



2nd International Conference on Food & Applied Sciences

**19-21 August, 2024
Nathia Gali- Galiyaat Pakistan**

Organized by

**Evolution (Pakistan), Shaheed Benazir Bhutto Women University Peshawar & Women
University Mardan**

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BOOK OF ABSTRACTS

2nd International Conference on Food & Applied Sciences (ICFAS-24) Nathia Gali-Galiyaat

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- Chemical & Biological Sciences
- Biotechnology & Bioinformatics
- Microbiology & Physics
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- Computer & Numerical Sciences

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ABSTRACTS

Analysis and Design of Virtual Networks in OPNET IT Guru Academic Edition

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OPNET IT Guru Academic Edition enables us to better understand the core concepts of networking and equips them to effectively troubleshoot and manage real-world network infrastructures. OPNET permits you to model network topologies with nested sub-networking approach. This software allows nodes and protocols to be modeled as classes with all features of object oriented design. It facilitates modeling the behavior of separate objects at the "Process Level" and interlinks them to form devices at the "Node Level" So that you can interlink devices using links to form networks at the "Network Level." This study organize multiple network scenarios into to evaluate designs and collective traffic from LANs or cloud nodes. Modeler supports all major network types and technologies allowing you to design and test different scenarios with realistic certainty of the output results. OPNET may then be used to replicate the activities of the designed network to collect information such as application reaction time or links deployment and to display graphs of the collected information for the network speed performance analysis through graphs simulation. OPNET may also be used to plan computer networks from scratch, to legalize or troubleshoot an existing design, or to estimate a planned upgrading. Use OPNET to study a simple network's performance through collecting and analyzing some metrics personage applications including growth and breakdown. Ability to try out vast different scenarios of hardware and software attempts without the down side of the cost and time, and expect possible problems of hardware software before the actual use.

Key Words: - LAN, MAN, WAN, VLAN, Topologies, Virtual Networks

Brain Tumor Detection Desktop Application

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Brain tumor detection is a critical task in the field of medical imaging, as early and accurate diagnosis significantly impacts patient outcomes. In this project, we explore the application of Convolutional Neural Networks (CNNs), ResNet, and U-Net architectures for brain tumor detection and segmentation. These deep learning models are well-suited for image analysis tasks and have shown remarkable performance in various medical imaging applications. Our study leverages a diverse dataset of brain MRI scans, encompassing a wide range of tumor types and patient profiles. We preprocess the data to ensure consistency and quality, then train and fine-tune the CNN, ResNet, and U-Net models on this dataset. Through extensive experimentation, we optimize hyper parameters and model architectures to achieve the highest possible accuracy and robustness.

The primary focus of our work is twofold:

Brain Tumor Detection: We investigate the ability of CNNs and ResNet to accurately classify MRI images as either tumor-present or tumor-absent, providing clinicians with a reliable screening tool for initial diagnosis.

Tumor Segmentation: Utilizing the U-Net architecture, we delve into the precise delineation of tumor boundaries within MRI scans. This crucial task aids in treatment planning and monitoring tumor progression.

We evaluate the performance of these models through rigorous validation, including cross-validation and independent testing, to assess their generalization capability. Our results demonstrate that these deep learning architectures exhibit remarkable accuracy, sensitivity, and specificity in brain tumor detection and segmentation.

Furthermore, we explore the interpretability of these models, shedding light on the regions and features that contribute to their decision-making processes. This transparency is crucial for building trust with healthcare professionals and ensuring the clinical adoption of our system.

In conclusion, our project showcases the potential of CNN, ResNet, and U-Net models in the realm of brain tumor detection and segmentation. We believe that this research contributes significantly to the development of advanced tools for aiding medical professionals in diagnosing and treating brain tumors with greater precision and efficiency.

Efficacy of Different Plant Extracts and Novel Chemistry Insecticide, Cypermethrin Against Mosquitoes, *Aedes aegypti* (Diptera: Cricidae)

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Mosquitoes are the most significant insects for public health as they spread several diseases, including malaria, dengue, chikungunya, Japanese encephalitis, yellow fever, filariasis, and yellow fever, which kill millions of people annually. Dengue fever, dengue hemorrhagic fever, chikungunya, and yellow fever virus are all commonly transmitted in urban areas by *Aedes aegypti* mosquitoes. An allergic reaction, such as urticarial disease, can also result from a mosquito bite, as can localize skin reactions. The synthetic insecticides, due to their quick action, are considered as the first line of action, but their large-scale use has resulted in environmental hazards and development of resistance. Therefore, environmentally safe plant products having insecticidal properties are considered to be a potential alternative tool in mosquito control programs in the recent time. In the context of the human ecology, biopesticides may be used to manage mosquito populations. Biopesticide repellents have been used in current situation for generations in traditional practices as a personal protection measure against mosquitoes. Natural repellents development is in valuable resources through ethno-botanical studies. The natural insecticide is eco-friendly, cheaper, easily available and more resistant from mosquitoes. Recently, commercial repellents are plant based which is popularity among customers. In this study, we propose to evaluate the insecticidal properties of different plant extracts in combination with a new chemistry insecticide, Cypermethrin against *Aedes aegypti*. Additionally, we seek to compare the effectiveness of plant extracts and Cypermethrin in managing *Aedes aegypti* populations. The ultimate goal is to devise a straightforward, cost-effective, and environmentally safe approach for mosquito control and management under laboratory conditions. Four different concentrations (3%, 3%, 3%, and 3%) of each plant extract and one chemical 0.05% were used for this purpose. Effects of the various concentrations of plant extracts were found to be line or dose dependent. After five days of treatment the highest mortality rate of *Aedes aegypti* was 100% observed following the application of 3% *Azadirachta indica* extracts. Mean mortality of 100% and 92% was observed after the application of 0.05% Cypermethrin 10% EC and 3% *Melia azedarach* extracts, respectively. The 3% extracts of *Eucalyptus*, *Daturametel* and *Curcuma longa* caused an average mortality of 90%, 84%, and 78%, respectively. However, mortality due to 3% extracts of *Curcuma longa* was significantly lower. These results indicated that *Azadirachta indica* and *Melia azedarach* can be used for the effective management of *Aedes aegypti*. This study provides valuable insights for the utilization of these newly developed Plants extract in *Aedes aegypti* pest management programs.

Keywords: Mosquito, *Aedes aegypti*, indigenous plant extracts, efficacy, Cypermethrin10% EC and Control.

Mono-Model Image Registration Using SSD as Similarity Measure and Gaussian Curvature as Regularizer

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Image registration plays a vital role in numerous image processing applications. It aligns multiple images to facilitate effective information extraction through comparison, merging, or overlay techniques. This process requires designing an optimal transformation that aligns a template image closely with a reference image. Despite the existence of various models, crafting one that adeptly handles large and smooth deformation fields remains a significant challenge. This model presents a new variational approach to spatial registration of mono-model images. That incorporates Gaussian curvature (GC) as a regularization term and sum of square differences (SSD) as similarity measure. The model is inspired by prior work in geometric processing, particularly in surface restoration. A numerical solver that effectively manages the model is implemented using an augmented Lagrangian method. Our numerical evaluations demonstrate that this new model excels in robustness and accuracy compared to the diffeomorphic demon model.

Key words: Image registration, Regularization, Gaussian curvature, Robustness, Demon's model.

Honest Estimation of Sensitive Attributes Using Randomized Response Techniques in Survey Sampling

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In terms of survey research, the probability of getting proper data from the respondents dealing in sensitive topics makes the research hard because of anxiety and intrusion on privacy. RRTs (Randomized Response Technique) have become a powerful instrument not only to tackle the sensitive topics occur, but also to ensure confidentiality and to build trust between the researchers. The aim of this research is to set the RRTs in the provision of sampling survey for the trustworthy determination of sensitive attributes. However, RRTs have demonstrated in evoking truthful responses yet there is a need to optimize confidential information and also improve reliability and efficiency of results. Through this we will develop innovative systems that will allow us to measure and improve the effectiveness of RRT survey methods which are based on rapid response tools. This variety of methods is aimed at providing mechanisms to strengthen survey data credibility including technical or analytical shortcomings solutions as well as accuracy improvement. Our study will examine novel approaches including the BS1 Approach: Right and Left dominant Handedness (We can place choices on the left and right of the respondents as an experiment). BS2 Approach: Paper slip approach (We can place more than two different choices of written slips of paper as an experiment). BS3 Approach: Color coded response approach (We can place more than three different color-coded paper choices as an experiment because more than three color choices make humans indifferent). BS4 Approach: Calm before query approach (This approach can emphasize the process of easing participants into the questing phase, creating a relaxed atmosphere conducive to open and honest responses. BS5 Approach: Confidential questioning approach (This approach underscores the importance of sensitivity and privacy when engaging with individuals on sensitive topics, particularly when they are unfamiliar to the interviewer). These new approaches will lead to higher standards of the field of survey research since they better identify sensitive attributes, allowing us to estimate these attributes more accurately while ensuring respondent privacy and building trust. Verifying the efficiency of new RRT approaches and conducting real survey by using existing and new approaches of RRT.

Prevalence and antimicrobial susceptibility patterns of Staphylococcus aureus in Khyber Pakhtunkhwa

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Globally, *Staphylococcus aureus* is a leading cause of nosocomial infections. The purpose of this study was to ascertain the antimicrobial susceptibility pattern and prevalence of *Staphylococcus aureus* in Khyber Pakhtunkhwa.

Keywords: Prevalence, antimicrobial susceptibility, *Staphylococcus aureus*, nosocomial infection, KPK

Waste Food Management System

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Food waste is a major problem that affects the environment, economy, and society. To help solve this issue, we created a Waste Food Management App. This app helps people and businesses track, share, and recycle extra food. By making it easy to manage food waste, our app aims to reduce waste, help the environment, and support those in need. In this app we will try to connect NGO'S to some restaurants which will be more helpful to deliver extra food to deserving needy people. This project shows how technology can be used to solve real-world problems and promote sustainability. This application demonstrates how simple technology can make a big difference in solving everyday problems and promoting a greener future.

Versatile Zinc Oxide-Coated Dextran-Chitosan Nanocomposites: Increasing Antibacterial Potential, Accelerating Wound Healing, and Facilitating Tissue Regeneration

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A substantial advancement in biomedical research is made possible by the synergistic potential of neomycin in wound healing and the creative method of inserting it into graphene zinc oxide-polymeric nanocomposites. A well-known antibiotic called neomycin has been praised for its abilities to reduce the risk of infection and encourage tissue repair while also promoting wound healing. By cleverly incorporating neomycin into graphene zinc oxide-polymeric nanocomposites, this work advances the drug's wound healing capabilities. Zinc oxide is an effective antibacterial material that works well with graphene to create a matrix that is promising for the delivery of neomycin. By using methods like spectroscopy, microscopy, and thermal analysis to characterize these nanocomposites, structural characteristics are revealed. Neomycin is released in a regulated and sustained manner thanks to the novel delivery method, creating the perfect conditions for wound healing. In vitro and in vivo researches on wound healing are used to determine how effective these nanocomposites are. They hold great promise as advanced wound healing agents because of their capacity to speed up wound closure, encourage tissue regeneration, and reduce infection risk. The comprehensive aspect of this study, which includes neomycin's potential for wound healing and its incorporation into graphene zinc oxide-polymeric nanocomposites, is evidence of cutting-edge biomedical research. These nanocomposites open the door for effective and rapid wound healing techniques and have significant clinical practice ramifications thanks to their combination antibacterial and medication delivery characteristics.

Keywords: Graphene zinc oxide, neomycin, synergistic effect, antibacterial activity, wound healing

Fabrication of Novel Quinolone Derivative Nanocomposite with Improved Antibacterial Activity

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The emergence of microbial resistance to various antimicrobials is a significant problem in the field of medicine that could be addressed by three practical approaches: developing novel antibacterial drugs, derivatizing existing antimicrobials, or developing suitable nano carriers to enhance medication delivery at the site of action. Recently, novel gemifloxacin derivatives were developed in the laboratory that exhibited broad spectrum antibacterial activity especially against *Pseudomonas aeruginosa*. However, the developed nanoparticles lacked physiochemical properties such as aqueous solubility, which led to the development of a suitable nano carrier. The goal of this study was to develop a polymeric nanocomposite containing chitosan nanoparticles acting as suitable nano carrier loaded with the synthesized novel gemifloxacin derivative. Determining the zone of inhibition, the comparative antibacterial activity of the synthesized nanoparticles in relation to the parent medication was evaluated in this study. The results showing the zone of inhibition carried out using the well-played method clearly showed the rise in antibacterial activity. The characterization was carried out using UV/VIS, FTIR, and mass spectroscopy. DLS, Zeta-sizer and TGA-DSC and AFM were used to determine the morphology, and thermodynamic properties of nanoparticles.

Keywords: Chitosan nanoparticles, nanocomposite, gemifloxacin, *Pseudomonas aeruginosa*, antibacterial activity.

Anti-cancer properties of milk lactoferrin

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Cancer has emerged as a global health issue and become a one of major cause of deaths in 21st century. Even the existing therapeutic approaches for cancer prevention are indeed beneficial, but nowadays, tumor heterogeneity, non-specificity, and untargeted delivery of anti-cancer drugs have led to the problem of chemoresistance. Milk lactoferrin, a multifunctional protein belonging to the transferrin family. Lactoferrin, especially derived from bovine milk, has gained increased attention as a potential agent against cancer because of diverse immune-modulation, inflammation-related properties and low cost-effectiveness. Bovine milk lactoferrin is known to exert its anti-cancerous potential through the regulation of cell cycle, apoptosis induction, inhibition of metastasis, and immunomodulation. One of the major advantages of milk lactoferrin is its ability to cross the blood-brain barrier, making it suitable for treatment of brain tumors, especially glioblastoma. Moreover, lactoferrin can also act as a potential carrier for targeted delivery of anti-cancerous drugs, which can help eliminate multi-drug resistance in cancer. Lactoferrin plays a great role in host immune defenses as several important immune cells have surface receptors specific for lactoferrin. Lactoferrin can be used in oxidative stress-mediated inflammation-related disorders. Furthermore, the anti and pro inflammation characteristics of lactoferrin makes it of utmost interest in medical and therapeutic fields.

Key words: Cancer, apoptosis, immune-modulation, milk lactoferrin

Molecular Characterization and Analysis of the Antimicrobial Activity of Endophytic Fungi from *Withania coagulans*

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Endophytic fungi are a very diverse group of plant symbionts that have less defined ecological significance in terms of host fitness. In recent decades due to the wide biotechnological potential of endophytic fungi, the synthesis of bioactive secondary metabolites from these microorganisms has garnered considerable attention. Despite this, research on tropical endophytes is still lacking, especially on those that are isolated from medicinal plants. Furthermore, for the past 30 years, the pharmaceutical industry has stagnated, which has allowed pathogenic infections to advance and lead to the emergence of resistance. The isolation and description of fungal endophytes from various hosts have been published. An endophytic fungus was isolated and identified from *W. coagulans* based on its morphological and molecular characterization. The secondary metabolites from the isolated endophytic fungus displayed significant antimicrobial activity against pathogenic bacteria (*E. coli*, *P. aeruginosa*, and *K. pneumonia*, *S. aureus*, and harmful fungi (*C. albicans*, *C. krusei*, *C. tropicalis* and *A. flavus*). Gas-Chromatography Mass-Spectrophotometry (GC-MS) analysis was utilized to characterize the metabolite due to its volatile nature. Phylogenetic analysis of the fungus with other endophytic fungi producing bioactive metabolites revealed its close affinity with *Penicillium* species due to which it can be considered as a promising fungus that has broad spectrum antimicrobial activity and may provide future insight towards the production of bioactive compounds.

Key Words: Medicinal plants, *Withania coagulans*, Endophytic fungi, Secondary metabolites, Antimicrobial

Microbial Interactions with Microplastics and their Implications for Environmental Health and Food Security

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Microplastic (MPs) pollution without any doubt is one of the biggest environmental concern and has widespread implications for ecosystems and ultimately on human health. Understanding the complex connection of microplastic with microorganisms is very important for analyzing the severity of the given problem. MPs act as a base for different kinds of biofilms, which can intensify the production and transfer of pathogenic bacteria. This not only associated with the disruption of the natural microbial balance in ecosystems, but also become the source of such pathogens to harm other living organisms, including plants, animals and humans. Furthermore, plastics after degradation become extremely small with larger surface area. This makes them highly susceptible to adsorb many environmental contaminants like chemical additives, organic matter and heavy metals. This creates a synergistic effect where the combined toxicity of MPs and pollutants is significantly become greater than the individual components. The present study attempts to analyze the current researches on the topic of microbial interactions with different kinds and size of microplastics in different environments, including aquatic and terrestrial ecosystems. It also attempts to get better understanding of how MPs could pollute food chains. There are different microbial communities that could be associated with microplastics, including bacteria, fungi, and algae, and play important roles in plastic degradation, biofilm formation, and the transfer of harmful chemicals with living organisms and ultimately the food chain contamination. The findings indicated that microbes can colonize MPs, interacts with various pollutants and negatively impacts environmental health through altered nutrient cycling and the spread of pathogens. Through understanding the complex relation between microorganisms and microplastics, this review highlights the need for multidisciplinary steps to mitigate the environmental and human health risks posed by microplastic pollution.

Keywords: Microplastics, Food security, Organic pollutants, degradation, Food chain contamination.

A Comprehensive Review on exploring the functional properties of chickpea (*Cicer arietinum* L.)

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The adaptable legume crop known for its many functional qualities and high nutritional profile is the chickpea (*Cicer arietinum* L.). Chickpeas are a great source of protein, dietary fiber, vitamins, and minerals. One gram of chickpeas has around 3.64 kcal, 0.19 grams of protein, and 0.06 grams of fat (0.014 grams of monounsaturated fat, 0.026 grams of polyunsaturated fat, and 0.006 grams of saturated fat). Chickpeas have 0.03 grams of sugar, 0.17 grams of dietary fiber, and 0.61 grams of carbs per gram. Because of their high concentration of polyphenols, flavonoids, and vitamins E and C, they have remarkable antioxidant qualities. Chickpeas are a crucial part of a healthy diet because of their high dietary fiber content, which further increases their antioxidant potential. Chickpeas are an essential ingredient in many food compositions because of their remarkable functional qualities, which extend beyond their nutritional value. These qualities include water absorption, oil-holding capacity, emulsification, and foaming ability. They also have other health benefits, such as better digestion, weight control, and heart health. Furthermore, chickpeas are a significant plant-based protein source for vegetarians and vegans due to their high protein content and balanced amino acid profile. Chickpea flour's functional qualities allow it to improve texture and mouthfeel in processed foods, stabilize emulsions in sauces and dressings, and be used as a gluten-free substitute in baked goods. Moreover, products made from chickpeas have excellent sensory qualities. They give food items nutty tastes, creamy textures, and a pleasant mouthfeel. Chickpeas' health-promoting qualities are further enhanced by the presence of bioactive substances, such as antioxidants and anti-inflammatory agents, which may help prevent and treat chronic illnesses. Furthermore, when compared to animal-based protein sources, chickpeas exhibit environmental sustainability by lowering greenhouse gas emissions and improving soil fertility through nitrogen fixation. As a result, chickpeas' many useful qualities highlight their importance for the food sector, human nutrition, and sustainable agriculture, promoting their broad integration into a variety of dietary patterns and food systems.

Keywords: plant-based protein, vegan, heart health, weight loss, water absorption, bioactive substances, environmental sustainability sensory qualities, gluten-free substitute, oil-holding capacity, antioxidant properties.

Mycoremediation: A Sustainable Solution for Removing Pharmaceutical Pollutants from Wastewater.

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The population explosion and technological advancements have brought significant drawbacks, including environmental pollution and severe health issues. Massive industrial growth has left our biosphere contaminated, with a notable increase in pharmaceutical use exacerbating this problem. Pharmaceuticals, when improperly disposed of, pose severe risks to wildlife, ecosystems, and human health, making them significant environmental pollutants. Traditional wastewater treatment methods often fail to eliminate these contaminants, necessitating innovative solutions. Mycoremediation, which uses fungi and their derivatives to remediate environmental pollutants, offers a cost-effective, eco-friendly, and efficient alternative. Various fungal species, such as *Bjerkandera adusta*, *Aspergillus niger*, *Penicillium chrysogenum*, *Trichoderma harzianum*, *Trametes versicolor*, and *Pleurotus ostreatus* have shown effectiveness in degrading pharmaceutical compounds, including antibiotics, anti-

inflammatory drugs, antihypertensives, and endocrine-disrupting chemicals. These fungi employ enzymes to transform harmful pharmaceuticals into less toxic components, making mycoremediation a promising integration for existing wastewater treatment systems through fungal biofilm immobilization. Challenges in mycoremediation include optimizing conditions for fungal growth, scaling up the process for real-world applications, and ensuring the safety of fungal metabolites. Future recommendations involve combining fungi with other microorganisms for enhanced pollutant degradation, employing genetic engineering to boost fungal capabilities, and assessing long-term impacts on water quality and ecosystem health. These strategies aim to improve bioremediation efficiency and ensure sustainable environmental benefits.

Keywords: Mycoremediation, pharmaceutical pollutants, fungi, wastewater treatment, sustainable solution, human health.

Bioactive Compounds from Food Waste: Valorization and Potential Applications in Functional Foods and Pharmaceuticals

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Food waste is a rich source of bioactive compounds, which have potential applications in functional foods and pharmaceuticals. The valorization of food waste can reduce the environmental impact of waste disposal and provide a sustainable source of valuable compounds. This review highlights the bioactive compounds present in food waste, including fruit and vegetable peels, tea and coffee residues, and eggshell membranes. Food waste contains valuable compounds like polyphenols, flavonoids, and carotenoids, which have health benefits and can be used in functional foods and medicines. These compounds can act as antioxidants, anti-inflammatories, and even help prevent diseases like cancer. This innovative approach reduces the need for synthetic additives, which can have harmful effects on the environment and human health. By leveraging food waste-derived compounds, we can promote a circular economy where resources are utilized efficiently, and waste is minimized. This shift towards a more sustainable and regenerative food system not only benefits the planet but also offers potential health benefits. By harnessing the potential of food waste-derived bioactive compounds, we can create products that are better for the environment and human well-being, while reducing waste and supporting a more circular economy. Further research is needed to fully explore the potential of food waste valorization and to overcome the challenges associated with scaling up production and ensuring regulatory compliance.

Keywords: Food waste, Bioactive compounds, Valorization, Functional foods, Pharmaceuticals, Sustainable products, Eco-friendly products

Synergistic Effect of multitrait PSB for Osmotic stress Alleviation

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Drought is a significant abiotic stress that limits crop productivity worldwide. Water scarcity along with soil phosphorous deficiency adversely affects crop yield. Low mobility and high chelation rate makes phosphate a limiting macronutrient in soil, therefore, farmers commonly resort to synthetic fertilizers to deal with phosphate requirements of plants, however, the excessive application of synthetic phosphate fertilizers has had detrimental effects on our ecosystem. Plant growth-promoting rhizobacteria (PGPR) especially, drought-tolerant phosphate solubilizing rhizobacteria (PSB) present a range of sustainable solutions to address these issues. These microbes

colonize the roots and enhance plant resistivity through synergistic action of various mechanisms that assist plants in nutrient uptake through alteration in root morphology. In the present study, rhizobacteria with enhanced phosphate solubilization capabilities and the ability to withstand drought conditions were carefully chosen and their growth-promoting profile was thoroughly assessed. Phosphate solubilizing and drought resistance efficacy of these PSB was analyzed through HPLC and FTIR. The growth-promoting effects of these phosphate-solubilizing rhizobacteria were assessed using *Zea mays* L. Our findings indicated that these bacterial isolates demonstrated varying capabilities to solubilize phosphate under different physiological conditions. This data suggests that these bacterial strains hold promise as phosphate biofertilizers that can stimulate plant growth and enhance plant tolerance to water scarce conditions. Thus, use of such biofertilizers for growth improvement may replace chemical phosphate fertilizers which will be a cost-effective strategy for promoting green agriculture.

Key Words: Drought tolerant, PSB, Phytostimulation, HPLC, PGPR

Efficacy of Graphene-Based Nanocomposite Hydrogel as a Promising Wound Healing Biomaterial

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The development of biocompatible nanocomposite hydrogels with effective wound healing/ microbicidal properties is needed to bring out their distinguished characteristics in clinical applications. In current study, the synthesis, characterization, and angiogenic properties of graphene-based nanocomposite hydrogel have been corroborated and substantiated through several in vitro and in vivo assays. The nanocomposites were characterized by FTIR, UV-vis, XRD, SEM and TGA. Graphene based metal nanocomposites have shown strong anti-microbial activity against various bacteria and are considered as effective and non-toxic antibacterial agents. The combinational therapy of Bacitracin (BCT) with nanoconjugate system significantly improves the physicochemical properties of resulted materials and produces a synergistic effect in wound healing by improving the cellular response, producing a favorable microenvironment for cell survival which leads to optimum tissue regeneration in wound therapy. The cationic polymer chitosan was cross-linked with anionic dextran sulphate significantly *increased the BCT loading efficiency*. Thus, novel delivery strategy of BCT loaded graphene based CH / DEX nano conjugates gel has therapeutic potential in effective management of wound and scar free healing. Therefore, the developed scaffold can serve as a promising and cost-effective system against severe diabetic, burn and wound infections and a strong strategy for the advancement of therapeutic approaches for wound scar less healing.

Keywords: Bacitracin, nanocomposite, BCT, hydrogel, scar-free healing

Effect of kamarkas (*Butea monosperma*) flower extract on edema induced changes in inflammatory biomarkers: *In silico* and in vivo approaches

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Medicinal plants contribute a significant part of the natural defense against inflammation, in which vascular tissues multifaceted biological response to noxious stimuli like infections, injured cells, or irritants. Several experimental protocols were utilized to assess the efficacy of drug. New therapeutic drugs from plant sources that diminish inflammation and have fewer adverse effects, must be discovered and designed. The purpose of this research was to investigate the effect of *Butea monosperma* ethanolic flower extract in induction of paw edema by carrageenan of inflammation model in albino rats to evaluate inflammatory biomarkers and their phytoconstituents by *in-vivo* and *in-silico* approaches. In anti-inflammatory activity, 48 rats of either sex were split into three groups. Group I was the control group, had 10 rats and medicated with 10ml/Kg of saline. Group II was the standard group, had 10 rats and medicated with diclofenac. Group III was an experimental group, had 28 rats and medicated with ethanolic extract of *Butea monosperma* flowers at dosages of 50, 100, 200, and 400 mg/kg (7 rats for each dosage). At the 5th hour, ethanolic flower extract inhibits 70% of paw sizes, compared to the standard drug (diclofenac), which inhibits 74%. Blood samples were gathered under mild anesthesia and separated serum was stored at -20°C after centrifugation. ELISA kits were utilised to measure CRP, TNF- α and IL-6 contents quantitatively. Similarly, at a dosage of 400 mg/Kg, the biomarkers indicated significant anti-inflammatory activity. For *in silico* activity, target proteins CRP, IL-6 and TNF- α against butrin, isobutrin and standard drug diclofenac were chosen and their 3D structures were utilised in PDB format. Butrin, isobutrin had binding scores of -10.3kcal/mol and -9.2kcal/mol respectively, in comparison with diclofenac -8.1kcal/mol to target CRP in molecular docking. Butrin and isobutrin had binding scores of -8.2kcal/mol and -7.9kcal/mol respectively, in comparison with diclofenac -6.2kcal/mol to target IL-6. Butrin and isobutrin had binding scores of -7.5kcal/mol and -7.2kcal/mol respectively, in comparison with diclofenac -5.2kcal/mol to target the TNF- α in docking. Therefore, we concluded that alcoholic flower extract of *Butea monosperma* is capable to treat inflammation more efficiently and with fewer adverse effects as compared to synthetic drugs.

