that the patients suffered from ARDS after infecting with Covid-19 which caused the death of them.

**Keywords:** Corona virus, lung histopathology

## A Cross-Sectional Study of Nutritional Supplement Consumption Among Adults at Tishk International University in Erbil City, Kurdistan Region

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### Abstract:

A cross-sectional study was conducted at Tishk International University utilizing a survey questionnaire to investigate the consumption patterns of nutritional supplements among 609 adults (35% males, 65% females), with 98.7% aged between 17 to 30 years. Based on the results of this study, 26.9% of participants regularly consume supplements, 42.9% irregularly consume supplements, and 30.2% don't consume nutritional supplements. The most commonly consumed and recommended supplements were multivitamins and vitamin D3. In the study, it was found that 58.1% of the participants were found to be of a normal weight, while 25.9% were found to be overweight. 39.4% of participants consumed supplements for weight loss, and 19% rated their diet as unhealthy, and 75% rated their diet as moderately healthy. A weak positive correlation was found between supplement intake and BMI, diet type, and age group. In contrast, a weak negative correlation was found between supplement intake and gender, education level, economic status, health conditions and tobacco use. This study was designed to identify prevalent supplement consumption patterns, their regular use, and the correlations between consumption and various factors. This will provide valuable insights for public health and nutritional policy-making.

**Keywords:** Nutritional Supplement, Cross-Sectional Study, BMI, Diet type, Adults

## **Histological Alteration of Prostate Gland in Male Rats Induced by an Anti-Androgen Drug (Bicalutamide)**

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### **Abstract**

Bicalutamide (BCT) is an anti-androgen drug which used in treatment of prostate cancer. The present study was designed to investigate the histological changes of the prostate glands promoted by daily used bicalutamide in the rats. Treatment with bicalutamide caused significant decrease in relative prostate weight. Histologically, the prostate in Bicalutamide treated rats revealed certain alterations such as an increase in the density of papillary infolding that was accompanied by a decrease in lumen size, inflammation, hyperplasia of the epithelial cells of the acini, and blood vessels congestion. The prostate specific antigen concentration was shown a significant decrease when compared to the control group. In conclusion, bicalutamide treatment induced various histological changes in rat prostate.

**Keywords:** Bicalutamide; PSA; anti-androgen drug; prostate cancer

## Comparison of Antibody Levels Produced by Pfizer, AstraZeneca, and Sinopharm Vaccination in COVID-19 Patients in Erbil City-Iraq

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### Abstract

Vaccines are the most effective way for combating COVID-19 disease. In the Kurdistan region of Iraq, as in other countries, Pfizer-BioNTech, AstraZeneca, and Sinopharm vaccines were broadly utilized among the population. In this study, early adverse impacts that emerged after vaccination with each dose of these vaccines were compared with previously infected participants. Anti-SARS-CoV-2 spike-specific IgG and IgA antibodies produced by these three vaccines have been assessed using the ELISA method at different time periods; including pre-vaccination, 25 days after the first shot of vaccination and 30 days after the second shot of vaccination with Pfizer-BioNTech, AstraZeneca, and Sinopharm vaccine. Overall, 150 previously infected cases were studied, 50 cases received the Pfizer vaccine, 50 cases received AstraZeneca vaccine, and 50 cases received the Sinopharm vaccine. The findings showed that a higher number of vaccinated participants with AstraZeneca and Pfizer vaccines had tired/fatigue/lethargy, headache, fever, and soreness in arm at the first shot, but milder adverse effects, such as headaches, fever, and soreness in arm, were detected in the data on the Sinopharm vaccine's adverse impacts. At the second dose, a lower number of vaccinated cases with AstraZeneca and Pfizer vaccines reported higher frequencies of the side effects. However, the results showed that the level of anti-spike-specific IgG and IgA antibodies produced by vaccinated patients with the Pfizer vaccine increased compared to those who vaccinated with AstraZeneca and Sinopharm vaccine from 25 days after the first dose. From 30 days after the second dose, the IgG and IgA antibodies were significantly boosted in 97% of vaccinated patients with the Pfizer vaccine compared to 92% of those who vaccinated with AstraZeneca vaccines and 60% of those who vaccinated with Sinopharm. In conclusion, these results confirmed that two doses of the Pfizer, and AstraZeneca vaccines induce a higher response of IgG and IgA antibodies than that induced by Sinopharm vaccines.

**Keywords:** COVID-19, anti-spike-specific antibodies, ELISA, Pfizer, AstraZeneca, and Sinopharm vaccine

## Evaluation of the Diagnostic Role of CD56 Immunohistochemistry alone and in combination with another marker in Differentiation of Thyroid Papillary Carcinoma from its Mimics

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### Abstract

**Background:** papillary thyroid cancer is the most common malignant endocrine neoplasm worldwide, histopathological examination is the gold standard method for diagnosis of PTC, but certain cases with equivocal features need further investigation, IHC, is useful for such cases, CD56 has been expressed in follicular epithelial cells of the normal thyroid and benign thyroid lesions. Differentiate PTC (including papillary microcarcinoma) from other benign mimics' lesions using CD56 staining. Evaluate the expression of CD56 in the metastatic lymph nodes. Estimate the diagnostic value of the combined two markers, CK-19 and CD56 in the diagnosis of PTC. A retrospective study including 90 patients with different thyroid lesions was investigated from Jan.2018 till Jan.2020 in Erbil city. Immunohistochemical expression of CD56 on tissue block material was performed on different thyroid lesions. Our results showed that none of the cases of papillary thyroid carcinoma showed strong staining, and 54.8% had negative staining, while the largest proportions of the benign neoplastic and non-neoplastic thyroid lesions showed either moderate or strong staining and none of them had negative staining ( $p < 0.001$ ). The sensitivity and specificity of CD56 total estimated scores for the diagnosis of PTC were 91.2% and 92.9%, respectively. Combining the positive staining of CK19 and the negativity of CD56 could be a very helpful procedure in difficult and overlapping cases (100% sensitivity, 85.7% specificity. and agreement of 91.1%). CD56 & CK19 have been proved to be useful markers in the differentiation of PTC including follicular variant from its mimics benign thyroid lesions. In addition, lymph node metastatic papillary thyroid carcinoma retained the same negative staining intensity of CD56 same as the primary tumor. So Loss of CD56 in thyroid lesions worsen the prognosis and is important in deciding on further therapy and follow-up.

**Keywords:** CD56; immunohistochemistry; mimics; papillary thyroid carcinoma.

## Phenolic-rich Fraction of *T. catappa* Fruits Altered Dopamine Levels and Upregulates Phase II Enzymes Gene Expression in *Drosophila melanogaster* Neurodegenerative Model

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### Abstract

Phenolics provide intracellular protection through their antioxidant activities. Neuroprotective and cognitive enhancement effects of phenolic contents of *Terminalia catappa* ripped fruits were evaluated on an oxidative stress-induced neurodegenerative disease model in *Drosophila melanogaster*. A combination of male and female fruit flies was fed with a phenolics fraction containing diet (0.5 mg/10g diet) for seven days followed by exposure to 1 M Cu<sup>2+</sup> for another seven days. The dopamine level in the head and body homogenates and the activities of AchE in the flies were analyzed. Gene expression level of phase II antioxidant enzymes was also evaluated to identify the genotoxic protection level of the phenolic fraction in the diseased flies. It was observed that the fraction enhanced the dopamine production level by 15% in the head and 12% in the body homogenates. Meanwhile, the working concentration of the fraction protected the flies from the noxious effect of Cu<sup>2+</sup> by 12.5% and increased the expression level of *SOD*, *GST*, *Catalase* and *NOO1* genes by 10.6%, 12.7%, 12.2% and 8.5%, respectively. The neuroprotection and cognitive enhancement effect of the fraction in *D. melanogaster* was associated with an increase in the expression of some phase II antioxidant genes. The findings suggest the triggering of neuronal protection and cognitive improvement by *T. catappa* via regulating the production level of cognitive-related biochemicals and gene expressions. Thus, the study provides insights into understanding the neuroprotection mechanism of *T. catappa* phenolic-rich fraction in *D. melanogaster*.

**Keywords:** Antioxidant enzymes; *Drosophila melanogaster*; Gene expression; oxidative stress; Phenolic-rich fraction; *Terminalia catappa*

## Lead acetate deteriorates the improvement effect of L-arginine and tetrahydrobiopterin on endothelin-1 receptors activity in rat aorta

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### Abstract

Endothelin-1 (ET-1) is a potent vasoconstrictor hormone that has been identified as an important factor responsible for the development of cardiovascular dysfunctions. ET-1 exerts its vasoconstrictor activity through two pharmacologically distinct receptors, ETA and ETB that are found in vascular smooth muscle cells (VSMCs) and the vasodilator activity through an ETB receptor located on endothelial cells. This study aimed to show the impact of 1 $\mu$ M L-arginine (LA), 100 $\mu$ M tetrahydrobiopterin (BH<sub>4</sub>), and their combined effect on ET-1 activity in both lead-treated and lead-untreated rat aortic rings. This means, investigating how endothelial dysfunction reverses the role of nitric oxide precursor and cofactor. In this study, Rat aortic rings have been pre-incubated with BH<sub>4</sub>, LA and their combination. Subsequently, the aortic rings were pre-incubated with 200 $\mu$ M N-Nitro-L-arginine methyl ester (L-NAME) and 0.5 $\mu$ M BQ-123. Then, the vascular response to cumulative doses of rat ET-1 was analyzed in each of the above-mentioned groups (LA, BH<sub>4</sub>, LA & BH<sub>4</sub>, L-NAME, BQ-123), in the presence and absence of lead acetate 1 $\mu$ M Pb (C<sub>2</sub>H<sub>3</sub>O<sub>2</sub>)<sub>2</sub>. ET-1 efficacy and potency were significantly decreased in the presence of LA, BH<sub>4</sub>, and LA and BH<sub>4</sub> combination in the untreated group, while it significantly increased in the presence of lead. In the second trial of experiments ET-1 efficacy markedly decreased in BQ-123- incubated cells in both lead-treated and untreated aortic rings. In the presence of lead, the efficacy of ET-1 was raised with the use of L-NAME. In conclusion, LA and BH<sub>4</sub> can be considered pharmacological agents to alter the potency of ET-1-induced vasoconstriction and concomitantly lower blood pressure

**Keywords:** Endothelin-1, Endothelial dysfunction, L-arginine, Lead acetate, Nitric oxide synthase, Tetrahydrobiopterin.

## Evaluation Blood Pressure in Electric Generators Workers in Najaf City

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### Abstract

Electric generators workers are unceasingly exposed to a lot of hazardous and noise that has the potential to cause many health complications. The current study aimed to estimated blood pressure in electric generators workers in Najaf city. The study included determines blood pressure in 68 non-smoker and 86 smoker male electric generators workers with duration of work (3-12) years and 45 persons unexposed as control group. The research also included estimates prevalence of accident in electric generator in 100 diesel generators workers by using questionnaire surveys. The study recorded that significant increment ( $p \leq 0.05$ ) in systolic and diastolic blood pressure of smokers and non-smokers of workers in electric generators than control. Moreover, the results showed that a high prevalence of accident in electric generator such as tiredness or collapse (50%) , fuel ingestion (34%) and injury (27%) among electrical generators workers. The present study has demonstrated that exposure to occupational stress and noise cause significant elevation in blood pressure.

**Keywords:** Blood pressure, Electric generators, Generators workers, Noise, Occupational exposure.



## Protective Role of *Sonchus oleraceus* Extract against Glyphosate Impact on Pituitary-Testes Axis in Rats

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### Abstract

We have examined the toxico-protected roles of *Sonchus oleraceus* (*S. oleraceus*) against glyphosate (GLY) on rats anterior- pituitary-testes-axis. For this reason, twenty-four male rats weighing about 190 – 280 gm were conducted. Then they were divided equally and randomly into four groups as following; the first group received a control basal diet and tap water *ad libitum*, the Second group (model group) fed basal diet and tap water *ad libitum* with GLY (0.1 ml/rat administration orally by gavage, the third group served as mixed group fed basal diet and tap water *ad libitum* with both of GLY (0.1 ml/rat orally by gavage) and *S. oleraceus* (0.1ml/rat orally by gavage), the fourth group served as extract group fed basal diet and tap water *ad libitum* with *S.oleraceus* (0.1 ml/rat orally by gavage). The following parameters were measured involved, some organs weight, hematological parameters and some serological parameters include luteinizing hormone (LH), follicle-stimulating hormone (FSH), testosterone, and prostate-specific antigen (PSA). The administration of GLY and *S. oleraceus* was daily continued for seven executive days. the present result showed that GLY produced a non-significant increase in BW, some organ weights include right kidney, liver, testes, and seminal vesicle, and some hematological parameters including WBC, RBC, Hg, PLT, and HCT except MCV that decreased non-significantly, while it decreased non-significant changes in food intake, some organs weight such as prostate, spleen, and reproductive hormones such as testosterone and PSA, while LH and FSH were decreased significantly.

**Keywords:** Glyphosate, *S. oleraceus*, prostate, testosterone, LH, FSH

## Adaptive Enhancement on Noise Modeling in ECG-Based Signal Processing

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### Abstract:

The electrocardiogram (ECG) is the recording of the electrical potential of the heart versus time. The analysis of ECG signals has been widely used in cardiac pathology to detect heart disease. The ECGs are non-stationary signals which are often contaminated by different types of noises from different sources. In this study, simulated noise models were proposed for the power-line interference (PLI), electromyogram (EMG) noise, base line wander (BW), white Gaussian noise (WGN) and composite noise. For suppressing noises and extracting the efficient morphology of an electrocardiogram signal, various processing techniques have been recently proposed. In this paper, wavelet transform (WT) is performed for noisy ECG signals. The graphical user interface (GUI) system is developed for visual representation and adaptive enhancement on noise modeling in ECG-based signal processing. Percentage root mean square difference (**PRD**) was measured between the modeled noisy signals and the samples of the original ECG. Moreover, cross correlation (**XCorr**) and root mean square error (**RMSE**) were performed between the noisy EEG signals and the denoised ones which resulted from WT denoising technique initially to evaluate the effectiveness of the WT denoising technique. The results show that the WT was successfully removed different types of proposed models of noises. This study will help medical doctors, clinicians, physicians, and technicians to eliminate different types of noise. Moreover, the project could be crucial for the process of automatic diagnosis of different heart diseases.

**Keywords:** ECG, noise, wavelet, modeling, power-line interference, baseline wander, electromyogram, white Gaussian noise.

## Fertilization and embryo development of goldfish (*Cyprinus carpio*) exposed to copper (Cu)

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### Abstract

This study aimed to determine the effect of copper (Cu) on the fertilization rate, embryonic development, embryo diameter, and larvae morphometry of goldfish (*Cyprinus carpio*) larvae. Male and female goldfish with matured gonads and healthy physiques are put into the spawning pond with a ratio of 3:1. Fertilization carried out in this study is artificial fertilization. There were 4 treatments with Cu exposure of 0, 0.01, 0.05, and 0.1 mg/L. Each treatment group consists of 7 replications. The fertilization rate of goldfish was observed by mixing sperm that has been diluted in NaCl 0,9% simultaneously with eggs into various copper (Cu) solution concentrations. The percentage of fertilization rate was calculated then. Goldfish embryo development was observed by inserting fertilized eggs into various concentrations of copper solution. Then, each stage of embryonic development was observed. The result indicated that the higher concentration of exposure to Cu, the lower the fertilization rate. All treatment groups showed significant differences compared to the control group ( $p < 0.05$ ). The treatment group with a concentration of 0,1 mg/L had the lowest fertilization rate ( $33.34 \pm 1.23\%$ ). 0.1 mg/L of Cu exposure also had a big impact on embryonic development. Cu exposure affected the hatching rate. The treatment group with a concentration of 0,1 mg/L hatched 76 h 25 mins after fertilization ( $32.86 \pm 5.67\%$ ), which had a significant difference compared to control group. Embryo in each phase (2-4 cells, blastula, organogenesis) tend to decrease in diameter as copper concentration increase. Larva morphometry was found different significantly in all treatment groups compared to the normal control group. Tail length, abdomen width, head width, and eye diameter were decreased significantly after Cu exposure. This study showed that copper exposure could reduce the fertilization rate, embryonic development, embryo diameter, and morphometry of goldfish larvae.

**Keywords:** fish, copper, fertilization, embryo

## Characterization of Volatile and Non-Volatile Constituents by GC-MS and ATR-FTIR, and Evaluation of Anticancer Activity of *Nigella sativa* Linn. Oil

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### Abstract

Black cumin (*Nigella sativa* L.) is the most accepted remedy and spice in Middle-East countries. Black cumin is traditionally used for the treatment and prophylaxis of several chronic human diseases such as cancer, diabetes, and respiratory conditions. The present study was designed to characterize volatile and non-volatile components of black cumin oil by GC-MS (gas chromatography-mass spectroscopy) and ATR-FTIR (attenuated total reflectance-fourier transform infrared), and further its anticancer activity was determined by MTT assay using MG-63 (Human osteosarcoma) cell lines. GC-MS and ATR-FTIR methods were applied for the characterization of *N. sativa* seed oil, and anticancer activity was assessed by MTT assay using MG-63 cell lines. **Results:** The GC-MS analysis resulted identification of 30 chemical compounds, and major non-volatile components were thymohydroquinone (31.40%), linoleic acid (18.23%), oleic acid (18.02%), 2,4-decadienal, (*E,E*) (11.14%), diethyl phthalate (5.22%), and palmitic acid (4.33%); and citronellal (0.29%), carvacrol (0.35%),  $\beta$ -pinene (0.41%), and limonene (0.19%) as volatile components. FTIR analysis of oil confirms the presence of alkanes (hydrocarbons), aldehydes, aliphatic esters, cyclopentanone, and alkenes. It also produces dose (0.5-500  $\mu\text{g/mL}$ ) and time (24 h) dependent inhibition of MG-63 cell lines with an  $\text{IC}_{50}$  value of 33.66  $\mu\text{g/mL}$ . The GC-MS and ATR-FTIR analysis explore the chemical compounds of *N. sativa* oil and the study also provides the scientific basis for its potential remedy for the treatment of cancer. The anticancer activity of *N. sativa* may be due to phytoconstituents such as thymoquinone and its derivative thymohydroquinone present in its oil.

**Keywords:** *Nigella sativa*, black cumin, GC-MS, ATR-FTIR, cancer, MG-63 cell lines.

**Effect of probiotic *Lactobacillus casei* fnce 0090 on growth and immune response of catfish  
(*Clarias gariepinus*) infected with *Aeromonas hydrophila***

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**Abstract**

The purpose of this research was to evaluate the effect of variations concentration of probiotic *Lactobacillus casei* FNCC 0090 on growth and immune response of catfish (*Clarias gariepinus*) infected with *Aeromonas hydrophila*. The 200 catfish (150-200 g) were grouped into 5 treatment groups and 5 replications. The negative control group (KN), the fish without probiotic and without infection. The positive control group (KP), the fish without probiotic and infected by 0.1 ml (10<sup>8</sup> CFU/mL) *A. hydrophila*. Group A (5% probiotic), B (10% probiotic), C (15% probiotic), and with onfection. Fish were cultured for 6 weeks, probiotics are given orally by mixing into feed, whereas infection with *A. hydrophila* intraperitoneally. Growth parameters (net weight gain, weight gain (%), spesific growth rate SGR), survival rate, feed utilization (feed conervation ratio, FCR and feed conversion and survival rate SR). Immune response parameters (phagocytic activity and lysozyme levels). The results showed that treatment C had a significant effect on increasing phagocytic activity, lysozyme levels (p <0.05). But probiotic has no significant effect on growth of catfish. However, treatment C has a better effect than other treatments. This study concludes that the administration of probiotics can be used to increase growth and and immune response of infected catfish by *A. hydrophila*.

**Keywords:** probiotic, *A. hydrophila*, catfish, phagocytic activity, lysozyme levels

## Alginate-Chitosan Membrane as Physical Barrier for Anti Adhesion of Intraperitoneal Organ Post Operation

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### Abstract

Post-operative adhesion naturally appears caused by the wound healing process in human body tissue. Adhesion can affect tissue and organ function, and in some cases will threaten patient's life. One from every three patients who underwent operation on their abdomen part of the body will have to get continuity treatment from adhesion. Various research on chemical substances in form of physical barriers shows that physical barriers could prevent adhesion and have a significant impact. This research aims to synthesize and characterize the alginate-chitosan membrane as a physical barrier candidate to prevent digestive post-operative adhesion. Adhesion can cause adhesion-related disorder (ARD) such as infertility, dyspareunia (painful intercourse), pelvic pain and bowel obstruction or blockage. The membrane could prevent the adverse event of adhesion. Membrane synthesized by combining alginate and chitosan solution in different variations of concentration until it became homogeny before it's dried and immersed in CaCl<sub>2</sub> solution. The resulting membrane is then characterized with SEM test, FTIR test, swelling test, degradation test, MTT Assay test, and water contact test. From the characterization, variation with the best characteristic of alginate-chitosan membrane is alginate-chitosan membrane with 1.5% concentration with 96.71% degradation rate on the 10th day, 90.75% swelling rate, and 73.36% of cell viability. Due to all research result, it is known that alginate-chitosan membrane has potential as physical barrier to prevent digestive post-operation adhesion.

**Keywords:** alginate, chitosan, membrane, physical barrier, anti-adhesion

## IN VITRO STUDY OF POLY(ETHYLENE GLYCOL) DIMETHACRYLATE)- NANOFIBRILLATED CELLULOSE FOR HERNIATED NUCLEUS PULPOSUS

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### Abstract

The prevalence of low back pain case reaches 30-80% was caused by herniated nucleus pulposus. As many as 18-29% of cases are found in Indonesia. HNP occurs due to protrusion of the intervertebral disc through the annulus fibrosus. It can be caused by the rupture of the annulus fibrosus or decreased proteoglycans (PGs) content with age. Minimally invasive surgery used to restore disc function can be performed with injectable hydrogel. Biocomposite poly(ethylene glycol) dimethacrylate-nanofibrillated cellulose used to treat first-degree HNP was obtained by photopolymerization method. Variations of concentration PEGDMA:NFC were 1:0 (control), 1:0,5 (K1), 1:0,75 (K2) and 1:1 (K3). In vitro testing includes FTIR, viscosity and in vitro injection model. FTIR test showed a frequency shift of 1639 cm<sup>-1</sup> to 1722,43 cm<sup>-1</sup>, a change in C=O indicated photopolymerization method. Based on characterization results, the K3 sample has the best results with a concentration of 1:1. The viscosity value was 74,67 dPa.s. In vitro injection model test showed the increasing of NFC indicates the gel state when released from agarose will be not ruptured. Hydrogels can be injected with syringe 18 gauge. Thus, according to the results, biocomposite hydrogel PEGDMA:NFC can be applied for herniated nucleus pulposus case.

**Keywords:** Injectable hydrogel, minimal invasive, photopolymerization, PEGDMA, NFC

## Interleukin 18 and Interleukin 22 as Important Immune Markers in Patients with Tuberculosis

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### Abstract:

Tuberculosis (TB) is a lung infection caused by the bacterium *Mycobacterium tuberculosis* (MTB). TB is a leading cause of death globally, accounting for approximately 1.5 million deaths per year. The aim of this article was to evaluate the immunological role of Interleukin (IL) 18 and Interleukin 22 in patients infected with MTB and multi-drug resistant tuberculosis MDRTB. A total of 182 individuals suspected with MTB admitted to the tuberculosis center in AL-Najaf City, Iraq. A sputum acid-fast stain was performed for each individual and GeneXpert® heminested real time PCR has been performed for MDRTB detection. The two Interleukins was measurement in serum of infected individual using ELISA technique. Out of 182 individuals, there were 20 infected with MTB and 15 infected with MDRTB. Serum IL18 and IL22 levels were significantly elevated ( $P < 0.05$ ) in patients with MTB and MDRTB groups as compared with control subjects. The MDRTB group showed higher serum IL18 and IL22 levels ( $P < 0.05$ ) than the MTB group. This study showed that IL18 and IL22 had a relationship with MTB and might be used to help diagnose TB; Clinical diagnosis of TB may be aided by these tests.

**Keywords:** IL18, IL22, TB, MTB, MDRMTB, GeneXpert.



## CD4 and CD20 as Important Immune Markers in Patients with Pulmonary Tuberculosis

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**Abstract.** Tuberculosis (TB) is a serious lung infection caused by the bacterium *Mycobacterium tuberculosis* (*M. tuberculosis*) is highly contagious, and can be spread through the air from an infected person to others. The aim of this article was to evaluate the immunological role of CD4 and CD20 in patients infected with *M. tuberculosis* and multi-drug resistant tuberculosis (MDRTB). A total of 182 individuals suspected with *M. tuberculosis* admitted to the tuberculosis center in AL-Najaf City, Iraq. A sputum acid-fast stain was performed for each individual and GeneXpert<sup>®</sup> heminested real time PCR has been performed for MDR-*M. tuberculosis* detection. CD4 and CD20 have been measurement in serum of infected individual using ELISA technique. Serum CD4 and CD20 levels were significantly elevated ( $P < 0.05$ ) in patients with *M. tuberculosis* and MDR-*M. tuberculosis* groups as compared with control subjects. The MDRTB group showed higher serum CD4 and CD20 levels ( $P < 0.05$ ) than the *M. tuberculosis* group. This study showed that CD4 and CD20 had a relationship with *M. tuberculosis* and might be used to help diagnose TB.

**Keywords.** CD4, CD20, TB, MTB, MDRMTB, GeneXpert

## **Antimicrobial & Antioxidant Activity of a novel Exopolysaccharide production by *Pseudomonas savastanoi* pv. *Savastanoi* bacterium isolated from olive knot**

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### **Abstract:**

The present study aimed Isolation, characterization of exopolysaccharide from *Pseudomonas savastanoi* isolated from (*olea europea*) from different sites of Mosul city, and selected the isolation to produce EPS, Seven isolates of *P. savastanoi* were selected as the best isolates producing EPS based on the appearance of colonies and their growth with a viscous mucous. The results of the secondary screening showed that the best isolate was *P. savastanoi* (Pss3), gave best yield of EPS, produced on liquid King M reached 3 g/l after three days of incubati on. The EPS composition Extracted from bacteria was characterized by using TLC and HPLC technique, the results showed that the main units that make up the product such as glucose, fructose and mannose, The results of the study revealed that the inhibitory that EPS towards the growth of some pathological microorganisms and the *Antioxidant Activity* by effect of EPS on *DPPH scavenging ability*.

**Keywords:** *P.savastanoi*, EPS, HPLC, Antimicrobial, Antioxidant

## Socioeconomic Status of Breast Cancer Patients in Erbil Kurdistan Region - Iraq

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### Abstract

Breast cancer is the most common cancer among women, which is considered as a multifactorial disease and several factors including age, gender, family history, and socioeconomic status of the patient have impact on its incidence. Accordingly, the aim of the current study was to investigate the influence of socioeconomic, cultural habits, and patients' awareness on breast cancer incidence and prognosis among patients in Erbil, Kurdistan Region of Iraq. The study was conducted using direct interviewing of 67 patients who were visiting Nanakaly Hospital to get their chemotherapy and/or other needed treatments between November 2021, and March 2022. The interview was done based on a questionnaire that have been prepared by researchers. The questionnaire focused on demographic status, personal and familial educational background, economic status, and the patient's awareness of cancer. For the collected data frequency and correlation analysis have been performed. The age of patients was between 25 to >60 years old, and 86.56% of participants were living in Erbil city centre. Moreover, most of the patients 47 were illiterate or had only basic education, and the majority 82% were unemployed while only 13.5 % were employed. Furthermore, the frequency analysis regarding the economy has shown that among the patients, 70% were in the middle class, whereas 15% were both high and low economic class patients. In addition, correlation analysis has shown that breast self-examination has a negative and weak correlation with stages of diagnosing ( $r = -0.127$ , Pearson Correlation), however, this correlation is not statistically significant ( $P = 0.304$ , OR 0.520, CI 0.236-1.114). Besides, Breast self-examination has a positive and strong as well as statistically highly significant correlation with the patient's doctor visit before being diagnosed as ( $r = 0.843$ ,  $P \text{ value} = 0.00001$ , OR 0.356 95% CI 0.0084-0.70). In addition, the reasons why they didn't visit the doctor before being diagnosed had also positive and significant correlation ( $r = 0.365$ ,  $P \text{ value} = 0.015$ , OR 0.112 95% CI 0.075-0.188). In conclusion, it can be stated that patients' awareness such as breast self-examination and regular doctor visiting which are influenced by socioeconomic status might have a vital role on breast cancer incidence and prognosis among Kurdish patients.

**Keywords:** Breast Cancer, Demographic status, Breast self-examination, Socioeconomic Status.

## Effect of mushroom *Agaricus bisporus* on the biodegradation of agricultural residues and the quality of the resulting compost

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### Abstract

This study was conducted in 2021 in the laboratories of the College of Agriculture / University of Kufa, and aimed to use various agricultural residues to grow the mushroom *Agaricus bisporus*, in addition to using the same plant residues as biological fertilizers for plant growth. It was found that the growth medium prepared from wheat straw led to the best radial growth rate of white mushroom *A. bisporus*, after 6 days of inoculation, followed by rice straw and rice husks media. The results showed that the vegetative growth of *A. bisporus* is not pathogenic to the seeds of cress, wheat and barley and did not cause the seed rot. The results showed that there was an increase in the percentage of protein, fiber and chitinase enzyme in wheat straw decomposed by the mushrooms compared to the normal straw not treated with mushrooms. The antagonism of edible mushroom *A. bisporus* with a number of pathogenic fungi was tested on P.S.A. It was found that mushrooms had a high antagonism that of level 2 according to the Bell scale against the pathogenic fungi *Alternaria* sp, *Aspergillus flavus*, *Penicillium* sp and *Fusarium solani*, and of level 3 against *Aspergillus niger*, after 5 days of growth on the medium.

**Keywords:** *Agaricus bisporus*, Agricultural residues, Biodegradation, plant enzymes

## The prevalence of irritable bowel syndrome (IBS) and its association remarks on undergraduate students

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### Abstract

The aim of this study was to investigate how IBS symptoms affect anxiety levels, quality of life, and academic performance in undergraduate students. A total of 357 students participated in a cross-sectional study, where IBS prevalence was assessed using a questionnaire combining the Rome III criteria and the Birmingham IBS Symptom Questionnaire. Anxiety levels were assessed using the Beck Anxiety Inventory, and quality of life was assessed using the IBS-QOL Questionnaire. The results of the study showed that several factors significantly affect students' health, including diet, lifestyle, and cultural habits. The prevalence of IBS was found to be 16%, with females having a higher prevalence than males. It was also found that physical and mental health significantly affects students' academic performance, which, in turn, affects their grades. Students suffering from IBS were mostly from medical departments, with high levels of anxiety and a low GPA of CC. Moreover, the majority reported having a quality of life below average and insufficient knowledge of IBS. The study found both positive and negative correlations between demographic variables. However, levels of anxiety and quality of life were positively and significantly correlated. In conclusion, this study highlights several factors that can affect the academic performance of undergraduate students and their development. The study indicates that undergraduate students may suffer from anxiety and stress that can negatively affect their quality of life and academic performance due to their health condition. The incidence of IBS in undergraduate students may be caused by several factors, including diet, anxiety, and post-traumatic stress disorder. This condition not only affects their academic performance but also their social lives and characteristics. Therefore, providing sufficient knowledge about IBS and support for students with IBS could improve their physical and mental health, leading to better academic performance and quality of life.

**Keywords:** Irritable Bowel Syndrome, Anxiety, Students, Performance, Life.

## Evaluation of the Anticancer Activity of Limonene, Myristicin, and Caryophyllene Extracted from Agarwood (*Aquilaria malaccensis*) Using In Vitro and Insilico Study

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### Abstract

Natural Products, derived from plants and microorganisms, have been used for the treatment of various diseases and a large number of new drugs have been developed from them. Recently, the possible role of these natural products have expanded for their widely applications to prevent and treat human disease such as cancer, cardiovascular. Limonene, Myristicin, and Caryophyllene are bioactive compounds existing in agarwood (*Aquilaria malaccensis*). They have wide arrays of pharmacological and biochemical effects and are used as chemotherapeutic agents. COX1, VEGF, and HIF growth factors play a significant role in angiogenesis and the formation of blood vessels. Hence, inhibiting COX1, VEGF, and HIF growth factors can contribute to preventing cancer. Limonene, Myristicin, and Caryophyllene are recognized as anticancer agents owing to their ability to induce apoptosis by up-regulating pro-apoptotic factors and down-regulating anti-apoptotic factors. Molecular docking analysis is essential to show the comprehensive activity and role of compound binding to some cell proteins. To investigate the anti-proliferative, anti-angiogenic activities of agarwood bioactive compounds using in silico and in vitro. Accordingly, to understand the mechanism behind this significant activity, molecular docking analysis of D-Limonene, Myristicin, and Caryophyllene, as the highest quantity of compounds available in the extract was analyzed against selected cancer molecules. The extract inhibited the angiogenesis formation significantly with 100% of blood vessels inhibition. The in vivo and colony formation assay results showed significant inhibition of cell viability with a cell inhibition ratio of 100%. The result of the molecular level interaction of limonene with the COX1, VEGF active site confirmed its potential activity. They revealed important binding models which probably are responsible for the anticancer activity of the extract via inhibition of the COX-1, VEGF, HIF, and EGF enzymes. The results of each compound individually showed lower anti-cancer effects compared with 5FU except for VEGF. However, D-Limonene, Myristicin, and Caryophyllene, along with each other in the extract may induce further anticancer effects in vitro and in vivo. Our findings propose that the anticancer activity of Limonene and Myristicin may be related to the initiation of the apoptosis signaling pathway. Our result confirmed the functional activity of these compounds in preventing and treating cancer via regulating metastasis and apoptosis. These finding reveals that the supercritical extraction oil of *Aquilaria malaccensis* has strong anticancer activity towards human colon cancer cells and hence can be a good candidate for treating cancer. Further purification and isolation of related bioactive compounds is warranted together with proper chemical characterization and biological investigations in order to understand the mechanism of action of the agar wood extracts on cancer cells.

**Keywords:** *Aquilaria malaccensis*, anticancer, agar wood

## **Anti-Moesin antibody regulates neutrophil infiltration and extravascular recruitment in mice with acute pancreatitis**

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### **Abstract**

Infiltration of leukocytes and pancreatic acinar cell damage are important indicators of acute pancreatitis (AP). The signaling pathways for inflammation and tissue damage in AP have not been deeply understood. In this study, we investigated the role of moesin signaling in AP. C57BL/6 mice were injected with Anti-Moesin (30 µg/kg) before induction of taurocholate into the pancreatic duct to induce pancreatitis. Treatment with anti-moesin decreased blood concentrations of amylase, lipase, neutrophil recruitment in the pancreas, hemorrhage and edema formation in pancreatitis. Additionally, anti-moesin administration decreased the MPO activity in the pancreas and lung induced by taurocholate. Intravenous (IV) injection of anti-moesin significantly decreased concentrations of CXCL2 and IL-6 in the pancreas and plasma, respectively, in response to challenges of taurocholate. Finally, anti-moesin did not have a direct impact on secretagogue-induced trypsinogen activation in pancreatic acinar cells in vitro. Thus, these findings demonstrate new signaling pathways in AP and suggest that moesin targeting might be an efficient way to improve extreme AP.

**Key words:** Amylase, Chemokines, Inflammation, Leukocytes, and Pancreas

## The Reduction of Anxiety DASS21 in Diabetic Patients in Erbil –Kurdistan Region of Iraq

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### Abstract

People diagnosed with DM are approximately 20% more likely to suffer from anxiety than those without diabetes. Metformin is the first line therapy for treating T2DM, whereas pregabalin is the first line therapy for treating diabetic neuropathy as well as generalized anxiety disorder (GAD). The objective of this study was to determine the effect of combining pregabalin with metformin in patients who suffer from anxiety and see to what extent does it reduce anxiety symptoms as well as their glycated hemoglobin level. Related data were collected from T2DM individuals that were undergoing treatment with metformin alone and those with metformin and pregabalin combination. A greater decrement in anxiety symptoms and HbA1c occurred in patients taking the combination therapy. Besides pregabalin's use to decrease neuropathy symptoms it can also alleviate anxiety symptoms in diabetic patients bringing about a better glycemic control in them.

**Key words:** Amylase, Chemokines, Inflammation, Leukocytes, and Pancreas



## SNP molecular markers development and annealing temperatures optimization for rodent tuber (*Typhonium flagelliforme* lodd.) mutant plants

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### Abstract

Among the Araceae family of plants, rodent tuber (*Typhonium flagelliforme* Lodd.) plays a role in inhibiting cancer cell growth. The anticancer compounds found in rodent tuber have been obtained from mutant plants. There are no specific molecular markers associated with rodent tuber mutant plants that have high anticancer compounds. Bogor accession rodent tuber mutants to be identified as anticancer, it is necessary to obtain specific molecular markers. SNP molecular markers were designed as specific primers and PCR annealing temperatures optimized the rodent tuber mutant and wild-type plants. Previous studies indicated that a single mutation in the lectin gene sequence at 500 bp as based marker for design specific primers. Thus, seven SNP primers were selected and developed to validation by amplifying the rodent tuber mutant plants Bogor accession. The selected primers were amplified in different PCR annealing temperatures at 55°C and 60°C to optimize the specific band. Anticancer compounds were selectively isolated from rodent tuber mutant and wild-type plants. According to this study, seven SNP primers were successfully designed for lectin gene SNPs in rodent tuber mutant and wild-type plants. A PCR annealing temperature of 55°C produced several bands in all samples, whereas a temperature of 60°C produced in one band. All seven primers used in this study were effectively optimized at 60°C, and amplified the lectin genes at 300 bp. The developed SNP marker would be used to investigate the application of SNP based studies to promote different rodent tuber mutant plants.

**Keywords:** *Typhonium flagelliforme* Lodd., SNP specific primer, annealing temperature optimization.

## Molecular Characterization of Carbapenem resistant *Escherichia coli* and *Klebsiella pneumoniae* in Erbil, Iraq

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### Abstract

Antimicrobial drugs known as carbapenems are used to treat infections caused by bacteria that produce extended-spectrum -lactamases, such as those found in the family Enterobacteriaceae. Carbapenemases in drug-resistant Gram-negative bacteria must be identified and differentiated at the phenotypic and molecular levels for effective infection management. Resistance genes in *Klebsiella pneumoniae* and *Escherichia coli* were characterized here by analyzing their phenotypic and genotypic profiles. Genotypic confirmation of carbapenemase synthesis in 98 *K. pneumoniae* and *E. coli* isolates was found. PCR was used to look for the metallo-beta-lactamase genes OXA-48 and NDM-1 in the collected isolates. The blaOXA-48 and blaNDM-1 genes were found in 22.45 and 12.24% of the isolates, respectively. The genes for carbapenemase resistance, blaOXA-48, and blaNDM-1, were identified in *K. pneumoniae* and *E. coli* isolates from the city of Erbil in the Kurdistan area of Iraq.

**Keywords:** *Escherichia coli*, *Klebsiella pneumoniae*, OXA-48, NDM-1.

## Antimicrobial potential of biosurfactant produced by *Achromobacter xylosoxidans* BP(1)5

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### Abstract

Glycolipid biosurfactant is a surface-active compound which is widely known for its potential application in the biomedical industry. *Achromobacter xylosoxidans* BP(1)5 was isolated from oil sludge and identified as a potential glycolipid biosurfactant producer. This investigation aims to obtain the glycolipid biosurfactant produced by *A. xylosoxidans* BP(1)5 and to examine its antimicrobial potentials. The *A. xylosoxidans* was cultivated in glucose mineral salts medium and the crude biosurfactant was isolated by the ammonium sulphate precipitation method. The crude biosurfactants were solvent extracted using acetone then characterized by CMC, TLC, and FTIR then was examined for their potential as antimicrobial agent using the agar diffusion method against *Candida albicans* ATCC 10231, *Escherichia coli* ATCC 25922, *Pseudomonas aeruginosa* ATCC 27853, and *Staphylococcus aureus* ATCC 25923. The extracted biosurfactant has a CMC of 2 g/L with surface tension and emulsification activity of  $50 \pm 0.3$  mN/m and  $50.74 \pm 1.6$  %. The biosurfactant was found to be stable to temperature changes over ranges from 30 to 90°C, salinity 0 to 15% (w/v), and showed no loss of emulsification activity after incubation in different pH ranges from 3-9. The biosurfactant sample belongs to the anion and has an R<sub>f</sub> value of 0.36. IR absorption also showed similar and overlapping patterns with that other glycolipid biosurfactants namely rhamnolipid. Furthermore, this biosurfactant showed antimicrobial activities against Gram positive bacteria, *S. aureus* ATCC 25923 produced an inhibition zone of  $14.4 \pm 0.30$  mm while standard rhamnolipid produced an inhibition zone of  $15.0 \pm 0.02$  mm at the same concentration of 10 g/L. Whereas at a concentration of 5 g/L it produced an inhibition zone of  $0.6 \pm 0.03$  and  $1.2 \pm 0.10$  mm, respectively. These results indicate that glycolipid *A. xylosoxidans* has the potency to be applied as a natural antimicrobial agent to control Gram-positive bacteria.

**Keywords:** Antimicrobial agent, Biosurfactant, *Achromobacter xylosoxidans*

## Evaluation of Medium-chain Fatty Acids, Such as Caprylic Acid and Capric Acid, Showed Distinctive Peaks in the FT-IR Spectra of Fermented Virgin Coconut Oil, Which Reduced the Median Lethal Dose in Sprague Dawley Rats.

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### Abstract

There is limited information available on the median lethal dose (LD50) of fermented virgin coconut oil in animals or humans. The LD50 is the amount of a substance that causes death in 50% of the test animals when administered in a single dose. Several studies have investigated the toxicity of virgin coconut oil in animals, but the majority of these studies have used non-fermented coconut oil. FT-IR spectroscopy is a widely used technique in the analysis of natural products and food chemistry because it provides rapid and non-destructive analysis of chemical compounds. FVCO (fermented virgin coconut oil) exhibited a wide range of antioxidant properties. The purpose of the current investigation is to assess the in vivo toxicity of fermented coconut oil by identifying any potential adverse or toxic effects on the liver in Sprague-Dawley rats following acute dose oral feeding. In addition to evaluate fermented virgin coconut oil by FT-IR spectroscopy and Chromatography-mass spectrometry (GC-MS). Single doses of 5000 mg/kg were assessed in the acute study. The dose for 21 days did not show any sign of toxicity. It was determined that the LD50 of FCO was greater than 5000 mg/kg. There were no signs of toxicity after receiving the dose over 21 days. The results revealed no significant difference ( $P > 0.05$ ) in clinical and biochemical parameters, Liver weight, and gross findings compared to the control group. Histopathology examinations of Liver did not reveal morphological alteration. It has been used to identify and characterize the fatty acid composition and changes in the chemical structure caused by fermentation. The study found that fermented virgin coconut oil contained a range of bioactive compounds, including phenolic acids, flavonoids, and terpenoids. These compounds have been linked to potential health benefits, such as antioxidant and anti-inflammatory effects, and may have potential therapeutic applications. In addition in this study by FT-IR spectroscopy and Chromatography-mass spectrometry (GC-MS) found that fermented virgin coconut oil had a higher content of medium-chain fatty acids (MCFAs), such as caprylic acid and capric acid, compared to non-fermented virgin coconut oil. The study found that fermentation of virgin coconut oil caused changes in the chemical structure and composition, including an increase in the content of unsaturated fatty acids and the formation of new functional groups. In general for human health MCFAs have been linked to several potential health benefits, including improved cognitive function, weight management, and a reduction in cardiovascular risk factors.