Keywords: Inflammatory biomarkers, phytoconstituents, ligands, *in-silico*, *in vivo*

Biological Activities and LC-MS profiling of the medicinal plant *Solanum xanthocarpum* L

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Medicinal plants are found overall the world and have great importance in formulation of herbal medicines. The present study deals with anti-oxidant and anti-bacterial activity and phytochemistry of medicinal plant *Solanum xanthocarpum*. Anti-bacterial activity was investigated against five gram+ive and gram-ive bacterial strains, using Agar well diffusion method. As a result, all bacteria shows different zone of inhibitions. According to observation *Micrococcus luteus* (8 $\pm$ 0.8, gram positive), and *Salmonella typhi* (7 $\pm$ 0.5) shows more inhibitions compared to *Staphylococcus aureus* (7 $\pm$ 0.5), *Enterobacter aerogens* (Nill), *Salmonella Setubal* (7 $\pm$ 0.6). *Enterobacter aerogens* shows no any inhibition. DMSO and Cafexime used as control. Anti-oxidant efficacy of *Solanum xanthocarpum* showed TFC (24.7 μ gGAE/mgDW), TPC (48.1 μ gGAE/mgDW), TRP (52.0 μ gAAE/mgDW), TAC(89.7 μ gAAE/mgDW) and DPPH (47.7% inhibition). Important phytochemicals identified by LCMS profiling of methanolic extract of *Solanum xanthocarpum*. It indicated that important glycosteroidal alkaloids like Solamargin (878.67 m/z), Solasonine (848.67 m/z), Solasodine(293.25 m/z), and Monatin (414.4 m/z) are present in effective extract of *Solanum xanthocarpum* on positive ionization mode. On negative ionization mode Flavonoids (Crismaritin 313.3 m/z), many Fatty acids (Linoleic acid 279.2 m/z, Stearic acid 283.8 m/z)phenolic (Caffiec acid 179.17 m/z, Rosmarinic acid 359.3 m/z, Sinapic acid 223.17 m/z,Catechin 289.25 m/z, Quinic acid 191.17 m/z), and Amino acids Carnitine (162 m/z) were also found.

Keywords: Anti-oxidant, Anti-bacterial, *Solanum xanthocarpum*, DDPH analysis, Liquid Chromatography.

Plasma Processing: A Sustainable Technology in Agri-Food ProcessingSafa Fatima¹, Mubeen Bashir², Tehreem Fatima³, Nisa Israr⁴, Dr. Amal Shaukat⁵, Dr Kanza Aziz Awan⁶.*Department of Food Science and Technology, University of Central Punjab, Lahore.*Corresponding author email: safamanzoor5@gmail.com

Globalization and rapid urbanization have resulted in significant advancements in agriculture and food processing sectors to meet growing food demands. Ensuring food product safety and quality across the entire agri-food chain, from pre-harvest to post-harvest stages, is crucial to prevent food spoilage and boost production. While various innovative approaches have been explored to address these challenges, no single technology can be universally applied at all processing stages, necessitating different solutions. Cold plasma, however, emerges as a versatile solution for many pre- and post-harvest issues, including soil and water contamination, microbial spoilage, insect infestation, and prolonged seed dormancy. Furthermore, recent applications of plasma in shaping food products underscore its versatility in agri-food processing. Its advantages, such as on-site production and residue-free treatment, contribute to its sustainability. Key compounds in plasma treatment, such as reactive species, UV photons, and electrons, equip it with the unique ability to address various pre- and post-harvest challenges. This review explores the potential of plasma technology throughout the agri-food chain. While various plasma systems have been developed, their scalability to large-scale applications remains a focus for future research.

Keywords: Globalization, Rapid urbanization, Advancements in agriculture, Cold plasma, Seed dormancy, Sustainability, Plasma treatment, Electron generation, Scalability, Large-scale applications

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Time Fractional Analysis of Free Convection Heat-Mass Transfer in Generalized Maxwell Fluid Flow with Heat Source and Radiations in a Porous Medium by Caputo-Fabrizio derivative

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This study investigates the time fractional analysis of free convection heat-mass transfer in generalized Maxwell fluid flow within a porous medium, under the consideration of the effects of heat source and radiation. The Caputo-Fabrizio derivative is used to the time fractional system of partial differential equation. The governing equations are derived using appropriate conversation laws and obtained the exact analytical solutions by Laplace transform technique. The impact of various physical parameters of the problem such as, fractional order, porosity, heat source and radiation on the flow are investigated graphically. Mathcad software has been used for the graphical illustration.

Key Words: Maxwell fluid, radiation, porosity, chemical reaction, Caputo-Fabrizio derivative.

Blockchain Technology for Ensuring Food Traceability and Transparency in Supply ChainsAmal Shaukat¹, Kanza Aziz Awan¹

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The use of blockchain technology in food supply chains offers a promising solution for ensuring traceability and transparency. Blockchain's reorganized and Permanent log technology enables real-time tracking and monitoring of food products throughout the supply chain, from farm to table. This increased visibility allows for swift identification and recall of contaminated or spoiled products, reducing the risk of foodborne illnesses and improving consumer trust. Blockchain technology enables farmers, suppliers, and manufacturers to share data and collaborate more effectively, streamlining supply chain operations and reducing costs. Blockchain helps us follow food from the farm where it's grown to the table where it's eaten, in real-time, so we can see where it's been and what's happened to it along the way. It also empowers consumers to make informed decisions about the food they eat, providing them with access to detailed information about the origin, quality, and movement of their food. The adoption of blockchain technology in food supply chains has the potential to revolutionize the industry by increasing efficiency, reducing risk, and promoting transparency and accountability. As the global food supply chain continues to grow and becomes more complex, the implementation of blockchain technology will play a critical role in ensuring the safety and integrity of our food.

Keywords: Blockchain technology, Food supply chains, Traceability, Real-time tracking, Food safety, Consumer trust, Supply chain operations

Removal of pharmaceutical pollutant in Aqueous Solution using Metal-Impregnated ZnO Photocatalysts Driven by Visible Light

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For the sonophotocatalytic degradation of emerging pollutant drug in aqueous solution under visible light irradiation, a comparative investigation of metals impregnated ZnO was conducted. In comparison to photolysis, sonolysis, photocatalysis, and sonocatalysis, sonophotocatalytic degradation efficiency is higher. Numerous operational factors were optimized, including pH, catalyst dosage, various enhancers and the scavenger effect, drug concentration at start, catalyst reusability, and catalyst settling time. It was found that, at pH 10, 30 minutes was the ideal time for the degradation of the selected pollutant while employing metal-impregnated ZnO photocatalysts. With 4 mmol of hydrogen peroxide and 0.15 g/L of photocatalyst, 99% degradation of the selected drug was achieved. The reusability of the catalyst was studied for three cycles, and good outcomes were obtained using a pseudo-first order kinetic model. With positive outcomes, the suggested approach was also used on synthetic and commercial samples successfully.

Keywords: Sonophotocatalysis; impregnated ZnO; Cefixime; degradation; regeneration.

Cinnamon: A potent nutraceutical supplement for cardiovascular disorders

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The application of common therapies for cardiovascular diseases is associated with side effects. Cinnamon contains cinnamaldehyde and cinnamic acid with protective properties against cardiovascular disorders, cardiac ischemia and myocardial infarction. Some risk factors for cardiovascular diseases are stress, and diseases such as diabetes, atherosclerosis, and hypertension. Furthermore, cinnamon has antioxidant and anti-inflammatory properties and exhibited beneficial effects on the complications of diabetes, obesity, [hypercholesterolemia](#), and hypertension which cause cardiovascular diseases. Using 100 mg cinnamon /kg body weight for two weeks had significant antioxidant ability in reducing the complications related to oxidative stress and increased total antioxidant power by reducing lipid peroxidation. Cinnamon supplementation improves the performance of the heart and increases coronary flow by enhancement of cardiac performance. It's declared that cinnamaldehyde protects smooth muscle cells of vascular against LDL oxidation-induced proliferation. The consumption of 500 mg cinnamon in type 2 diabetic patients for two months reduced blood sugar and lipid. Daily consumption of cinnamon powder for 16 months in male diabetic patients reduced diabetes complications. Ingesting 6 g cinnamon daily lowers triglyceride and total cholesterol in type 2 diabetes. Using cinnamon extract capsules in type 2 diabetes for two months reduced total cholesterol, HDL and LDL. Although the protective effects of cinnamon on the heart have been reported in many studies, it needs more clinical studies to prove the therapeutic efficacy of cinnamon on cardiovascular diseases.

Keywords: cardiovascular disease, cinnamon, nutraceutical

Utilization of Food Waste for Sustainable Biofuel Production: A Comprehensive Review

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As global energy demands and environmental concerns intensify, sustainable biofuel production emerges as a critical solution for mitigating climate change and reducing dependence on fossil fuels. Food waste, a significant environmental burden, offers a promising feedstock for biofuel production due to its abundance and high organic content. This study explores the potential of converting food waste into biofuels through advanced biochemical and thermochemical processes. Key methods such as anaerobic digestion, fermentation, and pyrolysis are examined for their efficiency, yield, and economic viability. The integration of these processes with existing waste management systems is also discussed to highlight the dual benefits of waste reduction and energy generation. Our findings suggest that food waste can significantly contribute to a circular economy by providing a sustainable and renewable energy source. This study underscores the importance of innovative technologies and policies to optimize the utilization of food waste, thereby advancing biofuel production and environmental sustainability.

Keywords: Food waste, biofuel production, anaerobic digestion, fermentation, pyrolysis, sustainable energy, waste management, circular economy, renewable energy, environmental sustainability.

Synthesis of Silver Nanoparticles using “*Kickxia ramisissoma* (Wall) Jan.” Extract and its Effect against “*Streptococcus mutans*” Biofilm

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Dental caries is a well-known oral health problem mostly in well-developed countries. Dental plaque is caused by microbes and in majority of the cases initiated by *Streptococcus mutans*. *S. mutans* is commonly found in oral cavity

and is acid-tolerant species because they produce acid and survive in an acidic environment. It is the main etiological agent of dental caries. Nanotechnology is one of the most advanced technologies. Use of this technology for the removal of *S. mutans* biofilm because the biofilm-forming microbial infection is difficult to treat. Silver nanoparticles (AgNPs) are a novel type of treatment used to remove. The study was performed using 80 samples from patients having dental plaques. Samples were screened using the protocols for the isolation of target species based on culturing and biochemical tests. During screening 47 (58%) were having *S. mutans* and 33(41%) were having other bacteria. AgNPs were synthesized using methanolic extract of *Kickxia ramisissoma* and characterized by Scanning Electron Microscopy (SEM), Ultraviolet spectroscopy (UV-spectroscopy), Fourier Transform Infrared spectroscopy (FT-IR), and X-Rays Diffraction (XRD). Biochemical tests showed that the isolated species were gram-positive, catalase-negative, facultative anaerobes, acid-producing, and alpha hemolytic. Silver nanoparticles synthesized using *K. ramisissoma* plant extract were used for the inhibition of *S. mutans* biofilm growth. In the case of *S. mutans*, it was observed that no layer of *S. mutans* was formed inside the tubes after treatment with AgNPs with different concentration, but the most effective concentrations were 100(73%), 75(46%), and 50(33%) µg/ml which show inhibition at a high level and low inhibition of biofilm at 25 µg/ml showed 15% inhibition. AgNPs of *K. ramisissoma* with crystalline size 43.825nm and with spicule shaped showed effective results against biofilm-forming microbes. The *K. ramisissoma* plant reduced the chances of biofilm formation such as oral biofilm and inhibit the growth of *S. mutans* which initializes the oral biofilm formation such as plaque.

Biodegradation of plastic polymers by the greater wax moth *Galleria mellonella*

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Various types of plastic are used extensively in agriculture, from plastic-coated seeds to mulch and biosolid fertilizers. Emerging evidence now suggests that these plastics are contaminating the soil and impacting biodiversity and soil health leading to reduced productivity and threatening long-term food security. Plastic degradation in the soil or water bodies may take centuries and efforts are being made to develop methods for the rapid and safe degradation of plastics in the environment. In this study, we evaluated the potential of the greater wax moth (GWM) *Galleria mellonella* larvae for the eco-friendly degradation of three different types of plastic; low-density polyethylene (LDPE), high-density polyethylene (HDPE) and extended polystyrene (EPS). Furthermore, the gut microbes of plastic-fed larvae were also identified via 16srRNA sequencing, and their role in plastic degradation was also investigated. FTIR analysis was performed to identify plastic degradation byproducts in the larval frass. GWM larvae were found to consume all three types (LDPE, HDPE, EPS) of plastic by directly munching or eating as food. Ten GWM larvae consumed more than 10% of plastics within one week. A total of 11 different species of bacteria from the *Pseudomonas*, *Bacillus*, and *Enterococcus* were identified in the gut microbiome of plastic-fed GWM larvae along with *Penicillium goetzii*. Results indicated an essential role of the gut microbiome in plastic degradation as GWM larvae fed with an antibiotic cocktail consumed significantly less plastic with a significantly lower bacterial recovery from the guts. Scanning electron microscopy of polyethylene discs treated with gut bacteria indicated significant degradation and biofilm formation by the gut bacteria. FTIR analysis of frass samples from plastic-fed larvae indicated the presence of several plastic degradation products such as benzene, vinylene, tetrachloroethylene, and ethyl esters. It is concluded that GWM larvae consume several types of plastic as food and therefore, can play an important role in the environmentally safe biodegradation of plastics. Further experiments including “no choice” and “free choice” tests are required to determine the suitability of GWM larvae for large-scale use in the environment.

Acknowledgment: The study was funded by the KNU convergence research project “Eco-safe biodegradation of plastic pollutants through insects” and the Abdul Wali Khan University Mardan Research & Innovation Fund to Dr. Adil Hussain.

Phytochemical Composition and Antibacterial Activities of *Xanthium strumarium* L. Extract Using GC-MS Analysis Collected From Polluted and Non-Polluted Areas of District Kohat

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Xanthium strumarium has a history of traditional medicinal use for various ailments, but scientific backing is limited. Research suggests potential anti-inflammatory and antimicrobial properties. A single plant of the genus *Xanthium strumarium*, which is a flowering plant in the Asteraceae family, can yield up to 20,000 seeds in a single growing season. Further research is required, although preliminary findings point to possible anti-inflammatory and antibacterial effects. Phytochemicals obtained from this plant have antispasmodic, anti-inflammatory, and analgesic activities, and also the plant is used to treat a wide range of illnesses (Linh et al., 2019). This kind of plant has therapeutic qualities and compounds that may be used in medicine. According to studies, these substances may be able to influence the secondary metabolites of the plant, which are crucial to its therapeutic qualities and include flavonoids, phenolic compounds, and alkaloids. Samples of plants and soil were gathered in triplicate from several locations throughout Kohat District at BARS Kohat Soil Testing Laboratory, the physical and chemical characteristics of the soil samples were examined, and the phytochemical elements (Cadmium, Chromium, Cobalt, Iron, Nickel, and Manganese) in the plant and soil samples were evaluated using a modified version of the (Catenza and Donker 2022) protocol. Analysis using Gas Chromatography-Mass Spectrometry (GC-MS) was carried out at the University of Peshawar CRL Laboratory. An assessment of the plant extract's phytotoxicity was conducted. The agar well diffusion method was used to test the plant extracts' antibacterial activity against gram-positive bacteria *Staphylococcus aureus*. Additionally, the ethanolic extract of *Xanthium strumarium* exhibited potent antibacterial against various bacteria's and pathogens.

In addition to measuring the quantity of heavy metals in soil and plant samples from different *Xanthium strumarium* locations in District Kohat, GC-MS analysis will be used to analyze the phytochemical profiles of the plant, as well as its phytotoxicity and antibacterial properties.

Key words: *X. strumarium*, Contaminants, Antibacterial activity, GC-MS, Anti-inflammatory, and Ant oxidative, phytotoxicity.

Pomegranate Peel: From Waste Material to Valuable Functional Food Ingredient

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Pomegranate production and consumption have been increasing globally due to their distinct taste and nutritional profile. During pomegranate processing, its peel is produced as agro-industrial waste, which if not properly handled can lead to severe environmental problem. The peel are rich in phenolic compounds, flavonoids, tannins, dietary fibre, minerals and vitamins. Presence of these compounds play a key roles as anti-inflammatory, antibacterial, improvement of cardiovascular disease, anti-infection and healing for welfare of human beings. These

phytochemicals can be employed in a wide range of industries, including food business for creation of enriched or functional foods, the pharmaceutical and health industries, as well as the textile industry. The macromolecules found in pomegranate peel have been recommended as substitute for synthetic nutraceuticals, food additives, and chemopreventive agents because of their well-known ethno-medical significance and chemical properties. The high antioxidant activity, inhibition of lipid peroxidation and broad-spectrum antimicrobial efficiency of pomegranate peel play an intrinsic quality foundation for its development as a food preservative. Various studies on addition pomegranate peel in dairy, meat, poultry, fish and milk product proved its role as bio preservative. This review aims to present the composition and benefits that can be obtained by processing pomegranate peel into food products to ultimately improve the health of individuals.

Keywords: Pomegranate peel, waste utilization, functional food, product quality, health benefits

Impact of Banana Peel Flour Supplementation on the Shelf Life and Antioxidant Properties of Biscuits: A Comprehensive Review

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The incorporation of banana peel flour into biscuit formulations has emerged as a strategic approach to address sustainability concerns while potentially enhancing product quality. This investigation focuses on elucidating the impact of banana peel flour addition on both the shelf life and antioxidant properties of biscuits, pivotal factors in ensuring product longevity and nutritional value. Through meticulous experimentation encompassing shelf-life assessments under diverse storage conditions and comprehensive analysis of antioxidant activity utilizing established methodologies, this study aims to discern the nuanced effects of banana peel flour incorporation. Key parameters such as moisture content, texture alteration, and microbial stability are rigorously examined to gauge alterations in shelf life attributable to banana peel flour inclusion. Similarly, robust evaluation of antioxidant properties offers crucial insights into the potential health-enhancing attributes conferred by banana peel flour. By systematically elucidating the dual influence of banana peel flour addition on shelf life and antioxidant properties, this research contributes essential knowledge to the development of sustainable, nutritionally enriched biscuit products poised to meet evolving consumer demands.

窗体顶端

窗体底端

Keywords: Banana peel flour, nutrition value, key parameters, consumer demand.

Therapeutic Properties of Camel Colostrum

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Colostrum is an essential source of nutrients and immunosuppressants for newborns. Camel colostrum contains less lactose and fat and more proteins, peptides, vitamins, and minerals than other animal colostrum. The major proteins in camel colostrum are immunoglobulins (IgG1, IgG2, IgG3), camel serum albumin, lactoferrin, and α -lactalbumin. Camel colostrum contains antimicrobial agents which actively stimulate the camel calf's immune system. Colostrum is characterized by very high levels of immunoglobulin, transmitted immediately after delivery from the mother's colostrum to the infant, born without immunoglobulin in the blood, thus creating passive immunity. The highest insulin concentration was at 0 hours after calving. It was the highest, then reached $367.5 \pm 286.1 \mu\text{mol} / \text{mL}$ in 24

hours, 20% of the initial rate. Camel colostrum is rich in fatty acids with potential health benefits such as oleic acid, vaccenic acid and CLA. The high lactoferrin content can explain this in one hump colostrum. Camel lactoferrin has antimicrobial activity on various infectious agents such as bacteria, molds, and viruses, anti-cancer, and anti-oxidant activities. α -lactalbumin is involved in the apoptosis of tumor cells and the trapping of free radicals. Colostrum is characterized by very high levels of immunoglobulin, transmitted immediately after delivery from the mother's colostrum to the infant, born without immunoglobulin in the blood, thus creating passive immunity.

Key words: Camel colostrum, immunoglobulin, lactoferrin

Fake Product Review Identification

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In the age of digital e-commerce, the integrity of product reviews is important for consumers to make informed purchasing decisions. Sometimes it's hard to know which product reviews are real and which are fake, fake product reviews can trick customers into buying something that isn't worth the money. So, it's necessary to identify fake reviews so that buyers make better decisions. Using machine learning algorithm, machine is trained and able to spot signs that reviews may be unfair. In proposed work analysis is done to differentiate between fake and real reviews. We look at the frequency of certain words, the emotions expressed, and even the spelling. Reviews for popular products can reach thousands. This makes it difficult for potential customers to read them and decide whether to purchase the product. It's a way to use profile mining to obtain real products from real customers, let companies and other customers know whether reviews are good or bad, and blacklist fake accounts. New reviews can be quickly verified and provide reliable ratings. The score will help buyers know whether they can trust what they're reading or whether they should take it with a grain of salt. Through our work, we hope to encourage our customers to make an informed decision and avoid falling victim to fraud.

An Overview Of Deep Learning Model For Active Contour Models For Medical Image Segmentation.

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The cardiovascular system, which includes the heart and blood vessels (veins, arteries and capillaries), is important for transport oxygen, nutrients, hormones and other essential substances throughout the body. Cardiovascular health is critical, as it has a direct impact on overall health and longevity. However, a variety of disorders can damage the cardiovascular system, causing a major health risks. Medical image segmentation, particularly in cardiac MRI scans, is important for diagnosing, treating, and monitoring cardiovascular diseases. Current deep learning algorithms struggle to accurately detect regions of interest. The proposed model is given, which takes into account both the inner and outside parts of the area of interest, along with the boundary size. This proposed model incorporates area and size information, which improves its capacity to segment cardiovascular structures. Evaluations on a large dataset of over 2,000 images demonstrated that the proposed loss function improved segmentation accuracy and efficacy. The approaches robustness was also evaluated across multiple hyper parameter values, confirming its adaptability and consistency in a variety of circumstances.

Key words: cardiovascular, segmentation, deep learning, MRI scans, robustness.

A comprehensive review of the Pharmacological Impact of Mulberry (*Morus spp.*) on Human Health

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Mulberry (*Morus spp.*) has been recognized for its pharmacological properties and therapeutic potential in traditional medicine systems worldwide. This review aims to provide a comprehensive overview of the pharmacological impact of mulberry on human health. Mulberry is rich in bioactive compounds such as flavonoids, phenolic acids, anthocyanins, alkaloids, and polysaccharides, which contribute to its diverse pharmacological effects. Mulberry extracts exhibit potent antioxidant activity, scavenging free radicals and protecting cells from oxidative stress-induced damage. Additionally, mulberry demonstrates anti-inflammatory properties by inhibiting pro-inflammatory mediators and pathways, thus mitigating inflammatory responses implicated in various chronic diseases. Mulberry has been extensively studied for its anti-diabetic effects, with evidence suggesting its ability to lower blood glucose levels, improve insulin sensitivity, and regulate lipid metabolism. These effects are attributed to mulberry's ability to inhibit carbohydrate-digesting enzymes, enhance glucose uptake, and modulate insulin signaling pathways. Furthermore, mulberry extracts have shown promising anticancer activity by inducing apoptosis, inhibiting proliferation, and suppressing angiogenesis in cancer cells. Its phytochemical constituents exert chemopreventive effects by targeting multiple signaling pathways involved in cancer development and progression. Moreover, mulberry exhibits hepatoprotective effects, attenuating liver damage induced by toxins, oxidative stress, and metabolic disorders. Its anti-fibrotic and anti-steatotic properties contribute to liver regeneration and function restoration. Mulberry's cardiovascular benefits include vasorelaxant, anti-hypertensive, and anti-atherosclerotic effects, which collectively improve vascular function and reduce the risk of cardiovascular diseases. Additionally, mulberry demonstrates neuroprotective effects, enhancing cognitive function, and ameliorating neurodegenerative disorders through its antioxidant, anti-inflammatory, and anti-apoptotic actions. In conclusion, mulberry emerges as a promising pharmacological agent with multifaceted health benefits. Its antioxidant, anti-inflammatory, anti-diabetic, anticancer, hepatoprotective, cardiovascular, and neuroprotective properties highlight its therapeutic potential in the prevention and management of various diseases. Further research is warranted to elucidate the underlying mechanisms and optimize its clinical applications.

Key words: pharmacology, anti-oxidant, anti-cancerous, alkaloids, flavonoids, phenolic acid,s anthocyanins.

Polypyrrole: synthesis, characterization and its potential application for humidity sensor

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In this work, polypyrrole (PPy) is synthesized, characterized, and employed as an active sensing material for the fabrication of humidity sensors. An 80 nm thick layer of PPy is spin coated on the pre-patterned thermally deposited silver (Ag) electrodes spaced 50 μm apart to fabricate Ag/PPy/Ag surface-type sensor. Atomic force microscopy analysis revealed granular microstructure morphology in the thin films of PPy. Additionally, X-ray diffraction (XRD), ultraviolet–visible (UV-Vis) and Fourier transformed infrared (FTIR) spectra of PPy are analyzed to study

its crystallinity, optical bandgap and bond dynamics to confirm the molecular composition of PPy. The fabricated Ag/PPy/Ag sensor is characterized by varying the humidity levels between a broad range [0–95% relative humidity (RH)] at different frequencies of 120 Hz and 1 kHz. The prepared sensor showed promising sensing features such as higher sensitivity 233 nF/%RH (at 120 Hz), 83 pF/%RH (at 1 kHz), quick response time (5.20 ± 0.2 s) and recovery times (6.43 ± 0.2 s), a wide working range of relative humidity (20–95%RH) and low hysteresis gap (1.57%) with outstanding recyclability. This study reveals the potential of PPy as the best candidate for humidity sensing applications.

The Transformative Potential of Plant-Based Diets in Preventing and Managing Chronic Diseases: A Comprehensive Review

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The surge in chronic diseases such as cardiovascular ailments, diabetes, and cancer has prompted an urgent quest for effective dietary interventions to alleviate these health burdens. Plant-based diets have emerged as a focal point due to their potential to prevent and manage these conditions. This review aims to elucidate the profound impact of plant based dietary patterns on the prevention and management of chronic diseases. It delves deeply into the intricate biological mechanisms through which plant-based diets confer their beneficial effects, encompassing the modulation of inflammation, oxidative stress, gut microbiota composition, and metabolic well-being. Notably, this review underscores the pivotal role of whole food sources including fruits, vegetables, legumes, nuts, and whole grains in mitigating disease risk factors. Furthermore, it meticulously explores the robust evidence linking plant-based diets to enhanced cardiovascular health, improved glycemic control, and lowered cancer risk, drawing from seminal studies and clinical trials that substantiate these assertions. Additionally, it scrutinizes the impact of plant-focused nutrition on weight management and overall longevity. Moreover, it critically evaluates the potential of plant-based dietary interventions in not only halting disease progression but also in elevating quality of life. Furthermore, it underscores the imperative of tailoring nutritional strategies to individual needs, preferences, and cultural contexts. In summation, this review underscores the transformative potential of plant-based diets in combatting chronic diseases, offering invaluable insights into the profound health enhancements achievable through the adoption of a plant based lifestyle.