**Keywords:** LD50 of VFCO on Rats; Liver histopathology Assessments, and FT-IR spectroscopy, Caprylic acid and Capric acid

## Vitamin D Deficiency is Associated with Immune-Mediated Inflammatory Diseases.

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### Abstract

The important role of vitamin D is being increasingly recognised. This has important clinical implications, as vitamin D deficiency has reached epidemic proportions worldwide. Vitamin D has proposed as anti-inflammatory properties. The purpose of this research was to investigate the impact of vitamin D deficiency on immune-mediated inflammation disease. Ninety samples were used for the experiment, forty-five samples had Vitamin D deficiency and forty-five samples were normal Vitamin D level. Whole blood was taken to test levels of ESR, WBC and lymphocytes. Serum was made to perform immuno-inflammatory markers such as IL-6, CRP, Rheumatoid factor, ferritin, LDH level. All immune-inflammatory markers were significantly higher in Vitamin D deficient samples compared to Vitamin D normal samples. It can be concluded that Vitamin D deficiency people are more prone to develop immune-inflammatory diseases.

**Key words:** Vitamin D, Rheumatoid disease, Immune-inflammatory disease.

## **Aspergillosis in mouth cavity among patients with immunocompromised diseases.**

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### **Abstract**

The main goal of our work is to study the mycotic infection of 100 diabetic patients. Also, to observe the main risk factors that associated with oral Aspergillosis. 100 samples were collected from Al-Ramadi and Hit Hospitals., Oral samples were taken from diabetic patients. The swabs were inoculation on SDA culture media for isolation of pathogenic *Aspergillus* and microscopic examination with KOH 10% and lactophenol cotton blue.The results of this study indicate a significant association between species of *Aspergillus*, ( $P$ -value = 0.000) and ( $Chi$ -square = 14.440<sup>a</sup>). In addition, our outcomes

proved that the oral Aspergillosis occur in urban more than in rural and in females more than in males and its more frequency in older peoples. Diabetes and oral Aspergillosis occurs in people of all ages and both sexes between the ages of 20 and 83 years but in old peoples is more common.The oral Aspergillosis which was caused by *Aspergillus niger* was the most frequent infection among diabetic patients.

**Keywords :** Aspergillosis, Oral, Diabetes mellitus

## Synthesis and Characterization of nanoparticles by Laser-ablation for biomedical applications

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### Abstract:

Nanoparticles have received much attention recently due to their use in cancer therapy. Titanium dioxide (TiO<sub>2</sub>)/polyethylene glycol (PEG) , titanium dioxide (TiO<sub>2</sub>)/Chitosan (Ct's) nanocomposite was synthesized using laser ablation method. This nanocomposite has been used for the delivery of 5-Fluorouracil (5Fu). The developed composites were characterized using Fourier transform infrared spectroscopy (FT-IR), ultra-violet spectroscopy UV-Visible, X-ray diffraction (XRD) analysis, and transmission electron microscopy (TEM). The FT-IR results revealed the presence of chemical interaction among the composite; whereas, the XRD results confirmed the presence of Ag, TiO<sub>2</sub>, PEG, Ct's and 5Fu in the composites, the measurement of particle size distribution proved that the particle size is from 10 to 100 nm, with an average size of particles of 50 nm.

**Keywords:** Titanium dioxide nanoparticles, Polyethylene Glycol, chitosan, 5 FU , Nanomaterial characterizations

## **Effect of mushroom *Agaricus bisporus* on the biodegradation of agricultural residues and the quality of the resulting compost**

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### **Abstract**

This study was conducted in 2021 in the laboratories of the College of Agriculture / University of Kufa and aimed to use various agricultural residues to grow the mushroom *Agaricus bisporus*, in addition to using the same plant residues as biological fertilizers for plant growth. It was found that the growth medium prepared from wheat straw led to the best radial growth rate of white mushroom *A. bisporus*, after 6 days of inoculation, followed by rice straw and rice husks media. The results showed that the vegetative growth of *A. bisporus* is not pathogenic to the seeds of cress, wheat and barley and did not cause the seed rot. The results showed that there was an increase in the percentage of protein, fiber and chitinase enzyme in wheat straw decomposed by the mushrooms compared to the normal straw not treated with mushrooms. The antagonism of edible mushroom *A. bisporus* with a number of pathogenic fungi was tested on P.S.A. It was found that mushrooms had a high antagonism that of level 2 according to the Bell scale against the pathogenic fungi *Alternaria* sp, *Aspergillus flavus*, *Penicillium* sp and *Fusarium solani*, and of level 3 against *Aspergillus niger*, after 5 days of growth on the medium.

**Keywords:** *Agaricus bisporus*, Agricultural residues, Biodegradation, plant enzymes



## **Platelet activating factor concentration with C reactive protein biomarkers in patients with coronary atherosclerosis pre and post percutaneous coronary intervention**

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### **Abstract**

Atherosclerosis is a multifactorial disease. Various signal cascades involved in progression of the disease. Importantly, Platelet activating factor (PAF) participates in a wide range of inflammatory conditions. In coronary atherosclerosis, PAF has been shown to have an important role in platelet and neutrophil aggregation, as well as triggering and progression of the disease. The aim of this study is to determine the value of PAF compared with high sensitivity C reactive protein (hs-CRP) in patients presented with coronary atherosclerosis pre and post percutaneous coronary intervention (PCI). 60 patients with coronary atherosclerosis were categorized into two groups, according to the pre percutaneous coronary intervention and post percutaneous coronary intervention, with 20 subjects with normal angiography considered as a control group. The serum levels of PAF and hs-CRP were estimated by using a sandwich enzyme-linked immunosorbent assay (ELISA). Other parameters like lipid profiles, hematological indicators, and certain parameters were also compared among a studied group. The SPSS (Statistical Package for Science Services) version 26 was used to conduct computerized statistical analysis. The levels of PAF and hs-CRP decreased significantly in Post PCI patients compared to the pre PCI patient ( $p < 0.01$ ). The level of PAF decrease significantly in control group compared to the patients groups ( $p < 0.01$ ). The platelet activating factor could be used as dependable diagnostic inflammatory biomarker for coronary atherosclerosis, like hs-CRP for coronary atherosclerosis progression.

**Keywords:** Platelet activating factor, Percutaneous coronary intervention, C-reactive protein

## Diversity of potential phosphate solubilizing bacteria in durian plantation, De Durian Park, Jombang, Indonesia

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### Abstract

Soil fertility is an important factor of plant fertility and productivity. One of the determining factors for soil fertility is the phosphate content in the soil. The existence of phosphate is inseparable from the role of phosphate solubilizing bacteria. Phosphate solubilizing bacteria can be found around the roots of various types of plants, one of which is durian. This study aims to explore phosphate solubilizing bacteria from the rhizosphere soil of De Durian Park Wonosalam, Jombang, Indonesia. Soil samples were taken from various altitude using a soil corer, then composited and analyzed the presence of phosphate-solubilizing bacteria. The bacterial suspension was grown on Pikovskaya's medium and incubated for 3 days. Bacteria were isolated and characterized to obtain a single isolate. Phosphate solubilization ability was obtained by growing bacteria on solid media of Pikovskaya. Phosphate solubilization ability was indicated by the presence of a clear zone around the colony of bacteria. The diameter of the bacterial colonies and the clear zone were measured using calliper to obtain the phosphate solubilization index. The exploration obtained 16 bacterial isolates with variations in the characteristics of morphology colony and cells microscopy. The best isolate was examined for biochemical characteristics and analyzed for 16S rRNA gene sequences to identify the species. All of the isolates showed the ability to solubilize phosphate and the phosphate solubilization index was in the range of 1.08-2.86. L1.1 isolate had the highest phosphate solubilization index of  $2.86 \pm 0.35$  and categorized as medium solubilization. Based on BLAST analysis, L1.1 isolate identify as *Burkholderia stabilis* and showed the highest homology with *Burkholderia stabilis* strain LMG 14294 (NR041719.1) with a percentage of 99,91% identity value. Phosphate solubilizing bacteria has the potential to be examined further in obtaining candidate bacteria for biofertilizer formulations to enhance soil quality and support sustainable agriculture.

**Keywords:** Phosphate solubilizing bacteria, biofertilizer, *Burkholderia stabilis*

## Biological activity of *Balanites aegyptiaca* (L.) Delile

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### Abstract

Africa, the Middle East, and the Indian subcontinent are all home to the common medicinal herb *Balanites aegyptiaca*. This is due to the plant's extensive range of components, from its roots to its leaves, which have been used for years in traditional medicine. Plants with potential for therapeutic benefit, particularly medicinal plants, have had a significant impact on the evolution of the modern healthcare system. The emergence of new diseases throughout the world has prompted experts to look at the possibilities of various plant sections as well. The study intends to gather data on traditional *B. aegyptiaca* use and biological activity from a local native population in Kaduna state, northern Nigeria. For gathering traditional medical knowledge on *B. aegyptiaca*, random sampling was used. Disk diffusion assay, ferric reducing antioxidant power, and radical scavenging activity were used to assess the biological activity of *B. aegyptiaca* ethanol and aqueous extracts. According to the study, *Balanites aegyptiaca* has the highest faithfulness at 0.9% and is traditionally used in the region to cure several illnesses, including hypertension, migraines, and spiritual issues. At 79.3 g ML<sup>-1</sup> and 13.1 mmol g<sup>-1</sup>, the leaves showed the highest levels of radical scavenging, ferric reducing power, and antibacterial activity. An ethanol leaf extract of *B. aegyptiaca* showed a 19.4 mm zone of inhibition against *Pseudomonas aeruginosa*. According to the study, *B. aegyptiaca* leaves are a promising source for the creation of contemporary medicines.

**Keywords:** Antioxidant, antibacterial, *Balanites aegyptiaca*

## Recent insight into the Role of Genetic Engineering in Incurable Diseases

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### Abstract

Humans have been diagnosed with around 10,000 diseases, yet there is only treatment for 500 of them and the rest considered as incurable. Thus, finding novel therapeutic approach is crucial to resolving these problems. Genomic engineering, including CRISPR, is one of the major technologies that offers hope in the field of incurable diseases. CRISPR/Cas9 (clustered regularly interspaced short palindromic repeats-associated protein 9) shows the opportunity to treat a diverse array of untreated various genetic and complicated disorders such as cancer, obesity, allergy and many monogenic disorders. Therapeutic genome editing processes that target disease-causing genes or mutant genes have been greatly accelerated in recent years as a consequence of improvements in sequence-specific nuclease technology. However, the therapeutic promise of genome editing has yet to be explored entirely, many challenges persist that increase the risk of further mutations. Here, we've highlighted the key advantages of genomic engineering for curing incurable diseases and present the key difficulties this approach faces in human clinical trials.

**Keywords:** CRISPR/Cas9, Cancer Therapy, incurable disease and Genomic Engineering

## Occurrence of multiple -drug resistance strains of bacteria in Erbil City, Iraq.

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### Abstract

Antimicrobial resistance (AMR) is the ability of pathogenic microorganisms to destroy the antibiotics used against them and it is one of the top 10 global public health threats with the highest burdens in low-resource settings. Tackling AMR is a challenge to understand the true burden of resistance. We addressed the types of infectious bacteria, the occurrence of antimicrobial resistance and the types of antibiotics that ineffective. Samples were collected from a local laboratory in Erbil city and the results showed that from 38 bacterial infections the most predominant cause of was *Escherichia coli*. Bacteria have developed resistance to the beta-lactam antibiotics (Ampicillin, Amoxicillin-clavulanic acid). The percentages of resistance among the studied samples in our region were much higher when compared to the results of more developed countries. Finding new strategies against the development of antibiotic resistance is a major global challenge for the life sciences community and public health.

**Keywords:** antibiotics, multi-drug resistant bacteria, antibiotic susceptibility, bacteria, *Escherichia coli*, beta-lactam antibiotics, Antibiotic sensitivity test.

## qRT- PCR based on SYBR-Green I fluorescence of anticancer, chemical characterization and antidiabetic properties of clove oil

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### ABSTRACT

*Syzygium aromaticum* is an important herbal plant in the China, Europe and Asia region. It has been described as an effective analgesic, anti-inflammatory, antioxidant, cardiovascular disease, antifungal, and antibacterial agent. This study's objective is to identify the phytoconstituents in clove oil extracted from *Syzygium aromaticum*, a member of the Myrtaceae family. The GC/MS analysis of clove essential oil yielded 23 chemical compounds, and eugenol (58.65 %), caryophyllene (6.60%), camphane (monoterpenes) (2.95%), Bisabolol (7.31%), tricosane (3.80%) eugenol acetate (3.35%), naphthalene (18.81%) and endo-borneol (19.98 %) were found as major compounds and some organic acids such as benzoic acid (33.65 %), acetic acid (9.30%), cinnamic acid (6.69 %), and phenol (5.47%). By using an analysis to suppress amylase, the anti-diabetic activity was assessed. In a human bone cancer cell line (MG-63), the anticancer activity was evaluated using Cas 3 gene expression analysis by qRT-PCR. Clove oil inhibited the  $\alpha$ -amylase enzyme in a concentration-dependent manner, with an  $IC_{50}$  value ( $IC_{50}$  167.24.46  $\mu$ g/ml) that was revealed to be comparable to that of conventional acarbose ( $IC_{50}$  85.393.14  $\mu$ g/ml) Real-time qRT-PCR results revealed that after treatment with clove oil with an  $IC_{50}$  value of 33.6  $\mu$ g/ml, the Cas 3 gene expression level in  $\beta$ -actin and in the human bone cancer cell line (MG-63) was expressed with a value of fold gene variation differences of 2.07. Clove oil may be used to treat diabetes and human bone cancer, according to study.

**Key words:** *Syzygium aromaticum*, *Myrtaceae*, Diabetes, Human bone cancer, GC-MS, Cas3 gene expression,  $\alpha$ -amylase and  $\beta$ -actin

## **An overview of the function and health properties of probiotic bacteria in yogurt**

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### **Abstract**

Recently, in addition to their nutritional worth, the majority of causal consumers, particularly in Third World nations, have paid close attention to the health and management of foods with functional qualities. Probiotic dairy products are better known for their functional qualities than other probiotic products because probiotic bacteria added to traditional fermentation cultures have a number of therapeutic advantages, including quicker relief of diarrhea, decreased lactose intolerance, lowered cholesterol, and improved immunity. On the other hand, dairy products, particularly yogurt, are popular because of their flavor, ease of accessibility, low cost, and widespread use in the community. Since the human digestive system contains 500 or more different species of bacteria, many of which have beneficial functions, and since their numbers decline with advancing age and in the presence of germs, this issue is particularly crucial for the elderly. Pathogens are more prone to exist. Probiotic bacteria, found in foods like yogurt, are intended to be added to the human diet in order to halt or stop this process and replace lost species. In this study, we'll talk about how to build this aim inside ourselves and the outcomes that came from doing so.

**Keywords:** probiotic; yoghurt; functional food; dairy products

## Development and application of imprinted zeolite TS-1 modified carbon paste electrode as a sensor for amitriptyline analysis by potentiometry

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### Abstract

An imprinted zeolite TS-1 based electrode to determine amitriptyline (AMT) levels in pharmaceutical formulation by potentiometry has been developed. Zeolite TS-1 was synthesized hydrothermally from TEOS, TBOT, TPAOH, and water with a mole ratio of 1 : 0.017 : 0.24 : 21.2. Imprinted zeolite (IZ) was prepared with a mole ratio of AMT/Si of 0.0306. The presence of AMT mold in the zeolite pores causes its surface area to be about 4 times larger than zeolite without mold. This causes the adsorption capacity of IZ to be greater than that of unmodified zeolite. The IZ-carbon paste electrode which showed optimum performance was prepared with a mass ratio of activated carbon, paraffin, and imprinted zeolite of 11:8:1. Electrode performance was reviewed based on the Nernst factor value of 58.3 mV/decade, a measurement range of  $10^{-7}$ – $10^{-4}$  M, upper detection limit of  $9.1 \times 10^{-5}$  M and a lower detection limit of  $1.02 \times 10^{-7}$  M. The electrode exhibited precision of 94.5–98.3%, accuracy of 95.1–102.1%, response time of 15–38 s, and lifetime of 4 months, with more than 100 times uses. The carbon paste electrode modified imprinted zeolite TS-1 showed high stability and can be applied to determine low level amitriptyline in pharmaceutical (5 mg). The application of modified sensor for the determination of AMT in antidepressant tablets produced a recovery of 90.2 – 102.5%, while the presence of glucose, lactose, sucrose as commonly used carrier compounds in AMT tablets did not interfere on AMT determination. The good analytical performance of the modified electrode suggests its potential applications in the determination of amitriptyline, an affordable medicine.

**Keywords:** amitriptyline analysis; potentiometry; carbon paste electrode-imprinted zeolite TS-1; sensor selectivity; affordable medicine



## Multi-Stage hydrothermal synthesis of hierarchical amorphous aluminosilicate

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### Abstract

We report the synthesis of hierarchical amorphous aluminosilicates consisting of different pore morphologies through the multi-stage hydrothermal process. Hydrothermal process was carried out sequentially at 40°C for 6 h, 60°C for 6 h and 80°C for 12 h. Amorphous aluminosilicates consisting of both micropores and mesopores were obtained. The mesopore surface area, pore volume and pore diameter were larger compared to that of synthesized by single-stage hydrothermal process. For addition, the amount of Brønsted and Lewis acid sites in the amorphous aluminosilicates increased significantly. This hierarchical structure could provide a wide access for bulky reactants and strong acid sites for catalytic activity.

**Keywords:** hierarchical aluminosilicate; multi-stage hydrothermal; sol-gel preparation

## Development of Imprinted Zeolite for Indoxyl Sulfate Uremic Toxins Removal in Hemoperfusion System

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### Abstract

The clearance of uremic toxins through hemodialysis treatment systems in patients with kidney failure is continuous to be studied. In this study, the clearance of indoxyl sulfate (IS) which is a category of protein-bounded uremic toxins was studied with zeolite Y as an adsorbent. Zeolite Y was synthesized with a mole ratio of  $10\text{SiO}_2:\text{Al}_2\text{O}_3:4\text{Na}_2\text{O}:180\text{H}_2\text{O}$ . The modification uses the imprinting technique and IS as a template to generate IZ-IS. The success of the IS-printed zeolite Y was proven by comparing the results of the FT-IR and *Surface Area Analyzer* (SAA) characterizations compared to synthetic zeolite (ZS) and commercial zeolite (ZC). By the FT-IR spectra, IZ-IS has been produced successfully. The average pore size of IZ-IS is 1.21 nm smaller than ZS which is 1.35 nm by BET analysis. IZ-IS has a shorter contact time during adsorption, has a higher adsorption capacity, and is 1.23 times more selective than synthetic zeolite. The highest percentage of IS adsorption efficiency in IZ-IS was 59.16% while ZS was 54.73% and 54.45% for ZC.

**Keywords:** Hemodialysis, Mixed Matrix Membrane, Indoxyl Sulfate, Imprinted Zeolite

## Potentiometric Applications of Lanthanum Nanoparticles Prepared by Green Synthesis Using Maize Extract Applied for Determination of Fluoride ion in Tea Samples

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### Abstract

This paper includes new lanthanum nanoparticles synthesized by the green method with maize extracts. This study was divided into two parts, the first was about the techniques which were used for the characterization of prepared lanthanum nanoparticles with maize extracts such as Fourier transform infrared spectroscopy, ultraviolet/visible spectroscopy, x-ray diffraction crystallography examination indicates that lanthanum nanoparticles prepared from maize extract were semi-crystalline and their crystalline size was around 4.0 nm, field-emission scanning electron microscopy showed that lanthanum nanoparticles prepared from maize extract appeared to be morphologically spherical, and energy disperse X-ray which indicated that the nano compound contains lanthanum and fluorine elements which are evidence for the preparation of lanthanum nanoparticles prepared from maize extract. The second part showed the determination of fluoride ion using commercial fluoride ion selective electrode and prepared lanthanum nanoparticles from maize extract electrode. Fluoride was successfully determined by commercial and lanthanum nanoparticles prepared from maize extract electrodes; the best results were obtained at pH 6. The calibration curve was drawn for solutions of fluoride ions for both electrodes in the concentration range:  $(5.0 \times 10^{-6} - 4.0 \times 10^{-3})$  mol/L with the regression coefficient of 0.9992 and 0.9978 for commercial and lanthanum nanoparticles prepared from maize extract electrodes, respectively. The precision of the method was investigated and the range of RSD% was between (1.9261 - 0.2659) % for commercial electrodes and ((-3.0452) - 4.4400) % for lanthanum nanoparticles prepared from maize extract electrodes. The accuracy of the determinations as the relative error was also estimated which allows between ((-4.70) - 3.14) % for fluoride.

**Keywords:** lanthanum nanoparticles, maize extracts, green synthesis, fluoride ion.

### Three alkaloids from *Casimiroa edulis*

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#### Abstract

*Casimiroa edulis* belong to the family of Rutaceae, and also known as white sapote. The stem barks of this plant were collected and dried, then extracted with methanol. The dried extracts were dissolved in a small amount of methanol and separated with *n*-hexane. The methanol fraction was further fractionated by using vacuum liquid chromatography (VLC) and gravity column chromatography (GCC), which lead to the isolation of three alkaloids, 5-hydroxy-1-methyl-2-phenyl-4-quinolone, 7-methoxy-1-methyl-2-phenyl-4-quinolone (edulein), and 4,8-dimethoxy-2(1H)-quinolinone (edulitine). The structures of the compounds were elucidated on the basis of extensive spectroscopic methods including FTIR, UV-visible, 1D, 2D NMR, and HRMS.

**Keywords:** Rutaceae, *Casimiroa edulis*, alkaloids

## Catalytic transformations based on a Continuous flow mechanochemistry: Future Prospective

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### Abstract

New techniques have been developed to overcome the disadvantages of traditional batch mechanochemistry due to the desire to develop modern alternatives. To achieve this goal, mechanochemistry, and flow processes could be combined in continuous processing. The purpose of this paper is to highlight two technologies: twin-screw extrusion (TSE) and Impact (induction) in continuous flow heated mechanical chemistry (I-CHEM), which are capable of producing polymers, active pharmaceutical ingredients, synthesizing nanomaterials, and converting biomass and wastes into high-value products.

**Keywords:** Flow Mechanochemistry, Extrusion, Ball milling, Industrial, Catalytic transformations.

## A Review of Peroxi-Electrocoagulation Removal of Different Pollutants from Wastewater

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### Abstract

The peroxi-electrocoagulation (PEC) process uses electrochemistry to introduce coagulants to remove suspended solids, colloidal particles, metals, and other dissolved solids from water and wastewater. Metals and contaminants are all successfully eliminated using the PEC procedure. This process also eliminates dangerous microbes. Direct current is used during EC operation more frequently, and electrode plates are sacrificed as a result. Oxidation-related corrosion of the anode and forming of an impenetrable oxide layer on the cathode are possible in this scenario. As a result, electrocoagulation procedures become less successful because effective current transfer between the anode and cathode is prevented. An alternating current (AC) was used to solve this problem. The PEC process is preferred to other physicochemical processes because of its design and use of inexpensive materials. This essay seeks to analyze the mechanisms of the process, reactor and process design elements, electrode configuration, treatment effectiveness, application and case studies, and finally, the economics of using electrocoagulation for the treatment of textiles or metals in wastewater. This paper also summarizes the key findings from the publications examined. The primary conclusions of this article demonstrate that PEC technology is economical, efficient in removing metals, and environmentally beneficial.

**Keywords:** Heavy metals removal, Optimization conditions for electrocoagulation, H<sub>2</sub>O<sub>2</sub> electrocoagulation, Water pollution, PEC cell design.

## Pyridine sulfonic acid for cellulose and glucose hydrolysis

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### Abstract

Biofuels offer the potential to replace a large percentage of fossil fuels, however the use of lignocellulose biomass, via second generation bio-refining technologies, is essential to achieve this economically and sustainably. A 3-pyridine sulfonic acid as a homogeneous catalyst was used for the hydrolysis of cellulose, with a maximum glucose yield of more than 98% at 130 °C at 6 hours and conversion to other products thereafter. Since the solubility of cellulose is a very important factor to make hydrolysis easier. It was used for that that purpose mixture of DMF/LiCl which had a high ability to dissolve cellulose. Glucose was also hydrolysis to other products. Very short time was deducted to hydrolysis glucose which was only 2 h. The material was studied at different weights, different temperatures, and several solvents were used to find out the optimal conditions of the homogenous catalyst.

**Keywords:** Pyridine sulfonic acid; Glucose; Cellulose hydrolysis; Bio-fuel

## Effect of bleaching concentration on the crystallinity and crystallite size properties of microcrystalline cellulose extracted from PDMS-coated wastepaper Zaiton

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### Abstract

The objective of this study was to determine the effect of sodium hypochlorite (NaOCl) concentration during bleaching treatment on the crystallinity and crystallite size of extracted microcrystalline cellulose (MCC). MCCs were extracted from polydimethylsiloxane (PDMS)-coated wastepaper by conducting alkali treatment with sodium hydroxide (NaOH) followed by bleaching treatment with NaOCl at 6 different concentrations. The wood content analysis was carried out on the PDMS-coated wastepaper to determine the percentage of alpha-cellulose, hemicellulose and lignin present in the sample. The extracted MCCs at different bleach concentration were characterized by means of Attenuated Total Reflectance Fourier Transform Infrared (ATR FTIR), X-Ray Diffraction (XRD), Thermogravimetric Analysis (TGA), Scanning Electronic Microscopy (SEM) and Particle Size Analysis (PSA) to confirm the formation of MCCs. The wood content analysis revealed that the PDMS-coated wastepaper comprised of 75.83%, 21.32% and 2.84% of alpha-cellulose, hemicellulose and lignin, respectively. ATR FTIR confirmed the structure of cellulose and the removal of PDMS in the sample. The extraction procedure with 1.6% NaOCl led to highest crystallinity index of 78.9% with crystallite size of 3.33 nm and uniform spherical particles with approximate particle size of 36.42 nm. The extracted MCC with highest crystallinity index is preferable as it is strongly affects mechanical and chemical of its properties thus contribute strength to the composite.

**Keywords:** cellulose extraction, microcrystalline cellulose, bleaching effect



## Synthesis and characterization of Mg-Zn nanoferrites flavonoids fabricated: an advanced multifunction hybrid nanocomposite for biomedical application

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### Abstract

Nanosized mixed ferrites  $Zn_{1-x}Mg_xFe_2O_4$  ( $0 < x < 1$ ) was successfully synthesized by wet ferritization route. The as-prepared spinel nanoparticles were pre-treated with freshly extracted flavonoids (Flv) from agri-waste of Punica Granatum L. and Allium cepa L. The surface morphology, magnetic behavior and elemental compositions were characterized using XRD, FTIR, VSM, DTA-TGA, FE- SEM, EDX, TEM and BET. X-ray diffractograms proposed that the as-synthesized  $Zn_{1-x}Mg_xFe_2O_4$  (ZMFO) nanoparticles have a single-phase cubic spinel structure. The morphological results confirm ZMFO NPs fall into two categories of morphology: flower-shaped and plate-shaped particles and EDX spectra of ZMFO and fabricated Flv/ZMFO indicates the existence of Zn, Mg, Fe, O and C elements. Meanwhile, the TEM analysis of the modified ZMFO corroborates that each particle is a single crystal, which is a significant finding with the average particle size of 22nm. Further, the modified ZMFO NPs showed a weight loss of 39.17% associated to the surface modification. In addition, remarkable superparamagnetic behavior recorded for the modified ZMFO with the saturation magnetization  $M_s$  up to 41.8750emu g<sup>-1</sup>. BET results revealed that the as-synthesized Flv/ZMFO is mesoporous nanosized materials with a total pore volume, average pore size, and specific surface area found to be 0.1349cm<sup>3</sup>/g, 17.044nm, and 31.655m<sup>2</sup>/g, respectively. Significant antibacterial efficacy (7, 8 mm inhabitation zone) of conjugated Flv/ZMFO nanoferrites was noticed against Gram-negative and Gram- positive bacteria, respectively. The minimum inhibitory concentration (MIC) of modified Flv/ZMFO nanoferrites against E-coli and S. aureus were found to be 0.312 and 0.156 mg/ml, respectively. Hence, in vitro cytotoxicity assay demonstrated that the modified nanoferrites were not toxic on NIH/3T3 fibroblast cells up to 500µg/ml concentration. The obtained results from this work highlighted that the fabricated Flv/ZMFO are low-cost, safe, challenges and prospective nanosized material in the biomedical field for the development of novel antibacterial agent and materials. Also, could be promising candidate nanocarriers for magnetically targeting drug delivery in future.

**Keywords:** nanospinel ferrites; magnetic properties; antimicrobial activity; wet chemical method; biocompatibility

## Ni-Co and Fe-Co bimetallic catalyst supported on mesoporous carbon and its application in methylene blue photodegradation

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### Abstract

Fe and Ni-based catalysts are considered as efficient photodegradator for methylene blue due to their low cost and high activity in aquatic media. Herein, we demonstrate that Fe-Co and Ni-Co bimetallic particles with high activity can be dispersed using mesoporous carbon as supporting material. The character of the Ni-Co and Fe-Co on mesoporous carbon is observed by FTIR and SEM EDX. The porous Ni-Co and Fe-Co on mesoporous carbon particles exhibited considerably enhanced catalytic activity for methylene blue photodegradation by providing a high surface area and fast mass transport for methylene blue degradation. It is also found that Co-doping significantly increases photodegradation. The kinetic model of methylene blue photodegradation with the porous shows an excellent performance with maximum efficiency close to 90% at neutral pH for 30-minute dark adsorption and 60-minute irradiation of Fe-Co/mesoporous carbon, respectively. Thus, this work suggests that the highly porous Ni-Co and Fe-Co on mesoporous carbon can be used as a photocatalysis for methylene.

**Keywords:** Mesoporous, carbon, photodegradation

## Ring opening polymerization of new Schiff base complexes derived from [Bis-(2,6 diisopropylaniline) furfural and 2,2'-oxydianiline.

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### Abstract

Polycaprolactone (PCL) is one of the biodegradable polymers which have attracted the attentions of the researchers because of its widespread application in the medical arena (as biodegradable implants) and packaging industries. Over the last decade, ring opening polymerization (ROP) of cyclic esters has been the major route to synthesizing these polymers. Coordination chemistry plays a central role in this field by allowing the development of new, efficient, metal-based initiators by manipulation of the coordination environment. In this work, the reaction of 4,4' methylene bis (2,6-diisopropylaniline with one and two equivalent of furfural afforded new Schiff base compounds. The reaction of the new ligands with one or two mole of metals salt gave a new series of transition metal complexes of Fe(II), Co(II), Ni(II), Cu(II) and Zn(II). Also new ligand derived from 2,2'-oxydianiline Schiff-base with their complexes with Fe(II), Co(II). The new ligands and their prepared complexes were characterized by x-ray single crystal. The new ligands and their prepared complexes were characterized by IR, <sup>1</sup>H NMR and CHN analytical techniques. The complexes were screened for their potent activity as catalysts for the ring opening polymerization (ROP) of 3-caprolactone (3-CL). Results revealed that good activity is only achievable at temperatures  $\geq 100^{\circ}\text{C}$  over the minimum period of 1h. The polymer polydispersities were narrow, and the obtained molecular weights were much lower than calculated values.

**Keyword:** Ring opening polymerization, 2,6-diisopropylaniline, furfural, 2,2'-oxydianiline

## **A study of non-destructive tests of geopolymer sifcon concrete formed from fly ash as a binder**

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### **Abstract**

The ability to produce SIFCON concrete has been the subject of extensive prior studies, which also covered its properties. By using fly ash as a binder and two types of steel fiber (micro and hooked steel fiber) in various percentages (0, 6, 12, and 18) of the mortar that was used, certain physical and mechanical properties for SIFCON geopolymer concrete were examined in this study. The SIFCON geopolymer concrete underwent several tests, the tests began with the geopolymer slurry to experiment with the best texture, then compressive strength, rebound number, ultrasound pulse velocity, shear modulus "dynamic" (Gd), elastic modulus "dynamic" (Ed), Logical relationship between Compressive Strength Test and Non-destructive Testing (NDT) (RN and UPV). The results of all these tests showed enhanced properties where compressive strength increased by 26.1% when using 12% micro steel fiber. Ultrasound pulse velocity value (UPV) (Longitudinal pulse velocity (V<sub>l</sub>) and Shear pulse velocity (V<sub>s</sub>)) were also increased by 27.5% and 33.7% respectively when using 12% micro steel fiber. The Rebound number reading went in another direction and showed the best value during the use of 12% hooked-end steel fiber.

**Keywords:** Sifcon, geopolymer, fly ash, steel fiber, rebound number.

## **Spectrophotometric determination of amisulpride in tablets by diazotization coupling reactions**

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### **Abstract**

A simple and sensitive spectrophotometric methods for assay of amisulpride in pure form and tablets is achieved. Both methods involves the diazotization of amisulpride with nitrite in an acidic medium to produce the corresponding diazonium salt, followed by either coupling with iminodibenzyl (IDB) in acidic medium to give a violet azo dye which showed maximum absorption at 558 nm (method A) or coupling with 7-iodo-8-hydroxyquinoline-5-sulfonic acid (chiniofon) in alkaline medium to produce a red azo dye which show maximum absorbance at 522 nm (method B). The two methods have been applied successfully to determine of amisulpride in tablets and also evaluated by applying the standard addition technique.

**Keywords:** amisulpride, diazotization, iminodibenzyl, 7-iodo-8-hydroxyquinoline-5-sulfonic acid, spectrophotometric determination.

## The theoretical investigation by QTAIM approach to chemical bonding of a di-rhenium bis(triphenylphosphine) carbonyl cluster containing sulfuric and hydrido bridge: $[\text{Re}_2(\text{CO})_6(\mu\text{-S})(\mu\text{-H})(\text{PPh}_3)_2]$

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### Abstract

Several integral and local electron density's topological parameters of significant metal-metal and metal-ligand bonding interactions in a di-rhenium bis(triphenylphosphine) carbonyl cluster containing sulfuric and hydrido bridge:  $[\text{Re}_2(\text{CO})_6(\mu\text{-S})(\mu\text{-H})(\text{PPh}_3)_2]$  were calculated and interpreted by using the quantum theory of atoms in molecules (QTAIM). The properties of bond critical points such as the delocalization indices  $\delta(A, B)$ , the electron density  $\rho(r)$ , the local kinetic energy density  $G(r)$ , the Laplacian of the electron density  $\nabla^2\rho(r)$ , the local energy density  $H(r)$ , the local potential energy density  $V(r)$  and ellipticity  $\varepsilon(r)$  are compared with data from earlier organometallic system studies. A comparison of the topological processes of different atom-atom interactions has become possible thanks to these results. In the core of this cluster, the calculations show that there is no bond critical points (BCPs) or identical bond paths (BPs) between Re-Re. The distribution of electron densities is determined by the position of bridging hydride and sulfur atoms coordinated to Re-Re, which significantly affects the bonds between these transition metal atoms. On the other hand, the results confirm that the cluster under study contains a 6c–8e bonding interaction delocalized over  $\text{HRe}_2\text{SP}_2$ , as shown by the non-negligible delocalization index calculations. The small values for  $\rho(b)$  above zero, together with the small values, again above zero, for Laplacian  $\nabla^2\rho(b)$  and the small positive values for total energy density  $H(b)$ , are shown by the Re-H and Re-S bonds in this cluster is typical for closed-shell interactions. Also, the topological data for the bond interactions between phosphine metal atoms with the C atoms of the phenyl ring ligands are similar. They show properties very identical to open-shell interactions in the QTAIM classification.

**Keywords:** AIM approach, Bonding analysis for the di-rhenium cluster, DFT calculation, and Topological properties.

## Utilization of Indonesian biomass waste as a sustainable anode material in lithium-ion batteries to contribute in reducing CO<sub>2</sub> emissions

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### Abstract

Graphite is a crucial constituent in lithium-ion battery (LIB) anodes. Yet, its production from renewable and sustainable carbon sources continues to be a tremendous challenge. In this study, we apply the simultaneous activation and graphitization technique to develop high graphitic carbon material from waste coconut coir. The graphitic carbon produced at 1200 °C exhibits outstanding electrochemical performance as a LIB anode, with a specific capacity greater than that of commercial graphite (339.90 mAh/g) and a high level of graphite IG/ID (1.99) and a surface area of 162.31 m<sup>2</sup>/g. The interaction of K and Ni metals with amorphous carbon boosts internal heating and catalytic graphitization, resulting in an ordered carbon structure and a larger graphite structure area. It was observed that ion diffusion in the graphite interlayer is the major ion storage mechanism in its material, similar to the mechanisms observed in commercial graphite. Finally, this simultaneous activation and graphitization approach proved successful in transforming unused biomass waste into a graphite-like material with a high degree of graphitization and great LIB anode performance, all while contributing to reduced CO<sub>2</sub> emissions.

**Keywords:** Biomass waste, porous graphitic carbon, lithium-ion battery anode

## Incidence of vitamin D deficiency among thyroid patients

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### Abstract

A cross-sectional study was carried out to study the prevalence of vitamin D deficiency among thyroid patients by determination of thyroid hormones (T3, T4 and TSH) and 25-OH vitamin D in sera of 30 healthy individuals as a control group, and of 60 patients with thyroid disease (30 samples with hyperthyroidism and 30 with hypothyroidism) collected from external medical laboratories and Kirkuk general hospital. The results showed there was a significant decrease in serum 25-OH vitamin D level for women with hyper- and hypothyroidism as compared with the control group, and there was 90% of patients with hyperthyroidism have 25-vitamin D > 20 ng/ml, and 93% for patients with hypothyroidism have 25-vitamin D > 20 ng/ml. So, we can conclude that vitamin D is very correlated with thyroid hormone secretion.

**Keywords:** Vitamin D, Thyroid disease, Vitamin D deficiency



## Effect of Pine Oil on Carpet Weed (*Galenia pubescens*): Implications for Weed Management

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### Abstract

*Galenia pubescens* is a woody prostrate perennial weed belonging to the family Aizoaceae, and the presence of this aggressive species is a significant barrier to the establishment and improvement of native grasslands. In this study, experiments were carried out in controlled and field conditions to determine the effect of a plant essential oil (pine oil) on *G. pubescens*' seed germination, seedling emergence, the aboveground *G. pubescens* population, and the seedbank composition. The laboratory trial applied pine oil at different concentrations (0 to 15%) both directly and indirectly (vapour) to determine the best dose-response application. The effect of pine oil application was significant ( $p < 0.05$ ). Compared to the untreated seeds, 1% or greater concentrations of pine oil reduced germination by more than 90% when applied directly to the *G. pubescens* seeds. Germination was completely inhibited by applications of pine oil at 5% or higher concentrations. Fumigant impacts of pine oil also reduced germination at rates directly proportional to increased concentrations. Results from the pot trial also showed significant pine oil dose-response effects on reducing seedling emergence of *G. pubescens*, with the percentage of seedling emergence reduced by between 90 and 100%. In the field experiments, a 10% pine oil solution was applied. It caused a dramatic reduction of viable *G. pubescens* seeds in the seedbank and decreased the population of mature *G. pubescens* plants aboveground. This demonstrates the viability of pine oil as a long-term control option for this species. It also provides key understanding of the use of organic herbicides to reduce the weed seedbank in the soil over a wide range of grasslands. Such knowledge can be applied to help management agencies and programs in the control of dominant introduced weed species and in the conservation and restoration of biodiversity.

**Keywords :** Carpet weed, *Galenia pubescens* , Pine oil , weed management

## **Virtual 3D City Reconstruction and Online Sharing Using Airborne Imagery: Case study, College of Engineering campus, Erbil, Iraq**

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### **Abstract**

3D city modelling is considered one of the most prominent products in urban planning, simulation and visualization. Although producing 3D models is considered to be very time-consuming and costly. This paper presents the full pipeline for generating and sharing a 3d virtual model of the city from aerial imagery based on the photogrammetric technique. For the modelling aerial imageries with a resolution of 10 cm have been used. initially, aerialtriangulation has been achieved to obtain the exterior orientation parameters of the images, which were later used in SURE photogrammetric software to produce a point cloud. The mesh model has been produced using the image-matching technique. The produced point cloud and mesh model have been shared using the Cesium website, which has been embedded into web site <https://3d-erbil.weebly.com/> for easy access. The published model allows the user to better understands the buildings in the area which is useful for urban planning. Furthermore, it is possible to make the measurement from the shared model and obtain geocoordinates for any point on the ground.

**Keywords:** Virtual city model; urban planning; mesh model; online sharing; 3D city model.

## **Antibacterial activity of *Oscillatoria principis* and *Chroococcus turgidus* against some pathogenic bacteria**

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### **Abstract**

The antibacterial activity of various solvent of two algae *Oscillatoria principis* and *Chroococcus turgidus*, isolated from Shaqlawa district within Erbil province versus four pathogenic bacteria have been tested. The diethyl ether and hexane of algal extract were more effective versus four pathogens, especially the *Staphylococcus aureus* and *Streptococcus pneumonia* showed the minimum inhibition concentration (MIC) at (10 and 15mg/ml) but MIC for bacteria *Pseudomonas aeruginosa* and *Escherhshia coli* was at (25 and 30mg/ml) . The methanolic extracts could inhibition bacterial growth but in higher concentration between (30 to 40mg/ml), whereas water extracts showed less efficient than other solvent. Antibacterial activity of algal extracts more effectiveness for inhibition growth G+ve bacteria than G-ve bacteria.

**Keywords:** Antibacterial, Activity, Oscillatoria, Chroococcus, Pathogenic, Bacteria

## Examining the Climate Change influence on Water Resources System Resilience of the Diyala River Basin in Iraq

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### Abstract

The planning and management of water resources are being impacted by climate change and are in need of comprehensive adaptation strategies in order to respond to potential long-term future scenarios. The goal of this study is to provide a decision-making framework, employing a probabilistic-nonstationary hydroclimatic circumstances, to examine the long-term water resources system's resilience for multiple dam objectives.

A modified approach to examine the resilience was applied. In which, the so-called bottom-up approach was used along with the modified resilience concept to achieve the long-term operation targets. Herein, the bottom-up approach is employed which merges Global Circulation Models (GCMs) and Stochastic Weather Generator (SWG) to produce wide range of future scenarios including those beyond the GCMs bounds. Then, the system response is evaluated against those scenarios. The study utilizes pre developed SWG to synthesize different future trajectories by altering, precipitation mean and its coefficient of variation alteration; temperature mean and wind speed mean. The proposed paradigm for the investigation is consisted of four stages phases: identification of the future climate exposure; future water supply estimation for different scenarios (3) future water demand estimation for different scenarios; and (4) the evaluation of system performance resilience to quantify the system performance. Diyala River Basin in Iraq has been selected for use as a case study to apply the suggested paradigm.

The outcomes of the analysis of the GCM outputs revealed that the rainfall mean vary between -37.4% to +31.3% ; coefficient of variation of precipitation vary between -38.2% to 34.0%; temperature mean vary between +0.4 to 5.1 °C; and the mean wind speed vary between -22.3% to 11.7%. Based on these ranges, the future climate trajectories were simulated using a pre-developed SWG. The findings glimpsed that the precipitation mean is the most effective parameter, then the temperature change, and lastly the wind speed. The findings revealed that the existing system operating rules are reliable in terms of flood protection but vulnerable in terms of drought management. The analysis system resilience indicator to manage the drought was found 0.74 for the future trajectories, while it was found 0.901 for flood protection. This implies that the project managers should comprehensively pay attention to the drought and water scarcity management due to climate change impact and upstream country development in the river basin.