Keywords: Chronic diseases, Plant-based diets, Prevention, Biological mechanisms, Inflammation, Whole foods, Cardiovascular health, Glycemic control, Cancer risk
Weight management, Longevity, Quality of life

e-DNA as a powerful tool for revealing the composition of biological communities in natural ecosystems

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Increased anthropogenic activities have impacted community composition in the natural environments and are still ongoing, causing unfavorable habitat variations such as endangerment, extinctions and introduction of invasive species. Several conventional approaches have been implemented to assess rare and small species with constraining outcomes which need to be replaced by innovative molecular techniques like e-DNA. e-DNA released in the environment provides authentic insights of ecological patterns and processes which can improves monitoring efforts

of lost, extinct, rare and present biodiversity there. e-DNA occurs in all ecosystems (air, soil and water) and is used to assess species distribution and their abundance and provides information of characteristics like nucleotide sequences, identity of organisms (identified and non-identified) and their evolutionary histories. Improved e-DNA approaches can also improve bio-monitoring and high resolution assessments of marine and freshwater biodiversity and their spatio-temporal nestedness. e-DNA based technologies also provide quantitative data of endangered species, detect invasive species and help to investigate cryptic and elusive species and ultimately scale up the biodiversity data to perform further quantified assessments. However, technical challenges and complexities should be evaluated carefully and determine the scope and relevance of target species or environment critically with e-DNA based techniques. By standardizing e-DNA techniques and understanding their distribution and persistence in the natural environments to perform accurate spatio-temporal distribution, species composition, their abundance and rarity studies, we can improve the bio-monitoring, conservation efforts, species composition and diversity, and give future interpretations for e-DNA detection studies.

Key words: Anthropogenic activities, Biodiversity, e-DNA, Bio-monitoring, Conservation, Species composition.

A Comprehensive Review on pharmaceutical benefits of jujube fruits (*Ziziphus jujuba*) on Human Health"

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Jujube fruits, also known as *Ziziphus jujuba*, have been valued for their medicinal properties for centuries in traditional medicine, particularly in Asian cultures. These small, red or green fruits are rich in various bioactive compounds that contribute to their extensive range of pharmaceutical benefits. One of the most notable benefits of jujube fruits is their high antioxidant content, which includes flavonoids, polysaccharides, and triterpenic acids. These antioxidants help combat oxidative stress in the body, reducing the risk of chronic diseases such as cancer and cardiovascular ailments. Additionally, jujube fruits are known for their immune-boosting properties. The fruit's polysaccharides enhance the immune system by increasing the production of immune cells and enhancing their activity, which helps the body fight off infections more effectively. Moreover, jujube fruits have significant anti-inflammatory and anti-microbial properties. The saponins and alkaloids present in the fruit have been shown to reduce inflammation, which can be beneficial for conditions like arthritis and other inflammatory disorders. These compounds also exhibit antibacterial and antifungal activities, making jujube fruits useful in preventing and treating various infections. Another notable benefit is their role in improving digestive health. Jujube fruits are rich in dietary fiber, which aids in digestion by promoting healthy bowel movements and preventing constipation. They also have a soothing effect on the gastrointestinal tract, which can help alleviate symptoms of ulcers and other digestive issues. Furthermore, jujube fruits are known for their calming and sedative effects, making them a natural remedy for anxiety and insomnia. The fruit contains compounds such as saponins that have a soothing effect on the nervous system, helping to reduce stress and promote better sleep. Additionally, jujube fruits have been linked to improved cognitive function. Regular consumption of jujube has been associated with better memory and learning abilities, likely due to their antioxidant and anti-inflammatory effects, which protect the brain from damage and support overall brain health. Overall, the pharmaceutical benefits of jujube fruits make them a valuable addition to a health-conscious diet, offering a natural way to enhance physical and mental well-being.

Key words: traditional medicine, bioactive compounds, high antioxidant content, reducing the risk of chronic diseases, immune-boosting properties, anti-inflammatory and anti-microbial properties, improving digestive health, improving digestive health, promoting healthy bowel movements, preventing constipation.

Use of Bovine Protein Hydrolysates from Slaughterhouse Wastes to the Diet of Farmed Rainbow Trout (*Onchorynchus mykiss*)

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The environmental conditions of Balochistan are perfect for trout culture, but trout fishing sector is not sufficiently developed. The farmers apply basic techniques; as a result, yields are low—less than one tonne per hectare. Affordable and quality trout feed should be available in Balochistan's local markets in order to promote trout farming. Animals can benefit from the highly digestible proteins and bioactive peptides found in bovine-protein hydrolysates, as well as certain amino acids (such as glutamate), through which they can perform physiological and regulatory activities and get nutritional benefits. These peptides have positive impacts on fish's health and wellness as well as feed efficiency by boosting gastrointestinal function, and immunity to fight against infectious diseases. The aim of the research was the formulation of a feed for rainbow trout (*Oncorhynchus mykiss*) by the application of bovine protein hydrolysate from slaughterhouse wastes. This research offers a practical method for turning animal waste into high-class protein hydrolysate for trout feed. This is a low-cost method of turning animal byproducts into high-quality protein-hydrolysate. This research confirms that protein hydrolysates made from waste from livestock can be used either on their own or as a supplement for trout feeding.

Impact of diet composition on the fitness of the greater wax moth *Galleria mellonella* L. and the subsequent parasitization by Entomopathogenic nematodes

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The Greater Wax Moth (GWM) *Galleria mellonella* L. is an important insect pest threatening Apiculture globally. The *G. mellonella* larvae infest beehives and cause significant damage. Numerous chemical and biological methods have been proposed for controlling *G. mellonella*'s infestations, but they are cost-effective and need alternative eco-friendly/sustainable control strategies. However, *G. mellonella* larvae are promising hosts for rearing entomopathogenic nematodes (EPN). Therefore, the present study aimed to investigate the effect of different synthetic diets (sustainable) on the fitness parameters of *G. mellonella* and the production potential of EPNs under laboratory conditions. We collected *G. mellonella* samples from local farms and reared them on artificial diets under standard laboratory conditions. After successfully establishing *G. mellonella* colonies, we challenged the GWM larvae (L4-L6) with ENP *Steinernema feltiae* and *Steinernema carpocapsae* infective juveniles (IJ) to evaluate their EPN-rearing potential. The synthetic diets beneficially affected the *G. mellonella* life history traits/EPN production potential. Life history traits analysis showed that artificial diets had improved the overall health of GWM, notably shortened egg incubation period and increased egg hatching rates, larval/pupal instar length, weight, and adult longevity. Consequently, lab-reared GWM larvae have supported EPN growth, and the number of EPN (IJ) increased compared to the initial infectious dose (EPN-ID). Hence, the selected diets were deemed cost-effective and sustainable in enhancing fitness parameters and the production of EPN. We recommend a more detailed investigation into the biology of GWM, including its life history traits, sustainable diet search, and underlying molecular drivers that enhance the overall vigor of GWM larvae and effective utilization of this pest for the commercial production of eco-friendly biocontrol agent *S. carpocapsae* and *S. feltiae*.

Keywords: Greater wax moth (GWM), *Galleria mellonella*, Synthetic diets, Entomopathogenic nematodes (EPNs), *Steinernema feltiae*; *Steinernema carpocapsae*

Microplastics Interaction with Co-Stressors and their Subsequent Influence on Health and Quality of Edible Food Crops

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Microplastics (MPs) have emerged as a ubiquitous environmental pollutant with devastating impacts on ecosystem and human health. Micro plastics are very harmful for edible plants and crops, and their influence increase multiple times when they combine with other environmental stressors like heavy metals, organic pollutants and other chemical additives. Microplastics interacting with co-stressors influence morphological, physiological, ecological and genetic damages in edible plants such as disturbed ionic homeostasis, varied chlorophyll content and photosynthesis, inhibited growth, decreased shoot and root mass, reduction in seedlings leaf area, its shoot and root biomass, reduced crop yield, decreased lysine and protein contents, oxidative damages, root necrosis, crop productivity, altered gene expressions, decreased root hydraulic activity, mechanical injuries, reduces grain yields in crops like rice. However, in soil they reduce nutrient availability, reduced soil pH, increased toxins mobilization, decreased soil micro-biome diversity, and reduced soil nitrates. Translocation and accumulation of MPs in edible parts of crops leads to potential human exposure through food chain. Several indigenous approaches can help these impacts in edible crop plants to be minimized for example, by growing resistant and tolerant plants systematically in crop fields to immobilize these contaminants. Further, deep understanding of antagonistic or synergistic combined effects of MPs and costressors is very crucial to develop sustainable agricultural practices and mitigating their risks on both humans and food security. There is also need for interdisciplinary approaches to address multifaceted challenges posed by MPs in agroecosystem. However, awareness about environmental pollutants and their health effects is necessary to make precautionary measures, research efforts and solutions more effective.

Key words: Microplastics, Co-stressors, Food security, Crop quality, health damage, soil system.

Physiochemical Analysis of Wastewater from Peshawar

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Waterborne infections persist as substantial global challenges to public health. This investigation seeks to thoroughly examine the quality of wastewater and the extent of contamination in wastewater originating from diverse sources through the application of various physicochemical and biological methodologies. A total of 15 samples were accumulated from various sources and locations within Peshawar, KPK (Khyber Pakhtunkhwa).

The parameters assessed included discoloration (Pt/Co scale), pH, Total plate count (TPC), Coliform presence, fecal coliform presence and confirmatory test for *E. coli*. The results confirmed the presence of the most deadly and life-threatening microbes in water along with suspended solids. The colony count from each dilution accumulated from various sources marked the water as highly pathogenic and extremely toxic for human health.

The insights derived from this study offer crucial guidance for policymakers to take measures to use advanced techniques to purify and detoxify the water to make it suitable for drinking.

Key words: Global public health, waterborne, physicochemical, parameters, biological test.

***Eleutheronematetradactylum* Oil Ointment Efficacy in Arthritis Patients**

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The aim of study was to find out effectiveness of massage oil doses of different composition containing measurable quantity of Iron (Fe), Calcium (Ca), Magnesium (Mg), Sodium (Na) and Potassium (K) in the samples of Mustard and Extra Virgin Olive oil. Analysis was done on atomic absorption spectrophotometer for the detection of elements Iron (Fe), Calcium (Ca) and Magnesium (Mg). Different doses were prepared by frying process through Mustard and Olive oils. These doses were applied on arthritis patients to relief joint pain instead of oral supplement. In frying cycle I (500g fish fried in 500 ml Mustard oil) show positive strong correlation coefficient 0.83 between raw and processed mustard oil. Very strong correlation observed 0.99 between raw and processed mustard oil in frying cycle II (500g fish fried in 250 ml Mustard oil). Distilled water 250 ml was added in frying cycle III with similar composition of frying cycle I which show strong positive correlation is higher 0.98 as compared to frying cycle I. In frying cycle IV 250ml distilled water was use with similar composition of frying cycle II the positive strong correlation was measured lower as 0.94 when compared with frying cycle II. Extra virgin olive oil use as a dilution factor to prepared different doses for massage. These doses of different composition applied on the selected female patients of osteoarthritis under observation of physiotherapist. These females applied doses on pain targeted area for 14 days before sleep, on day 15 physiotherapist investigate the pain intensity. The remarks were quoted as the patients woke up with no pain in morning.

Keywords: Mustard oil, Olive oil, Salmon fish, Arthritis

The Importance of Food Science and Technology

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Food science is a multidisciplinary field that integrates various scientific disciplines to comprehensively understand food components and materials. This paper focuses on transforming these components into safe and nutritious products for consumers, examining their critical role in contemporary society, particularly in economic growth, food security, and public health. The study explores future challenges and opportunities in food science and technology, assessing the effectiveness of food safety measures and advancements in food processing techniques. A thorough review of research literature, including industry reports, academic publications, and case studies, was conducted. Expert insights on emerging trends, multidisciplinary contributions to food science, and historical analyses of technical breakthroughs were synthesized. Qualitative data from case studies provided real-world applications of food science advancements, while quantitative data analyzed the impact of food safety measures on public health outcomes. The study delved into significant developments in food processing methods, such as high-pressure processing and modified atmosphere packaging, which have enhanced food safety and preservation, leading to improvements in public health and a reduction in foodborne illnesses. Challenges identified include the need for sustainable practices and addressing global food security issues, with a focus on advancing food supply technologies to meet the demands of a growing population. The report underscores the importance of ongoing technological advancements in food processing to maintain product quality and highlights future considerations and potential

solutions to address complexities in the food production-to-consumption chain, emphasizing the urgency for accelerated technical innovation to meet global needs for diverse, nutritious, and affordable food choices.

Keywords: Food science /technology, public health, food safety, technological developments, and multidisciplinary collaboration.

Sports Anxiety, Emotional Intelligence and Quality of Life among University Athletes

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Aim of the study: The present study was conducted to investigate the relationship between sports anxiety, emotional intelligence and quality of life among university athletes. **Methodology:** The sample comprised of 200 university athletes of males and females. Sports Anxiety Scale-2 (2006), Wong and Law Emotional Intelligence Scale (2002) and Athlete Quality of Life Scale (2004) were used to measure sports anxiety, emotional intelligence and quality of life of university athletes. **Results:** Results showed that sports anxiety negatively effects quality of life and emotional intelligence positively affects quality of life. Emotional intelligence significantly predicts quality of life and sports anxiety inversely predicts quality of life among university athletes. Emotional intelligence moderated the relationship between sports anxiety and quality of life. Athletes with higher emotional intelligence being associated with increased quality of life and decreased sports anxiety. A significant gender difference indicates that male athletes have lower sports anxiety and higher quality of life as compared to female athletes. This study also indicates that non significant differences were found between sports anxiety and emotional intelligence on individual and team sports. Results also showed that beginners/young athletes have higher sports anxiety as compared to professionals/adult athletes. **Conclusion:** The findings of the study will serve as platform for improving the emotional intelligence in university athletes to better cope with sports anxiety and to improve quality of life.

Keywords: Sports Anxiety, Emotional Intelligence, Athlete Quality of Life, University Athletes.

A Comprehensive Review on Anti-oxidant Properties of Watermelon (Citrullus lanatus) on Human Health"

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This in-depth analysis looks at the health implications of watermelon's (*Citrullus lanatus*) antioxidant qualities. Antioxidants, such as beta-carotene, lycopene, and vitamins C and A, are abundant in watermelon and are essential in scavenging free radicals and lowering oxidative stress. The review summarizes the most recent findings about the roles played by these antioxidants in promoting a range of health advantages, with particular attention to cardiovascular health, cancer prevention, skin health, and general metabolic function. One of the most prevalent antioxidants in watermelon, lycopene, has been the subject of much research due to its powerful ability to scavenge free radicals. Research indicates that lycopene consumption lowers the risk of cardiovascular illnesses by lowering inflammation and improving lipid profiles. Additionally, lycopene and other antioxidants in watermelon have showed promise in decreasing the risk of some malignancies, including prostate cancer, through pathways involving the suppression of cancer cell growth and activation of apoptosis. The research also highlighted the impact of watermelon's antioxidants in increasing skin health by guarding against ultraviolet (UV) damage and improving skin moisture and suppleness. Moreover, the immune system and collagen formation are supported by the high vitamin C content. According to preliminary research, watermelon's antioxidants may help regulate metabolic parameters by enhancing insulin sensitivity and lowering signs of oxidative stress. In spite of the positive health effects, the study recommends more clinical research to make conclusive connections and comprehend the body's

absorption and metabolism of these antioxidants. In general, this review underscores the significant potential of watermelon as a functional food with powerful antioxidant properties, advocating for its inclusion in the diet to promote health and prevent disease.

Synthesis and Evaluation of the Therapeutic Efficacy of Nanoparticles by Employing the Genus *Echinacea*

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Echinacea plants, particularly *Echinacea purpurea*, have been long valued for their immunostimulatory, anti-inflammatory, and antioxidant activities. Key constituents like chicoric acid and alkyl amides are used to treat upper respiratory tract infections. Despite the promising therapeutic effects, the stability and bioavailability of these compounds are significant challenges. Nanotechnology is the potential solution to enhance drug delivery to targeted sites while minimizing adverse effects. Combining *Echinacea* with nanotechnology is a novel multidisciplinary approach to treating resistant bacteria like *Staphylococcus aureus*. The phytoconstituents of *Echinacea* species specifically *E. purpurea*, *E. angustifolia*, and *E. pallida* act as natural reducing and capping agents which makes them highly effective and biocompatible for the synthesis of organic, inorganic, and polymeric nanoparticles. This review explores the traditional use of *echinacea*, its pharmacological properties against multidrug-resistant pathogens and wound healing, and the use of nanotechnology to improve therapeutic outcomes. Furthermore, it focuses on its potential use in developing efficient and sustainable healthcare solutions.

Use of nanoparticles and entomopathogenic fungi for the sustainable management of oriental fruit fly (*Bactrocera dorsalis*, Diptera:Tephritidae)

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Entomopathogenic fungi (EPF) serve an important role in pest management, as indicated by their successful activity against a variety of fruit fly species, including *Bactrocera zonata* and *Ceratitis capitata*. To sustainably manage *B. dorsalis*, we assessed the synergistic and additive impacts of three EPF strains (*Beauveria bassiana*, *Metarhiziumanisopliae*, and *Aspergillus* spp.) and nanoparticles that were biosynthesized (silver and zinc oxide). Four different amounts of EPF strain (1×10^2 , 1×10^4 , 1×10^6 , and 1×10^8 cfu/ml) and silver/zinc oxide nanoparticles (100, 200, 300, and 400 µg/ml) were utilized utilizing direct and topically approaches under laboratory circumstances. Data for EPF was gathered at 4, 6, 8, and 10 day intervals, whereas nanoparticles were analyzed daily for up to 6 days..At an average concentration of 1×10^8 cfu/ml, *B. bassiana* showed the highest rate of proportional mortality (90.47%), followed by *M. anisopiliae* (85.71%) and *Aspergillus* spp. (66.79%). The death rates for silver and zinc oxide nanoparticles were 95.56% and 86.74%, respectively. Regarding the additive effect of EPF and nanoparticles, the highest mortality rates were $97.77\% \pm 0.91$ (AgBB), $93.57\% \pm 0.87$ (AGMA), $82.22\% \pm 0.79$ (AGAF), $83.77\% \pm 0.79$ (ZnOBB), $80.89\% \pm 0.87$ (ZnOMA), and $70.98\% \pm 0.67$ (ZnOAF). These findings imply that using entomopathogenic fungus and nanoparticles to control *B. dorsalis* is a highly successful integrated pest management (IPM) strategy and an acceptable substitute to insecticides that are chemical-based.

Exploring the Nexus: Exposure to Media Violence, Learned Helplessness, and Perceived Stress in Young Adults amidst the Israel-Palestine Conflict

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Objective: This study investigates learned helplessness and perceived stress levels among young adults exposed to media violence related to the Israel-Palestine conflict.

Methods: A cross-sectional, correlational design was utilized to collect data from 100 young adults (aged 18-30) via online surveys. Learned helplessness and perceived stress levels were assessed using the Learned Helplessness Scale (Quinless & Nelson, 1988) and the Perceived Stress Scale (Cohen & Williamson, 1988), respectively. Demographic information and media consumption data related to the Israel-Palestine conflict were also gathered. Statistical analyses, including descriptive statistics, Pearson Product Moment Correlation, t-tests, ANOVA, and Tukey's HSD test, were conducted using SPSS software.

Results: The study explored form of media violence exposure in terms of content, time spent watching the content and demographic factors of age and gender differences among the participants and its relation with psychological factors like learned helplessness and perceived stress. The findings revealed that while exposure to violent media is positively related with perceived stress, but it is not significantly related to learned helplessness. Younger adults consumed more violent media compared to older adults. There were no significant gender differences in perceived stress and learned helplessness. Viewed content indicated that bombing related media content was related to greater learned helplessness in comparison to graphic content.

Conclusion: In summary, the study underscores the link between media violence and psychological distress among young adults during the Israel-Palestine conflict. Exposure to media violence can bring in harmful psychological effects like stress, or may desensitize people to violence in the real world and that, for some people, watching violence in the media becomes enjoyable and does not result in the anxious arousal that might be expected from seeing such imagery. Therefore, measures may be taken to limit the spread of such information on media sources.

Keywords: Exposure to media violence, Perceived stress, Learned helplessness, Young adults, Israel Palestine Conflict

High-Fidelity Full Frontal Image Reconstruction From Occluded Faces Via Conditional Generative Adversarial Networks

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This work presents a novel method for reconstructing whole front images that are high in quality from occluded faces, with the use of a Conditional Generative Adversarial Network (CGAN). In this paper, we try to solve a very challenging problem in synthesizing and recognizing face images, the so-called side-to-front face conversion. In the following, we propose a general framework that allows training realistic frontal views from side facial images using convolutional neural networks (GANs variant: CGANs), conditioning by additional inputs. Through adversarial training, our model knows how to synthesize the corresponding frontal facial features correctly and convincingly. We explain in which situations our method is particularly well suited due to occlusions where conventional methods suffer. This innovative methodology has the potential to revolutionize how we handle facial recognition tasks,

particularly in challenging real-world scenarios where faces are partially obscured. This creation is a game changer that could greatly impact how we approach facial recognition, i.e., as a partial solution, particularly in difficult, real-world scenarios where faces are obstructed.

Keywords: Facial Reconstruction, Conditional Generative Adversarial Networks, Occluded Face Imaging, Side-to-Frontal Transformation, Computer Vision Applications

Thiophene-Azomethine-Sulfone Linked Copper Oxide Nanocomposites: Synthesis, Characterization and Their Antimicrobial Activities

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Thiophene-incorporated sulfone-based composites integrated with copper oxide nanoparticles were synthesized and characterized via spectral analysis. The sulfone linked thiophene based additive (ST) was synthesized via condensation of 4,4'-diaminodiphenyl sulfone (DDS) and thiophene carbaldehyde. The polymer matrix and its composites were synthesized from diglycidyl ether of bisphenol A (DGEBA), DDS and ST (1-5, C1-C5) %. Each composite was checked for its thermal resistance, antimicrobial activity, and observed that composite C3 with 3 % additive exhibited relatively good antimicrobial activity and thermal stability. Therefore, C3 was used to prepare nanocomposites (NC1-NC5) by incorporation of 1-5 % copper oxide nano particles, characterized via spectral analysis and XRD diffraction. The study evaluates the influence of varying concentrations of copper oxide nanoparticles on the antimicrobial and thermal properties of the resulting nanocomposites. It was observed that the thermal stability increases linearly with the loadings of copper oxide nanoparticles. All the synthesized thiophene-copper oxide nanocomposites exhibited excellent antibacterial as well as antifungal activity against *streptomyces*, *bacillus subtilis*, *Candida albicans* and *Penicillium*.

Chemical Composition and Bioactivities of Essential Oil and Extracts of *Cynoglossum amabile*

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Cynoglossum amabile as therapeutic herb. *C. amabile* belongs to family Boraginaceae, The therapeutic effect of these plants is related to the content of many biologically active compounds, including naphthaquinones, flavonoids, terpenoids and phenols. The constituents isolated from these plants exhibit antimicrobial, antitumor, antiviral, anti-inflammatory, cardiogenic, contraceptive and antiplatelet activity . *C. amabile* contains a variety of alkaloids, of which the main components are pyrrolizidine alkaloids with high clinical value. In addition, extracts of *C. amabile* were shown to have inhibitory effects on certain bacteria and fungi. Extract and characterize essential oils and fractions of *C. amabile* by hydrodistillation, Soxhlet extraction, gas chromatography-mass spectrometry (GC-MS), ultraviolet-visible (UV-Vis), and Fourier Transform infrared (FT-IR) spectroscopic techniques. Evaluate antioxidant, *in vitro* antioxidant, antimicrobial, insecticidal, and anti-inflammatory activities of the extractives and the products. The organic solvent extracts and Eos of this species showed good antioxidant antimicrobial, insecticidal, and anti-inflammatory activities.

Key Words: CaEos

Relationship between Psychological Distress, Resilience and Burnout among University Students

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Objective: This study aimed to investigate the relationship between the variables of Psychological distress, resilience, and burnout among university students. Additionally, the study sought to analyse gender differences in Psychological distress, resilience, and burnout among university students.

Methods: The study utilized a quantitative approach with a cross-sectional research design and convenience sampling technique. The research included 100 participant (47 males and 53 females) from the universities of Islamabad and Rawalpindi, Pakistan. Kessler Psychological Distress Scale (K10), brief resilience scale (BRS), and indigenous burnout scale (IBS) were administered to the participant. Descriptive statistics, Pearson moment Correlation and t.Test analysis were employed for hypothesis testing.

Results: The findings indicate that psychological distress had a significant negative relationship with resilience among university students. Furthermore, psychological distress had a significant positive relationship with burnout among university students. Burnout has a non-significant negative relationship with resilience among university students. Results also showed that there was a significant gender difference in resilience, whereas no significant gender difference was found in psychological distress and burnout. Male students had higher resilience as compared to female students.

Conclusion: Students facing prolonged periods of stress may experience burnout. There is need to pay recognition and acknowledgement of the condition, followed by commitment to change current habits of students and counseling services by educational institutes.

Alleviation of Salt Stress Using Indigenous Strains of *Trichoderma* species in Maize(*Zea mays* L.)

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Salt stress significantly hampers maize (*Zea mays* L.) growth and yield, posing major agricultural challenges in regions with high soil salinity. This study explores using indigenous *Trichoderma* species to mitigate these adverse effects. Researchers isolated various *Trichoderma* strains from local environments, characterized them for plant growth-promoting properties, and applied them to maize plants under controlled saline conditions. The experiment featured several treatment groups, each with a different *Trichoderma* strain, and a control group without *Trichoderma*. The maize plants were exposed to a range of saline conditions to simulate natural soil salinity. Key growth parameters measured included germination rate, plant height, biomass accumulation, chlorophyll content, and yield components like kernel number and size. Results indicated significant improvements in all growth parameters for *Trichoderma*-treated maize plants under saline conditions. Treated plants showed higher germination rates, increased plant height, greater biomass, and enhanced chlorophyll content compared to controls. Yield components also improved, with more and larger kernels, indicating a direct positive impact on productivity. The study hypothesizes that *Trichoderma* alleviates salt stress by producing plant growth-promoting hormones (auxins, gibberellins, cytokinin's), enhancing root development, and overall plant vigor. *Trichoderma* strains likely improve nutrient uptake efficiency by modifying root architecture and increasing nutrient availability in the soil. They may

also promote beneficial microbial communities and suppress pathogens, leading to improved soil health. These findings highlight the potential of using indigenous *Trichoderma* species as a sustainable, eco-friendly strategy to combat salt stress in maize. This approach could enhance agricultural productivity in saline-prone areas, contributing to food security and sustainable farming practices. The study recommends further research and field trials to optimize *Trichoderma* use and fully understand their interactions with maize under various environmental conditions

Key words: *Trichoderma* Species, Maize, Salt stress, Growth Parameters, Indole-3-acetic acid

Genetic Analysis of Achondroplasia in Family of District Kurram

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Achondroplasia is the most prevalent kind of skeletal dysplasia in humans. It is an autosomal dominant genetic disorder. The estimated prevalence effecting at least 25000 people worldwide. There hasn't been much research on this disease in Pakistan, and further research is needed to fully comprehend the condition. In order to identify sequence variation, the goal of this work is to create allele-specific primers and its impact on the protein structure for transmissible achondroplasia in a particular family of specific north western area district Kurram Khyber Pakhtunkhwa Pakistan.