**Keywords:** Climate Change, Resilience, Diyala River Basin, Stochastic processes, GCM.

## Bioremediation of micropollutants in raw water for drinking water Kali Surabaya River using immobilized *Skeletonema costatum*

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### Abstract

Micropollutant in river waters is an important challenge for drinking water treatment plants because micropollutants are persistent contaminants with a toxic effect at minimal concentrations. Microalgae can remove organic and inorganic materials from the industry. *Skeletonema costatum* is one of the abundant microalgae in the Java Sea. This study aimed to know the removal efficiency of micropollutants (endosulfan, alkylphenol, and estradiol) in raw water for drinking water using immobilized *Skeletonema costatum* at variations in contact time and highest removal efficiency. Water samples were taken at the intake of PDAM Karangpilang Surabaya (Kali Surabaya River). This study used ten contact times (one, two, three, four, five, six, seven, eight, nine, and ten days), and their replications were three times. The number of *Skeletonema costatum* used in this study was  $1.5 \times 10^7$  cells/100 mL, and *S. costatum* was immobilized with 0.65% sodium alginate. Endosulfan, alkylphenol, and estradiol was analyzed by UV-Vis spectrophotometer at 230, 228, and 281 nm. The statistical test used the F test (ANOVA), and if there were significant differences, then continued with the Duncan test at  $\alpha = 0.05$ . The result of the statistical tests showed a difference in the removal efficiency by immobilizing *S. costatum* at various contact times. The highest removal efficiency was 98.44% of endosulfan, 98.71% of alkylphenol, and 99.86% of estradiol at day ten of contact time.

**Keywords:** alkylphenol; bioremediation; endosulfan; estradiol; immobilized *Skeletonema costatum*; Kali Surabaya River;

## Landsat Time-Series Based LST and VHI as a Proxy for Analysis Drought Impacts on Erbil, the Iraqi Kurdistan Region

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### Abstract

Drought is a natural disaster that has severe implications for various aspects of society, including the economy, agriculture, environment, and community. The purpose of this study is to examine the frequency and severity of droughts in the Erbil province of the Iraqi Kurdistan Region (IKR) spanning from 1998 to 2022. To detect the severity of drought, proxies such as Land Surface Temperature (LST) and Vegetation Health Index (VHI) were used. The results indicated that Erbil suffered from severe droughts in the years 1999, 2000, and 2008, which led to a significant reduction in crop productivity. Moreover, drought conditions, indicated by VHI values above 40, increased in the years 2000, and 2008, reaching 86.5%, 67.6%, and 53.7%, respectively. Furthermore, strong correlations were found at a 0.9 confidence level between VHI and variables such as LST, precipitation, and crop yield, with coefficients of (-0.612), (0.615), (0.613), and (0.635), respectively. Precipitation declines and fluctuations during the growing season to fulfill the minimum crop water requirements resulted in the most significant yield decline in the years 2000, 2008, and 2012. Additionally, the study identified the southwestern and central governorates of Erbil as the most affected areas.

**Keywords:** Drought, Landsat time series, VHI, LST, Crops yield, Erbil.

## **Health risk assessment of toxic heavy metals in commercial rice available at local markets in Erbil, Iraq**

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### **Abstract**

Rice serves as a staple food worldwide, and its production is frequently linked to heavy metal contamination, which can result from natural causes or anthropogenic sources. Hence, this study aimed to analyze the concentration of toxic heavy metals in rice available at local markets in Erbil city, Iraq and estimating the potential health risks associated with their consumption. The estimation of human carcinogenic and non-carcinogenic risks from heavy metal exposure was based on the measurement of metal concentrations and exposure parameters. A total number of 55 samples (at least 3 samples of each brand) were analyzed for Arsenic (As), Lead (Pb), Cadmium (Cd), Nickel (Ni) and Chromium (Cr). Inductively Coupled Plasma (ICPE-9820 Shimadzu) was utilized to analyze the toxic heavy metals. A survey was carried out to gather information about the rice consumption patterns of residents, including the types, origins of rice they eat and amount and the frequency of rice intake. The overall mean concentrations of toxic heavy metals in rice were as follows: As (0.712), Pb (0.515), Cd (0.164), Ni (0.396) and Cr (0.161). Combining the rice consumption data, the estimated daily intakes (mg/kg/day) were calculated for the studied population and the range were (3.29E-04 - 1.63E-03), (2.38E-04 - 1.18E-03), (7.59E-05 - 3.75E-04), (1.83E-04 - 9.05E-04) and (7.45E-05 - 3.68E-04) for As, Pb, Cd, Ni and Cr, respectively. Non-carcinogenic risk assessment (HQ) for all heavy metals were less than acceptable level (=1) except for As that exceeded the acceptance level for all ages. Carcinogenic risk assessment (CR) for all ages and genders were ranged from 2.03E-06 to 9.08E-03, while the total carcinogenic risk of the population in Erbil was 5.86E-03 on average. Furthermore, males had higher carcinogenic risk than females, and the people in the age of 11-20 suffered from the highest carcinogenic risk.

**Keywords:** Toxic heavy metals, Risk assessment, Hazard Quotient, Cancer risk, Rice

## **Sustainable Environmental Solutions: Mussel Farming as a Win-Win Solution for Natural Water Cleaning and Economic Growth**

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### **Abstract**

This paper explores the potential of mussel farming as a sustainable environmental solution for natural water cleaning and economic growth, in the context of heavy metal pollution, eutrophication (eutrophication, or the overgrowth of algae and other aquatic plants due to excess nutrients such as nitrogen and phosphorus), industrial waste, intensifying agricultural production, and other sources of contaminations can have harmful effects on water quality (rivers, ponds and lakes) and aquatic ecosystem. Similarly, heavy metals- important pollutants-, such as lead, mercury, and cadmium, can also pose significant environmental challenges. Mussel farming, as a form of biological control, has the potential to address among of these issues by improving water quality through natural filtration and bioaccumulation of heavy metals. Moreover, mussel farming can also provide an economic opportunity for local communities, promoting job creation, income generation, and sustainable development. This paper examines the benefits of mussel farming and its potential to create a win-win solution for both the environment and the economy, while addressing the challenges of eutrophication and heavy metal pollution. Through a review of relevant literature and case studies, this paper provides evidence of the effectiveness of mussel farming in improving water quality and reducing eutrophication and heavy metal pollution and other sources of contamination. Furthermore, this paper argues that mussel farming can serve as a model for sustainable environmental solutions in potential challenges and opportunities of implementing mussel farming in the Kurdistan region' lacks, other regions, and industries, addressing the lack of sustainable solutions that currently exists. Overall, this paper will discuss the feasibility of mussel farming offers a promising path towards a more sustainable future in the Kurdistan region, with the potential to address multiple environmental and economic challenges, including heavy metal pollution and other sources of contamination and eutrophication.

**Keywords:** Eutrophication, heavy metal, mussel farm, environmental problems, aquatic ecosystems, lake, nitrogen and phosphorous.



## Effects of Artificial light at Night of different Spectra and Predator cues on foraging of Freshwater Gammarids.

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### Abstract

Artificial light at night (ALAN) is a significant type of anthropogenic pollution that occurs at night in urban and suburban areas with different spectral compositions for instance streetlights, lit-up structures, illuminated signs, and interior lights. Animals' circadian rhythms are affected by artificial light at night (ALAN), which can lead to environmental stress that has an impact on their behavior and predator-prey relationship. We performed two experiments to examine the predation efficiency of common macroinvertebrate species (*Gammarus jazdzewskii*) under low levels of ALAN (2 lx) differing in the spectral compositions: white cool LEDs, high-pressure sodium lamp (HPS), and darkness as a control. We tested feeding efficiency on prey by the gammarid with and without the presence of a predator signal. Our experiments revealed that consumption in dark was significantly higher than in the presence of light, but no significant difference between light treatments, the gammarids were much more efficient in the dark. In the presence of light and predator signals, no significant difference was found, but there was a significant difference between the controls of both experiments. It means the signal made stress on the animal and made the animal fed less. To conclude that the gammarids' ability to survive, grow, and reproduce may be significantly impacted by changes in predation efficiency caused by ALAN.

**Keywords:** Light Pollution, LED, HPS, Amphipods, Predator signal.

## Analyzing Weather Data and Renewable Energy Generation from Photovoltaic Panels and Wind Turbines in Three Provinces in Iraq

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### Abstract

In this research, several weather data parameters such as dry bulb temperature, dew point temperature, absolute humidity, relative humidity, rainfall, wind speed, and solar irradiance will be compared for three provinces in Iraq. The selected provinces differ in terms of having very disparate climatic conditions. Regarding the type of the utilized data; yearly average, monthly average, and daily average weather data over the course of five years will be employed as the bases to carry out the comparative study. Then, the climate data will be used to estimate the amount of the electrical energy which typical solar photovoltaic panels and wind turbines can generate in each of the selected provinces. The results will be used to present a comparative study using several performance metrics. Based on the results, the authors will be proposing the most suitable type of renewable energy plant to be deployed in different provinces in Iraq to generate clean electricity.

**Keywords:** weather data analysis, solar energy, wind energy, power generation

## Assessing the Performance of a Novel Dew Point Evaporative Cooler Considering the Climatic Conditions of Different Cities in Iraq

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### Abstract

This paper presents a theoretical study about a novel cooling system called a dew point evaporative cooler (DPEC). The focus will be on introducing a novel design into the typical design of DPEC in order to improve the performance of the system. The performance of this new DPEC is assessed after preparing the mathematical model. The mathematical model will be developed based on the mass and energy balance equations. Then, the developed model will be simulated numerically via Engineering Equation Solver (EES) software. In our study, we designed the novel DPEC for space cooling Iraqis' homes during hot summer season. But, since the climate conditions in different parts of Iraq tend to be different, we will be simulating and assessing the DPEC performance considering the climatic condition of three Iraq's provinces. The performance metrics which we will be using to evaluate the system performance in each of the selected provinces are: dew-point and wet-bulb effectiveness, energy efficiency, water consumption, and cooling capacity. In the discussion, we will firstly, declare how much the performance of the DPEC is improved. Then, we will discuss the viability of using the novel DPEC in Iraq's homes instead of using traditional direct evaporative cooler.

**Keywords:** air conditioning, dew point evaporative cooler, heat and mass transfer, numerical simulation

## Investigating the Effect of Water Flow Direction, Velocity, and Temperature on the Child Water/Air production by the Environmentally Friendly Novel Dew Point Evaporative Cooler

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### Abstract

Simultaneous child water and child air production by the environmentally friendly dew point evaporative coolers (DPECs) remains one of the challenges encountered by the researchers during the performance investigation of such systems. Most of the previous studies focused on lowering the product air temperature to below the wet-bulb temperature of the ambient air and towards the dew-point temperature. In this study, alongside the attempts for lowering the product air temperature, the outlet water temperature also attempted to be reduced towards the dew-point temperature of the ambient air. This attempt will be executed by employing a novel design for the DPEC which improves the performance of the system, then a numerical model will be developed and simulated from which the effect of the water flow direction, velocity, and temperature on the child water and child air production will be investigated. The newly designed DPEC with the relative thermodynamical process will be graphically depicted in detail. In addition, a comprehensive discussion of the obtained results will be carried out and illustrated with figures and tables.

**Keywords:** dew point evaporative cooler, child water, child air, numerical simulation

**A Cubic B-Spline Finite Element Method of Volterra Integro-Differential Equation**  
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**Abstract**

This work aims to propose a numerical solution of the integro Volterra-differential equation. The proposed method is based on the cubic B-spline method and is linked with the finite element method to solve this type of equation. The term of integral part is carefully handled through Gauss rules to approximate the integral of differential equations. These rules allow us to achieve precision in the results. Furthermore, we investigated the coercivity and continuity of suggested problems with a focus on addressing some challenges to deriving the priori error estimate, which leads to proof of convergence analysis. The effectiveness of presented methods is discussed by several examples to demonstrate and illustrate the applicability of the method, and to compare the approximate results and analytical solutions.

**Keywords:** Integro-Volterra differential equation, B-Spline Method, Gauss Rule.

## Robust algorithm for regression variables selection with simulation and application on thalassemia patient's data in Nineveh province

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### Abstract

The idea of this paper is based on reducing or excluding the effect of not satisfying the assumption of normal distribution of the data because of the presence of types of outlying values in it when choosing the best regression equation by the robust methods, and this was achieved by using weights from the robust methods in the estimate and testing their robustness and suitability for the model in advance and then Choosing the weights resulting from the highest efficient robust methods and inserting these weights into the selection stages of methods to choose the best regression equation, resulting in a model that achieves two characteristics at the same time, which are robustness and reducing dimensions in return for increasing efficiency.

The simulation was used on different sample sizes and different contamination rates in the dependent, independent, and in both together a third time, with a focus on studying the possible impact of the presence of outliers on the variables that will remain in the model and the variables that will be deleted.

To achieve the idea of the paper, a number of estimation methods were compared and the results were compared, where the ordinary least squares method (OLS) was applied to the data of thalassemia patients in Nineveh Governorate, and then the M estimator method was used to estimate the regression model, and three weighting functions were used, namely Huber, Hampel and Bisquare, and the weight functions were changed Through the use of MM and S estimators, the variance estimators were also changed, so the Median Absolute Deviation estimator (MAD) was used, and the initial estimator was changed to be the least squares estimator once and the least trimmed of squares estimator LTS again, and then we have thirty different estimators.

In the end, the weights that resulted from each estimator were used to weigh the Ordinary Least Squares method to obtain the least squares estimators with different weights. A comparison was made between the models using some comparison criteria such as the Coefficient of Determination  $R^2$ , the Adjusted Coefficient of Determination  $R^2_{adj}$ , Mallows CP statistics, and the Residuals sum of squares RSS, and the simulation results were compared using the standard Root Mean Squares Error RMSE.

**Keywords:** Robust Regression, Variables Selection, Outliers Detection

## Robustness Measures of Special Case of Huber M-estimator

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### Abstract

In this paper, some properties of the robust M-estimators were studied, where a set of this type of estimators were taken with their mathematical formulas and calculation mechanisms in a simplified way, on the other side and in order to prove some of the properties, the Huber estimator was taken as an example since it is the most common used M-estimator among other estimators, and the paper tried to find the Influence function (IF) of the Huber M-estimator of location and the corresponding Asymptotic Variance (AV), Gross Error Sensitivity (GES), Local Shift Sensitivity (LSS), Rejection Point (RP) and its Breakdown Point (BP). The properties of the estimator were studied at the standard Gaussian distribution. A numerical example was conducted on the given estimator and its efficiency was compared through some performance measures.

**Keywords:** robust regression, M-estimator, robustness measures

## **Robust Weighted Least Squares using different schemes of M-estimators (RWLSM), A comparative Study**

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### **Abstract:**

The idea of this paper is to robustify the least squares estimators by using some robust initial values and measures of scale, and this was achieved by using weights from the robust methods in the estimate, resulting in a model that achieves two characteristics at the same time, which are robustness and reducing dimensions in return for increasing efficiency.

The simulation was used on different sample sizes and different contamination rates in the dependent, independent, and in both together a third time, with a focus on studying the possible impact of the presence of outliers on the variables that will remain in the model and the variables that will be deleted.

To achieve the idea of the paper, a number of estimation methods were compared and the results were compared, where the ordinary least squares method (OLS) was applied to the data of thalassemia patients in Nineveh Governorate, and then the M estimator method was used to estimate the regression model, and three weighting functions were used, namely Huber, Hampel and Bisquare, and the weight functions were changed Through the use of MM and S estimators, the variance estimators were also changed, so the Median Absolute Deviation estimator (MAD) was used, and the initial estimator was changed to be the least squares estimator once and the least trimmed of squares estimator LTS again, and then we have thirty different estimators.

In the end, the weights that resulted from each estimator were used to weigh the Ordinary Least Squares method to obtain the least squares estimators with different weights. A comparison was made between the models using some comparison criteria, and the simulation results were compared using the standard Root Mean Squares Error RMSE.



## Using Coloring Method to assign the required tasks with application

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### Abstract

This research studies (required tasks distribution) using coloring method which is considered as means of Graph theory, a real issue has been processed which is a tasks distribution in one of marketing centre on five employees in this centre. The study includes two topics, the first is theoretical in coloring method and the second is practical to find solution for this issue according to this method. A solution to the problem is found that satisfies the conditions of the coloring method and achieves the objective of the issue.

**Keywords:** Coloring method, Graph theory, nodes, edges, graphic chart.

## Nano connectedness via nano $S_C$ -open sets in nano topological spaces

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### Abstract

In this present study, we shed light on some types of spaces via nano  $S_C$ -open sets including nano  $S_C$ -connected, nano  $S_C$ -hyperconnected and nano  $S_C$ -ultraconnected spaces in nano topological spaces where nano  $S_C$ -open set is defined and related to nano semi-open and nano closed sets. Here, we implement each space on the family of all nano  $S_C$ -open sets according to upper, lower and boundary approximations in which there exist exactly five families of nano  $S_C$ -open sets. This study brings out some results such as it is shown that a nano hyperconnected space is nano  $S_C$ -hyperconnected but not the converse where upper and lower approximations are leading conditions to results. In addition, the relationship among those spaces and with the other known spaces is also considered.

**Keywords:** nano  $S_C$ -open sets, nano  $S_C$ -connected, nano  $S_C$ -hyperconnected, nano  $S_C$ -ultra connected.

## Using Kernel and Classification Tree Approaches for Classifying Relative Humidity Data

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### Abstract

Studying climatic status and meteorological effects is important to identify climatic effects of human life. In this study, relative humidity (RH) variable will be studied and classified based on its autoregressive variables through identifying the mathematical relationship among these variables by using Kernel and classification tree (CT) approaches. Iraqi datasets taken from agricultural meteorological station in Mosul city, Iraq used as real case study. In these types of data, there are many obstacles such as nonlinearity and uncertainty will be the reasons for inaccurate classifications. The results of comparisons explain that CT approach outperforms Kernel in RH classification, while both of them perform accurate results. In conclusion, CT and Kernel approaches can be used to classify RH accurately.

**Keywords:** Kernel Model, SVR, Classification Tree, Classification, Relative Humidity

## Comparing SVR and Random Forest Forecasting based on Autoregressive Time Series with Application

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### Abstract

The accuracy of forecasting the time series of relative humidity in its maximum and minimum cases is important for controlling environmental impacts, damages and risks. In this study, the support vector regression (SVR) method and the random forest (RF) method will be used, depending on the principle of auto regression based on the principle of autocorrelation, which is the main characteristic of time series in general. Comparisons of the forecasting results will be performed by using SVR, RF methods and compared to the traditional method of analyzing time series which is the integrated autoregressive and moving average (ARIMA) model. The SVR and RF methods were employed due to their importance in improving the forecast results, as they are the ideal solution to the problem of non-linearity of the data, as well as the problem of heterogeneity in the climate data, especially as a result of the fact that they contain many seasonal and periodic compounds, which may lead to inaccurate forecast. The forecast of the time series of relative humidity in its minimum and maximum cases was studied in this study for one of the agricultural meteorological stations in the city of Mosul-Iraq. The results of this study reflected the superiority of both SVR method and RF method compared to the traditional method represented by the ARIMA model. The results also included the superiority of the RF method in forecasting the training period compared to the SVR method, which was more balanced despite that, as it superiority the results of ARIMA in forecasting the training period and the testing period, while it was Its forecast performance is slightly better than the forecast results of the RF method in the test period.

**Keywords:** ARIMA model, SVR, Random Forest, Forecasting, Relative Humidity

## Parameters Estimation of a Proposed Generalized Goel-Okumoto process

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### Abstract

The purpose of this paper is to use the Generalized Goel-Okumoto distribution as the rate of occurrence of the non-homogenous Poisson process (NHPP) to improve the rate of occurrence of the non-homogenous process, which has been named the Generalized Goel-Okumoto process (GGOP). To estimate the parameters of this process, it was proposed to use the maximum likelihood estimator (MLE), and a modification was made to this method, due to the inability to find estimators, by using an intelligent algorithm of the likelihood function that improves its performance. The results of the modified maximum likelihood estimator (MMLE) were compared with an intelligent method (PSO) in estimating the rate of occurrence of the proposed Goel-Okumoto process to reach an estimator that best represents the process. The paper also included a simulation of the process as well as a practical application.

**Keywords:** Generalized Goel-Okumoto process, modified maximum likelihood estimator, PSO, simulation.

## The Second Hankel Determinant of New Subclasses Functions

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### Abstract

In the present , We looked into it. The classes of starlike functions and convex functions are extended versions of the Second Hankel of  $W_x^k(\gamma, \delta, \theta)$ . The results of starlike and convex functions can be easily obtained by giving specific values to  $W_x^k(\gamma, \delta, \theta)$ . The result of  $W_x^k(\gamma, \delta, \theta)$  can be easily obtained by giving and the specific values.

**Keyword:** univalent function, bi univalent function, unit disc, analytic function, bounded.

## Stability of the COVID\_19 models as application of fractional differential equation

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### Abstract

In this work we study the stability for the COVID-19 models as the application of the fractional differential equations. we study the stability of the model by studying the stability for the following equation.

Consider the following Fractional-Order Nonlinear systems:

$$\dot{x}_i^\alpha = \frac{d^\alpha x(t)}{dt^\alpha} = f_i(t, x(t)) = Ax(t) + h(x(t)) \quad (1)$$

where  $x(t) = (x_1(t), x_2(t), \dots, x_8(t))^T \in \mathbb{R}^8$  denotes the state vector of the state system  $f: \mathbb{R}^8 \rightarrow \mathbb{R}^8$  defines a nonlinear vector field in the 8 –dimensional vector space, fractional-order  $\alpha$  belongs to  $0 < \alpha \leq 1$ ,  $A \in \mathbb{R}^{8 \times 8}$  is a constant matrix, and  $Ax(t)$  and  $h(x(t))$  denotes linear part and nonlinear part of  $f_i(t, x(t))$ . And we classified in two types depended on  $h(x(t))$ . If  $h(x(t)) = 0$  then the system became linear, and otherways the system become nonlinear model. Before studying the stability in both linear and nonlinear model we proving in the preview works the system has the existences and uniqueness solution. We proving some theorems for both linear and non-linear types to prove that the models are stable in the critical points

**Keywords:** stability, COVID-19 models, fractional differential equation

## Parameters Estimation of Power Law Process with an application

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### Abstract

Non-homogeneous Poisson process with power law intensity function has often been used as a model for describing the failure pattern of repairable systems. Maximum likelihood and Bayesian estimation were used to estimate model parameters that would be simulated and applied to an important aspect of life, which is the failure of the Mosul gas power plant.

**Keywords:** Nonhomogeneous Poisson process, Power law process, maximum likelihood estimator, Bayesian estimator, simulation.



## **Bilinear system classification and control design by input-output linearization method**

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### **Abstract**

In this paper, we will classify a specific class bilinear system and control design. We classify specific class bilinear systems by using coordinate transformations to determine the normal form. Here, we construct some theorems that state the bilinear system has non-minimum, minimum or weak minimum phase. Next, we design a control by using input-output linearization to stabilize the original system. From the design results, we obtain a stable origin system.

**Keywords:** Bilinear system, non-minimum phase, minimum phase, input-output linearization

## Too Intense in Cluster Topological Proximity Space

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### Abstract

This research presents new concepts for four of the sets that were built by depend on the concept of follower set and takeoff set with the study of the most important properties and characteristics of these sets and their relationship to open and closed sets in cluster topological proximity space as well as their relationship with each other. Moreover, it is building other sets that depend on those sets and studying their most important characteristics within the co-bushy spaces.

The definitions which were presented in this research it is more effective within the co-bushy space, where when the space is stripped of this feature, the definitions remain active, but they lose some of their important properties. Moreover, the collection of some of these sets constitutes a sub-base in the co-bushy space.

**Keywords:** Cluster Too Intense, Cluster semi Intense, Cluster Intense, Follower set, Bushy set.

## A Comparative Study of Traditional Methods and Machine Learning Techniques for Predicting Sunspot Numbers

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### Abstract

Sunspot number prediction is of crucial importance due to its substantial impact on various domains, including human activities, health, communication, natural disasters, Earth's climate, agriculture, and other relevant matters. Therefore, it is essential to be prepared for potential changes in the number of sunspots. In this study, traditional methods such as ARIMA and SARIMA, as well as machine learning models such as Support Vector Machine (SVM), K-Nearest Neighbours (KNN), Random Forest, and Decision Trees, were used to predict the maximum amplitude of Solar Cycle 25. Monthly mean sunspot number data from January 1900 to December 2022 (solar cycles 13-25), obtained from the World Data Centre SILSO at the Royal Observatory of Belgium, Brussels, were used as inputs for the machine learning models. Among the models tested, the Random Forest algorithm demonstrated superior forecasting performance, with the smallest root mean squared error (RMSE) of 2.70 and mean absolute error (MAE) of 1.2. The algorithm predicted a peak sunspot number of 123 in June 2025 for Solar Cycle 25 and 141.63 in October 2035 for Solar Cycle 26.

**Keywords:** Sunspot, time series, traditional methods, Machine Learning, Prediction.

## Model Order Reduction of Continuous Time Linear System Using Linear Matrix Inequality Method

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### Abstract

The purpose of this paper is to show the necessary and sufficient conditions of the existence of model order reduction of continuous time linear system using Linear Matrix Inequality (LMI) method and to explain the result of the simulation about the existence of model order reduction of continuous time linear system via LMI method using MATLAB R2009a software. Via simple algebraic manipulation, the necessary and sufficient conditions of the existence of model order reduction of continuous time linear system using LMI method can be obtained. Moreover, lower bounds and infimum of  $\mathcal{H}_\infty$  norm of the error incurred using LMI method are also gained.

From the result of this paper can be concluded that if system  $(A, B, C, D)$  has order  $n$  with transfer function  $G(s) \in \mathcal{RH}_\infty$  and it is minimal realization, then there exists a system  $(A_r, B_r, C_r, D_r)$  which has order  $r < n$  with transfer function  $G_r(s) \in \mathcal{RH}_\infty$  satisfying  $\|G(s) - G_r(s)\|_\infty < \gamma$  if and only if there exists positive-definite matrices  $X_{11}$ ,  $P_{11}$ ,  $P_{22}$ , and a real matrix  $P_{12}$ , satisfying matrix inequalities  $AX_{11} + X_{11}A^T + \frac{1}{\gamma^2}BB^T < 0$  and  $P_{11}A + A^T P_{11} + C^T C < 0$  where  $X_{11} = (P_{11} - P_{12}P_{22}^{-1}P_{12}^T)^{-1}$ . Moreover, lower bounds and infimum of  $\mathcal{H}_\infty$  norm of the error incurred using LMI method are  $\sigma_{r+1}$  and  $\sigma_m$ , respectively. As a study case, the existence of model order reduction of continuous time linear system using LMI method is applied on heat conduction problem.

Keywords : Linear system, Model order reduction,  $\mathcal{H}_\infty$  norm, Linear matrix inequality (LMI)

## Comparison of Dynamic models using Wavelet -Comparative Study

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### Abstract

In this research, the prediction process for water purification in the city of Mosul was study by using the input and output variables represented by some tests that are carried out on the raw water before the filtration process to, be treated through the multiple stages of filtration. To ascertain the suitability of water for human use, the filtration process has been studied through prediction using dynamic models, and a comparison of prediction through for some statistical criteria has been done.

**Key words:** Time Series, Dynamic System, Identification, Wavelet.

## Reliability estimation of the Lomax distribution under Ranked Set Sampling (RSS) with application

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### Abstract

In this research, the parameters and reliability of the Lomax distribution will be estimated based on the Ranked Set Sampling (RSS) method, using four estimation methods, which are the Maximum Likelihood (ML) method, the Maximum Product of Spacings (MPS) method, the Least Squares (LS) method, and the weighted least squares (WLS) method, then the best method for estimating the reliability function will be found under the groups sampling. We will use the simulation method, in addition to using actual data which represents the death time of corona disease in Iraq, to apply the best estimation method that we obtain.

**Keywords:** Lomax distribution, Ranked Set Sampling, Maximum Likelihood, Maximum Product of Spacings, Least Squares, weighted least squares

## Using Lasso Procedure for Variables Selection of Autoregressive Model for High Dimensional Time Series of Caenorhabditis Elegans Motion

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### Abstract

The Lasso is a common model selection and also a common estimation procedure for linear models. In this study, Lasso estimator will be used for fitting autoregressive time series models. Simulation is used to generate a time series of the motion caenorhabditis elegans (CE represented by the tan-angles of wave-motion. Each observation of this time series is a recorded frame (0.5 second) of 2.5 hours video of CE motion. Simulated and real univariate time series of CE motion (tan-angles) are modeled via Lasso and autoregressive models (hybrid Lasso-AR approach) after multi-processes of variable selection procedure. The results of simulated and real univariate time series reflects closed fitted models after variables selection procedure. In conclusion, hybrid Lasso-AR approach can be used for best high dimensional time series modelling.

**Keywords:** Time Series, Auto-Regressive, variable Selection, LASSO.

## Comparison of CNN and SVM Approaches for Classifying Time Series of *Caenorhabditis Elegans* Motion

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### Abstract

Studying the motion of some roundworms types such as *caenorhabditis elegans* (CE) is important to identify the actions and reactions and their effects of worms life. In this study, the time series of CE motion represented by the angles of wave-motion between 1 to 177 degrees will be the case study. Each observation of this time series is a recorded frame (0.5 second) of 2.5 hours video of CE motion. A convolutional neural network (CNN) as one of deep learning techniques will be used to classify CE motion as dependent variable in binary cases based on the images of the angles of wave-motion as explanatory variable. The images of motion angles is imagined and designed by two dimensions image corresponding to every observation. These images combined into 4-d image (four dimensions matrix) to represent univariate explanatory variable. Support vector machine (SVM) will be also used to classify the angles of CE. In these types of data, the nonlinearity and uncertainty will be the most probably problems as reasons for in accurate classifications. CNN and SVM used with this type of dataset to improve the classification results. The results of comparisons explain that CNN approach outperforms SVM absolutely. In conclusion, CNN approach can be used to classify this type of time series with accurate results.

**Keywords:** *Caenorhabditis elegans* (CE), Time series, Classification, Autoregressive (AR), Convolutional Neural Network (CNN), Support Vector Machine (SVM).



## **Solving linear differentiation equation system using fuzzy logic**

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### **Abstract**

In recent years, various interests in fuzzy set theory have emerged as a generalization of ideas from classical set theory. In this research, the classical mathematical equations of various types and their development were studied from the perspective of fuzzy logic, and the representation of the system of linear fuzzy equations was discussed and some methods of solving them were presented.

## DENSE AND NOWHERE DENSE ON DUAL SOFT TOPOLOGICAL SPACE

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### Abstract

The density plays an important role in general topology. In this research concepts of dense, nowhere dense and somewhere dense within dual soft set theory have been introduced in detail. The interrelationships between the various notions have been studied and their examples as well as most important properties. There is a number of research papers have been published on density topology. There where many important results about dense and nowhere dense set. We summarized the most important of these results and contribute some new one in our space dual soft topological space.

**Keywords:** Soft set, dual soft set, dual soft dense set, dual soft nowhere dense set, dual soft somewhere dense set.

## Combining Laplace transform and Adomian decomposition method for solving singular IVPs of nonlinear Lane–Emden type equation

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### Abstract

This study use the combined Laplace transform method and Adomain decomposition technique to solve IVPs of nonlinear Lane-Emden type equations. To show the excellent accuracy of the solution results, we compare the numerical results with the exact solution. The results demonstrated how simple and efficient the proposed method.

**Keywords:** Nonlinear Lane–Emden type equation; Laplace transform method; Adomian decomposition method; Adomian polynomials

## Stability of nonlinear $m$ -perturbed Feedback Controls Systems

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### Abstract

In this paper the global and local stability have been studied with some necessary conditions for classes of unstable nonlinear first and second order dynamical systems. More precisely, the globally and locally stability achieved when it is controlled by  $m$ -perturbed feedback controls. Thus, to give a dynamical system contained  $m$ -perturbed feedback controls involving as a summation form. Furthermore, the nonlinear function which is used in integral part and supported the obtained results with some illustrative examples.

**Keywords:** Stability, feedback, control function, nonlinear system,  $m$ -perturbed.

## A new Statistical Distance to Classify the Thalassemia Diseases in Erbil City

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### Abstract

Thalassemia is one of the common diseases in the current era and it can be characterized as an inheritance problem in blood cells with low hemoglobin levels, a decline in the number of red blood cells from the usual rate, and its appearance is caused by a deficiency in hemoglobin, which is the substance found in red blood cells and responsible for carrying oxygen. This research will use the distance between two variables to study the measurement of similarity or dissimilarity between them. The object of this research is to compare three methods of distances: Euclidean distance, Pearson Correlation distance and the proposed method. Its Weighted Correlation distance depending on the minimum distance, Data was collected in Rizgari Hospital it included 234 cases. The analysis showed that the minimum distance between RBCC and HB for by using Euclidean distance, minimum distance between RBCCH and HB for by using Pearson Correlation distance and the proposed method is better than the two methods due to minimum distance between RBCD and HB.

**Keyword:** Classification, Distances, Proximity Matrix , Weighted Correlation Distance.

## Uniform transverse magnetic field effect on Newtonian Poiseuille flow with slip and non-zero slip yield stress in a planar channel

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### Abstract:

The effect of a uniform transverse magnetic field on Newtonian Poiseuille flow is considered for the planar channel under the assumption that wall slip occurs above a critical value of the wall shear stress known as, the slip yield stress. For this geometry, there are two flow regimes defined by a critical value of the pressure gradient above which slip occurs. The volumetric flow rate at different strengths of magnetic field have been studied. And it shows that with the increase in magnetic field there is an increase in the critical value of the pressure gradient for the occurrence of slip.

**Keywords:** Magnetic field, Poiseuille flow, Slip yield stress, Planar Channel.

## Statistical Analysis of the Effects of Some Factors on the Vegetative Growth Characteristics of Limonium Sinuatum Plant

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### Abstract

In this article, Analysis of variance and Box-Cox transformation for a response of a number of factorial experiments was conducted to diagnose the effects of three factors on the Vegetative Growth Characteristics of Limonium Sinuatum Plant. The first factor was the use of three levels of electric current severity (2, 4 and 8 amps) for three times of electric shock (1 and 3 minutes), which is the second factor, while the third factor was spraying with nano fertilizers (20 N 20 P2O5: 20 K2O) at a concentration of 3 (0, 2.5 and 5 mg L<sup>-1</sup>). The results of six different responses to the Vegetative Growth Characteristics were monitored and recorded; Plant Height (PH) (cm), Leaves Number (LN), Main Branch's Number MBN, Vegetative Dry Weight (VDW), Longest Root (LR) (cm) and Root Dry Weight (RDW) (gram). The results of six different responses to the Vegetative Growth Characteristics were monitored and recorded; Plant Height (PH) (cm), Leaves Number (LN), Main Branch's Number MBN, Vegetative Dry Weight (VDW), Longest Root (LR) (cm) and Root Dry Weight (RDW) (gram). In order to ensure the validity and accuracy of the results of statistical inference tools in diagnosing the effects of factors and estimating confidence intervals, the Box-Cox transformation was used to achieve the normality of random error. The process of transforming responses from one analytical space to another achieved the normality of random errors for the estimates of some responses, while these errors became close to the normal distribution for others, which made the F-tests more accurate and robust.

**Keywords:** Limonium Sinuatum Plant, Factorial analysis, Box-Cox transformation

## A Study of Relationship between Hamming bound and Perfect Code with new Examples

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### Abstract

The aim of this study is to find theories that show the relationship between the perfect linear code and the Hamming bound, as we study the possibility that each Hamming bound is a perfect code, as well as every binary code is a perfect. We will study new examples in coding theory that prove these theories. In these examples, we found the generator matrix  $G$  of a  $[m, p]$ -code  $C$  and the coded words, and then we found the smallest weight  $d$ . Such that we get a code  $C$  that achieves the relationship, if  $q^{m-p} > \sum_{i=0}^{d-2} \binom{m-1}{i} (q-1)^i$ , then there always exists a  $[m, p, d]_q$ -code.

**Keywords:** perfect code, Hamming bound, code word



## Robust Hybrid Conjugate Gradient Methods for solving Unconstrained Optimization Methods

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### Abstract

Conjugate gradient methods are iterative processes used to solve unconstrained optimization issues. The conjugate gradient methods include the hybrid conjugates gradient methods. New spectral and hybrid conjugate gradient algorithms are proposed in this article. A unique spectral conjugate gradient method meets global convergence features on the basis of certain assumptions and a robust Wolfe line search. In addition, the hybrid conjugate gradient approach meets the global convergence requirements for accurate line searches. We further demonstrate that the offered approaches meet the necessary descent requirements. On the basis of several test problems, the numerical results of the proposed methods are extremely competitive and highly effective.

**Keywords:** Conjugate gradient method; Global convergence; Wolfe line search; Spectral conjugate gradient.

## Solitary solution for nonlinear Schrodinger equation arising in optical fibers

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### Abstract

In this paper, we investigate the solitary solutions of the nonlinear Schrodinger equation (NLSE) in optical fibers. We show how solitary solutions can be found analytically using modification of the Sardar sub-equation method. The NLSE has proven to be a powerful tool in understanding the behavior of waves in fiber optics. Its applications have helped engineers and scientists optimize the design of optical fibers and predict the behavior of various conditions. Overall, our study provides insights into the fundamental properties of solitary solutions in the NLSEs and their practical implications in physical systems.

**Keywords:** Schrodinger equation; Sardar sub-equation method; optical fibers; Optical solitons.

## Standard Training Dataset vs. Different Testing Datasets to Compare Deep Learning Architectures Models in Diagnosing COVID-19

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### Abstract:

Due to the harmful impacts of the Coronavirus (COVID-19) disease, which infected the entire world, in order to recognize the contagious disease, using X-rays and Computer Tomography (CT) scans, lung lesions connected to coronavirus illness have been characterized by their morphological features. Because the accuracy of chest scan diagnosis is mostly dependent on specialists, the adoption of deep learning architectures, particularly the Deep Convolutional Neural Network (DCNN), has piqued the interest of academics worldwide. In many developing countries, there is also a lack of access to radiologists with the necessary training and COVID-19 imaging expertise. Because of the rapid advancement of deep learning architectures, image datasets have recently attracted much interest in computer vision. And, it's important to choose a sufficient dataset size and high-quality images to avoid underfitting or overfitting. Furthermore, these methods for developing high-performance models necessitate additional data for training and testing, yet the data is frequently unavailable.

We propose a new standard dataset in this paper for training with two different input sample sizes which include chest CT scan, and the positive and negative images in training the DCNN models, and assess the results of changing the input images samples size. Additionally, we try the suggested approach to test certain images that were not utilized during the training phase to evaluate them and show that it is effective. Also, to investigate the outcomes of the most recent DCNN techniques to diagnose Coronavirus disease and to do the comparison with the CT scans dataset from SARS-CoV-2. We noted the DCNN models behave differently when we use different datasets, and also when we use different datasets for training and testing, we conclude that depended on the model's and dataset's behavior. Also, we conclude that the proposed approach has excellent Coronavirus disease detection performance, therefore, the provided approach can be used by illness diagnosis systems that depended on imagery for other diseases. The strategy might make it possible to use low-powered computing devices, without resorting to more expensive GPUs. In our next study, we propose applying this approach to investigate the performance of some proposed methods for deep classification approaches in other studies and generate substantial CT imaging datasets for COVID-19.

**Keywords:** Machine Learning-ML, Deep Convolutional Neural Networks -DCNN, Computer Tomography (CT) scan images, Coronavirus Dataset.

## On The New Hahn Sequence Spaces $h_\infty$ , $h^{(2)}$ , and $h(\lambda)$

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### Abstract

The Hahn sequence space was defined and studied by several mathematicians as a Banach space with AK. Then some other generalizations of Hahn sequence space have been recently defined and studied. In this paper, we defined bounded Hahn sequence space  $h_\infty$ , the Hahn sequence space  $h^{(2)}$  of order two, and the Hahn sequence space  $h(\lambda)$  with speed, where the speed  $\lambda = (\lambda_k)$  is a monotonic increasing sequence of positive reals. Then we studied some geometric and topological properties of these new spaces. Moreover, we calculated the  $\alpha$ -,  $\beta$ -, and  $\gamma$ -duals of the new Hahn sequence spaces. Finally, we concluded the paper with some matrix transformations from and into the new Hahn sequence spaces, and from the new Hahn sequence spaces into the classical sequence spaces.

**Keywords:** Hahn sequence space, difference operator, second order difference, Hahn sequence with speed, dual spaces.

## Four-Dimensional Forward Difference Matrix Domain in some Double Sequence Spaces

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### Abstract

In this article, we investigated the new bounded double sequence spaces  $\mathcal{M}_u(\Delta)$  and  $\mathcal{C}_\vartheta(\Delta)$ , which we calculated the the four-dimensional forward difference matrix domain in the double sequence spaces  $\mathcal{M}_u$  and  $\mathcal{C}_\vartheta$ , respectively, where  $\vartheta \in \{bp, bp0, r, r0\}$ . Then, we proved some topological properties of the spaces  $\mathcal{M}_u(\Delta)$  and  $\mathcal{C}_\vartheta(\Delta)$ . Moreover, we determined the dual spaces of the spaces  $\mathcal{M}_u(\Delta)$  and  $\mathcal{C}_\vartheta(\Delta)$ . Finally, we characterized some four-dimensional matrix classes  $(\lambda(\Delta), \mu)$  and  $(\mu, \lambda(\Delta))$ , where  $\lambda, \mu = \{\mathcal{M}_u, \mathcal{C}_\vartheta\}$ .

**Keywords:** Double sequence space, Four-dimensional forward difference operator, Dual spaces, Matrix transformations.

## Examine the Internet Addiction Scale of Students in Turkey and Iraq Comparatively with The Multivariate Adaptive Regression Splines (MARS) Method

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### Abstract

In recent years, the internet has altered how modern life is lived. Internet addiction is thought to be a recent condition that could affect mental health. The aim of the study is to develop a scale for internet addiction and examine the factors that can affect the addiction status of individuals. The literature uses the novel non-parametric method known as MARS. MARS has the ability to provide accurate parametric forecasts as well as readable model curves. The sample of the study is at the international level, and cosmopolitan universities from each country (Turkey and Iraq), and the target audience was determined as university students.

The data for the study came from a questionnaire designated, which was meant to evaluate a person's level of addiction. The Internet addiction scale is a 5-point Likert scale, with the lowest score that each participant can get from the scale being 35 and the highest score being 175. The population of the study consists of 2235; 1220 students (427 males and 793 females) from the Turkish Sample and 1015 students (461 males and 550 females) from the Iraqi Sample were assigned by random sampling method. For MARS data mining analysis, the default values of the SPM 8.2 program were taken as a basis, and operations were carried out considering the entire data set. MARS obtained nine base functions of the model for Turkey and twenty base functions of the model for Iraq. As a result of the MARS analysis method, it was proven that the predictors of Daily Internet Usage, Mothers' Education, Number of Siblings, Smoking, Age, Daily Internet Usage During Covid-19 Quarantine, The Quality of Online education in The Covid-19 Pandemic, the device used for the Turkey sample, and the predictors of Daily Internet Usage, Internet Usage Covid-19 Pandemic, Quality Online Education Covid-19 Pandemic, Covid-19 Pre-Quarantine Daily Internet Usage, Mothers' Job, internet Usage Purpose, Family Income, Daily Internet Usage in Covid-19 quarantine, Age, Number of Siblings, Mothers' Education, Internet Home, Fathers' Job, Device Preference for Online in Quarantine for Iraq sample had a significant effect ( $P < 0.05$ ).