In this cross sectional a family of the achondroplasia was studied in which total three (4) members were effected. Blood was collected from two (2) effected and four (4) normal members of the family. In this study the blood was collected in EDTA tube from the family. Genomic DNA was extracted from the blood (750ml) using the phenol chloroform method and whole exome sequence (WES) was performed. The WES data was analyzed and candidate variants were filtered out the segregation analysis using the sanger sequencing. Allele specific primers were designed to amplify the target specific region through PCR. Insilico analysis was performed to analyze the pathogenicity of candidate variant.

The WES analysis of the family identified a missense-mutation in GALNS gene at chromosome number 16. The nucleotide "C" is replaced by "T" at cDNA position 1175 (c.1175C>T) due to which the protein Alanine was replaced by Valine at position 392 (p.(Ala392Val)). The mutations were proven to occur together with the illness in a recessive phenotype using Sanger sequencing of the family. Several web-based bioinformatics applications verified the pathogenicity of the variants.

Key words: Achondroplasia , PCR, WES, GALNS, EDTA

The Impact of Social Anxiety on Social Media Addiction among Adolescents: Mediating Role of Para-Social Relationships

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Objective: This study aimed to investigate the impact of social anxiety on social media addiction among adolescents and the mediating role of Para-social relationships. Additionally, the study sought to analyse gender differences in social anxiety, social media addiction, and Para-social relationships among adolescents.

Methods: The study utilized a quantitative approach with a cross-sectional research design and snowball sampling technique. The research included 120 participants (68 females and 52 males) aged 10 to 19 from Rawalpindi and Islamabad, Pakistan. The Bergen Social Media Addiction Scale (BSMAS), Social Anxiety Scale for Adolescents

(SAS-A), and Para-Social Relationship Scale were administered to the participants. Descriptive statistics, Pearson Product Moment correlation, t-Test analysis, and regression analysis were employed for hypothesis testing.

Results: The findings indicated that social anxiety is a positive predictor of social media addiction among adolescents. There was a significant positive relationship between social anxiety, social media addiction, and Para-social relationships. Additionally, Para-social relationships significantly mediated the relationship between social anxiety and social media addiction. Gender analysis revealed that males exhibited higher social media addiction compared to females.

Conclusion: Social anxiety contributes to social media addiction in adolescents, with para-social relationships playing a significant mediating role. Males are more prone to social media addiction than females. These findings underscore the importance of addressing social anxiety and understanding Para-social relationships in mitigating social media addiction among adolescents.

Keywords: Social Anxiety, Social Media Addiction, Para-Social Relationships, Adolescents, Gender Differences

Revolutionize Administrative Processes within Educational Institutions by Automating Tasks, Facilitating Seamless Communication, and Fostering Collaboration Among Stakeholders

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The School Management System (SMS) represents a pivotal advancement in educational administration, offering a robust and intuitive web-based platform to optimize school operations and communication. Leveraging a comprehensive array of technologies including HTML, CSS, JavaScript, PHP, and SQL, this system embodies efficiency and accessibility through its dual portals: the Student Portal and the Admin Portal.

At its core, SMS aims to revolutionize administrative processes within educational institutions by automating tasks, facilitating seamless communication, and fostering collaboration among stakeholders. With a user-friendly interface accessible to administrators, teachers, students, and parents, SMS is poised to enhance the educational experience for all involved.

The Student Portal serves as a hub for students, providing essential information about the school, academic services, faculty, and extracurricular activities. Through features like online admission forms and authenticated access, students can engage with the system effortlessly.

Conversely, the Admin Portal empowers administrators with centralized control over student, teacher, and parent information. From managing student records to overseeing class schedules and assignments, administrators can streamline operations with ease.

Built upon a technology stack comprising HTML, CSS, JavaScript, PHP, and SQL, SMS is designed for scalability and reliability. Implementation will occur in phased stages, prioritizing core functionalities before refining the interface and introducing additional features.

Looking ahead, SMS anticipates future enhancements such as integration with third-party services for online payments and attendance tracking, as well as the development of mobile applications for enhanced accessibility.

In conclusion, the School Management System represents a collaborative effort to redefine educational administration through innovation and technology. With its comprehensive features and user-centric design, SMS is poised to revolutionize administrative processes and enhance the educational experience for all stakeholders.

Thickness Optimization and Photovoltaic Properties of Bulk Heterojunction Solar Cells Based on PFB–PCBM Layer

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We report on the fabrication and study of bulk heterojunction (BHJ) solar cells based on a novel combination of a donor–acceptor poly(9,9-dioctylfluorenyl-2,7-diyl)-co-(N,N0-diphenyl) -N,N0di(p-butyl-oxy-pheyl)-1,4-diamino-benzene (PFB) and [6, 6]-phenyl-C61-butyric acid methyl ester (PCBM) blend composed of 1:1 by volume. indium tin oxide (ITO)/poly(3,4-ethylenedioxythiophene):poly(styrenesulfonate (PEDOT:PSS)/PFB–PCBM/Ag BHJ solar cells are fabricated by a facile cost-effective spin-coating technique. The thickness of the active film (PFB–PCBM) plays an important role in the efficiency of light absorption, exciton creation, and dissociation into free charges that results in higher power conversion efficiency (PCE). In order to optimize the PCE as a function of active layer thickness, a number of solar cells are fabricated with different thicknesses of PFB–PCBM films at 120, 140, 160, 180, and 200 nm, and their photovoltaic characteristics are investigated. It is observed that the device with a 180 nm thick film demonstrates a maximum PCE of 2.9% with a fill factor (FF) of 53% under standard testing conditions (STC) (25 °C, 1.5 AM global, and 100 mW/cm²). The current–voltage (I–V) properties of the ITO/PEDOT:PSS/PFB–PCBM/Ag BHJ devices are also measured in dark conditions to measure and understand different parameters of the heterojunction. Atomic force microscopy (AFM) and ultraviolet-visible (UV-vis) absorption spectroscopy for the PFB–PCBM film of optimal thickness (180 nm) are carried out to understand the effect of surface morphology on the PCE and bandgap of the blend, respectively. The AFM micrographs show a slightly non-uniform and rough surface with an average surface roughness (Ra) of 29.2 nm. The UV-vis measurements of the PFB–PCBM blend exhibit a reduced optical bandgap of ≈ 2.34 eV as compared to that of pristine PFB (2.88 eV), which results in an improved absorption of light and excitons generation. The obtained results for the ITO/PEDOT:PSS/PFB–PCBM (180 nm)/Ag BHJ device are compared with the ones previously reported for the P3HT–PCBM blend with the same film thickness. It is observed that the PFB–PCBM-based BHJ device has shown two times higher open circuit voltage (Voc) and, hence, enhanced the efficiency.

Clean Waters, Safe Food : Selective Removal of Radioactive Cesium in Water Using Self Assembled Magnetic Prussian Blue Graphene based Aerogel (3D-MPBRGO)

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Highly selective removal of Cesium (Cs) is critical for environmental remediation. Since the nuclear weapon's testing in 1950s and 1960s and subsequent nuclear power plants mishaps such as Chernobyl and Fukushima disaster in 1986 and 2011 respectively has resulted into the release of radioactive Cs into our environment. Self assembled

magnetic Prussian Blue/ reduced graphene oxide (3D-MPBRGO) aerogel was prepared by an easy and cost effective process at room temperature for elimination of radioactive Cesium from contaminated aqueous solution selectively. The 3D-MPBRGO displayed excellent adsorption capability of 3.64 mmol per g (484.12 mg/g) for Cs (initial 50mM cesium concentration, pH 7 and 30°C) and quick separation from solution by applying magnetic field as compared to previously published results for graphene based adsorbents. This excellent removal efficiency of nanocomposite can be ascribed to enlarged adsorbent surface area (402.68m²/g) and uniform distribution of nanoparticles on RGO which removes aggregation of sheets as well. The thermodynamic analysis displayed exothermic and spontaneous nature of Cs ion adsorption. The experimental data of adsorption isotherm followed the Langmuir isotherm model than that of Tempkin and Freundlich while adsorption kinetics followed pseudo second order.

Anticonvulsant Effect of Phytotherapeutics Targeting Neuroinflammation in PTZ Induced Mice Model

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Epilepsy is the most prevalent and life-menacing neurological disorder distributed among 50 million people worldwide. Epilepsy more dominantly occurs in developing countries and is considered to be connected with witchcraft as divine. Epilepsy characterized by spontaneous unprovoked seizures as well as unexpected transient behavioral changes caused by abnormal, synchronous rhythmic sacking of a group of neurons. The disease presents notable therapeutic challenges as a result of its various etiology including pathobiology, and variants that are resistant to medication resulting in the development of refractory epilepsy. Additionally, focusing on biocompatibility and toxicity concerns linked with conventional drugs leads to investigate alternative therapies including plant extract and essential oils etc. The anticonvulsive properties of herbal remedies have generated a lot of interest and motivated systematic investigation in the hopes of utilizing them in conjunction with anti-seizure pharmacotherapies and for targeting novel targets in case refractory epilepsy. Medicinal plants possess great therapeutic potential to be used against epilepsy. Many bioactive leads are being used to treat epilepsy. This study was designed to analyze the anti-inflammatory and anticonvulsant properties of *Solenum americanum* in PTZ induced mice model. Results were quite promising relevant to seizure score and % protection. It was noted that plant extract presented considerable anti convulsant effect by reducing seizure score and % mortality as compared to diazepam. Conclusively, these phytoconstituents attenuated the expression of inflammatory cytokines NF-κB and p-TNF-α in treated group comparable to PTZ group.

Mono-Model Image Registration Using SSD as Similarity Measure and Gaussian Curvature as Regularizer

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Image registration plays a vital role in numerous image processing applications. It aligns multiple images to facilitate effective information extraction through comparison, merging, or overlay techniques. This process requires designing an optimal transformation that aligns a template image closely with a reference image. Despite the existence of various models, crafting one that adeptly handles large and smooth deformation fields remains a significant challenge. This model presents a new variational approach to spatial registration of mono-model images. That incorporates Gaussian curvature (GC) as a regularization term and sum of square differences (SSD) as similarity measure. The model is inspired by prior work in geometric processing, particularly in surface restoration.

A numerical solver that effectively manages the model is implemented using an augmented Lagrangian method. Our numerical evaluations demonstrate that this new model excels in robustness and accuracy compared to the diffeomorphic demon model.

Key words: Image registration, Regularization, Gaussian curvature, Robustness, Demon's model.

Analyzing Sepsis in the ICU: Severity, Antibiotic Prescribing Patterns, and Patient Outcomes through the APACHE-IV Scale

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Sepsis, the body's systemic immune response to infection, can execute organs. This study evaluates the prevalence, severity, prescribing pattern of antibiotics, and outcomes of sepsis in ICU patients. This observational-analytical prospective investigation was conducted on 140 ICU patients admitted with severe sepsis and septic shock in health care. The severity of illness was assessed by Acute Physiology and Chronic Health Evaluation IV (APACHE-IV). Antibiotic prescribing trends were also assessed to optimize therapeutic failure risk assessment for septic ICU patients. Statistical analysis such as Fisher's exact test and Pearson-Chi square test were used to determine the statistical relationship between age, APACHE-IV score, therapeutic outcome, and microbial growth studies across different parameters. The clinical and laboratory profiles of the survivor and non-survivor groups were compared using one-way ANOVA. Results revealed that sepsis occurred in one quarter (25.1%) of ICU-admitted patients. APACHE-IV under-predicted death rates as the Actual Mortality Rate (AMR = 50%) was higher than the average APACHE-IV predicted mortality rate (PMR = 36.6%). The use of combination antibiotics is more prevalent in empiric therapy than in definitive therapy. Meropenem was the most prescribed empiric antibiotic either as monotherapy or in combination, whereas colistin was the most prescribed antibiotic in definitive therapy either alone or in combination. This study concluded that sepsis is associated with high mortality. Continuous calibration of severity scales can improve patient outcomes. Judicious use of antibiotics is highly recommended as the last resort of antibiotics for treating sepsis. This study focused on optimizing antibiotic stewardship programs to improve treatment options for critically ill septic patients in ICUs. It integrates APACHE IV scoring and provides a comprehensive analysis of antibiotic choices.

Establishing THTT Derivatives as Promising Anti-leishmanial and Anti-inflammatory Compounds; an - In-vitro & In-silico approach

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ABSTRACT

Cutaneous leishmaniasis is neglected tropical disease caused by *L. tropica* and *L. major* and other members of the same species. This disease is a significant challenge in public health sector especially in developing and underdeveloped countries. Currently available drugs are facing serious challenges like, toxicity, resistance to available drugs and are not cost effective thus there is a dire need for the development of safe and effective treatments. In current study thirty derivatives of Thiadiazine thione (THTT) were screened against *L. tropica*, at a varying concentrations utilized in an MTT assay over a 48-hour period. Notably, compounds T25, T24, T9, BG and PG exhibited noteworthy IC₅₀ values of 8.074, 8.827, 9.025, 10.77 and 12.00 µg mL⁻¹, respectively. Moreover, the

same compounds demonstrated promising docking scores against critical leishmanial enzymes. The evaluation of cytotoxicity through hemolytic assay revealed that all compounds are non-cytotoxic to human blood erythrocytes with CC_{50} values less than 5%. Furthermore, *in-silico* investigations targeting *COX-1* and *COX-2* enzymes unveiled high affinity towards the tested compounds indicating their potential involvement as anti-inflammatory agents. Subsequent *in-vitro* assays confirmed the anti-inflammatory potential of the compounds T9, T25, T24, BG and PG. These results demonstrate the potential of THTT derivatives as an effective and a novel class of antileishmanial agents against *L. tropica* together with favorable safety profiles along with potential anti-inflammatory properties. Further research elucidating their mechanisms of action and *in-vivo* efficacy is highly recommended.

Keywords: Cutaneous leishmaniasis, Cytotoxicity, MTT assay, Thiadiazine thione, Anti-inflammatory assays.

Study of Anti-oxidant Activity of Whole Orange Powder and Its Application as a Food Preservative

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Background: People's awareness of functional essential components is growing in the present lifestyle context, which is driving up demand for functional foods. In recent years, there has been a growing interest in orange trash due to its antioxidant capabilities, which can be used as a preservative and also to prevent disease. Citrus by-products have been shown to have the potential to be significant sources of phenolic compounds if they are fully utilized. More phenolics are present in the peels than in the edible parts and they are a rich source of natural flavonoids. Whole orange powder, which has high levels of bioactive components but is underutilized, may help treat degenerative illnesses.

Methodology: This study examined the effects of water, ethanol and methanol on the antioxidant activity and total phenolic content of whole orange powder, which was then employed as a natural preservative in cookies. The DPPH test was used to evaluate the antioxidant activity and total polyphenolic content were measured by Folin reagent.

Results: The findings showed that the total phenolic content and antioxidant activity of whole orange extracts varied. Water extracts had the lowest total phenolic content values (167 mg GAE/g), whereas methanolic and ethanolic extracts displayed the highest values (350.8 and 283.4 mg GAE/g, respectively). At a concentration of 100µg/ml, the methanolic extract had the greatest antioxidant% inhibition value, 87.67%, followed by the ethanolic extract (65.40%), and the water extract had the lowest, 52.25%. When whole orange powder (2-10%) was use as a natural preservative in cookies promising results obtained with 5% amalgamation.

Conclusion: Based on the study's findings, it can be concluded that the solvents significantly affect the amount of phenolic compounds overall and the antioxidant capacity of whole orange powder. In addition, it concludes that waste orange powder is a significant natural antioxidant source.

Keywords: whole orange powder, polyphenols, antioxidants, preservative, cookies.

Sustainable Production of Anti-Hypertensive Peptides from Caprine Milk Proteins Oral Presentation

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In the quest for sustainable healthcare solutions, this project explores an innovative approach to address hypertension using caprine milk as a renewable resource. Angiotensin-I-converting enzyme (ACE), a key player in blood pressure regulation, is targeted for the production of ACE inhibitory peptides (ACE-IP). Caprine milk protein (CMP) serves as the raw material, undergoing hydrolysis by various proteolytic enzymes—trypsin, pepsin, and their combination at different intervals. Pepsin emerges as the optimal enzyme, exhibiting the highest ACE inhibitory activity at 87.84% after 36 hours. Gel filtration chromatography (Sephadex G-25) is employed to purify ACE-IP, resulting in eight fractions demonstrating ACE inhibitory activity. Fraction 64, derived from CMP hydrolysates by pepsin (36 hr), stands out with the maximum ACE inhibition activity. RP-HPLC analysis refines the purification process, and F64, with an IC₅₀ of 8.7 mg/mL, emerges as a promising candidate. This innovative approach not only taps into the potential of caprine milk as a sustainable source but also aligns with the broader theme of renewable energy by emphasizing eco-friendly production processes. By repurposing natural resources for healthcare solutions, we take a step towards a more sustainable and interconnected future.

Keywords: Angiotensin-converting enzyme, ACE-IP, caprine milk, protein hydrolysate, amino acid sequence, renewable energy

Poultry and PCOS: Decoding the Hormonal Impact

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The primary aim of this study is to determine whether there is a correlation between the consumption of chicken and the manifestation of PCOS (Polycystic Ovary Syndrome) symptoms in female participants.

The study also seeks to understand the level of awareness among participants regarding the potential association between chicken consumption and PCOS.

To determine the correlation of chicken consumption and prevalence of overweight individual Poultry consumption is a common dietary practice worldwide, with chicken and turkey being the most widely consumed poultry products. Poultry is favoured for its relatively lean protein content and versatility in various culinary dishes. It provides essential nutrients such as protein, vitamins, and minerals, making it a popular choice for many diets. Poultry consumption has also increased as a result of the shift towards healthier eating habits and a preference for white meats over red meats. However, it's important to consider factors like sourcing, preparation methods, and portion sizes to ensure a balanced and healthy diet. Poultry consumption has raised concerns about potential links to hormonal imbalance especially in the female causes the PCOS this happen due to the use of growth-promoting agents and sex steroids in poultry farming. These hormones, when ingested, may disrupt the endocrine system in humans, potentially leading to imbalances. This could result in health issues such as disrupted menstrual cycles and leading to PCOS .In this study, perform a cross sectional survey based study in order to find out the correlation between the poultry consumption and hormonal imbalance. Current study analyse the data in which 180 participants took a part and through which conclude and elucidate the relation between poultry consumption and hormonal imbalances leading to PCOS.

Key Words: PCOS, Hormones. Chicken Consumption and females participants

Antibiofilm Activity of *Eucalptus camaldulensis* for Combating Bacterial Infections

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Eucalyptus (river red gum.) is considered as important medicinal plant worldwide. It is used for medicinal purposes especially as a cough remedy and has significant role against most of microbial pathogens that impose serious diseases, negatively affecting the humans and cause serious illness. Major aim and objective of this study was to identify the antibiofilm activity of *Eucalyptus camaldulensis* against biofilm forming bacterial pathogens affecting human. All samples (leaves of plants) were collected from different regions of district Haripur. Well diffusion method was used for initial antibacterial activity of plant extracts. Muller Hinton agar medium was used for antibacterial activity of bacterial pathogen by using temperature of 37°C for 1 to 2 days of incubation. After antibiofilm activity on 96 well plate cultured samples were stained by using crystal violet stain. For confirmation of strains Congo red method was performed. After GCMS analysis eucalyptol(37%), 10S, 11S-HIMACHALA-3(12), 4-DIEN(56%) and AZIRIDINE, 2-METHYL-2-(2,2,4,4) were detected along with many other compounds which could be used against antibiofilm activity of bacteria. Some of these compounds had reported antibacterial activities. Traditional treatment of infectious diseases is based on compounds that aim to kill or inhibit bacterial growth. Further research is needed on un-reported compounds having antibacterial activities. The reported compounds having proven antibacterial activities could be utilized for treatment of multidrug resistant bacterial pathogens.

Time Fractional Analysis of free Convection Heat Mass Transfer in Generalized Second Grade Fluid with Heat Source and Chemical Reaction in a Porous Medium by Using Caputo Fabrizio Derivative

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This study investigates the time-fractional behavior of free convection heat-mass transfer in a generalized second-grade fluid flowing through a porous medium, subjected to a heat source and chemical reaction. The Caputo-Fabrizio derivative is utilized to model the time-fractional derivatives. The system of dimensionless equations as like, temperature, concentration and velocity equations with appropriate initial and boundary conditions is obtained through dimensionless analysis. The Laplace transform technique is adopted to obtain the exact analytical solutions for the temperature, concentration and fluid velocity profiles. Finally the effects of various parameters such as Prandtl number, fractional parameter alpha, and Grashof number on the heat and velocity fields are visualized and analyzed graphically through Mathcad software.

Key Words: Second grade fluid, exponential heat, chemical reaction, slip, Laplace transform, Caputo-Fabrizio derivative.

Chemical Composition of Essential Oil of *Artemisia vulgaris*

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Essential oils are the volatile bioactive compounds sourced from different plant parts. Biologically, they are used for the delay of formation of free radicals/oxidation reactions, and microbial growth inhibition. *Artemisia vulgaris* (Mugwort) one of the most distributed species of family *Asteraceae* has a rich historical background in traditional medicines to cure irregular menstruation cycle, stomach pain/gastric ulcers, neonatal jaundice, and hepatitis. It

exhibits hypoglycemic, diuretic, anti-septic, anti-helminthic, and analgesic activities. The present study investigates the chemical composition of the essential oil hydrodistilled from *Artemisia vulgaris* by gas chromatography followed by mass spectrometry (GC/MS) technique. The GCMS analysis revealed the presence of caryophyllene, lavandulyl isobutyrate, cycloundecatriene, germacrene D, nerolidol, ethyltetramethylcyclopentadiene, caryophyllene oxide, caryophyllenyl alcohol, acorenone B, and *n*-hexadecanoic acid. These compounds serve as primary source in formulation of new drugs.

Key words: *Artemisia vulgaris*, essential oil, hydrodistillation, chemical composition, GC-MS analysis

Poly Methyl Methacrylate, Polypyrrole and Graphite NANoplatelets Blending System Preparation and their Dielectric Characterization

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The polymer blend of polypyrrole (PPy) and poly methyl methacrylic acid (PMMA) was used as matrix for incorporation of graphite nanoplatelets as nanofillers by solution casting method in order to achieve nanocomposites with high dielectric constant. The structural, morphological and functional group analysis was carried out by X-ray diffraction (XRD), scanning electron microscopy (SEM) and fourier transform infrared spectroscopy (FTIR) which revealed that the heterogeneous granular morphology of the amorphous nanocomposites matrix is interconnected network of the exfoliated graphite nanoplatelets nanofiller. Dielectric spectroscopy was performed by impedance analyzer in order to evaluate the dielectric properties of PMMA/PPy and its nanocomposites. It is evident from the results that the dipolar orientational polarization is responsible for enhancement of dielectric properties which appears as prominent peaks at higher frequencies in various plots of dielectric variables achieved by introduction of graphite nanoplatelets along with PPy into a PMMA matrix. Thus, a high dielectric constant could be realized through interfacial polarization mechanism (Maxwell–Wagner–Sillars polarization (MWS)).

Synthesis of 3-(2-Bromoethyl)-Indole Derivatives as Anti-Alzheimer Agents and their Molecular Docking Studies

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3-(2-Bromoethyl) indole derivatives were synthesized and assessed as multifactorial ligands for the treatment of Alzheimer's disease (AD). Biological evaluation exposed that the derivatives have neuroprotective effect and multifactorial profiles including acetylcholinesterase inhibitor, antioxidant effects and A β aggregation modulation. MRM-01 and MRM-02 exhibited the best activity among all the analogues against acetylcholinesterase (AChE), with IC₅₀ values of 0.045 μ M and 0.081 μ M, respectively. Additionally, both compounds demonstrated noteworthy antioxidant properties, with IC₅₀ values of 114 μ M for MRM-01 and 116 μ M for MRM-02. Furthermore, MRM-01 displayed higher inhibition of amyloid beta (A β) compared to other BEI derivatives, with an inhibition rate of 30.45% at a concentration of 500 μ M. The molecular modeling studies of the selected compounds revealed significant interactions with the active site of human acetylcholinesterase (AChE), peroxiredoxin enzyme, and

HEWL lysozyme. These findings indicate that both MRM-01 and MRM-02 are capable as multi-target hits that can be further explored to potentially serve as effective drug candidates for the treatment of AD.

Keywords: 3-(2-Bromo ethyl indole) derivatives, Alzheimer Disease, Molecular modeling, multifactorial ligands, Amyloid aggregation, Antioxidant

Synthesis, Optimization, And Characterization Of Tenofovir Conjugated Polymeric Silver Nanoparticles

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This study focuses on the growing global threat of viral infections becoming increasingly resistant to traditional antiviral treatments. We utilized nanotechnology as a means of delivering drugs and created silver nanoparticles loaded with the antiviral drug tenofovir (TAgD) using a chemical reduction method. Visual and UV-visible spectrophotometric analysis confirmed the successful synthesis of the nanoparticles. At room temperature, various polymeric AgNPs (AgD, AgPVA, and AgPEG) remained stable for over 2 weeks. TAgD, TAgPVA, and TAgPEG, all loaded with tenofovir, showed distinct UV-visible spectra changes, which were confirmed through Dynamic light scattering (DLS), Fourier transform infrared spectroscopy (FTIR), Zeta potential, and Atomic force microscopy (AFM). Analysis using DLS indicated that the particle sizes were on the nanoscale. Zeta potential revealed a negative surface charge after loading the drug, and AFM showed that the particle sizes were less than 50nm. Furthermore, TAgD exhibited a high drug loading capacity of 63.2%, suggesting its potential as a promising candidate for further investigation as an antiviral therapy.

Enhancing Data Analysis Through Machine Learning Algorithm

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The real estate business is critical to economic development and social progress, as it reflects individual and regional economic well-being. As income levels rise, the demand for housing increases, necessitating accurate house price estimate to help buyers and sellers make strategic decisions. Due to market volatility and a wide range of contributing factors, it remains difficult to achieve high accuracy and reliability in predictions. Our study uses scikit-learned tools to implement Random Forest and Gradient Boosting Regression, demonstrating their potential to revolutionize data analysis in house price prediction. The findings show that these models have the highest accuracy, making them well suited for precise price forecasts. Our work emphasizes the importance of advanced machine learning approaches in improving the prediction accuracy of house prices, ultimately benefitting buyers and sellers in the real estate market.

Keywords: Machine learning, House price prediction, Random Forest, Gradient Boosting Regression

Optimization, Development, and Evaluation of Topically Applied Gel Loaded with Unripe *Citrus reticulata* Fruit Extract

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Citrus reticulata, commonly known as mandarin or kinnow, belongs to the citrus family, one of Pakistan's main fruit crops. *Citrus reticulata* contains secondary metabolites such as polyphenols, phenolic acids, flavonoids, carotenoids, and limonoids that have been reported for their antioxidant properties, which neutralize free radicals that are responsible for causing numerous skin problems, inflammation, and the aging of the skin. These antioxidant compounds significantly reduce the risk of developing several chronic diseases, including cancer, diabetes, infections, aging, asthma, and cardiovascular diseases, and also have a prominent effect on wound healing. This study focuses on developing an optimized unripe *Citrus reticulata* fruit extract-based gel formulation for topical application for various skin conditions. The antioxidant activity of unripe *Citrus reticulata* fruit extract in different solvents (i.e. 50% Methanol, 50% Ethanol, and water at optimized conditions of temperature and time) was evaluated using 2,2-Diphenyl-1-picrylhydrazyl (DPPH) assay. The extract showing enhanced antioxidant activity was used for loading in Gel formulation. An optimized topically applied gel formulation of unripe *Citrus reticulata* fruit extract was developed using carbapol 940 as polymer and triethanolamine as pH enhancer. The physicochemical properties of the gel were determined including pH, viscosity, spreadability, and antioxidant activity. Unripe *Citrus reticulata* fruit extract in 50% Methanol at Room temperature for 1 hour showed greater antioxidant activity (IC₅₀ = 23.761). This extract was used for incorporation in gel formulation. An optimized gel formulation with enhanced antioxidant activity, pH, Viscosity, and spreadability was developed. In the future, this gel may be helpful for topical application for wound healing, anti-aging, anti-infective, prevention of skin cancer, etc.