**Keywords:** Internet use, Addiction, MARS, Classification

## Poor Academic Achievement in Mathematics at Secondary Schools, from the Teachers' Point of View, and Ways to Improve it through Data-Driven Teacher Training Programs

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### Abstract

Mathematics is accepted by society as the cornerstone of scientific and technological knowledge. However, at the same time, students' poor achievement in mathematics is a great concern for many countries around the world. This paper explores the issue of poor academic achievement in mathematics at secondary school from the teachers' point of view. An online survey was used in this quantitative study to gather data from teachers in public and private schools across Iraq. The findings showed that factors including students' and teachers' attitudes, teaching methods, gender, and parental factors have an impact on students' mathematics achievement. The study proposes data driven in service teacher training programs to tailor instruction and update teaching methods, and by implementing these approaches improve students' mathematics achievement.

### Keywords:

## Solution of Bagley-Torvik Equations Using Aboodh Integral Transform

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### Abstract

The analytical solution of a class of fractional differential equations called Bagley-Torvik equations is crucial for progress in various areas of ecological and finance mathematics. The goal of this paper is to apply Aboodh integral transform (AIT), to find the analytical solution of the Bagley-Torvik equations, In this case, we consider all the fractional derivatives in Caputo sense. AIT's basic characteristics are first provided, and then it is used to solve the Bagley-Torvik equation completely. The suggested approach is simple, extremely effective, and reliable for determining the precise solution.

**Keywords:** Bagley-Torvik equation, Caputo fractional derivative, Aboodh integral transform



## Solution of Brusselator System via Vitae Lucas Operational Matrix

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### Abstract

In this study, we developed a collocation approach to obtain the numerical solutions of a nonlinear fractional-order chaotic system known as the fractional-order Brusselator system using the shifted form of Vieta-Lucas polynomials with various symmetries as the basic base. The nonlinear fractional-order Brusselator system is transformed into an algebraic equation system by the operational matrices of fractional derivative and collocation method. To illustrate the reliability and convenience of the suggested techniques, two examples are provided.

**Keywords:** Brusselator System, Caputo fractional derivative, Vitae- Lucas Polynomials, Operational Matrix, Collocation Method.

## Numerical Treatment of Allen's Equation using Du-Fort Frankel Methods

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### Abstract

This paper aims to developed Allen equation that commonly arises in chemistry, heat and mass transfer, biology and ecology. We proposed Du-Frankal schemes for numerical solution of one dimensional nonlinear Allen equation. The accuracy of the proposed method is second order in time and second order in space. Stability and convergence analysis are proved. Some numerical results are presented to show the accuracy of the presented methods for different values of Diffusion coefficient and time steps are matching with exact solution.

**Keywords:** Numerical Treatment, Allen's Equation, Du-Fort Frankel Method.

## Approximation of cumulative function for t-distribution

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### Abstract

This study focuses on approximating the cumulative distribution function (CDF) of the t-distribution, which is commonly used in statistical analysis and hypothesis testing. The traditional method of using tables for the CDF can be tedious and time-consuming, so this study proposes a new formula that simplifies the process. The formula is derived using a Polya's formula which is used in 1945, which allows for an accurate approximation of the CDF with fewer calculations. To validate the accuracy of the proposed formula, a simulation study was conducted and compared to the traditional table method. This research has practical implications for statistical analysis and can potentially save time and effort in obtaining CDF values for the t-distribution.

**Keywords:** Cumulative distribution function, Taylor's series, t-distribution

## The Solitary Wave Solutions of the Nonlinear Benjamin-Mahony Equation

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### Abstract

The Benjamin-Bona-Mahony (BBM) equation is a nonlinear partial differential equation that describes the propagation of long waves in a shallow water channel. In this work, we present a comprehensive solution for the BBM equation using the Riccati-Bernoulli sub-ODE method. The method involves transforming the BBM equation into a Riccati equation, which is then further transformed into a Bernoulli equation. The Bernoulli equation is then solved analytically, and the solution is used to obtain the solution for the original BBM equation. Our results show that the Riccati-Bernoulli sub-ODE method provides an efficient and accurate solution for the BBM equation. The method can be extended to solve other nonlinear partial differential equations, making it a valuable tool for researchers in various fields.

**Keywords:** Benjamin-Bona-Mahony; Riccati-Bernoulli sub-ODE method; water waves; Solitary wave.

**Determine the efficiency of academic institutions using Data Envelopment Analysis ((Applied study on the graduate program - University of Basra))**

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**Abstract:**

The method of Data Envelopment Analysis (DEA) is one of the modern methods used in measuring and evaluating the efficiency of any multi-criteria system. Therefore, the research aims to measure the efficiency of a sample of the faculties of the University of Basra through its implementation of a graduate program that contributes to the provision of academic institutions and other specialized human resources. Orient-Output Constant Return Scale (CRS) is based on a hypothetical principle of measuring efficiency in light of the stability of the system inputs with an increase in the output of the higher education system achieved at the University of Basra, which will be the basis for comparison between the target colleges of the study. The problem of research in how to find a suitable method comparing institutions by measuring the efficiency of the graduate program of the faculties of the University of Basra through the adoption of a number of criteria that can be the basis in the development of academic programs, this study applied to what has been achieved during the three academic years. The results show that the faculties that have been able to achieve full efficiency according to the fixed-size dividend model during the researched years are the Faculty of Engineering, Education for Pure Sciences, Fine Arts, Education Girls. The colleges have varied efficiency between incompetence or competence Complete.

Finally, the research was able to reach a number of conclusions and recommendations, the most important of which is the necessity of activating scientific research and urging teachers to publish research internally and externally, which in turn will contribute to activating scientific promotions.

**Keywords:** DEA analysis, efficiency measurement, CRS.

## Strongly Fitting Shadowing Property for Hyperbolic Manifolds

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### Abstract

A  $C^1$  diffeomorphism  $\mathcal{L}: M \rightarrow M$  of a compact smooth manifold  $M$  to  $M$  and  $\mathfrak{B} \subset M$  a  $C^1$  compact invariant submanifold is said to be hyperbolic for  $\mathcal{L}$  if  $T_{\mathfrak{B}}M$  has a continuous splitting

$$T_{\mathfrak{B}}M = E^s \oplus E^u$$

with a hyperbolic structure as a subset of  $M$ . We restrict the diffeomorphism  $\mathcal{L}|_{\mathfrak{B}}$  to explain  $\mathcal{L}$  is Anosov if and only if  $\mathfrak{B}$  has the strongly fitting shadowing property SFSP, and also to find hyperbolic sets for example the Birkhoff centre, chain recurrent, periodic points and non-wandering sets of  $\mathcal{L}$ , which have the strongly shadowing property, and find the relations between them in general and in case Anosov diffeomorphisms in special case.

**Keywords:** pseudo-orbit, strongly fitting shadowing property, chain recurrent set, Birkhoff centre set, non-wandering set.

## comparing between models with application

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### Abstract

In this research, show how simulation procedure (Monte-carlo technique) to obtain the best model from exponential model, Rayleigh model, exponential-Rayleigh model and generalized exponential Rayleigh model by using Akaike information criterion, correct Akaike information criterion and Bayesian information criterion. Finally, we apply this distribution to real data in hospitals and we choose the disease is (stroke) Because of important of this disease, we have collected data related on mortality from this disease from the Ministry of Health/Al-Yarmouk Teaching Hospital/Stroke for the period of time from 1/1/2022 to 1/7/2022.

**Keyword:** Akaike criterion, correct Akaike criterion, Bayesian criterion

## The Riccati-Bernoulli Sub-ODE Method for Nonlinear Partial Differential Equations Arising in Water Waves

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### Abstract

Our research focuses on water wave dynamics, specifically weakly nonlinear and unidirectional waves in shallow water. We employ a nonlinear partial differential equation (NLPDE) to describe this phenomena, which accounts for the wave amplitude's reliance on its own velocity. Using the Riccati-Bernoulli sub-ODE approach, we created a thorough solution for the NLPDE. The NLPDE is transformed into a Riccati equation, which is then transformed into a Bernoulli equation, which is solved analytically. We derive the solution for the original NLPDE using this approach. Our results show that the Riccati-Bernoulli sub-ODE approach is efficient and accurate. Furthermore, this strategy can be extended to other NLPDE, which make it an adaptable tool for researchers in numerous domains.

**Keywords:** Riccati-Bernoulli sub-ODE method; water waves; Solitary wave



## Angle in normed spaces and their properties

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### Abstract

Let  $X := (X, \langle \cdot | \cdot \rangle)$  be an inner product spaces. We already know that we can define an angle inside this spaces, even, we also have the similar notion in normed spaces  $Y := (Y, \|\cdot\|)$ .

After this, we can also define, for every three different points, the notion of triangle in this spaces and develop their elementary properties just like in trigonometry in high school. For examples, we develop similar formula like sine and cosine formula, and also some elementary formulas for triangle.

**Keywords:** Wilson angle, triangle in normed spaces, sine and cosine formula.

## Improving Compression Methods For Medical Image Databases Based On MIN-MAX

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### Abstract

Recent years, there has been a huge increase in the amount of medical imaging data, which causes obstacles in the operations of PACS communication systems and archiving images. The most prominent solution to this problem lies in the compression of images through digital encryption, which is the most efficient in terms of space use, formatting the imaging data by reducing redundancy generates image compression. This is what we see in single images (reduces redundancy), but here it is possible to diagnose a weakness in these methods, which lies in ignoring a source of repetition that appears in similar stored images. We cite the term redundancy group to highlight this species in abundance. Similar images are most commonly observed in medical image databases. This generates highly set from redundancy.

In this paper, we will work to improve the efficiency of extracting redundancy control of the data used (medical images). To improve the compression efficiency of standard image compression is done by improving the efficiency methods ((MMP) MinMax Predictive and (MMD) Min-Max Differential), in our paper, tests have shown that the average improvement in brain CT pressure can be as high as 130% in Huffman, the improvement also appears in the coding that reaches 94 for the number-arithmetic code (37 for the Lempel-Ziv compress), and this occurs when the MMP technology is combined with the MMD technology based on inverse operations that result in lossless compression.

**Keywords:** redundancy, compression, decompression, MMD, MMP

## The influence of Chat-GPT and AI tools on the academic performance

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### Abstract

The use of Chat-GPT and other AI tools in education has become increasingly widespread these days, as educators seek to leverage the benefits of technology to improve student learning and academic performance. This review paper examines the existing research on the influence of Chat-GPT and AI tools on academic performance, with an emphasis on both the potential benefits and challenges of these AI tools. The literature review indicates that while Chat-GPT and other AI tools have the potential to enhance personalized learning, feedback and assessment, and interaction, they also encounter challenges such as moral concerns, lack of human interaction, and possible biases. In a summary, this paper emphasizes the need for additional empirical research to completely understand the impact of Chat-GPT and AI tools on academic performance and provides recommendations for educators and policymakers on how to use these tools effectively and responsibly in educational environments.

**Keywords:** Chat-GPT, AI, Education

## Stroke prediction analysis of imbalanced data based on machine learning methods

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### Abstract

The study aims to classify stroke by using machine learning methods on unbalanced data. Dataset were obtained from the official website of the National Center for Biotechnology Information (NCBI). Furthermore, Random Undersampling (RUS), Random Oversampling (ROS), and Synthetic Minority Oversampling Technique (SMOTE) were conducted as resampling methods. Classification was carried out using Random Forest (RF), Extreme Gradient Boosting (XGBoost) and Support Vector Machine (SVM) methods. The ratio of training and testing utilized were 60% and 40%, 70% and 30%, also 80% and 20%, respectively. From hyper parameter tuning with 5-fold cross validation, the RF method (ratio of 60% training and 40% testing) from SMOTE acquired the most optimal results with an accuracy, AUC, and recall is 44.73%, 71.30%, and 40%, respectively. The feature importance explained that the attribute regarding indicator of whether the patient has an infarct on the CT scan is the most important attribute. The resampling data can improve the performance of classification models of the unbalanced data. The feature importance could be considered as an education on the most important risk factors that cause stroke.

**Keywords:** Machine learning, imbalanced data, feature importance

## An Assessment of Random Forest and Decision Tree Techniques in Detecting Distributed Denial of Service (DDoS) Attacks

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### Abstract

The increasing reliance on digital technologies in today's world has made networks and systems more vulnerable to cyber-attacks. One of the most common and damaging types of attacks is the Distributed Denial-of-Service (DDoS) attack, which can result in significant financial losses and reputational damage. Machine learning (ML) algorithms have been widely used to detect and mitigate DDoS attacks. In this study, we compare the performance of two popular ML algorithms, decision tree and random forest, in detecting DDoS attacks. We evaluate the algorithms using a publicly available dataset named "Time Series Dataset for DDoS Attack Detection". We compare the performance of the algorithms using various evaluation metrics, including accuracy, precision, recall, sensitivity (TPR), specificity (TNR), training time (sec), and the F1-score. Our results show that the decision tree algorithm outperforms the random forest algorithm in terms of training time. The random forest algorithm achieved an accuracy of 100%, while the decision tree algorithm achieved an accuracy of 100%. Our study provides insights into the use of machine learning algorithms for the detection of DDoS attacks and highlights the advantages of using random forest over decision tree algorithms for this purpose.

**Keywords:** Decision tree; Random Forest; DDoS attack; Cybersecurity; Anomaly detection

## A Traffic Flow Prediction Approach Based on a Developing Car-Following Model

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### Abstract

Modeling the vehicle's traffic flow represents a significant approach to understand, analyze, predict, and simulate different transportation system states. Many models of car-following models were proposed and developed to illustrate the behavior and the characteristics of moving vehicles. These models were derived from real driving assumptions by considering a safe distance, obeying the street driving rules, and driving at a comfortable desired range of speed and acceleration. One of the important research directions applied to improve intelligent transport systems is the car-following models. These models can be used in controlling traffic congestion by utilizing drivers' behavior and road conditions. In this paper, a car-following model is developed and implemented based on the proposed driving behavior probability. A developed modeling approach is suggested to estimate and create threshold values for predicting driver behavior during the next periods. The driver's behavior is considered according to the change in the acceleration value and its relation to the vehicle's speed. The acceleration value can be to accelerate, decelerate, or with no change (keep the same speed).

**Keywords:** Traffic flow, mobility, car-following models, safety distance model, vehicles arrival rates, simulation, VANET, vehicular communications, Driver behavior.

## HARDWARE IMPLEMENTATION OF SCMA CODEBOOK USING CHAOTIC INTERLEAVER

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### Abstract:

Non-orthogonal multiple access (NOMA) technology is a significant topic of the present 5G investigation. A possible NOMA approach is Sparse Code Multiple Access (SCMA), increasing next-generation communication's ability to handle multiple users. In SCMA, codebook design and optimization are crucial components that define the performance of multiple access systems. In this work, the hardware implementation of the SCMA codebook based on chaotic interleaving using Altera FPGA board that is presented. Arnold's cat map is used for chaotic interleaving to reduce the computational complexity. The design is carried out using Quartus II package v.13 while Altera Cyclone V kit is used as target device for hardware implementation. The experimental test results using interactive switches and LEDs available on the board confirm the right generation of SCMA codebook.

**Keywords:** codebook design; sparse code; multiple access; chaotic interleaving

## Parallel Processing Distributed-Memory Approach influences on Performance of Multicomputer-Multicore Systems using Single-Process Multi-Thread

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### Abstract

The purpose of this research is to provide a method for creating a multicomputer-multicore distributed memory system that can be implemented on distributed-shared memory systems based on the concepts of client/server architecture. Monitoring and managing the programs that may be executed on various distributed-multi-core architectures with (2, 4, and 8) CPUs to complete a certain job are the two primary components of the system that has been presented. For problem-solving purposes, the network may accommodate one client in addition to any number of servers. For the stage of implementation, it is necessary to rely on three distinct scenarios, each of which takes into consideration the majority of the design alternatives. The suggested system is able to calculate the Total-Task-Time (TTT) on the client side and the timings of all involved servers (Started, Elapsed, CPU, Kernel, User, Waiting, and Finish). While developing User Programs (UPs), the following creation scenario is taken into consideration: single-process-multi-thread (SPMT). The findings demonstrated without a reasonable doubt that an increase in processing capability leads to a commensurate acceleration in the rate of problem resolution (i.e., the number of servers and the number of processors for each server). As a result, the amount of time it took to complete the assignment rose by 9.156 times depending on three different SPMT UPs situations. The C# programming language is used to carry out the coding for the implementation of this system.

**Keywords:** Distributed System, Parallel processing, Process /Threads Monitoring, Process/Threads controlling



## A Secure and User-Friendly Graphical Pin Entry System with Shoulder Surfing Resistance

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### Abstract

The use of authentication-based access for computer privacy and security is widely adopted. However, users often choose weak passwords that are easy to remember, such as dates of birth, phone numbers, or the names of loved ones, instead of utilizing combinations of letters, numbers, and special characters. With the proliferation of internet programs and cell apps, users can access applications from various devices at any time and location, providing significant convenience but also increasing the risk of passwords being exposed to shoulder surfing attacks. Attackers may directly observe or use external recording devices to collect user credentials. To address this issue, we propose a novel authentication system called Pass Matrix, based on graphical passwords, to withstand shoulder-surfing attacks. Pass Matrix uses a one-time valid login indicator and horizontal and vertical bars that cover the entire range of password images. Even if attackers conduct multiple camera-based attacks, Pass Matrix does not provide any clues to estimate or reveal the password. Our approach offers improved security against shoulder-surfing attacks and utilizes.

**Keywords:** Graphical Pin Entry Systems, Authentication, Shoulder Surfing Resistance, Graphical Passwords, Password Images.

## Computer Vision System to Improve the Gymnastics Player's Performance Based on Deep Learning

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### Abstract

Sports analysis is one of the very important topics for the coach, on the basis of which it is possible to improve the player's performance on the field. Relying on analyzing video clips of different matches and then measuring the player's performance can give better results than relying on the human eye if computer vision systems and deep learning algorithms are relied upon that can extract the characteristics of this clip and then analyze more clearly. This paper presented a method to improve the performance of the gymnast player in the stability process, based on a computer vision system and a bypass neural network. After the player is identified in the video clip, a set of points are placed on the main joints of the body, and then some mathematical equations are made between these points and a comparison is made. With the standard position of this movement, and thus the amount of convergence and divergence can be noted, which the player can retry and train the movement until reaching the standard position

**Keywords:** computer vision , deep learning , gymnastics sport , YOLOv7

## A Proposed Priority Approach to Improve the Intelligent Transport System Environment

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### Abstract.

Intelligent transport systems (ITS) aim to improve the transportation environments. Vehicular ad hoc network (VANET) is the essential tool to offer the facilities to improve the ITS. The communication process in vehicular networks consist of exchange messages for various purposes. Most of these purposes in are the occurrence of road congestion, road accidents, and other occurrences on the roads. These messages are generally classified according to their significance as urgent, important and normal. These messages classification sequence is according to their priority of processing. The availability of a communication link between the vehicles and the roadside units will improve and ensure the messages transmission and reception process. In this paper, a priority approach is implemented to process the urgent message first and the important messages as a second alternative before the normal messages. The data transmission rate is also analyzed. An optimization approach is proposed in delaying and processing the received messages. Their waiting times, sequencing and priority are highly considered.

Keywords:

## Designing a Convolutional Neural Network Architecture for Kurdish Handwriting Digits and Character Recognition on a Vast Dataset

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### Abstract

This study proposes a convolutional neural network (CNN) architecture for Kurdish handwriting digits and character recognition on a vast dataset named K-ZHMARA and K-PIT proposed by researchers at Halabja University. The problem of recognizing Kurdish handwriting characters and digits is challenging due to the lack of existing resources and the complexity of the Kurdish script. The problem is significant because of the increasing need for automated recognition systems in various domains, including finance, education, and communication. The proposed solution utilizes a CNN architecture that consists of three convolutional layers, three max-pooling layers, and two fully connected layers for classification. The architecture was optimized and trained on the K-ZHMARA and K-PIT datasets using the Adam optimizer and categorical cross-entropy loss function. The K-ZHMARA and K-PIT datasets contain over 270,000 samples of Kurdish handwriting digits and characters. The main results of the experiments showed that the proposed model achieved a test accuracy of 93.53%. The research findings indicate that the proposed CNN architecture can effectively recognize Kurdish handwriting digits and characters, which can be used in various applications.

**Keywords:** Kurdish handwriting recognition, Handwriting applications, A CNN Architecture, Image processing, deep learning

## Investigating Quality of Service (QoS) in a Combined WLAN and Hetnet-Based LTE-A Architecture

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### Abstract

This paper presents a loosely coupled integration architecture between WiFi and LTE heterogeneous networks (HetNet), with the aim of examining the practicality and feasibility of the design by evaluating its performance for various network applications. Additionally, the architecture incorporates load balancing functionality to demonstrate its flexibility and potential for further enhancements. The architecture is implemented and simulated using the Riverbed network simulator, and the results confirm its effectiveness in enabling seamless communication between different technologies. Furthermore, several existing load balancing algorithms are tested on the architecture, and the numerical outcomes demonstrate the superiority of a specific algorithm.

## Robust Stability and Stabilization of a Class of Uncertain Discrete Time Systems

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### Abstract

In this paper we gave a solution to the robust stability and stabilizability problem of linear discrete time systems subjected to nonlinear perturbation. The solution to this problem is formulated as an optimization problem. The formulation is made in an LMI framework. An extension is made to cover the problem of robust stabilization of interconnected systems for which the coupling terms between the multi-input subsystems are considered as nonlinear uncertain perturbations.