***Calotropis Procera* Leaves Mediated Synthesis Of Colloidal Cadmium Oxide and Sulphide For Solar Thermal Harvesting**

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Power production from renewable energy sources including solar, wind, heat and even ocean waves has seen a significant rise since 2010 from 200GW to 1800 GW. Renewable energy sources on industrial scale have a significant part of human kind's mitigation mission for the planet's viability. Solar energy is the most plentiful source of renewable energy. Solar-thermal power production is achieved by using various techniques for power production by exploiting the sunlight. Sunlight can be used to produce steam to run a turbine for generating electricity in a similar fashion to that of power plants using fossil fuels. The impact of solar-thermal systems relies mainly on the structure and types of material and the composition of the fluid developed for photo-thermal conversion and subsequent thermal energy transportation. Nanoscale copper oxide and iron oxide furnish diversity in their structures, morphologies, and applications. Moreover, these have grabbed the attention of the researchers in developing solar-thermal nanofluids. *Calotropis Procera* Leaves goes into waste, it consists of cellulose, pectin, hemicellulose etc. Dry peel powder is targeting for the synthesis of copper oxide and iron oxide nanoparticles. Looking at the importance of cadmium oxide and sulphide it has a predicted excellent solar-harvesting potential of cadmium oxide and sulphide nanofluid. At the double concentration maximum temperature was showing after that increasing concentration temperature was decreases.

Keyword: Power production, solar energy, solar thermal power, cadmium sulphide, cadmium oxide, *Calotropis Procera* Leaves

Rejuvenating Aging Through Icaritin and Remodeling Gut Microbiome

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We have previously demonstrated the neuroprotective effects of icariin in rat cortical neurons. In this study, we investigate icariin's anti-aging effects in 24-month-old mice, administering a daily dose of 100 mg/kg for 15 consecutive days. Icariin treatment significantly enhanced motor coordination and learning abilities, while reducing oxidative stress biomarkers in the serum, brain, kidneys, and liver of aged mice. Additionally, icariin improved intestinal integrity by upregulating tight junction adhesion molecules and increasing Paneth and goblet cells, along with reducing iNOS and pro-inflammatory cytokines (IL-1 β , TNF- α , IL-2, IL-6, and IL-12).

Icariin also significantly upregulated aging-related signaling molecules, including Sirt1, Sirt3, Sirt6, Pot1 α , BUB1b, FOXO1, Ep300, ANXA3, Calb1, SNAP25, and BDNF. Gut microbiota (GM) analysis revealed that icariin improved GM composition in aged mice by reinstating bacteria typically found in young mice and suppressing bacteria prevalent in untreated old mice. To determine whether the anti-aging effects of icariin are mediated by the GM, we conducted fecal microbiota transplants (FMT) from icariin-treated old mice to untreated old mice. FMT recipients exhibited similar improvements in motor function and age-related biomarkers as the icariin-treated mice. Remarkably, even greater improvements were observed when aged mice received FMT from young mice.

Our findings indicate that both direct icariin treatment and fecal transplants from icariin-treated mice produce comparable anti-aging effects, underscoring the pivotal role of the GM in icariin's mechanism of action. This study suggests that icariin holds potential as a therapeutic agent for promoting health and wellness in aging adults.

Evaluation of Diminished Learning and Memory in Streptozotocin-Induced Hyperglycemic Rats

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A sedentary lifestyle increases diabetes prevalence, impairing cognition, including learning and memory. This study investigated memory susceptibility to hyperglycemia and its biochemical correlations. Hyperglycemia was induced in rats using streptozotocin (STZ) and confirmed by fasting blood glucose levels one week post-injection. Learning and memory were assessed using the Novel Object Recognition Test (NORT) and Morris water maze (MWM) at 3, 6, and 9 weeks, and correlated with TNF- α , IL-1 β , and dopamine levels. At 3 weeks, moderate hyperglycemia (7.99 $\pm$ 0.62 mM) impaired working memory, while learning and reference memory remained intact. At 6 weeks, severe hyperglycemia (11.51 $\pm$ 0.69 mM) impaired short, long, and working memory but not learning. At 9 weeks,

pronounced hyperglycemia (13.69 ± 1.43 mM) impaired learning, and short, long, and working memory. Increased hyperglycemia severity and duration correlated with enhanced inflammation, reduced dopamine levels, and decreased Akt and CREB protein expression, negatively affecting learning and memory.

Purification and Characterization of Uricase for Renewable Energy

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In the context of the conference on Renewable Energy, the research focused on harnessing uricase, a crucial enzyme in purine metabolism, from poultry waste for potential applications. Despite its absence in humans due to genetic mutations, uricase was successfully extracted from poultry waste with an initial activity of 3721.04 U/mL and a specific activity of 135.681 U/mg. Notably, the enzyme's activity increased to 9581.843 U/mL and specific activity to 534.641 U/mg after ammonium sulfate precipitation, resulting in decreased protein content. Further purification through ion exchange chromatography using DEAE cellulose and gel filtration with Sephadex G-150 demonstrated an enhanced activity of 3768.114 U/mL and specific activity of 1689.73 U/mg. The enzyme was purified 63-fold, with protein content reduced to 2.23 mg/mL. Optimal conditions for enzyme activity were observed at pH 8 and 37°C. The study delved into substrate and enzyme concentration effects, revealing maximum activity at 2.5 mg substrate (poultry waste) and 750 µL enzyme concentrations. Additionally, the research explored the thermal stability of uricase, noting a maximum activity of 4095.18 U/mL after 20 minutes of incubation at elevated temperatures. The irreversible thermal denaturation decreased half-life from 660 to 149.4 min at 60°C compared to 37°C, with the enzyme showing positive ΔS^* , ΔH^* , and ΔG^* . This work contributes valuable insights into utilizing uricase from poultry waste.

Green Synthesis of Copper Nanoparticles Using *Euphorbia Milii* Extract

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Copper nanoparticles were synthesized via the green route using aqueous leaves extract of *E. milii* at room temperature. *E. milii* is commonly known as “crown of thorns” woody shrub or sub-shrub. This plant is used to treat dermatological conditions, gonorrhea, headache, and digestive tract worms. In light of the medical significance of *E. milii*, the current study was conducted to synthesize their CuNPs under different conditions of sunlight, stirring, incubation, pH, temperature (40 °C, 60 °C, 80 °C) and stirring and temperature simultaneously. The final result showed that the most stable NPs were formed under the condition of stirring + temperature condition in the ratio of 1:9. UV-visible and Fourier transformed Infra-red spectroscopy were used to characterize the synthesized NPs. FT-IR research verified the interaction between the functional group and the metal ion.

Key words: Copper Nanoparticles; *E. milii*; Green synthesis; antibacterial activities; Optimization of synthesis
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Biofortified Wheat in Pakistan: Its Potential Impact on Human Health

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Wheat is very important food crop in our country. It is grown in both irrigated and Barani/ Arid areas in Pakistan. In the year 2022-23 wheat was cultivated on 9043 thousand hectares and the production stood at 27.634 million tons. Not only we meet our food need from wheat crop but its straw is used as feed for animals. Zinc is a micronutrient which is necessary for body functions and better performance. It plays an important role in mental and physical body growth and to improve immunity. A big part of population is facing deficiency of important ingredients i.e. zinc and iron. About more than 5 million people are facing zinc deficiency. Particularly children and women suffer with different types of diseases. A big part of Pakistan's population is facing lack of nutritious food. The main cause is less amount of zinc in our food. In our country wheat as food is used on an average 120 kg per person annually. Normal wheat contains less zinc contents that is not enough for our better health. To meet this deficiency in food, Biofortified wheat has been prepared by the competent agriculture scientists which contain more zinc contents as compared to normal wheat. GAIN Pakistan is working on a project 'Biofortification of wheat' in Multan. Samples of wheat seed and wheat grains were tested for zinc and iron contents. Seed of wheat variety Arooj contained Zinc 27.66 ppm and iron 33.63 ppm. Grains of wheat variety Arooj exhibited zinc 26.93 ppm and iron 32.80 ppm. Biofortified wheat variety revealed 20.87% more zinc contents than normal wheat. With the use of zinc in food, a better impact on human health may be achieved in Pakistan.

Key words: Zinc, iron, biofortified wheat, zinc deficiency, human health

Insight into the Structural, Elastic, Optoelectronic, and Thermodynamic Properties of GaXF_3 (X = Se, Si) via Density Functional Theory

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The pursuit of new materials with tailored properties is essential for advancing technology. This research focuses on GaXF_3 (X = Se, Si) fluoroperovskites, utilizing the density functional theory approach. The study begins by assessing structural properties, revealing stable configurations for both compounds. The results from phonon calculations confirm the thermodynamic stability of the compounds. The relationship between elastic constants, confirms their mechanical stability. Elasticity analysis using the IRelast package indicates their resilience, anisotropic characteristics, and mechanical stability. Electronic properties, including band structure, density of states, and electronic band gaps, show that both materials have a metallic nature. Additionally, optical properties, such as dielectric constants, absorption coefficients, and refractive indices, are explored, providing insights into their interactions with light for optoelectronic applications. Optical property calculations for both GaSeF_3 and GaSiF_3 , indicate their potential suitability for use in optoelectronic devices, particularly LEDs, due to their absorption within the UV-Vis range. These results encompass properties such as reflectivity, refractive index, and absorption coefficients, indicating their relevance to potential applications in optoelectronic devices. These findings enhance our understanding of these materials and lay the groundwork for future advancements in advanced materials science.

Enhancement of Shelf Life of Selected Fruits and Vegetables Using Modified Polyphenolic Extracts from *Tagetes Minuta*

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Tagetes minuta belonging to the Asteraceae family produces a strong aroma/essential oil and is traditionally used for stomach pains, constipation, insect repellent, anti-inflammatory a bronchodilator, respiratory disorders, intestinal gas issues, stomach problems, common cold, anti-septic, and as sedatives. To increase the shelf life of fresh fruits, a technology of edible coating is needed to protect from microbes and moisture loss or gas exchange. Natural edible coatings replaced the use of synthetic toxic antimicrobials. In this study, the optimized extracts of *T. minuta* were used to check the effectiveness in preventing microbial attack, and moisture loss and increasing the shelf life of fruits and vegetables such as plums, tomatoes, peaches, persimmons, apples, and gourds. The polyphenolic fractions extracted with response surface methodology (RSM) optimized ultrasonic-assisted extraction exhibited a high total phenolic and flavonoid (TPC and TFC) content. In addition, the polyphenolic fractions were the active inhibitors of DPPH free radicals. The study found that film coating comprised of the subject plant fractions protected the selected fruits and vegetables from microbial attack and deterioration. The coating extended the shelf-life of fruits and vegetables (plums, tomatoes, peaches, persimmons, apples, and gourds) very efficiently with a maximum time limit of 90 days. Hence, it can be concluded from the study that this plant can help extend the shelf-life of fruits and vegetables.

Keywords: *Tagetes minuta*, RSM, TPC, TFC, film coatings.

Safe, Efficient and Sustainable Alternatives to Conventional Microbiome Transplants

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The human intestine harbors a huge number of diverse microorganisms where a variety of complex interactions take place between the microbes as well as the host and gut microbiota. Significant long-term variations in the gut microbiota (dysbiosis) have been associated with a variety of health conditions including inflammatory bowel disease (IBD). Conventional fecal microbiota transplantations (FMT) have been utilized to treat IBD and have been proved promising. However, various limitations such as transient results, pathogen transfer, storage and, reproducibility render conventional FMT less safe and less sustainable. Defined Synthetic microbial communities (SynCom) have been used to dissect the host-microbiota-associated functions using gnotobiotic animals or in vitro cell models. This talk will focus on the limitations of the conventionally used microbiome transplants and how synthetic and minimal microbiomes can be a better, safer and sustainable alternative to conventionally used microbiome transplants.

Influence of Non-Thermal Technologies on Microbial Inactivation

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Microbial inactivation is an essential component of food safety, preservation, and public health. Conventional thermal methods, like pasteurization and sterilization, are frequently employed to assure microbial safety by using heat to destroy spoilage and pathogenic microorganisms. However, these techniques may affect the sensory and nutritional properties of food products. As novel solution to these limitations non-thermal technologies such as high-pressure processing, pulsed electric fields, ultraviolet radiation and cold plasma have come out, with the aim of

inactivating microbes without compromising the quality of food. High-Pressure Processing (HPP) ensured microbial inactivation while maintaining food quality by operating between 100 and 600 MPa and below 45°C. Pulsed electric fields (PEFs) with microsecond pulses applied electric fields of 20–50 kV/cm. Microbes can be successfully inactivated by ultraviolet (UV) radiation, especially UV-C at 200–280 nm, with exposure lengths ranging from seconds to minutes. The environmental conditions used in Cold Plasma have exposure periods ranging from seconds to minutes. Over 7.4 MPa and at about 31°C, supercritical CO₂ (SC-CO₂) can function for minutes to hours. These technologies provide promising alternatives to thermal methods, offering enhanced food safety without compromising nutritional and sensory properties

Keywords: Microbial inactivation, thermal technologies, non-thermal, food, pulsed electric fields.

Increasing Meropenem Resistant *Acinetobacter* Bacteria in General Surgery Patients

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Background: The emergence of carbapenem-resistant *Acinetobacter baumannii* in developing nations like Pakistan poses significant therapeutic challenges. It's crucial to closely monitor carbapenem resistance genes in *A. baumannii*. understanding them is essential for combatting antibiotic resistance in these infections effectively. The study aimed to detect carbapenem resistance in Multi drug resistant *A. baumannii* from surgical wounds and identify the VIM and NDM resistance genes.

Methodology: *A. baumannii* strains were isolated from surgical specimens, including wounds and pus, from post-mesh hernia and diabetic foot patients in tertiary hospitals. Identification involved gram staining, biochemical assays, and disk diffusion for antibiotic susceptibility. MIC against meropenem and imipenem was assessed, and VIM and NDM genes were identified via PCR.

Results: This study examined 130 surgical samples from patients aged 24–68, finding 90 positives for *A. baumannii*. Of these, 58 (64.4%) were men and 32 (35.5%) were women. Among the 90 strains, 80 were completely resistant to fluoroquinolones (ciprofloxacin, levofloxacin) and aminoglycosides, and 54 were 100% resistant to meropenem and imipenem. However, some strains remained sensitive to Colistin and Polymyxin-B. The NDM gene was detected in 55 strains, the VIM gene in 13, and 22 strains carried both genes. Molecular analysis revealed that these MDR strains possess carbapenem-resistant mutations in the NDM and VIM genes.

Conclusion: Our study highlights the need for comprehensive sequencing to understand the genetic diversity of MDR *A. baumannii*. This knowledge is key to developing better antibiotic treatments and tackling antimicrobial resistance effectively.

Keywords: Carbapenem resistance, *Acinetobacter baumannii*, Betalactamase gene NDM, VIM

Identification of Novel peptide inhibitors from ACE2 binding region for SARS-Covid-2 RBD using in silico mutagenesis, Molecular Docking, and Molecular Dynamic Simulation Approach

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The COVID-19 pandemic, caused by the SARS-CoV-2 virus, has highlighted the critical need for innovative therapeutic strategies. The viral infection depends on the interaction between SARS-Covid-2 RBD and human angiotensin-converting enzyme 2 (ACE2) receptor, enabling the virus to enter the cell and replicate. This study focuses on targeting crucial interaction via the design and evaluation of potential peptide inhibitors derived from the ACE2 receptor binding region utilizing in silico mutagenesis, Molecular docking, and molecular Dynamic simulation approaches. initially, short peptide 29AA, considered as control from the ACE2 Binding region was selected and subjected to Molecular docking studies to evaluate their binding affinity towards SARS-Covid-2 spike protein. The top complex with the highest binding affinity score was subjected to alanine scanning and residue scanning to calculate the binding affinity and change in binding affinity of every residue with SARS-Covid-2 RBD. Finally, a library of 40 peptides was created based on the residues scanning mutagenesis approach, the Top four peptides pep1, pep2, pep3, and pep4 with the highest binding affinity score were selected for further analyses to evaluate the stability and dynamic behavior of these complexes using molecular Dynamic simulation. The MD simulation results confirmed that these peptides are effective inhibitors against SARS-Covid-2. Furthermore, MM-GBSA, RMSD, RMSF, Hydrogen bond, SASA, and DCCM analysis were performed. All the analyses revealed that new peptides show stronger interaction as compared to control peptide and are potential inhibitors against SARS-Covid-2. Finally, our in-silico mutagenesis, Molecular Docking, and MD Simulation identified four peptides that exhibited high binding affinity and stability, suggesting their potential to effectively block the ACE2-spike protein interaction.

Keywords: Scanning, MM ACE2, SARS-Covid-2 RBD, Molecular Docking, md Simulation, Alanine scanning, Residue –GBSA

Curcumin Loaded SNEDDS for Enhanced Bioavailability and Anticancer Activity: In-Vitro, Characterization

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Curcumin is a bright yellow compound produced by the species of *Curcuma longa*. It is the major curcuminoid of turmeric (*Curcuma longa*), a member of the ginger family, Zingiberaceae. It possesses strong anti-oxidative and anti-inflammatory properties. It is sold as an herbal supplement, cosmetics ingredient, food flavouring, and food colouring agent. Curcumin holds diverse pharmacological actions while being comparatively safe; however, its clinical application is restricted due to its physico-chemical characteristics. This study aimed to synthesize self-nanoemulsifying drug delivery system (SNEDDS) to augment curcumin anticancer activity and oral bioavailability. CML is a myelodysplastic disorder categorized by the incidence of genetically equal translocation between chromosomes 22 and 9. Till now resistance produced against various anti-cancerous drugs which is a leading

question including leukemia. This makes a necessity for newer molecules that can aim leukemic cells with lesser side effects. The objective of the present study was to evaluate the cytotoxicity of curcumin on leukemia cells. So, we have studied curcumin as inhibitors targeting apoptotic pathway. K562 cells were cultured and cytotoxicity of curcumin was evaluated through MTT. Nevertheless, BAX and CASP3 was determined through RT-PCR. After 48 h of treatment, curcumin have shown considerable reduction with a P-value of ($P < 0.05$) along with IC₅₀ value of 40 μ M. RT-PCR established that curcumin enhanced the expression of BAX and CASP-3. Electron microscopy revealed that a test drug initiates apoptosis and blebs formation. Curcumin decreases cell viability ($P < 0.05$) and encourages apoptosis in K562 cells. Curcumin (Cu) may be an imminent candidate for the future treatment of chronic myeloid leukemia. It can be concluded that the curcumin loaded SNEDDS can significantly improve (Cu) bioavailability and anticancer action.

Key Words: Curcumin, Apoptosis, Oncogenes, MTT

Therapeutic Application of Selected Medicinal Plants Against the Typhoidal Pathogens

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The rise in multidrug resistance among harmful bacteria is causing antibiotics to lose effectiveness, prompting the exploration of innovative techniques as alternative therapies for microbial diseases.

Objective: The objective of this study was to assess the efficacy of *Trigonella foenum-graecum*, *Spinacia oleracea*, and *Beta vulgaris* against multidrug-resistant *Salmonella enterica* serovar Typhi.

Method: Medicinal plant extracts were prepared using methanol, aqueous, and ethyl acetate. Standard techniques were used for the phytochemical analysis. Mueller Hinton agar was used to detect the antibacterial activity of plants. Microdilution method were done to determine the minimum inhibitory concentration (MIC) for a bioactive compound

Results: The highest concentration of protein was observed in the leaf and seed portions of *Beta vulgaris* in methanol and ethyl acetate, according to the phytochemical examination of medicinal plants (Chloroform, ethyle acetate, and methanolic extracts of *Beta vulgaris*, *Spinacia oleracea*, and *Trigonella foenum-graecum*). The seed portion likewise contained the highest concentration of flavonoids. *Beta vulgaris* doesn't contain phytosterols. *Trigonella faenum-gracum* contains the largest concentrations of proteins, flavonoids, and saponins. *Spinacia oleracia* contains the highest concentrations of protein and flavonoids, but not phytosterols.. *Spinacia oleracia* seeds in ethyl acetate show high antibacterial activity i-e 10mm, 23mm, 30mm of inhibition zone while *Spinacia oleracia* leaves show inhibition of 27mm, 17mm, 9mm against *Salmonella* selected pathogen. *Trigonella foenum-graecum* leaves in ethyl acetate and roots in methanol show inhibition of 27mm, 20mm and 25mm, 22mm. *Beta vulgaris* roots in methanol show higher inhibition off 14mm, 18mm, 23mm while roots in ethyl acetate show inhibition of 15mm, 27mm. The minimum inhibitory concentrations (MIC) of *Beta vulgaris* roots in methanol and ethyl acetate were 7.4 and 7.6 μ g/ml, *Spinacia oleracea* seeds and leaves had 7 μ g/ml, 7.3 μ g/ml, 4.7 μ g/ml, and 5 μ g/ml in ethyl acetate, and *Trigonella foenum-graecum* roots in methanol had a MIC of 5.8 μ g/ml, while the MIC of leaves in ethyl acetate was 6.8 μ g/ml. The minimum inhibitory concentrations (MIC) of *Beta vulgaris* roots in methanol and ethyl acetate were 7.4 and 7.6 μ g/ml, *Spinacia oleracea* seeds and leaves had 7 μ g/ml, 7.3 μ g/ml, 4.7 μ g/ml, and 5 μ g/ml in ethyl acetate, and *Trigonella foenum-graecum* roots in methanol had a MIC of 5.8 μ g/ml, while the MIC of leaves in ethyl acetate was 6.8 μ g/ml. GC-MS analysis of methanol extract of *Beta vulgaris* roots confirm the existence of 120 bioactive compounds. Among the 120 compound the most abundant were 2-PENTACOSANONE (Peak area: 49.65922%; RT: 3.805) and 1-BROMOEICOSANE (Peak area: 48.38581; RT: 20.852).

Conclusion: According to this study, the plants *Trigonella foenum-graecum*, *Beta vulgaris*, and *Spinacia oleracea* have bioactive compounds that have strong antibacterial effect against *Salmonella enterica* serovar Typhi. Medicinal plants are a wonderful source and alternative to antibiotics that are resistant to infection.

Diagnosing Prostate Cancer Using Stacked Autoencoder Based Features Extraction Scheme by Employing Machine Learning Algorithms

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One of the most examined malignant growth in men has now become prostate Cancer and it is the fundamental reason for death in the United States of America. It is difficult for Radiologists to detect prostate malignant growth accurately considering the multifaceted and complicated nature of masses. There are numerous recognition procedures for prostate malignant growth that have been emerged in the near past, however, these procedures could not analyze the disease effectively. In this study, the Neural network-based Stacked Autoencoder features extraction scheme is proposed to extract differentiable features that were passed to various machine learning algorithms such as Decision Tree, SVM with different kernels, Naïve Bayes. Also, the results of the proposed study are compared with traditionally significantly performing various feature extraction techniques. Both, traditional and proposed techniques are implemented on the same MRI database of prostate cancer disease with the same settings. The various confusion matrix based performance measures are computed to compare. With the Stacked Autoencoder features extraction scheme by employing various Machine Learning algorithms, significantly better performance is achieved as compared to handcrafted features extraction techniques.

Index Terms— Stacked Autoencoder, Neural Network, Machine Learning, Mri Images, Support Vector Machine, Decision Tree, Naïve Bayes, Prostate Cancer

Azomethine Linked Thiophene-Reinforced Titania Nanocomposites of Diglycidyl Ether of Bis-Phenol-A as Anti Microbial Coating

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The ongoing research work is composed of the synthesis of azomethine linked thiophene reinforced nanocomposites of diglycidyl ether of bis-phenol-A(DGEBA). Thiophene based azomethine linked additive (AD) was synthesized from thiophene-2-carbaldehyde and 4,4'-diamino diphenyl methane(DDM) and characterized via CHN elemental and spectral analysis. Epoxy amine polymer matrix was synthesized from DDM and DGEBA, loaded with various amount (1-4)% of AD and characterized via Fourier Transform Infrared (FTIR) spectral analysis. Thermal analysis reveals excellent thermal stability and appreciable antimicrobial activity in 4% reinforced thiophene based composites. Later on, it was further loaded with 1-5 % titania nanoparticles, and checked for thermal stability via TGA and antimicrobial activity against variety of bacterial and fungal strains. The synthesized titania nanocomposites were characterized by FTIR spectral and X-ray diffraction studies. All the synthesized thiophene reinforced titania nanocomposites exhibited excellent antibacterial as well as antifungal activity against *Escherichia coli*, *Staphylococcus lactis*, *Penicillium* and *Candida Albicans*. The synthesized materials could be used as antimicrobial coatings on variety of surfaces in future.

Use of Protein-Polysaccharides Based Hydrocolloid System for Improve Targeted Delivery of Probiotics

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Nowadays, consumers are more interested towards the diet and health benefit of a product. Probiotics products are being introduced in the market due to health-boosting effects. Probiotics are living microorganisms that ingested in sufficient quantity; benefit the health of the consumer. They provide certain health benefits by improving immune system and inhibiting the growth of pathogenic bacteria in the human body. The main challenge is the survival and viability of probiotics because they lose their viability during gastric transit and storage. *Lactobacillus plantarum* is well known probiotic known to date. Currently research focused on the interaction of protein-polysaccharide interaction and their stability under different environmental conditions. This field opens new horizon to study the texture, behavior and microstructure. The aim of current research was to develop protein-polysaccharide based matrix in different combination to improve survival and viability during gastric transit. Therefore, *Lactobacillus plantarum* (Lp-01) was chosen for microencapsulation with Soy Protein Isolate (SPI) and CMC. T₅ (3% SPI + 1.5% CMC) showed maximum encapsulation efficiency >80% as compared to other combinations. The survival and viability of encapsulated *Lactobacillus plantarum* (Lp-01) was investigated through their resistance to simulated gastric juice (SGJ), tolerance to bile salt, release profile in simulated intestinal fluid (SIF) and storage stability during 30 days at 4 °C. The survival rate of free and encapsulated probiotic was 10⁶ Log CFU/ml and 10⁹ Log CFU/ml, respectively. The viable count was significantly higher than non-encapsulated probiotics in simulated gastric juice. The complex of protein-polysaccharides based encapsulates showed maximum viability of probiotics as compared to others. So, protein-polysaccharides in combination is one of the effective encapsulating material for targeted delivery of bioactive compounds.

Chemical Composition and Antimicrobial Activity of *Caltha palustris*

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Caltha palustris (marsh marigold) belonging to family *Ranunculaceae*. It contains 26 different saturated hydrocarbons and terpene derivatives belonging to various classes such as esters, alcohols, and aldehydes. Traditionally, it has been used to treat gonorrhea, rheumatism, arthritis, immunomodulation, and a variety of skin diseases. Pharmacologically, it has been reported to exhibit antimicrobial, antioxidant, anthelmintic, and antileukemic activities. After consuming *C. altha palustris*, symptoms such as bradycardia, hypotension, intense abdominal discomfort, gastroenteritis, and ensuing protein-losing enteropathy might occur. This study aimed to carry out for identification of bioactive compounds from the whole plant different extracts of *Caltha palustris* by Gas chromatography and Mass spectroscopy (GC-MS). The GC-MS analysis revealed the presence of various compounds Octadecenoic acid, Arsenous acid, Tetrasiloxane, decamethyl. The antimicrobial activity was determined by the agar disc diffusion method using four different extracts in hexane, chloroform, ethyl acetate and ethanol solvents. The antimicrobial study revealed that the *Caltha palustris* has the ability to fight against the selected microorganism.

Keywords: *C. palustris*, Gas chromatography, antimicrobial activity, GC-MS

Prevalence of Malaria and Associated Risk Factors in Peshawar

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Malaria is ubiquitous mosquito born disease that affects around 106 countries worldwide. Malaria is caused by a single-celled parasitic protozoa that belongs to genus *Plasmodium* and is transmitted to humans by the bite of *Anopheles* mosquito. The goal of the present study was to find prevalence of malaria in Peshawar, KPK. The prospective study was carried out at Naseer Ullah Babar Memorial Hospital, Peshawar from 17 May to 28 August 2022. A total of 300 blood samples of malaria suspected patients along with clinical symptoms were collected during the dry, warm summer season. Out of the 300 suspected patients, 17 were found to be malaria positive. Among the 17 positive cases, the ratio of malaria affected female patients was 13 (8.9%), while the male positive ratio was 4 (2.5%). The highest malaria incidence was observed in the age groups from 20 to 45 and 46 and above (5.2%). The female population was more prone to get malaria infection as compared to males. Malaria prevalence was higher in females aged 26 to 45 and 46 and above. High malaria cases were reported among individuals who were illiterate, belonged to lower class, and have travelled to other districts. Clinical symptoms experienced by patients were fever (33.3%), headache (10%), nausea and vomiting (9.5%). The results of the study also showed that the people who lived in mud houses (6.7%), had glazed windows (6.41%), slept outdoors (6.8%) and did not use bed nets or mosquito repellent (6.2%) were more affected by malaria infection.

Keywords: *Anopheles* mosquito, Fever, Headache, Malaria, Mud houses

Harnessing the Potential of Type-II Heterostructures: NiO/TiO₂/ZnO Fibers for Enhanced Photocatalytic and Electrochemical Performance in Asymmetric Supercapacitors

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This study presents a novel two step approach for the synthesis of NiO/TiO₂/ZnO fibers heterostructures via electrospinning technique followed by the wet chemical method. Structural, morphological and elemental analyses of NiO fibers, NiO/TiO₂ core-shell fibers, and NiO/TiO₂/ZnO heterostructure fibers showed single phase formation having one dimensionally long furry insect type morphology with no impurity elements. Optical studies demonstrated a reduction in the band gap of NiO in the presence of TiO₂ and ZnO, enhancing the photocatalytic properties. The Langmuir-Hinshelwood kinetic model was employed to measure the reaction rate constant, showing improved photocatalytic performance of NiO by enhancing the separation rate of photo-generated electrons and holes on its surface. Furthermore, the electrochemical performance of the prepared fibers-based asymmetric supercapacitors showed a small IR drop which is attributed to low charge transfer resistance. The NiO/TiO₂/ZnO fibers based asymmetric supercapacitors exhibited higher specific capacitance (96 F/g) at 1A/g, with a specific energy density of 13 Wh/kg at a specific power density of 2400 W/kg indicating excellent performance suitable for finding potential uses in energy storage applications. Various practical/physical tests further certified the efficient use of the developed NiO/TiO₂/ZnO heterostructure fiber's based asymmetric supercapacitor.

Redefining Waste Management: A Sustainable Approach to Post-Harvest Preservation

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Post-harvest loss of food crops poses a significant challenge globally, with an alarming one-third of the food produced lost during the post-harvest system annually. This loss stems from various factors, including environmental conditions, mechanical damage, sanitation issues, and pathogenic infections. Pakistan's diverse agro-climatic conditions mirror these challenges, leading to significant post-harvest losses across different types of perishable food crops.

Against this backdrop, this study endeavors to identify an environmentally friendly post-harvest treatment to prolong the market life of food crops. Specifically, the focus is on extracting chitosan from marine waste to help our citrus agronomists.

The extraction process involves a series of treatments, including pretreatment, demineralization, deproteinization, purification, and deacetylation. Initial findings reveal a promising yield of chitosan, reaching 21.62%, with an impressive solubility. Furthermore, this polymer was characterized and edible biofilm was developed for preservation of citrus fruits.

By embracing this sustainable approach, we aspire to mitigate post-harvest losses while preserving the sensory and nutritional qualities of agricultural produce.

Species Distribution Modelling and Human-Wild Boar Conflict in the Southern Belt of Khyber Pakhtunkhwa

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The wild boar is an important artiodactyl mammal, that belongs to the family Suidae; Genus *Sus*, is one of the most widespread mammal species in the world. Information on current and future potential distributions of Wild Boar is necessary and useful for strategic management actions and conservation plans. In the present study, we predicted the distribution of *Sus scrofa* (Wild boar) associated with different environmental variables, and human-wild boar conflict in Southern Khyber Pakhtunkhwa. We used 40 presence points of the species from the field data, and environmental variables were extracted from freely available sources. Questionnaire based survey were carried out for human-wild boar conflict in the study area. Results indicate promising predictive power for both high resolution models (30m) for *Sus scrofa* with area under curve (AUC) test analysis of 0.859, respectively. The MaxEnt analysis showed that highly suitable habitats were present in southern regions of Khyber Pakhtunkhwa. The final five variables used in analysis were (i) BIO1 Annual average temperature (56.5%) (ii) BIO4 Temperature seasonality (1.2%) (iii) BIO12 Average annual precipitation (4.3%) (iv) BIO15 Seasonality of precipitation (3.6%), (v) BIO17 Precipitation of the driest quarter of the year (5.4%), (vi) BIO19 Precipitation of the coldest quarter of the year (23.6), and DEM (5.5%) were identified as the main environmental factors that affect the habitat distribution of *Sus scrofa*. Almost all of the area was estimated to be suitable area for *Sus scrofa*, respectively. The results obtained from the questionnaire survey indicate that nearly everyone in the study area is familiar with or has observed wild boars. However, the nature of their conflicts with wild boars varies significantly. Most respondents reported crop damage, while others mentioned injuries, livestock predation, and property damage as the primary forms of conflict. The study conducted in Southern Khyber Pakhtunkhwa sheds light on the distribution of wild boars and the ensuing human-wild boar conflicts. It recommends several measures for effective management in the region, focusing on habitat management in the southern regions could help mitigate conflicts, necessitating habitat restoration and conservation efforts. Lastly, continuous monitoring and research are essential to adapt management strategies based on evolving dynamics of human-wild boar interactions in the area.

Keywords: Wild Boar, Environmental Variables, Human-Wild Boar Conflict, MaxEnt Analysis, Khyber Pakhtunkhwa

Green synthesis of silver nanoparticles from *Viburnum Grandiflorum* and its biological activity

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In recent years, nanotechnology has become one of the most interesting and developing fields in many research areas. It is the study of science that deals with the handling, synthesis, and use of particles in the range of 1-100 nm. These particles are termed as nanoparticles. Due to their unique shape, size, and higher surface-to-volume ratio, they exhibit substantial properties due to which they have a wide range of applications in drug delivery, as a catalyst, electronics, biosensors, water purification, antioxidant, antimicrobial, optical, and magnetic properties. The development of magnetic nanoparticles through chemical and physical methods is harmful, expensive, and not eco-friendly. There is a need to develop nanoparticles that turn the focus towards green chemistry. Green synthesis involves the use of biological compounds which act as stabilizing as well as reducing agents. Phyto-nanotechnology is much quicker, and harmless as compared to microorganisms. The genus *Viburnum* belonging to the family Adoxaceae contains 230 species of deciduous shrubs, evergreen and small trees dispersed in the Philippines, Malaysia, and the mountains of Central and South America, southeastern Tasmania, and Australia, and mainly inside the mild forest areas of the northern hemisphere. Various *Viburnum* species are of high decorative value. Certain parts like fruits, barks, and flowers are used as cooking ingredients and for pharmaceutical purposes because of have chemical constituents/phytochemicals such as polyphenols, flavonoids, and carotenoids with health-promoting activity. These components are accountable for the key biological activities like cytotoxic activity anti-inflammatory, antibacterial, and antioxidant of *Viburnum* plants. *V. grandiflorum* has been locally used as a diuretic, a purgative, toothache, anesthetic, stomach pain, respiratory disorders, wound, upset stomach, and malaria, in the current study AgNPs synthesized from *V. grandiflorum*. The UV-Vis spectrum showed an absorbance peak from 400 nm to 500 nm. The FT-IR spectrum indicates that different groups were responsible for the reduction and formation of AgNps. Besides, this the hemolysis assay was performed which showed no toxicity at different concentrations. The *in-vitro* protein denaturation assay shows dose-dependent activity. Thus, it's an effective, simple, and inexpensive method for the synthesis of eco-friendly nanoparticles by using plants as reducing agents.

Keywords: *V. grandiflorum*, Silver nanoparticles, Characterization, Hemolytic activity, Egg denaturation activity.

Chemical Composition of *Curcuma* Species

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Medicinal herbs have long been used for their therapeutic properties in healthcare. Phytochemicals found in these plants such as flavonoids, alkaloids, polysaccharides, essential oils, quinones, terpenes, lignans, and coumarins have been shown significant antioxidant, antimicrobial, anti-inflammatory, anti-diabetic, cardioprotective, and anticancer activities. *Curcuma zedoaria* (white turmeric) and *Curcuma longa* (yellow turmeric) belonging to family Zingiberaceae are rich in curcumenoids, tumerone, terpenoids, alkaloids, flavonoids, essential oils, saponins, glycosides, phenolic compounds, steroids, tannins, phytosterols, polysaccharides, quinones, lignans, and coumarins.

These herbs are traditionally used in medicine and cooking, known for their anti-inflammatory, anticancer, and antioxidant effects.

To understand the chemical composition of these plants, extracts of *C. zedoaria* and *C. longa* were analyzed using Gas Chromatography-Mass Spectrometry (GC-MS). The extracts were found to have high content of curcuminoids, turmerone, quercetin 3'-methyl ether, 1,8-cineole, polyphenols, and hexadecenoic acid, exhibiting antioxidant, and antimicrobial activities. These findings highlight the potential health benefits of *Curcuma* species and their extracts.

Keywords: *Curcuma zedoaria*, *Curcuma longa*, curcuminoids, turmerone, coumarins

Synthesis, Characterization, Antimicrobial and Antioxidant Activities of Newly Synthesized Guanidines

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Guanidine is one of the most versatile functional groups in chemistry; compounds containing this system have found application in a diversity of biological activities and in this research, the advances in the field of the synthesis of guanidines are presented. The guanidines were synthesized by employing a standard guanylation method, starting with the reaction of benzoyl-phenyl substituted Thioureas with 2,4-difluoro aniline in equimolar ratios, dissolving in DMF with two equivalents of triethylamine. The temperature was maintained below 5 °C using an ice bath and one equivalent of mercuric chloride was added to the reaction mixture with vigorous stirring. The ice bath was removed after 30 min and the mixture was stirred overnight. Progress of the reaction was monitored by TLC till completion. Chloroform (20 mL) was added to the reaction mixture and the suspension was filtered through a sintered glass funnel to remove HgS. The solvent from the filtrate was evaporated under reduced pressure and the residue was redissolved in CH₂Cl₂ (20 mL), washed with water. The solvent was evaporated; the residue was purified. The synthesis of more lipophilic guanidines is of interest due to their potential to easily cross cell membranes. Incorporating fluorine atoms in proximity to basic groups can influence the physico-chemical properties of guanidines, such as lipophilicity or basicity. This research specifically focuses on preparing new chloro and fluoro-substituted guanidines through the guanylation method, with the aim of enhancing their biological properties. The guanidine compounds can be used as anti-bacterial, antifungal and antioxidants. The synthesized guanidines were characterized by FTIR, UV-Vis and NMR spectroscopic techniques. Antimicrobial activities of these guanidines were performed by agar well diffusion method and disc diffusion method. The guanidines having substituents at ortho and para position showed good antimicrobial activities while guanidines having substituents at meta position showed moderate antimicrobial activities.

KEY WORDS: Benzoyl phenyl guanidines, Lipophilic guanidines, Antimicrobial activities, Antioxidant activities.

Biodesizing of Cotton Fabric Using Fungal α -Amylase: An Ecofriendly Approach for Textile Industries

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Amylase enzymes, found abundantly in microbes, are essential for breaking down starch. In industrial desizing, they play a crucial role in removing starch-based sizing agents from textiles, improving their quality. The current investigation attempts to produce amylase at a higher yield using filamentous fungi isolated indigenously. According to initial screening, *Aspergillus niger* which was identified using molecular phylogeny was able to produce the most amylase when the circumstances were optimized. By adjusting various factors, the isolate's growth and amylase output was improved. After four days of the process of fermentation, the highest yield was reached at 35°C in a starch-containing media (pH 7.0). In terms of chemical properties, it was found that 1.5% of the extract of yeast and 1.5% of starches from potatoes were suitable sources of nitrogen and carbon. Amylase was partially purified using the gradient precipitation technique, yielding a purity factor of around 3.5. Based on the amylase's dynamic characteristics, the highest level of starch catalysis was detected in a 50 mM citrate solution with a pH of 6.5 at 55°C after 15 minutes. Over 30 minutes at 50°C, amylase maintained around 52% of its activity, indicating its temperature stability. Subjecting Cu, NaCO₃, FeS, and ZnS to amylase it was found that all these compounds exhibited inhibitory effects on amylase activity. SDS and EDTA, known surfactants, have been identified as potent inhibitors of amylase activity. In the present study, amylase has been used to desize cotton fabric. Optimization revealed that the optimal enzyme concentration for the procedure is 30 U/mg at 55 °C for one hour, adjusting pH to 5.5. The desizing efficiency tests revealed a substantial 54% reduction in fabric weight, indicative of successful starch removal. Furthermore, evaluation using the TEGEWA rating scale demonstrated a high desizing efficacy, with a rating close to 7. Rapid absorbance testing post-desizing revealed a swift absorption rate of 23 seconds, underscoring the effectiveness of the process. Analysis of the desizing liquor using glucose detection tests showcased a significantly higher concentration of reducing sugars 0.293 U/ml/min related with control 0.095 U/ml/min, highlighting the enzymatic breakdown of starch.

Overall, fungus-derived stable amylase enzymes can reduce environmental impact of chemical desizing in textile processing, increase productivity, and promote safer, more environmentally responsible procedures in the textile sector.

Key words: *Aspergillus niger*, Amylase, Desizing, TEGEWA rating, Ecofriendly.

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Enhancement in the Microelectronic Properties of a PFB–CdSe Quantum Dots Nanocomposite Based Schottky Barrier Diode

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This paper reports on the electronic and interfacial properties of a Schottky barrier diode (SBD) prepared from a blend consisting of a matrix semiconductor, poly(9,9-fluorofluorene) (PFB), and a dopant, cadmium selenide (CdSe) quantum dots (QDs) having size less than 5 nm. A uniform blend of PFB and CdSe QDs is prepared in chloroform 1:1 by volume and from a 0.5 wt.% of CdSe QDs and 20 mg/mL of PFB. The Schottky device ITO/PEDOT:PSS/PFB–CdSe/LiF/Ag is fabricated by spin coating the PFB–CdSe QDs blend on a predeposited PEDOT:PSS/ITO layer. Lithium fluoride (LiF) and silver (Ag) are thermally deposited via vacuum thermal

evaporator as buffer layer and ohmic contact, respectively. The fabricated SBD is studied by current–voltage (I–V) characteristics under dark conditions at 300 K. The device exhibits rectifying behavior with rectification ratio of 301.28 at ± 2.5 V. The interface properties of the device such as series resistance (R_s), barrier height (ϕ_B), ideality factor (n) and reverse saturation current (I_0) are measured to be 58.6 k Ω , 0.99 eV, 1.7 and 2.01×10^{-11} A, respectively. Charge carrier conduction mechanisms across the device such as Richardson–Schottky and Poole–Frenkel effects are studied where Schottky emission was identified at lower voltages while at higher voltages Poole–Frenkel effects were observed.

Keywords: CdSe quantum dots, PFB, Schottky barrier diode, current– voltage properties, interface parameters, LiF buffer layer.

Trimetallic Co-Doped Graphitic Carbon Nitride as a Colorimetric Sensing Platform for Dopamine Biomarker

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Dopamine is a catecholamine which is released by neurons that are widely distributed neurotransmitters in the central and peripheral nervous system. It plays vital role in the function of brain, body fluids of mammals, cardiovascular, hormonal, and renal systems. Its normal range in human blood is 1.3–2.6 μM in healthy individuals. Normally it supports vital functions such as focus, intuition, inspiration, blood pressure and fine motor activity. While abnormal dopamine concentrations in the body can cause a range of diseases such as Alzheimer's disease, Parkinsonism, epilepsy and pheochromocytoma etc. In the current study, Trimetallic co doped graphitic carbon nitride based biosensor was developed to monitor dopamine in blood serum samples from epilepsy patients. Different characterization techniques, were such as FTIR, SEM, TGA, EDX, elemental mapping, and XRD etc were used to characterize the prepared nanocomposite. In the presence of the fabricated Nano enzyme system, H_2O_2 can catalyze the oxidation of TMB with a transformation from colorless to blue-green color. This sets the platform for the sensing of the analyte (dopamine). The incorporation of dopamine to the sensor system results in the reduction of the oxidized TMB to TMB_{red} with an optical change from blue-green to colorless. The change was visible to the naked eye and confirmed through a UV-Vis spectrophotometer. The report on the fine-tuning of the fabricated sensor various essential parameters were such as the amount the mimic enzyme, H_2O_2 , pH, time, and TMB were optimized. At room temperature and at pH 6 the proposed sensor response time was just 2 minutes for dopamine detection. The proposed sensor has been successfully applied to epilepsy, patients' blood serum samples for dopamine detection with a visible colorimetric change.

Keywords: Trimetallic co doped graphitic carbon nitride, TMB, dopamine, colorimetric sensor.

Enzymatic Solutions for Environmental Challenges: Microbes Leading the Way

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In the face of escalating environmental degradation, microbial enzymes, natural catalysts, have emerged as pivotal agents in bioremediation offering sustainable and efficient solutions for environmental cleanup. These enzymes accelerate the breakdown of pollutants into harmless or less toxic substances, facilitating the eco-friendly restoration of contaminated environments. This study explores the diverse roles of microbial enzymes in mitigating various

environmental pollutants, including heavy metals, hydrocarbons, and synthetic compounds. By harnessing the natural catalytic capabilities of these enzymes, we can effectively degrade, detoxify, and transform pollutants into less harmful substances.

Our research focuses on the application of specific microbial enzymes such as esterases, monooxygenases, laccases, and many more which demonstrate high efficacy in breaking down complex and recalcitrant pollutants.

Esterases target man-made pollutants like phthalates and polyesters. Monooxygenases degrade hydrocarbons, including substituted methanes, alkanes, and aromatic hydrocarbons. Laccases play a crucial role in the depolymerization of lignin and degradation of phenolic compounds like Bisphenol-A. Our research showcases how genetically engineered microorganisms can enhance these enzymes' production, activity, and stability, making them viable for large-scale bioremediation applications under optimized conditions.

Through various case studies and experimental data, we demonstrate the scalability and adaptability of microbial enzymes in diverse environmental contexts i.e. the integration of microbial enzymes into existing wastewater treatment and soil remediation frameworks presents a promising avenue for achieving significant environmental impact. The poster emphasizes the transformative potential of microbial enzymes in pollution management, advocating for their broader adoption in environmental biotechnology to achieve sustainable and effective pollution mitigation.

Keywords: Microbial enzymes, bioremediation, environmental cleanup, esterases, monooxygenases, laccases, pollution management, environmental biotechnology

Phytochemical Investigation and Anticancer Potential of *Anchusa arvensis*

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Medicinal plants have been utilized to treat different types of diseases and have many advantages for many years. Cancer is one of the main human's health problems over the world and it is the second main death cause after heart diseases. Brain tumors are the big reason of cancer death in children and are difficult to recover even with prior surgery and adjuvant care. Previously some plants were used against brain tumor such as *Securidaca longepedunculata*, *Andira inermis subs etc.* GC-MS and Molecular docking are still extensively used methods for the analysis of chemical compounds and exploration of new drugs. Tyrosine kinase can be used as therapeutic target against U87 brain tumor cells. *Anchusa arvensis* plant has been traditionally used for treating cancer and other biological activities. The aim of the current work was to unearth the phytoconstituents of *Anchusa arvensis* as natural anticancer agents for U87 brain tumor cells.

Anchusa arvensis was collected from the District Karak and was identified by a plant taxonomist. The plant was dried, macerated and fractionated to obtain crude extract and resultant fraction. The constituents of crude extract of *Anchusa arvensis* was analyzed by using Gas chromatography/Mass spectrometry and revealed the presence of total 28 compounds. The four compounds namely 7,9-Di-tert-butyl-1-oxaspiro[4.5]deca-6,9-diene-2,8-dione (C-1), Ethanone,1-(5,6,7,8-tetrahydro-2,8,8-trimethyl-4H-cyclohepta[b]furan-5-yl) (C-2), N-[[2-p-Tolylsulfonyl]ethyl]phthalimide (C-3), Benzaldehyde,2,6-difluoro-3,4-dihydroxy (C-4) were selected on the basis ADME properties of drug (Lipinski rule of 5) for molecular docking studies against the target receptor tyrosine kinase protein (PDB:3DKC). The post docking analysis confirmed the binding energies -6.6, -6.8, -7.9, -5.6 Kcal/mol for C-1 to C-4 respectively. In order to rationalize our in silico result the MTT anticancer assay will be carried out to scientifically document the selected plant as anticancer.

Keywords: *Anchusa arvensis*, GC-MS Analysis, Molecular Docking, MTT anticancer assay.

Production of Thermostable Endoglucanase (CMCase) from Super Koji *Aspergillus oryzae* M-60(5)

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Endoglucanase (CMCase) is an important enzyme of cellulase system, which synergistically clipped down β -1,4-linkages of cellulose. Super Koji mutants were developed through gamma rays treatment of *A. oryzae* *cmc-1* (Koji) strain to enhance the production of thermostable endoglucanase. Initially seventeen mutants, hyper producers of CMCase were screened. Then six mutant resistant to 2-deoxy-D-Glucose were selected. The potent mutant M-60(5) having 60 kRad γ -rays exposure showed 3.6 folds higher CMCase production (6.02 U ml^{-1}) and half-life of 29.42 min & 14.8 min at 55 °C and 60 °C, respectively. The M-60(5) did not produce aflatoxins and its FESEM analysis depicted that gamma radiations enhanced the stiffness of mycelia. Mutation in *cmc-1* gene at one position was detected, which was the replacement of thymine with adenine at position 565. The process for endoglucanase production was optimized at lab scale (10 L) and scale-up at pilot scale in 200 L fermenter. Specific activity of endoglucanase after ammonium sulphate precipitation was 471 U mg^{-1} and purity was increased to 1.77-fold. Molecular mass of CMCase produced by M-60(5) was 24.5 kDa. Endoglucanase can be used in different industrial applications.

Key words: Endoglucanase, M-60(5), Fermentation, γ -rays, Molecular mass

Chemical and Organic Control of Black Point in Diversified Commercial Wheat Varieties

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Wheat black point disease causes significant financial losses annually by lowering crop yield and grain quality. This study isolates fungi responsible for black point disease and explores their chemical and organic control. Pakistani commercial wheat varieties (204) were cultivated at the Nuclear Institute for Food and Agriculture, Peshawar. Fungicide and dose trials were conducted in a Randomized Complete Block design to assess their efficacy. Disease incidence, severity index, and thousand-kernel weight (TKW) were evaluated. Fungi were isolated from black-pointed seeds, and these isolated fungi were subsequently controlled using garlic and neem. Maximum disease incidence was observed in var. Bakhtawar-92 (100%) and minimal in var. Wafaq-01 (0.7%), with a mean incidence of 18.3%. Maximum disease severity index was recorded in var. Shalimar-88 (77.5%) and minimum in var. Wafaq-01 (0.2%). The mean number of infected seeds was 89 for severity score 1 and 49 for scores 2 and 3. The highest TKW was in var. Rakshan-10 (50.5g) and the lowest in var. Sarsabz (18.4g), averaging 32.4g. Tilt fungicide was most effective, with dose 4 providing optimal control. *Alternaria alternata* was identified as the fungus from all diseased seeds. Garlic and neem extracts exhibited antifungal properties, with 15% concentrations reducing *A. alternata* growth by 83.59% and 65.49%, respectively. These findings indicate no phytotoxicity or soil infertility when fungicides are used as prescribed. The results support garlic and neem extracts as practical, economical, and ecologically friendly approaches for preventing black point disease in wheat. This research is crucial for national seed health standards and disease management initiatives.

Keywords: *Triticum*, Black point, TKW, Tilt, *Alternaria alternata*, Organic control.

In vivo Antidiabetic Potential of Zinc Oxide Nanoparticles of *Plantago Lanceolata* in Mice against Alloxan Induced Diabetes

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Herbal medicine has been used for therapeutic purposes from a long time. Local peoples in poor countries, particularly those with limited resources, have traditionally utilized therapeutic plants belonging to the plant kingdom. Many people in this area rely on medicinal plants, either directly or indirectly, to meet their basic medical needs. *Plantago lanceolata*, has a wealth of biological, antioxidant, wound- healing, antiviral, and antiulcerogenic properties. It is used for production of medicines, such as cough syrup and herbal candies. The study's goals were the synthesis of ZnO nanoparticles and identify *Plantago lanceolata* antidiabetic potential in diabetic mice that had been given Alloxan. A well-known diabetogenic medication (Alloxan) is used to induce Type II diabetes in experimental animals. A single intraperitoneal injection was used to produce Type II DM in animals. The study included animals with blood glucose levels more than 200 mg/dl. The Alloxan -induced diabetic mice were orally treated with *P. lanceolata* nanoparticles. The blood glucose test results from the treated diabetic mice and nontreated diabetic mice were compared. The study suggests that *P. lanceolata*, at a high and low dosage, were able to regulate the blood sugar of mice with type 2 diabetes. Thus, it was shown by the data that *P. lanceolata* significantly reduced the amount of glucose in alloxan-induced diabetic mice as same level as a 3-day treatment with Glucophage. The present study also investigates the histopathological effects of kidney and pancreas treated with *P. lanceolata* nanoparticles. Under a microscope, the kidney and pancreas tissue showed some histological changes due to the *Plantago lanceolata* nanoparticles. After renal damage, the basement membrane of kidney thickens in both Group IV and V (diabetic mice). However, treatment with low dose results a mild reduction in glomerulus cellularity and an increase in Bowman's space, in contrast to the diabetic (negative control group), which exhibits hypercellularity in glomerulus and narrowing of Bowman's space. The histological analysis of the pancreas of diabetic-treated groups revealed that the nanoparticles -treated diabetic mice had higher percentages of beta cells and greater islet volume density, than that of non-treated diabetic (negative) control group which could be indicators of regeneration. After ingesting some plant extracts, there have been reports of β -cell regeneration, increased insulin secretion from the islets of Langerhans' surviving β -cells, and a drop in blood glucose levels. Based on these results, it is recommended that *Plantago lanceolata* nanoparticles should be utilized to treat diabetes.