**Keywords:** Nonlinear perturbation, Robust stability, State feedback.

## Period variation of AD And Algol Binary Stars

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### Abstract

In this work, the short period Algol type binary system AD And had been chosen to be analysed with B, V and R light curves by using Binary Maker (BM3(2017)), and the Phoebe(2010) and Peransoprogrammes (2010). These have been used to analyse the O-C plots and the results of the orbital parameters of the system were obtained and compared with those obtained from previous studies. The present results indicated that the selected system is a contact type and the absolute parameters of the components have been determined with suitable accuracy, for which the physical parameters have been also obtained in a uniform way. In this paper, the times of minima of the eclipsing binary AD And refers to collected of TOMs for the star via data base for one century. The scope of this research is to check for the existence of unknown bodies in a more distant orbit.

**Keyword:** Light curve, Photometric, Binary star, Roche loop, O-C, Third light

## Radioactivity Concentration and Effective Dose Assessment of Various Imported Walnut Consumed in Kurdistan-Iraq.

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### Abstract

Investigation is made of 20 commercially available walnut samples containing naturally occurring radioactive material (the samples are available in Kurdistan Region-Iraq markets, including local and imported products). Assessment is made of the radiological risk posed by consuming walnuts, internal exposure dose being the particular focus. Gamma spectroscopy analysis (HPGe) and XRF spectrometer are used. For <sup>238</sup>U, <sup>232</sup>Th and <sup>40</sup>K the walnut sample, code W13 (originally from the USA), was found to contain the greatest activity, at  $33.8 \pm 4.1$ ,  $76.7 \pm 6.24$  and  $583.8 \pm 64.3$  Bq kg<sup>-1</sup> respectively; least was for the walnut sample, code W18 (originally from China), at respective values  $1.54 \pm 0.03$ ,  $7.732 \pm 1.2$  and  $38.85 \pm 5.63$  Bq kg<sup>-1</sup>. The average radioactivity concentration was within the average ranges of the accepted values in the world by UNSCEAR, at 33, 45 and 412 Bq kg<sup>-1</sup>. for <sup>238</sup>U, <sup>232</sup>Th and <sup>40</sup>K, respectively). In terms of elemental concentration, sample W13 offered the greatest concentration, with mean percentages of  $0.00037 \pm 0.0001$  and  $0.002 \pm 0.0011$ , for U and Th, respectively. With the assumption of the annual intake of walnut at 1.5 kg for the child (10 years old) and 11 kg for adult, consuming the walnut W13 would give rise to an annual effective dose of 0.38 mSv, less than the public annual dose limit of 1 mSv.

**Keywords:** NORM; radiation risk; effective dose.



## Electrical Impedance Spectroscopy as Candidate Tools to Detect Bone Fracture

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### Abstract

There has been an increase in cases of bone fractures from 1990 to 2019 with a total of 178 million cases worldwide. Indonesia has a fracture injury prevalence of 5.5% with the distribution of injuries to the upper extremities 32.7% and 67.9% to the lower extremities. Treatment of bone fractures is generally done by radiological examination. X-ray is a tool that is commonly used to detect bone fractures because it is the easiest and fastest. However, the use of X-rays in the long term can cause radiation effects of ionizing radiation. Therefore it is necessary to use alternative imaging methods. One method that can be considered for detecting fractures without causing radiation effects is bio-impedance. Basically, biological systems have both resistive and capacitive properties. If a voltage or electric current is injected with a frequency variation, an electrical impedance spectrum will be obtained which is a characteristic of biological tissue called Electrical Impedance Spectroscopy (EIS). The impedance spectrum is directly related to the properties of body tissues. This research was conducted using an EIS based on Analog Discovery, a phantom 3D Printed Model of femur made from Poly Lactic Acid (PLA) as a phantom of human femur bones with normal bone and bone fractures. Impedance measurements were carried out with a frequency variation range of 100 Hz to 1 MHz. Based on the impedance spectrum data, information is obtained that there is a difference between normal bone and fracture. The position of the VCCS electrodes and the voltage meter affects the sensitivity of the measurement of bone fractures.

**Keywords:** Electrical Impedance, Spectroscopy, Bone Fracture

## Design And Development of Stroke Volume Measurement Using Impedance Cardiography

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### Abstract

Stroke volume (SV) is the volume of blood ejected from the ventricles for each heartbeat. Transpulmonary thermodilution is one of the methods used to continuously monitor stroke volume (SV). However, this method is invasive and requires special central arterial and venous lines. Therefore, another method is needed that can measure SV values, namely impedance cardiography (ICG). Impedance cardiography (ICG) is a non-invasive method used to determine changes in the fluid content of the thorax based on Ohm's law. This study aims to create a stroke volume (SV) measurement tool using impedance cardiography (ICG) and determine the performance of the tool. This tool works by supplying a current of 0.2 mA with a frequency of 50 kHz to the body of the experimental object to generate a voltage in the body's tissues. Data collection was carried out three times with a total of five female participants using four ECG Ag/AgCl electrodes. From this study, the optimal measurement time was 30 seconds with a standard deviation of 2.70. Based on the results of data analysis, it was found that the stroke volume (SV) in three of the five participants was normal, while in two participants it was abnormal. From these data, it was found that the greater the stroke volume (SV) value, the smaller the heart rate (HR) value.

**Keywords:** Stroke volume, Impedance Cardiography, Heart Rate

## Optimizing infrared laser exposure for in vitro breast cancer photodynamic therapy with gold nanoparticles photosensitizer

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### Abstract

This research was conducted to optimize the application of 808 nm infrared diode laser (GaAlAs) in a photodynamic therapy with the addition of gold nanoparticles (GNPs) photosensitizer for MCF-7 breast cancer cells in vitro. Toxicity test was firstly carried out to decide the appropriate concentration of GNPs that resulting in 25 µg/ml. Secondly, we investigated if the adjustment of exposure distance after photosensitizer addition is a promising method to get an effective result of a photodynamic therapy for breast cancer cell apoptosis. To prove the success of our improvement in PDT, we compared the treatment results of two main groups; LT groups (only received infrared laser exposure) and PT groups (received infrared laser exposure and GNPs photosensitizer). Three variations of energy densities (161,3 J/cm<sup>2</sup>, 184,3 J/cm<sup>2</sup>, and 207,4 J/cm<sup>2</sup>) were also applied in each main group to observe how different energy densities would give different effects on MCF-7 cells death. The result found that PT groups show a higher number of cancer cell apoptosis than LT groups due to the addition of GNPs in the controlled concentration. Specifically, the optimization of infrared laser and energy density were proved to give the remarkable effect to MCF-7 breast cancer cells in vitro since LT and PT groups have the highest percentage of cell apoptosis at 184,3 J/cm<sup>2</sup> energy density. The combination among the appropriate GNPs concentration, the optimization of infrared laser energy density and the adjustment of infrared laser exposure was proved in obtaining high death percentage of in vitro breast cancer cell.

**Keywords:** 808 nm infrared diode laser, Apoptosis, Gold nanoparticles, MCF-7 breast cancer cell, Photodynamic.

## Radiation Exposure and Potential Health Risks Associated with Consumption of Lo Salt in Kurdistan Region-Iraq

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### Abstract

The investigation is made of 35 salt samples containing naturally occurring radioactive material (NORM) and heavy metal. The samples are available from retail stores in Kurdistan-Iraq, including local and imported products. Types of the samples such as sea salt, lo salt (less sodium salt), Himalayan pink salt (pink rock salt), and iodized salt. Assessment is made of the radiological risk posed by consuming salt, internal exposure dose being the particular focus. Gamma spectroscopy analysis (HPGe) and XRF spectrometer are used. For radionuclides, <sup>226</sup>Ra and <sup>232</sup>Th, the salt sample ranged (from  $0.43 \pm 0.11$  -  $14.21 \pm 2.3$  and  $0.86 \pm 0.06$  -  $170.54 \pm 45$ ) Bq kg<sup>-1</sup> respectively. The salt sample, less sodium, coded S9 (originally from the UK) was found to contain the greatest activity of 40K at  $45935.9 \pm 8223$  Bq kg<sup>-1</sup>. While the sample, iodized white table salt, coded S35 (originally from Turkey) recorded the least at respective values  $65.6 \pm 4.8$  Bq kg<sup>-1</sup>. A wide variation in the range of NORM concentration across salt samples were observed. Whereas, the average radioactivity concentration was above the average ranges of the accepted values in the world by UNSCEAR, at 33, 45, and 412 Bq kg<sup>-1</sup> for <sup>226</sup>Ra, <sup>232</sup>Th, and 40K, respectively. It observed that samples lo salt less sodium (S9) and Himalayan fine pink salt (S12) contained a level of lead at 45.6 and 26 PPM (mg kg<sup>-1</sup>) respectively, that exceeded the national maximum contamination level set by Food Standards Contamination. With the assumption of the daily intake of salt at 5 g for child (10 years old) and 10 g for adult, consuming the lo salt sample S9 would give rise to an annual effective dose of 2.45 mSv and 3.47 mSv for child and adult respectively, exceeded the annual dose limit of 1 mSv for members of the general public. The risk to public health from potential hazards of radiation exposure should be addressed by food regulations.

**Keywords:** NORM, Annual Effective Dose, Heavy Metal

## Annealing Effect on Window Layer CdS Thin Films

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### **Abstract:**

Cadmium Sulphide (CdS) thin films were synthesized using the chemical bath deposition (CBD) technique. The films were annealed in air, at 350°C, for different time intervals. The deposition films were characterized with X-ray diffraction (XRD), field emission scanning electron microscope (FESEM), Raman Spectroscopy, and UV-Visible Spectroscopy to study structural, morphological, and optical properties of as-deposited and annealed CdS thin films at different time intervals. XRD analysis showed the polycrystalline nature of all films. The crystalline structure of the as-deposited CdS thin film was cubic whereas the structure changed to hexagonal for annealed films. The various parameters such as crystallite size, microstrain, and dislocation density were calculated. FESEM study showed the distribution of spherical shaped grains over the complete substrate surface of CdS thin films however the agglomeration of particles was increased with an increase in annealing time. An optical transmittance study showed the transmission of CdS thin films varied between 60 to 90%. It also confirmed the presence of direct transition with band gap energy varied between 2.10 to 2.82 eV. Raman Spectroscopy showed the 1LO peaks in all CdS thin films.

**Keywords:** CdS, CBD, XRD, UV-Visible

## The Synthesis of Anomalous Breast Phantom for Continuous Wave Diffuse Optical Tomography System

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### Abstract

The Synthesis of anomalous phantoms and anomalous breast phantoms made of a mixture of gelatin-glycerin-TiO<sub>2</sub> has been carried out. The anomalous phantom is the anomalous phantom that is inserted into the breast phantom. An anomalous breast phantom is a breast phantom that has been inserted by anomalous phantom. The phantom breast is composed of gelatin and TiO<sub>2</sub> with a composition ratio of 3:1. The anomalous phantom was made by adding 0.00075 gram of textile dye and TiO<sub>2</sub> in various weight variations to the breast phantom. The TiO<sub>2</sub> variations are 0.050; 0.075; 0.100; 0.125; and 0.150 grams. The anomalous phantom of breast was tested for its absorbance value using a UV-Vis spectrophotometer and its absorption coefficient using the System Continuous Diffuse Optical Tomography (CWDOT). The anomalous breast phantom with 7mm insert of diameter was used for the CWDOT sensitivity test. Based on the test at wave 650, 780 and 808 nm in wavelength, it shows that the highest absorption coefficient value is for the anomalous phantom with the addition of textile dyes. The higher concentration of TiO<sub>2</sub>, the higher absorbance value. From the sensitivity test, it can be shown that the variations of the addition of TiO<sub>2</sub> have not been able to show a clear boundary between the breast phantom and its anomalies.

**Keywords:** breast phantom, anomaly, tomography, synthesis

## Electrical Leakage Current Measurement Possibility Utilizing Faraday Effect with Lengthy Fiber Optics

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### Abstract

Fiber Optic (FO) in measurements of currents has been proposed and reported in wider applications. Most of them was using Magnetic Field as the source. Although that kind of measurement has been tested many times, the application were for strong enough magnetic field. Meanwhile a small current has not been much reported. Meanwhile, the leakage current limit could be as low as 0.5mA by following the IEC60601 standard. The same principal of Magneto Optical Effect (MOE) with Faraday Effect which well known as Faraday rotation would be utilized in this simulation. A fused silica core with a relatively low Verdet constant property would tested. As in common Fiber Sensor mechanism, it would be coiling around a current-carrying wire so that light experiences the Faraday Effect for a greater distance. In this simulation with a laser source power of 100 mW, FO measurements with up to 15 km can still be utilized with a power reduction of up to 50 mW.

**Keywords:** Leakage Current, Optical Measurement, Faraday Effect, Safety, Energy Efficiency

## TiO<sub>2</sub> nanorod for Gas Sensor Application Prepared Using Hydrothermal Technique: Effect of Reaction Duration

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### Abstract.

Titanium dioxide nanorods (TiO<sub>2</sub>NRs) were created using the hydrothermal method on a substrate made of F-doped tin oxide (FTO) to enhance the nitrogen dioxide (NO<sub>2</sub>) gas sensor performance at room temperature. The impact of reaction duration on the growing of TiO<sub>2</sub>NRs has been studied. XRD patterns reveal that the TiO<sub>2</sub>NRs contain a rutile phase. TiO<sub>2</sub>NRs are growing, as seen in images captured using FESEM. It is clear that the type of structure that was produced depended on the reaction time. Optical absorption tests reveal that the absorption edge moves towards longer wavelengths as the hydrothermal reaction duration rises (red shift). TiO<sub>2</sub>NRs generated with 30 min and 60 min of reaction duration have energy band gap of 3.64 eV and 3.56 eV, respectively. The results showed that TiO<sub>2</sub>NRs with hydrothermal reaction duration 60 min exhibited an optimum sensing performance. This work offers a simple and workable technique to develop an NO<sub>2</sub> sensor at room temperature.

**Keywords:** Gas sensor, TiO<sub>2</sub>, nanorods, hydrothermal technique, NO<sub>2</sub>.



## Structural, Morphological and Optical Properties of Reactive DC Magnetron sputtering NiO Nanostructure: Effect of annealing Time

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### Abstract

Nickel oxide (NiO) nanostructures were successfully made via reactive Dc magnetron sputtering at varying annealing times (2 and 4 hours) at 450 °C. The impact of annealing duration on NiO nanostructure morphological, structural, and optical properties was investigated. AFM was used to evaluate the roughness of the samples. The grain size was demonstrated to decrease after 4 hours of annealing as the annealing time increased. After two hours of annealing, the samples' surface morphology and crystallinity revealed that the particle size had dropped from 79.95 nm to 76.88 nm. According to X-ray diffraction (XRD) measurements, the deposited films contained polycrystalline nanoparticles with an average particle size in the range of (8.145-29.195 nm) and a cubic structure (111). The sputtered films showed a clear polycrystalline structure as a diffraction peak in the direction of NiO (200). It was demonstrated that the  $E_g$  is between (3.69 to 4 eV). After two hours,  $E_g$  dropped from 3.69 to 3.6 eV and then increased to 4 eV when the sample was annealed for 4 hours. The findings demonstrate that the annealing duration has a greater influence on optical characterizations.

## Third body perturbation effect on GPS satellite

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### Abstract

Satellites are drawn not just by the Earth's central force but also by the Earth's non-central force, the sun and moon's attractive forces, and the atmosphere's drag force. This paper investigated the analytical technique for long-term third body perturbation on an Earth orbit satellite. It was performed by solving the variation of parameters equations (VOP) using the numerical output results of the celestial mechanics version 1 software program and using Matlab (2018) to analysis the final results. Using a collocation technique as a tool to solve the differential equations employs for the numerical output results represented by six orbital components and three axes with increasing and decreasing rates of change in orbital elements. The study concludes from numerical results that the perturbation force on high orbits of satellites seems higher than other orbits third body has the most effective of high and medium orbits in front of different forces acting on satellites.

**Key words:** Third body perturbation, orbital elements, GPS satellite, Sun and Moon attractions

## Theoretical Study of Titanium Metal Clusters Suggested as Catalysts For Polymerization Reactions

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### Abstract:

The theoretical study based on the density functional theory DFT quantum mechanical approach. All calculations are carried out by employing the used method at the Gaussian 09 package of programs. In this study, Titanium was selected as a metal in the compounds as catalysts. It is the most effective and widely used Titanium clusters as catalysts. For Titanium metal clusters, the results reinforce that they have various electronic applications with different LUMO-HOMO energy gaps. The differences of the HOMOs and LUMOs energies distribution make the Titanium metal clusters to have chemical reactivity as Ziegler-Natta catalysts in the chemical applications such as polymerization processes. The results also prove that the electron density distribution is made from the Titanium metal clusters have low electrophilic index in which they play a significant role as catalysts in many chemical reactions especially the polymerization processes. The added groups of the studied clusters played an important role in improving the properties that were studied.

**Keywords:** DFT, B3LYP, Gaussian, Titanium clusters, polymerization.

## Light pollution and astronomy

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### Abstract

The science of astronomy is the world's oldest science, originating in a time when men first observed, wondered about and counted the stars with the naked eye. However, as our towns and cities have grown and light pollution has increased, we can no longer see most of the visible stars and other astronomical objects. Even in the country, wasted city light casts a pale glow over the heavens, masking its wonders and beauty. This study aims to identify the views and opinions of the Tishik International University students on light pollution effect on astronomy and then to create awareness among them about the risky problem facing rapidly our environmental related to the seeing stars in the future. The study is based on the survey questions and semi-structured interviews and then the data is collected from the survey questions and semi-structured interviews were qualitatively analyzed and quotes from the students' statements were included. Some suggestions and recommendations will be made for controlling and reducing light pollution here in Kurdistan to have suitable solutions as a consequence for the planet and stars observations along with the loss of the night sky, the other negative impacts damage to the environment, sky glow, and human health consequences and disturbing of sensitive ecosystems

**Keywords:** light pollution, glare, sky glow, astronomy, seeing stars.

## Theoretical investigation of the effect of encapsulation (Si & Ge) in fullerene (C<sub>60</sub>) molecule: a DFT

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### Abstract

SIESTA, an effective computer program, is used to conduct ab initio density functional theory simulations of the structural and electrical properties of encapsulated silicon and germanium in C<sub>60</sub> fullerene. A Trouiller-Martins approach is used to build the pseudopotentials, which represent how valence electrons interact with atomic cores. We have seen stable compounds in the endohedral doped embedding of additional Si<sub>n</sub> (n=1-9) and Ge<sub>n</sub> (n=1-4) atoms before cage breakdown. We have also looked into how the amount of semiconductor atoms in C<sub>60</sub> fullerene affects cohesive energy, electronegativity, chemical hardness, electrophilicity index, and chemical potential oscillation behaviour. The potential energy curve plotted as a function of C-Si and C-Ge distance showed that the Si/Ge approaches to the carbon atom without an activation barrier.

**Keywords:** Endohedral doping C<sub>60</sub>, cohesive energy, potential barrier

## Role of Ti Additions in Modifying Thermal and Structural Properties of High Temperature Cu-Al-Ti Shape Memory Alloys

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**Abstract.** Cu-based shape memory alloys (SMAs) are one of the significant families of functional alloys that exhibit superelasticity (SE) and shape memory effect (SME). By being regarded as the closest alternative to the superior but high-cost NiTi SMAs, the Cu-based SMAs are desirable because these smart materials have higher electrical and thermal conductivity and much lower prices (nearly ten times less than NiTi SMAs) except for exhibiting shape recovery, superelasticity, and high damping. But at the same time, they also have some drawbacks in mechanical strength and brittleness (mostly stemming from coarse grain structure) and thermal stability. Therefore, improving the SME, thermal, structural and mechanical properties of Cu-based SMAs has attracted a lot of scientific interest among many researchers. Easy fabrication makes them one of the most used shape memory alloys in high temperature applications. Adding some grain refining elements to these SMAs significantly affects their martensitic phase transitions, structure and mechanical properties. Cu-based alloys exhibit shape memory effects at the beta phase transition, exhibiting a simple bcc structure at low temperatures and an austenite structure at high temperatures. As the temperature is lowered, the austenite undergoes martensite transition following two order reactions, and structural changes on a nano scale govern this transition. In this research, new CuAlTi ternary high-temperature shape memory alloys were prepared by arc-melting. Thermal analyses of the prepared samples of the alloys were investigated by using differential calorimetry (DSC and DTA) measurements, while XRD and optical micrographs were used in analyzing the structure of the alloy samples. The effect of minor amounts of low soluble grain refining Ti element in the binary CuAl alloy system was investigated.

**Keywords:** High temperature shape memory alloys (HTSMAs), CuAlTi alloy, Thermal characterization, Structural characterization, Cu-based SMA.

## A Study of the mechanical properties of a new flexible keel prosthetic foot materials

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### Abstract

The design of prosthetic feet can involve a variety of materials such as wood, rubber, urethane, titanium, fiberglass, and carbon fiber. These feet can have different features, such as being lightweight, energy-storing, or dynamic, and may even allow for heel height adjustment. However, it is crucial that all prosthetic feet provide the necessary plantar flexion in the early stance, a neutral position in the mid stance, and toe hyperextension in the late stance. Despite the availability of various designs, the Solid Ankle Cushion Heel (SACH) Foot remains the most commonly used type, particularly in developing countries for low-activity individuals due to its low cost and ease of maintenance. Nevertheless, this type of foot has some limitations, including a rigid keel, limited shock absorption due to a fixed heel height, and minimal ability to customize it to the user's needs. Additionally, the single bolt that attaches the foot is susceptible to unexpected failure.

A new prosthetic foot has been developed to address some of these issues. It was designed to be similar to the SACH foot but with a flexible keel, achieved by using carbon fiber reinforced polymer (CFRP) and silicone rubber (SiR) as filler materials for the wooden keel. Foam rubber (FR) was used for the heel and sole. In this study, the mechanical properties of the materials used, such as tensile strength, compression strength, and tear strength, were tested and analyzed.

**Keywords:** SACH; flexible keel; silicone rubber; tensile strength; compression strength.

Notes:

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