Key words: *Plantago lanceolata*, Synthesis of ZnO nanoparticles, Alloxan induction, in vivo anti diabetic activity, histopathological analysis.

Encapsulation of Vitamin D Through Different Wall Materials to Improve Bioavailability in Fortified Mayonnaise

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Globally, vitamin D deficiency has been documented as serious health concern and Pakistan is one of vulnerable countries. In Pakistan, majority of the population especially pregnant (68.9%) & non-pregnant women (66.8%) and children (40%) are deficient in vitamin D. This nutritional imbalance exists due to poor dietary sources, malabsorption, obesity and unhealthy lifestyle. To overcome this situation, various strategies have been devised. Amongst, fortification is a promising approach to combat vitamin D deficiency. Whenever, vitamin D exposed to oxygen, light or heat, its functionality drops drastically. Thus, encapsulation with proteins or other suitable carriers

is desirable to enhance stability, bioactivity and absorption of this vitamin. In this context, the current study is planned to encapsulate vitamin D using protein based coating materials for development of fortified mayonnaise. Purposely, whey and soy proteins will be used to develop vitamin D encapsulates. Afterwards, particle size and morphological characteristics of prepared encapsulates will be assessed. Besides, encapsulation efficiency, loading capacity and releasing trend of vitamin D encapsulates will be evaluated. Based on these analyses, three best treatments will be selected for product development. In this module, vitamin D fortified mayonnaise will be prepared and evaluated for quality traits. Accordingly, various product analysis will be carried out. Compositional analysis such as moisture, fat, protein and minerals of mayonnaise will be performed. The viscosity and texture of fortified mayonnaise will be determined through viscometer and Texture Analyser respectively. The freeze-thaw stability, color, fat globule size and sensory characteristics of mayonnaise will also be determined. In-vivo studies of selected mayonnaise treatments will be carried out on Sprague Dawley rats for a period of 60 days. Diet intake, body weight, organ weight, serum vitamin D level, haematological indices and safety assessment tests (LFT, KFT) will be performed to measure the effect of vitamin D fortified mayonnaise on rats. Finally, the data will be subjected to statistical design to determine significance level.

Human Stem Cells Preconditioned with Isorhamnetin: Potential Therapy for 2nd Degree Burns

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Burn wounds are the most common and detrimental injuries that remain major health issue worldwide. Mesenchymal stem cells (MSCs) possess the ability to regenerate tissues by secreting factors involved in promoting cell migration, proliferation and differentiation, while suppressing immune reactions. Preconditioning of MSCs with small molecules having cytoprotective properties can enhance the potential of these cells for their use in cell-based therapeutics. Therefore, the study aims to enhance the therapeutic potential of MSCs by preconditioning them with isorhamnetin for the second degree burn wounds in rats. Human umbilical cord MSCs (hU-MSCs) were isolated and characterized by surface markers. For preconditioning, hU-MSCs were treated with an optimized concentration of isorhamnetin. Migration potential of these MSCs were analyzed by *in vitro* scratch assay. Healing potential of normal and preconditioned hU-MSCs was compared by transplanting these MSCs in a second-degree rat burn wound model. Normal and preconditioned MSCs (IH+MSCs) were transplanted after 72 h of burn infliction and observed for 2 weeks. Histological and gene expression analyses were performed on day 7 and 14 after cell transplantation to validate complete wound healing.

The scratch assay analysis showed significant reduction and complete closure in the scratch area in case of treated MSCs compared to the untreated MSCs at 48 h. The histological analysis showed reduced inflammation, completely remodeled epidermis and dermis without scar formation and regeneration of hair follicles in the group that received IH+MSCs. Gene expression analysis was time dependent and more pronounced in case of IH+MSCs. IL-1 β , IL-6 and Bax genes showed significant downregulation, while VEGF, and Bcl-2 showed significant upregulation compared to the burn wound, showing increased angiogenesis and reduced inflammation and apoptosis. Preconditioning of hU-MSCs with isorhamnetin decreases wound progression by reducing inflammation, and improving tissue architecture and wound healing. The study outcome is expected to lead us towards an improved cell based therapeutic approach for burn wounds.

Key words: Burn wound; Isorhamnetin; Mesenchymal stem cells; Preconditioning; Wound healing

Phytochemical Profiling and Invitro Biological Potential of Various Solvents Extracts from the Leaves of *Haworthia Attenuata*

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In the worldwide medical plants are used by different populations and play an important role in treating human and animal diseases. This study investigated the phytochemical profiling and Invitro biological potential of various solvents extracts from the leaves of *Haworthia attenuata* a medicinal plant used in traditional medicine. The extraction using solvents of varying effects, including hexane, ethyl acetate, methanol, and water. Phytochemical analysis shows the presence of secondary metabolites, including alkaloids, flavonoids, phenolics, terpenoids, and saponins, having concentrations to different solvent extracts. The in vitro biological activities of the extracts were evaluated by using 2,2-Diphenyl-1-picrylhydrazyl (DPPH)(0.466,0.567,0.890) and 2,2'-azino-bis-(3-ethylbenzothiazoline-6-sulfonic acid(0.890,0.896,0.678) was used to different activities, while the antimicrobial activity was determined against a panel of pathogenic microorganisms, including bacteria and fungi. Additionally, the anticancer potential was evaluated using Multi transit time (MTT) assay against selected cancer cell lines. The results indicated significant variations in the phytochemical composition and biological activities among the solvent extracts. The methanol, n hexhene and ethyl acetate exhibited potentials to Antioxidant activities attributed to their high phenolic and flavonoid contents to Gram-positive bacteria, as well as fungi.

Keywords. Photochemical profiling, invitro biological potential, *Haworthia attenuata*, medicinal plants.

Revolutionizing Food Preservation: A Review of AI Applications

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Artificial Intelligence (AI) is spearheading a transformative shift in the landscape of food preservation, leveraging cutting-edge technologies across the entire supply chain. Through machine learning algorithms, AI is enhancing quality control processes by accurately identifying defects and sorting products, ensuring that only high-quality items progress through the preservation pipeline. The application of predictive analytics is revolutionizing shelf life predictions, enabling precise optimization of storage conditions to curtail spoilage risks. Additionally, smart packaging, embedded with sensors and AI capabilities, actively monitors environmental factors like temperature and humidity, thereby extending the shelf life of perishable goods. AI-controlled climate systems in storage facilities optimize conditions intelligently, not only ensuring product freshness but also minimizing energy consumption for sustainability. The incorporation of AI into supply chain management introduces heightened traceability, enabling quick identification and resolution of issues to guarantee the safety and quality of food products. Early detection systems, powered by AI algorithms, scrutinize diverse data sources, allowing for swift intervention against contamination threats. Furthermore, AI-driven dynamic pricing and inventory management systems adapt to market fluctuations, reducing waste and maximizing revenue for producers and retailers alike. This comprehensive integration of AI technologies reshapes the entire paradigm of food preservation, fostering efficiency, sustainability, and safety throughout the intricate web of the food supply chain.

Unveiling the Chemistry of Citrus Peel: Insight into Nutraceutical Potential and Therapeutic Applications

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The recent millennium has witnessed a notable shift in consumer focus towards natural products for addressing lifestyle-related disorders, driven by their safety and cost-effectiveness. Nutraceuticals and functional foods play an imperative role by meeting nutritional needs and offering medicinal benefits. With increased scientific knowledge and awareness, the significance of a healthy lifestyle, including diet, in reducing disease risk is widely acknowledged, facilitating access to a diverse and safer diet for longevity. Plant-based foods rich in phytochemicals are increasingly popular and effectively utilized in disease management. Agricultural waste from plant-based foods is being recognized as a valuable source of nutraceuticals for dietary interventions. Citrus peels, known for their diverse flavonoids, are emerging as a promising health-promoting ingredient. Globally, citrus production yields approximately 15 million tons of by-products annually, highlighting the substantial potential for utilizing citrus waste in phyto-therapeutic and nutraceutical applications. Citrus peels are a rich source of flavonoids, with concentrations ranging from 2.5 to 5.5 g/100 g dry weight, depending on the citrus variety. The most abundant flavonoids in citrus peel include hesperidin and naringin, as well as essential oils rich in monoterpenes like limonene. The peel extracts exhibit high antioxidant capacity, with DPPH radical scavenging activities ranging from 70 to 90%, comparable to synthetic antioxidants like BHA and BHT. Additionally, the flavonoids present in citrus peel have been found to have antioxidant properties, which can help reduce oxidative stress by 30% and cardiovascular disease by 25%. Potent anti-inflammatory effects have also been demonstrated, reducing inflammatory markers such as IL-6 and TNF- α by up to 40% in cell culture studies. These findings highlight the potential of citrus peel as a valuable source of nutraceuticals in diet-based therapies.

Keywords: citrus peel; extraction; supercritical; hyperlipidemia; hypoglycemic; antidiabetic

Utilizing High Pressure Carbon Dioxide Processing HPCD for Fruits and Vegetables

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High Pressure Carbon Dioxide Processing (HPCD) has emerged as a promising technology for extending the shelf life and enhancing the safety of fruits and vegetables. This abstract offers a comprehensive review of the application of HPCD in the preservation of perishable produce. Fruits and vegetables are highly perishable commodities prone to microbial contamination, enzymatic degradation, and post-harvest losses. Traditional preservation methods often involve heat treatments, which may compromise the sensory attributes and nutritional quality of the produce. HPCD presents an alternative approach, utilizing elevated pressures of carbon dioxide (CO₂) to achieve microbial inactivation and enzyme inhibition while preserving the inherent characteristics of fruits and vegetables. Research findings highlight the efficacy of HPCD in reducing microbial populations, including pathogens such as *Salmonella*, *Escherichia coli*, and *Listeria monocytogenes*, without compromising the sensory attributes or nutritional integrity of the treated produce. The non-thermal nature of HPCD ensures minimal impact on flavor, color, and texture, making it an attractive option for preserving the quality of fresh fruits and vegetables. Moreover, HPCD extends the shelf life of fruits and vegetables by inhibiting enzymatic activity associated with ripening and deterioration processes. This contributes to reducing food waste and enhancing the economic viability of agricultural production and distribution systems. Furthermore, HPCD offers advantages in terms of food safety, as it eliminates the need for chemical preservatives and minimizes the risk of cross-contamination during processing. The versatility of HPCD

allows for its application across a wide range of fruits and vegetables, including berries, leafy greens, citrus fruits, and root vegetables. HPCD holds significant promise as a non-thermal preservation technology for fruits and vegetables, offering improvements in safety, quality, and shelf life compared to conventional methods. Continued research efforts are warranted to optimize processing parameters and ensure the widespread adoption of HPCD in the food industry.

Keywords: non-thermal, preservation, green technology, fruits, vegetables

Functional Food Trends in Combating Obesity

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Functional foods have emerged as a promising approach in combating the global epidemic of obesity. This abstract presents a comprehensive review of the trends in functional food utilization for obesity management. Obesity, characterized by excessive accumulation of body fat, is a multifactorial disorder influenced by genetic, environmental and behavioral factors. Conventional weight management strategies often face challenges in long-term efficacy and sustainability, thus fueling the quest for alternative solutions such as functional foods. Functional foods are those fortified with bioactive compounds beyond their basic nutritional value, exhibiting physiological benefits that contribute to improved health and well-being. In the context of obesity, functional foods offer potential avenues for weight control, appetite suppression, fat metabolism modulation, and promotion of satiety. Key trends in functional food development against obesity include the incorporation of ingredients such as dietary fibers, polyphenols, probiotics and bioactive peptides, each targeting specific mechanisms implicated in weight regulation. Fiber-rich functional foods, such as whole grains and legumes, aid in promoting satiety, regulating blood sugar levels and supporting digestive health, thereby assisting in weight management efforts. Polyphenol-rich foods including green tea, berries and dark chocolate, exhibit anti-obesity properties through their antioxidative and anti-inflammatory effects, along with modulation of lipid metabolism pathways. Probiotics found in fermented foods like yogurt and kefir, contribute to gut microbiota balance, influencing energy homeostasis and fat storage. Bioactive peptides derived from proteins in sources like fish, milk, and soy possess satiety-inducing and thermogenic properties, contributing to appetite suppression and increased energy expenditure. Furthermore, advancements in food processing technologies have enabled the development of novel functional food formulations, such as encapsulation of bioactive compounds for enhanced stability and bioavailability. Functional foods represent a promising strategy in the fight against obesity, offering diverse mechanisms of action and compatibility with dietary preferences. Continued research and innovation in functional food development hold significant potential for addressing the complex challenge of obesity on a global scale.

Keywords: functional, food, obesity, management, lifestyle, disorders

Examining the therapeutic potential of novel sapodilla-derived products in diabetes management

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Sapodilla (*Manilkara zapota*) is a tropical evergreen tree from the *Sapotaceae* family. Being rich in bioactive components, the parts of this plant are frequently used for various health benefits. These components are used in traditional medicine to cure coughs and colds and have diuretic, antidiarrheal, antibacterial, antihyperglycemic, and hypocholesterolemia properties. Additionally, sapodilla fruit and its by-products contain bioactive compounds with antioxidant, antidiabetic, and anti-inflammatory properties, making them valuable for developing functional foods for diabetic care. As consumer preferences increasingly lean towards healthier product options, exploring the therapeutic potential of novel sapodilla-derived products in managing diabetes emerges as a significant step forward. There are various researches done which highlighted its potential in modulating glucose metabolism and improving insulin sensitivity, making it a promising candidate for diabetes management. Study was conducted in which animals treated with sapodilla fruit and leaves juice showed significantly lower levels of glycaemia. It has also observed from investigations that sapodilla effectively inhibits α -amylase and α -glucosidase enzymes, aiding in managing blood sugar levels. Furthermore, the soybean milk enriched with sapodilla pulp and other beneficial ingredients, provides a soft, smooth, and nutritious beverage that aids in digestion and absorption, offering improved diet therapy and health effects for diabetic patients. These properties might be attributed to bioactive compounds like ellagitannins, gallotannins and phenolic acids, exhibits potential antidiabetic properties that are present in sapodilla plant. In this context, bringing attention to the therapeutic potential of sapodilla-derived products as adjunctive therapies in diabetes management would be valuable. This entails emphasizing the need for further research and clinical applications to explore the full extent of their benefits. By doing so, we can uncover new avenues for enhancing diabetes treatment strategies and improving patient outcomes.

Keywords: sapodilla, diabetes, bioactive compounds, glycaemia, novel products

“Development and nutritional evaluation of quinoa-watermelon seed-based functional bars”

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People have started paying more attention to healthy and nutritious snacks in recent years due to more diet-consciousness. Consumers are becoming more aware of the adverse health effects of eating junk food. This has led to increased popularity of healthy snacks and meals. The developed bars target busy lifestyles, offering a grab-and-go option that doesn't compromise on nutrition. Quinoa and watermelon seeds, rich in protein, fiber, healthy fats, and micronutrients, offer exciting possibilities for functional food development. This study investigated the creation and nutritional analysis of quinoa-watermelon seed-based functional bars. The bars were formulated with quinoa flour, watermelon seeds, and other ingredients to ensure a palatable and nutritious product. A rigorous nutritional evaluation assessed protein, fiber, fat, and micronutrient content. This research aimed to contribute to the development of novel snack bars that address the growing consumer demand for healthy and functional foods. By leveraging quinoa and watermelon seeds, these bars have the potential to be a convenient source of essential nutrients, promoting overall well-being. These findings hold value for food scientists, nutritionists, and manufacturers seeking to develop innovative and nutritious snack products. Beyond the core analysis, the research may explore functional additions like prebiotics or adaptogens, further enhancing the bars' health appeal.

Keywords: Quinoa, Healthy snacks, Micronutrients, Consumer demand, Innovation

Detect and characterize ESBL-producing *P. aeruginosa* isolated from SSIs, providing comprehensive insights into their prevalence and genetic profiles

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Abstract:

The emergence of extended-spectrum beta-lactamase (ESBL)-producing *Pseudomonas aeruginosa* poses a significant threat in clinical settings, particularly in the treatment of surgical site infections (SSIs). This study aims to detect and characterize ESBL-producing *P. aeruginosa* isolated from SSIs, providing comprehensive insights into their prevalence and genetic profiles.

Introduction: Surgical site infections (SSIs) are a major cause of morbidity and mortality in hospitalized patients. The treatment of SSIs is further complicated by the emergence of antibiotic-resistant pathogens, particularly ESBL-producing *Pseudomonas aeruginosa*. These bacteria produce beta-lactamase enzymes that confer resistance to a broad spectrum of beta-lactam antibiotics, rendering standard treatments ineffective. This study focuses on the molecular detection and characterization of ESBL-producing *P. aeruginosa* strains isolated from SSIs, with the aim of understanding their prevalence and genetic mechanisms of resistance.

Methodology: Over a six-month period, 110 *P. aeruginosa* isolates were collected from patients with SSIs at a Khyber Teaching Hospital Peshawar. Antibiotic susceptibility testing was performed using the disk diffusion method according to Clinical and Laboratory Standards Institute (CLSI) guidelines to determine resistance to third-generation cephalosporins. Molecular detection of ESBL genes (*bla*_TEM, *bla*_SHV, and *bla*_CTX-M) was carried out using polymerase chain reaction (PCR). Positive PCR results were confirmed by sequencing to identify specific mutations and genetic variations.

Results: Out of the 110 isolates, 47% exhibited resistance to third-generation cephalosporins, indicating potential ESBL production. Among these, 30 isolates were confirmed as ESBL producers. The *bla*_TEM gene was detected in 65% of the ESBL-producing isolates, *bla*_SHV in 45%, and *bla*_CTX-M in 38%. Sequencing confirmed the presence of these genes and identified specific mutations associated with enhanced antibiotic resistance.

Conclusion: The study highlights the significant prevalence of ESBL-producing *P. aeruginosa* in SSIs and underscores the critical need for robust infection control practices and prudent antibiotic use. The findings emphasize the importance of molecular diagnostic techniques for the accurate detection of resistant strains, aiding in the effective management and prevention of their spread within healthcare settings.

Keywords: *Pseudomonas aeruginosa*, surgical site infections, ESBLs, antibiotic resistance, molecular detection, PCR, *bla*_TEM, *bla*_SHV, *bla*_CTX-M

Impact of Environmental Contaminants on the Phytochemical and Biological parameters of *Parthenium hysterophorus* L.

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Background: *Parthenium Hysterophorus* L., often referred to as 'Congress grass' or 'Carrot weed', is a highly invasive weed that has received considerable attention due to its detrimental effects on agriculture, ecology, and

human health. Despite its negative impact, this plant species possesses medicinal properties and contains phytochemicals with potential therapeutic applications. Studies suggest that these compounds can modulate the plant's secondary metabolites, such as alkaloids, flavonoids, and phenolic compounds, which are essential for its medicinal properties.

Methods: Soil and plant samples were obtained from multiple sites in Kohat District and collected in triplicate. The physical and chemical properties of the soil samples were analyzed at the Soil Testing Laboratory in BARS Kohat, while the phytochemical elements (Cadmium, Chromium, Cobalt, Iron, Nickel, and Manganese) in the plant and soil samples were assessed following the Catenza and Donker (2022) protocol with minor adjustments. Gas Chromatography-Mass Spectrometry (GC-MS) analysis was conducted at the CRL Laboratory, University of Peshawar. The antibacterial activity of the plant extracts was tested using the agar well diffusion method against both gram-positive and gram-negative bacteria. Lastly, the phytotoxicity of the plant extract was evaluated.

Results: The physical and chemical properties of the soil samples were measured, revealing a pH of 6, Cr conc. of 0.370, Iron of 1.016, Zn of 0.082, Cd of 0.081, and Ni of 0.351.

Furthermore, the plant extract displayed a zone of inhibition of 14mm, 16mm, 22mm, and 26mm when tested on 70uL, 80uL, 90uL, and 100uL of the extract, respectively.

Conclusion: In conclusion, the plant extract showed good efficacy against both gram-positive and gram-negative bacteria.

Keywords: *Parthenium Hysterophorus L.*, Environment, Contaminants, Antibacterial activity

Aims and Objective

To assess the heavy metal concentration in soil and plant samples of *P. hysterophorus* from various sites in District Kohat, as well as evaluating the phytochemical profiles of the plant through GC-MS analysis, along with assessing its phytotoxicity, and antibacterial activities.

1. To assess the heavy metals concentration in soil and plant samples of *P. hysterophorus* collected from different sites of District Kohat.
2. To evaluate the phytochemical profiles of plant samples through GC-MS analysis and phytotoxicity, and its antibacterial activities of *P. hysterophorus*.

Sustainable Food Packaging: Biodegradable Films Blending Chitosan/PVA with *Terminalia Arjuna* Extract and Aloe Vera Gel

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The urgent environmental and health challenges associated with non-biodegradable food packaging materials, primarily sourced from plastics and petroleum, emphasize the critical need for sustainable alternatives. In light of this imperative, our research endeavors have led to the development of environmentally conscious films imbued with both antioxidant and antibacterial attributes. Within this study, we meticulously formulated a composite comprising chitosan (CS) and polyvinyl alcohol (PVA), augmented with the beneficial properties of Aloe vera gel (AG) and *Terminalia Arjuna* extract (TAE), ultimately manifesting as biodegradable films. This intricate blend represents a concerted effort to address the dual concerns of environmental sustainability and public health, offering

a sophisticated solution to the pervasive challenges posed by conventional packaging materials. Evidential characterization involved FTIR, SEM, XRD, camera imaging, and mechanical analysis. Evaluation covered thickness, moisture content, optical activity, solubility, antifogging effect, antioxidant and antibacterial properties, biodegradability, sensory analysis, and suitability for food packaging. FTIR confirmed functional moieties and interlinking, XRD and SEM showed amorphous and homogeneous structure. Films exhibited prominent antibacterial potential against *S. aureus* and *E. Coli*. AYA-4 and AYA-5 showed highest antioxidant potential (70.28 and 68.08, respectively) with IC₅₀ values of 7±4 and 7±0.35 mg/ml. The entirety of the film variants exhibited notable levels of biodegradability, showcasing a weight reduction of up to 94.24%. Moreover, their application on grapes and tomatoes revealed promising outcomes in terms of biodegradability, thus offering a compelling environmentally sustainable alternative for packaging. Furthermore, the incorporation of these films significantly enhanced the shelf life of model fruits, indicating a substantial improvement in preservation capabilities.

Key Word: Aloe vera gel; *Terminalia Arjuna*; Antibacterial; Antioxidant; Biodegradable film; Food packaging

Therapeutic Potentials in Malaysian Flora's Essential Oils

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Traditional medicinal plants in Malaysia have been integral to healing practices, with essential oils emerging as key therapeutic components. This presentation explores the diverse array of essential oils derived from Malaysian medicinal plants, providing insights into their distinct chemical compositions and potential therapeutic properties. Through detailed analysis of selected plant species, it highlights the roles of essential oils in traditional healing, focusing on their bioactive constituents and pharmacological attributes, thereby contributing to a deeper understanding of their therapeutic efficacy. Additionally, the presentation bridges the gap between traditional knowledge and modern scientific understanding, offering perspectives on integrating these essential oils into contemporary healthcare practices. It underscores the importance of preserving Malaysia's traditional medicinal plants, recognising them not only as sources of traditional remedies but also as reservoirs of potential therapeutic agents.

Keywords: Essential oils; Malaysia; medicinal plants; therapeutics; traditional plants

Role of Probiotics in Modulating the Human Microbiome

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Probiotics, live microorganisms that confer health benefits to the host, play a crucial role in modulating the human microbiome and enhancing overall health. This abstract delves into the mechanisms by which probiotics influence gut microbiota composition, improve gut health, and impact systemic conditions. Probiotics are found in fermented foods and supplements and have been shown to restore microbial balance, particularly after antibiotic use, and to prevent and treat gastrointestinal disorders such as irritable bowel syndrome (IBS) and inflammatory bowel disease (IBD). Emerging research suggests that probiotics also contribute to mental health through the gut-brain axis,

potentially alleviating conditions like anxiety and depression. The gut-brain axis is a complex communication network linking the central nervous system with the gastrointestinal tract, and probiotics can influence this connection by modulating the gut microbiota. Furthermore, probiotics enhance immune function, reduce the risk of infections, and may aid in weight management and metabolic health. Specific strains of probiotics, such as *Lactobacillus* and *Bifidobacterium*, have been extensively studied for their health benefits. For example, *Lactobacillus rhamnosus* has shown promise in reducing anxiety symptoms, while *Bifidobacterium infantis* can alleviate symptoms of IBS. The abstract also discusses challenges in standardizing probiotic products, ensuring their efficacy, and understanding individual responses to probiotic supplementation. Advances in next-generation sequencing and metabolomics are helping to unravel the complexities of the microbiome and its interaction with probiotics. By modulating the microbiome, probiotics offer a promising approach to improving health and preventing disease. Future research should focus on personalized probiotic treatments and the long-term effects of probiotic use on human health.

Keywords: Probiotics, human microbiome, gut health, gut-brain axis, immune function, gastrointestinal disorders, *Lactobacillus*, *Bifidobacterium*.

Neuroprotective effects of Mangiferin by targeting oxidative stress.

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To develop the novel therapeutic strategies for treatment of neurodegenerative disorder, the exploration of new neuroprotective compounds can play a great role to modulate the neurogenesis and treat the neuronal deficit. Formerly the Mangiferin (MNG), well known Xanthone glucoside and phenolic constituent of *Mangifera indica* has shown to inhibit H₂O₂ induced oxidative damage in rat Pheochromocytoma (PC12) and nucleus pulposus (NP) cultures, but its neuroprotective and antioxidant property on primary hippocampal neural progenitor cells (NPCs) has not evaluated. Targeting proneurogenic approach we designed to evaluate the in vitro antioxidant and neuroprotective potential of Mangiferin extracted from *Mangifera indica*. We examined the proliferative, antioxidant and neuroprotective actions of Mangiferin against H₂O₂ induced oxidative stress in primary isolated hippocampal neural progenitor cells (NPCs). The screening results displayed prominent neuroprotective effects by rescuing the hippocampal NSPCs against H₂O₂ induced oxidative damage. The proliferative effects of Mangiferin on hippocampal cells was also observed in dose dependent manner. We further demonstrated that the selected concentrations of Mangiferin did not produced any cytotoxic effect on hippocampal cell viability and significantly inhibited reactive oxygen species generation.

Barani Matar: 1st High Yielding Rainfed Pea Cultivar For Pothowar region

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Vegetable pea (*Pisum sativum* L.) is the most important vegetable belonging to family Leguminosae. Besides being rich in proteins, it is a good supplier of several minerals and vitamins. In Pakistan, Punjab being a top producer of peas, however, all cultivars released up-till now were only for irrigated areas. Thus in order to improved pea cultivation in rainfed areas of Pothowar region, 1st ever pea cultivar “Barani Matar” was developed by the Barani Agricultural Research Institute, Chakwal and released in 2023 through farmer field selection. “Barani Matar” is

attractive for consumers with maximum pod length (9.8 cm), number of seeds/pod (9-12), good taste and sweet flavor (10.1 TSS). It exhibited moderate resistance to Powdery mildew over the check varieties; Supreme, Meteore and Fsd-09 during different performance trials. As it is a rainfed cultivar, it showed better yield in low rainfall areas (4.5-5.5 t/ha) with comparatively better protein content, iron and zinc.

Molecular characterization and Antibigram assay of diarrheagenic *E.coli* in the cattle and buffalo populations of District Attock

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Diarrheal illnesses are a severe public health problem and a major cause of morbidity and mortality in cattle. *E.coli* strains involved in diarrheal diseases are one of the most important of the various etiological agents of diarrhea particularly diarrheagenic *E. coli* (DEC). The aim of present study was to determine antibiotic resistance profile of diarrheagenic *E.coli* isolates and to find out virulence genes *stx* 1 and *stx* 2 in diarrheagenic *E.coli* isolates. A total of 150 stool samples were collected from cattle with diarrhea in district Attock, in 2024. Diarrheagenic *E. coli* (DEC) strains were grown on MacConkey and EMB media followed by phenotypic identification through staining, cultural characteristics and biochemical tests. PCR was to detect the presence of genes *stx*₁, *stx*₂ for STEC strains. A total of 150 stool samples were tested in which 60 (40%) were identified as contaminated with *E. coli* by biochemical tests. Shiga toxigenic *E.coli* (STEC) strains were identified. Among STEC isolates, 27 (45%) strains were positive for *stx*₁ and 33 (55%) stains were for *stx*₂. Antibiotics: Amoxicillin (65%), tetracycline (78%), ciprofloxacin (66%), and gentamicin (85%), showed resistance against STEC. In this study we found high rates of STEC strains causing diarrhea in cattle.

Keywords DEC, EMB, STEC, conventional PCR

Cultivating Resilience: Navigating Climate Change's Impact on Crop Production and Food Security

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Solar radiation, temperature, and rainfall are critical climatic factors that significantly influence crop growth, development, and yield. However, heat stress resulting from high ambient temperatures poses a serious threat to crop production on a global scale. Additionally, human activities contribute significantly to greenhouse gas emissions, including CO₂, methane, chlorofluorocarbons, and nitrous oxides. These gases accumulate in the atmosphere, gradually raising the world's average ambient temperature. As a consequence, the changing climate affects agricultural systems, necessitating adaptation strategies to mitigate the impact on crop yields. Climate change significantly affects crop yields, resulting in both positive and negative effects. These impacts vary based on factors such as crop type, region, and specific climate patterns. Key factors influencing crop yields include changes in temperature (both increases and decreases), heat waves, alterations in precipitation patterns (such as droughts and flooding), elevated carbon dioxide (CO₂) concentration, enhanced photosynthesis, nutrient dilution, pests and diseases, extreme weather events, and regional variability. Crop production is inherently variable, posing risks and uncertainties for the agricultural community. Studies have shown that climatic variables—such as photo

synthetically active radiation, air temperature and water availability—strongly influence agricultural crop production. Rising temperatures and increased CO₂ levels, coupled with uncertainties in rainfall due to global climate change, further impact food security. To assess the effects of climate change on crop yield, researchers conducted a scientific study using a questionnaire to collect primary data from stakeholders, including farmers, researchers, and policymakers. The study revealed that climate change directly and indirectly affects crop yield, with factors like rising temperatures, soil erosion, floods, droughts, and natural disasters playing a significant role. To mitigate these effects, farmers should focus on cultivating resistant crop varieties and adopt water-saving technologies for future agriculture.

Keywords: Climate change, crop production, survey, food security.

Mitochondria-dependent apoptosis in triptolide-induced hepatotoxicity is associated with the DRP1 activation

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How triptolide is associated with mitochondrial dysfunction and apoptosis in connection with its hepatotoxicity remains unclear. The objective of our study was to find out the link between mitochondrial dynamics and cell death in triptolide induced hepatotoxicity. We treated L02 cells with 25 nM concentration of triptolide. The results demonstrated that triptolide treatment caused an increase in apoptotic cell death, mitochondrial depolarization, ROS overproduction, a decrease in ATP production, and mitochondrial fragmentation which in turn is associated with the activation of Drp1 fission protein. Triptolide treatment led to the translocation of Drp1 from the cytosol into outer mitochondrial membrane where it started mitochondrial fission. This fission event is coupled with the mitochondrial release of cytochrome c into the cytosol and subsequently caspase-3 activation. TEM analysis of rat liver tissues revealed the distortion of mitochondrial morphology in triptolide-treated group. Western blot analysis explained that disruption in mitochondrial morphology was attached with the recruitment of Drp1 to mitochondria, cytochrome c release, and caspase-3 activation. However, Mdivi-1 cotreatment inhibited the activation of Drp1 and caspase-3 and blocked the release of cytochrome c into the cytosol. In short, inhibiting Drp1 protein activation may provide a new potential target for curing Drp1-associated apoptosis in triptolide-induced hepatotoxicity.

Keywords: Triptolide, ROS, Drp1, Hepatotoxicity

Investigating Maleic Acid Derivatives for Antibacterial Activity: In Vitro and In Silico Insights

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This study investigates the synthesis, characterization, and biological evaluation of bis-Schiff bases derived from maleic acid, a dicarboxylic acid found in various fruits and a key building block for biologically active compounds. Maleic acid served as the starting material in a multi-step synthetic process: esterification of maleic acid, formation of maleic hydrazide, and subsequent reaction with various substituted aldehydes to yield bis-Schiff base derivatives. The structures of the newly synthesized compounds (1-15) were elucidated using ¹H NMR, ¹³C NMR, and MS spectral analyses. The antibacterial activity of these derivatives was screened *in vitro* against Gram-negative

(*Escherichia coli*) and Gram-positive (*Staphylococcus aureus*) bacteria. Among the synthesized derivatives, compounds 4l, 4c, 4m, 4g, 4j, 4o, and 4d exhibited the highest antibacterial activity against both bacterial strains. Additionally, a molecular docking study was conducted to evaluate the potential inhibitory activities of these compounds against the target enzyme flavohemoglobin (flavoHB). The results indicated that these compounds achieved the highest docking scores at the active site of flavoHB. Consequently, the combined *in vitro* and molecular docking studies suggest that compounds 4l, 4c, 4m, 4g, 4j, 4o, and 4d are promising candidates as bacterial flavohemoglobin (flavoHB) inhibitors, providing a strong foundation for the future design and development of novel antibacterial agents.

Keywords: Maleic acid, Bis-Schiff base, Antibacterial Screening, Spectroscopic Characterization, Molecular Docking Analysis

Molecular Characterization and Antibiofilm Profiles of Shiga Toxigenic *Escherichia coli* O157:H7 in Ruminants of District Kohat

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Shiga toxigenic *Escherichia coli* (STEC) causes different illness in humans and animals that are a serious public health concern. STEC related infections have not been previously reported from ruminants of Kohat district. This study was aimed to isolate and identify Shiga toxigenic *Escherichia coli* O157:H7 from animal stool samples and to determine the antibiotic susceptibility patterns of the identified isolates and to detect the presence of Shiga toxin producing genes *stx1* and *stx2*. Stool samples were collected from ruminants at different farms of Kohat District. Biochemical tests were performed for the identification and antibiotic susceptibility profiles were confirmed using disk diffusion method. A Minimum Inhibitory Concentration (MIC) test was also determined followed by polymerase chain reaction (PCR) to detect Shiga toxin, *stx1* and *stx2* genes. A total of 400 stool samples were collected from ruminants. Among these 40 (10%) were positive for STEC O157:H7, out of which 10% (4/40) of the isolates were resistant to Ciprofloxacin, 20% (8/40) were resistant to Gentamicin, 40% (16/40) were resistant to Tetracycline, 50% (20/40) were resistant to Amoxicillin while 60% (24/40) were resistant to Ampicillin. Among these 40 samples, Male Cattle were 15% (6/40), Female Cattle were 25% (10/40), Goats were 35% (14/40), Sheep were 25% (10/40) while Buffaloes were only 5% (2/40). Among these, 25 samples contained the *stx1* gene and 8 samples contained both *stx1* and *stx2* genes. The majority of STEC positive cases were found in diarrheagenic ruminants. Our study reveals a 10% prevalence of STEC O157: H7 in stool samples of ruminants in Kohat. The isolates showed high antibiotic resistance, highlighting the importance for improved farm hygiene and careful use of antibiotic to reduce STEC infections in the region.

Keywords: Shiga toxigenic *E. coli*, STEC, Kohat, diarrhea, *stx* genes, epidemiology, public health.

Isolation and Exploration of Morphological Characteristics of *Xanthomonas oryzae* pv *oryzae* Isolates Collected from Southern Punjab during 2017

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A study on the loss of rice, a third largest commodity, production is attributed to Bacterial leaf blight of rice. Eleven different areas of Southern Punjab were surveyed and sampled for their Isolation and morphological categorization. Six morphological tests performed showed similar results for all the isolates collected from 8 districts and 11 marked areas. Gram staining, spore staining and capsule staining techniques were done and after microscopic study, it was concluded that all *Xoo* isolates were gram negative, not endospore forming bacteria and contain encapsulated bacterial cells. Growth behavior of all the isolates was checked at two different pH levels i.e., 7.0 and 5.5. The number of bacterial colonies recorded at pH 7.0 was significantly higher than the colonies grown at pH 5.5. Growth of bacteria at two different temperatures 25 °C and 40 °C was checked and there was a little difference in growth behavior of bacterium at both temperatures that most of isolates showed maximum growth at 25 °C while at 40 °C some isolates showed poor or no growth. There is an alarming situation in these areas and there is a dire need to adopt the management practices to control disease.

Development of methodology for optimum extraction of essential oil from *Pistacia lentiscus* L. oleogum resin

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Pistacia lentiscus L. is an Anacardiaceae family plant containing a significant percentage of essential oil used in fragrance, pharmaceuticals, alcohol production, cosmetics, and the food industry. The current work focused on the development of methodology for optimum extraction of essential oil from *Pistacia lentiscus* L. oleogum resin by using superheated steam extraction. Response surface methodology with central composite design was used to optimize the experimental condition of superheated steam extraction including particle size (0.5-1mm), extraction temperature (140-180 °C) and extraction time (90-150 min). The optimum essential oil yield 5.65% was observed at 160 °C temperature, 0.75 mm particle size and time: 120 min. Furthermore, the superheated steam extraction results were compared with conventional hydro-distillation and hydro-distillation techniques. The comparison showed that superheated steam extraction yielded a higher quantity of essential oil as compared to other extraction methods. The chemical composition of *Pistacia lentiscus* L. essential oil was analyzed by GC-MS and their results showed α -pinene as a major chemical component of essential oil. Trans-verbenol, verbenol, cis-verbenone, camphene, β -myrcene, d-limonene, cymene, α -myrtenol, α -campholenal, α -copaene and α -thujene were the compounds whose concentration varied with different extraction techniques. Overall, superheated steam extraction is an efficient technique for extraction of essential oil from *Pistacia lentiscus* L. oleogum resin that enhances essential oil yield with shorter extraction time.

Key words: Essential oil, Yield, *Pistacia lentiscus*, Response surface methodology, Superheated steam extraction

Identification of the Status of Pakistani birds and their challenges using eBird

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Biodiversity is facing a global crisis, with significant declines observed across various taxa, including birds. In Pakistan, a country rich in biodiversity due to its diverse topography and climate, the status of bird populations remains poorly understood, despite increasing threats from habitat destruction and human activities. This ongoing study leverages citizen science data from eBird, iNaturalist, and Avibase to assess the status of Pakistani birds and identify the challenges they face. Our research involves analyzing large-scale abundance patterns and range sizes of birds in Pakistan using data submitted to these platforms from 31 May 2010-31 May 2025. We focus on four key indices: long-term trends, current annual trends, range size, and habitat-specific trends. We categorize bird species into groups based on their taxonomy, ecology, and range, and employ Generalized Linear Mixed-effects Models (GLMMs) to standardize the data and determine trends. Preliminary findings reveal that 555 bird species have been recorded across various locations in Pakistan. Initially, we planned to rely primarily on eBird data; however, due to insufficient available data on eBird, we expanded our data sources to include iNaturalist and Avibase. The use of citizen science data has proven invaluable in filling critical knowledge gaps regarding species distributions and population trends. Although our research is still in progress, it highlights the current status of avian biodiversity in Pakistan and underscores the importance of citizen science in biodiversity monitoring and conservation. Our study aims to provide essential insights into the state of bird populations in Pakistan and offers recommendations for conservation strategies. By engaging citizen scientists and leveraging their data, we aim to contribute to a broader understanding and better management of biodiversity in Pakistan.

Keywords: Biodiversity Decline, Citizen Science, eBird, Bird Population Trends, Species Distribution, Pakistan, Conservation Strategies.

Application of carboxymethylcellulose in combination with essential oils nano-emulsions edible coating for the preservation of kiwifruit

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The present research investigates the effectiveness of nano-emulsified coatings (C-1, C-2, and C-3) in preserving the kiwifruit at a temperature of 10 ± 2 °C with 90–95 % relative humidity (RH) for 30 days. The nano-emulsions were prepared from varied carboxymethyl cellulose (CMC) concentrations with different combinations of essential oils such as thyme, clove, and cardamom. Dynamic light scattering investigation with Zeta Sizer revealed that C-1, C-2, and C-3 nano-emulsions have nano sizes of 81.3 ± 2.3 , 115.3 ± 4.2 , and 63.2 ± 3.2 nm, respectively. The scanning electron microscopy images showed that the nanoemulsion of C-1 had homogenous spherical globules, C-2 had voids, and C-3 showed a non-porous structure with uniform dispersion. The X-ray diffraction analysis indicated that C-1, C-2, and C-3 nano-emulsion exhibited distinct crystallinity and peaks. The nano-emulsion C-1 had reduced crystallinity, while C-2 had lower intensity peaks, and C-3 had increased crystallinity. The results documented that compared to control kiwifruit samples, the samples coated with C-3 nanoemulsion have decreased weight loss, decay incidence, soluble solids, maturity index activity, ethylene production, total bacterial count, and increased titratable acid, and firmness attributes. The results of current research are promising and would be applicable in utilization in industrial applications.

Keywords: Nano-emulsions, Carboxymethyl cellulose, Essential oils, Preservation, Shelf-life, Kiwifruit

Enhancing Moringa-based nutraceuticals through AI-Optimized Formulations

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The rising popularity of nutraceuticals has placed *Moringa oleifera* in the spotlight for its potent health benefits. This abstract explores the application of Artificial Intelligence (AI) in optimizing the formulation of Moringa-based nutraceuticals. By utilizing AI technologies such as machine learning and predictive modeling, researchers can develop advanced formulations that enhance the bioavailability and efficacy of Moringa's active compounds. AI can analyze vast amounts of data from clinical studies, biochemical assays, and consumer feedback to identify the most effective combinations of Moringa extracts with other bioactive ingredients. For example, combining Moringa with turmeric or black pepper can enhance its anti-inflammatory properties, while pairing it with spirulina may boost its antioxidant capacity. This process ensures the development of nutraceuticals that offer maximum health benefits, including improved antioxidant activity, anti-inflammatory effects, and enhanced immune support. Furthermore, AI can streamline the formulation process by predicting stability and shelf-life, thereby reducing the time and cost associated with product development. AI-driven formulations can also cater to specific health conditions, such as diabetes or hypertension, by tailoring the nutrient profile to meet therapeutic needs. This research highlights the potential of AI to revolutionize the nutraceutical industry by creating highly effective Moringa-based health products tailored to meet diverse consumer needs. Additionally, the use of AI can facilitate regulatory compliance by ensuring consistency and safety in product formulations. Future research should explore the integration of AI with other emerging technologies, such as blockchain, to enhance transparency and traceability in the nutraceutical supply chain.

Keywords: *Moringa oleifera*, nutraceuticals, Artificial Intelligence, machine learning, predictive modeling, bioavailability, product development.

Synthesis and biological screening of hydrazone by using cholic acid

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Hydrazones possess an azomethine (-NHN=CH) group and are considered derivatives of aldehydes and ketones in which the oxygen atom has been replaced by the (R-NHN=C) functional group. They are synthesized by the reaction of hydrazide of cholic acid and carbonyl compounds which water molecules eliminate. These are widely studied molecules owing to their ease of preparation and diverse medicine, agriculture, and pharmacology potential. This has led researchers to synthesize different heterocyclic compounds bearing hydrazones. Medical chemists worldwide have done immense work on hydrazones and developed agents with better activity and low toxicity profiles. Hydrazones have biological activities including anti-microbial and anti-oxidant. The compound was isolated by thin-layer chromatography, preparative thin-layer chromatography, and column chromatography. Characterized by single crystal analysis, ultraviolet-visible Spectroscopy, infrared, Mass Spectrometry, and Nuclear Magnetic Resonance Spectroscopy. Finally, the synthesized compound was tested for its biological activities like anti-microbial and anti-oxidant.

Keywords – azomethine, carbonyl compounds, biological activities, anticancer, bile acid, cholic acid

Prevalence of coccidiosis and Their Associated Risk Factors in Domestic Rabbits (*Oryctolagus cuniculus*) of District Lakki Marwat

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Coccidiosis poses a significant economic threat to domestic animals globally, including domestic rabbits in Pakistan. This study investigated the prevalence and associated risk factors of coccidiosis in domestic rabbits in Lakki Marwat district. 100 faecal samples were collected from various tehsils in district Lakki Marwat. Each sample was examined morphologically with a light microscope, positive samples were further processed for PCR amplification using generic and species-specific primers for each *Eimeria* species based on the ITS-1 region of the *E. tenella* ribosomal internal transcribed sequence under standard PCR conditions. The overall prevalence of coccidiosis in domestic rabbits in District Lakki Marwat was 78%, with 78 out of 100 rabbits infected with *Eimeria* species. Tehsil Serai Naurang had a higher prevalence (88%) compared to Tehsil Battani (60%). Eight *Eimeria* species were identified, with *Eimeria intestinalis* having the highest prevalence (58%) and *Eimeria irresidua* the lowest (10%). Infection rates varied with age, with young rabbits (87%) more infected than adults (80%) and weaners (40%). Females (90%) were more affected than males (66%). Higher (90%) prevalence rate was recorded in tunnels housing system than Kacha housing system. This study concludes that coccidian infections of rabbit is endemic in District Lakki Marwat, Pakistan with breeds, hygienic practices and housing type been significant risk factors associated with the infection.

Keywords: Prevalence, Rabbits, Coccidiosis, *Eimeria*, DNA extraction, ITS-1, Risk factors Lakki Marwat.

Synthesis, Characterization, and Electrochemical Performance Evaluation of Activated Carbon-Polyindole Composite

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In this research work, polyindole-activated carbon (PIN@AC) composite was prepared via simple one-pot chemical oxidative polymerization. The physical and chemical properties of fabricated PIN@AC composites were investigated by using Fourier-transform Infrared (FTIR) spectroscopy, scanning electron microscopy (SEM), and X-ray diffraction (XRD) analysis. The electrochemical properties of PIN@AC composites on gold sheet electrode, were investigated in aqueous electrolytes by employing Cyclic Voltammetry (CV). The effect of various parameters such as varying positive potential limits, scan rate, and type of electrolyte on electrochemical stability and specific capacitance was evaluated. A relatively high specific capacitance of 400 F/g and excellent stability (90%) after 2000 cycles in 1.0 M HClO₄ was obtained. Therefore, the designed PIN@AC composite is a promising electrode material for energy storage devices.

CRISPR-CAS9: Revolutionizing Crop Improvement for Food Security

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CRISPR-Cas9 technology is at the forefront of agricultural biotechnology, offering unprecedented precision in genome editing and transforming crop improvement strategies. This abstract explores the revolutionary potential of CRISPR-Cas9 in enhancing food security by developing crops that are more resilient, nutritious, and sustainable. Through targeted modifications, CRISPR-Cas9 enables the introduction of desirable traits such as drought tolerance, pest resistance, and improved nutritional content in staple crops. The ability to edit genes with high accuracy minimizes off-target effects and accelerates the breeding process, surpassing traditional methods. Case studies on crops like rice, wheat, and maize demonstrate significant advancements in yield stability and nutritional enhancement. For instance, CRISPR-Cas9 has been used to develop rice varieties with increased beta-carotene content, addressing vitamin A deficiency in many developing countries. The technology also holds promise for fortifying crops with essential micronutrients, addressing malnutrition in vulnerable populations. Furthermore, the application of CRISPR-Cas9 in developing disease-resistant varieties can reduce the dependency on chemical pesticides, promoting sustainable agricultural practices. The regulatory landscape and public perception of genetically edited crops are discussed, highlighting the need for transparent communication and ethical considerations. Public acceptance is crucial for the widespread adoption of CRISPR-modified crops, and efforts must be made to educate consumers about the safety and benefits of these innovations. CRISPR-Cas9 represents a pivotal tool in achieving global food security and advancing sustainable agricultural practices. Ongoing research and collaboration among scientists, policymakers, and industry stakeholders are essential to harness the full potential of this technology and ensure its benefits reach all parts of the world.

Keywords: CRISPR-Cas9, genome editing, crop improvement, food security, drought tolerance, pest resistance, nutritional enhancement, agricultural biotechnology.

Value Addition through Active Conversion of Waste Feedstock into Useful Products: A Waste to Wealth Approach

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The socioeconomically devastation has tremendously affected the global community in the present era, thus, it is crucial to use inexpensive alternatives routes to mitigate the problems existing around the globe. The basic necessities including pure water, clean air and efficient green fuels are the needs of the hour. As a researcher, it is taken into consideration that development of new ideas involving the use of waste materials, which otherwise becomes the source of land pollution, into useful products will serve the community both economically and be environment friendly. This summarized work incorporate the active conversion of waste feedstock including peanut shells, banana peels, wood ash and fish scales (solid wastes) into value added activated carbons, chitin and chitosan products which worked as adsorbents, catalysts and filter materials applied in various sectors effectively. The water remediation, clean emission of gases through the consumption of renewable energy resources i.e. biodiesel obtained from waste cooking oils as an alternative to the depleting fossil fuels have made a strong impact on the socioeconomical perspectives of the society. The results have conferred the waste to wealth approach identifying the avenues to work on for the betterment of the community.

Keywords: Waste materials; Renewable Energy Resources; Water Remediation; Efficiency

To Treat or Not to Treat: A Comparative Study on Attitudes, Understanding, and Willingness' to Provide Care for Suicidal Patients among Frontline Clinicians

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Background: The experience and outcomes of patients, as well as clinical practice, are influenced by attitudes. Disparaging beliefs about those who attempt suicide may make it more difficult to help them with their issues. Thus, rejection might increase the risk of suicide. Hence, the present study aimed to compare the attitudes, understanding and willingness to provide care for suicidal patients among frontline clinicians.

Methods: Data were gathered through purposive sampling, and 220 frontline clinicians who met the inclusion requirements anonymously filled out the Understanding Suicidal Patients scale. The Pakistan Institute of Medical Sciences, Benazir Bhutto Hospital, Watim Medical Hospital, CMH, CDA Hospital, Pakistan Ordinance Factories Hospital, and Shifa International Hospital was approached for data collection. Data analysis was done with SPSS (V-25).

Results: The average age of the respondents was 1.86 ± 0.89 . Among them, female clinicians made up 54.51% (n = 120) while males made up 45.49% (n = 100). 38.2% are single (n=84), divorced (n=32, 14.5%), and widowed (n=3, 1.4%), and 45.9% are married (n=101). Thirteen (5.9%) belonged to the upper class, 73 (33.2%) to the lower class, and 134 (60.9%) to the middle class socioeconomic group. The majority of them work as Senior Medical Officers (n = 77, 35.0%), reside in urban areas (n = 200, 90.0%), and come from nuclear families (n = 140, 63.6%). Additionally, 98 participants, or 44.5% of the sample, reported having more than six years of field experience. Clinicians working in the psychiatry departments have more positive attitudes and are more inclined than those in the medical, surgical, and accident and emergency departments to care for, understand, and sympathize with suicidal patients, according to a post-hoc analysis using the Tukey test.

Conclusion: These findings suggest that engaging frontline clinicians beyond the field of psychiatry about mental health and suicide prevention can enhance awareness, decrease stigma, and contribute to suicide prevention efforts.

Key Words: Attitudes, Understanding, Suicidal Patients, Frontline Clinicians

Extraction, characterization, and application of natural colorants for the sustainable development of skin coloring cosmetics

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Synthetic colorants/dyes have adverse effects on women's skin which increase cancer risk, hormonal disorders, reduce fertility etc. So there is a need to replace synthetic colorants/dyes with natural ones to minimize or avoid the associated risk factors. Synthetic ingredient-based cosmetics cause de-coloration and dehydration of lips so there is a need to formulate lip coloring cosmetics that have various moisturizing agents. Natural colorant-based lip coloring cosmetics were not stable for a long period so there is a need to formulate sustainable lip coloring cosmetics. Colorants from different plants available in Pakistan were extracted, for example, red to purple shades colorants were extracted from the *Brassica oleracea* L., *Rosa indica* L., *Punica granatum* L., *Beta vulgaris* L. Three methods with three different polarity-based solvents ethanol, water, and acetone were used for the extraction of colorants. The anti-inflammatory activity of the extracts was done through the carrageenan inflammation model. Cytotoxicity of the extracts through hemolytic activity was calculated in terms of hemolytic activity. Characterization of

ethanolic extracts of natural colorants was done by UV-visible spectroscopy, thin layer, and high-performance liquid chromatography. The physical characteristics of prepared samples were carried out by using different physical tests after the application of prepared samples. Different physiochemical parameters were measured to characterize the formulated products, including pH, solubility, and skin irritation. All formulated cosmetics according to their melting point, breaking points, and perfume stability test. The development of multifunctional skin coloring cosmetics was accomplished using sustainable sources of coloring agents.

The Impact of Challenges and Opportunities on Food Entrepreneurship in Pakistan

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Abstract: Food entrepreneurship in Pakistan presents a mix of opportunities and challenges due to the country's diverse culinary heritage, growing population, and evolving market dynamics. Here's an overview:

Opportunities

Diverse Cuisine: Pakistan's rich and diverse culinary traditions offer a wide array of options for food entrepreneurs to explore and innovate.

Growing Middle Class: With an expanding middle class, there is increasing demand for dining out, ready-to-eat meals, and gourmet food experiences.

Youth Demographic: A significant portion of the population is young and more open to trying new foods and dining experiences, creating a vibrant market for new food ventures.

Urbanization: Rapid urbanization has led to the growth of urban centers where people have busy lifestyles and a higher propensity to spend on convenience foods.

E-commerce and Delivery Services: The rise of online food delivery platforms has made it easier for new food businesses to reach customers without significant investment in physical storefronts.

Government Initiatives: Various government initiatives and policies are aimed at supporting small and medium-sized enterprises (SMEs), including those in the food sector.

Health and Wellness Trends: Increasing awareness about health and nutrition is driving demand for healthier food options, organic produce, and specialty diets, providing niche markets for entrepreneurs.

Challenges

Regulatory Environment: Navigating the regulatory landscape, including obtaining licenses, ensuring compliance with food safety standards, and dealing with bureaucratic hurdles, can be daunting.

Supply Chain Issues: Inefficient supply chains, inconsistent quality of raw materials, and logistical challenges can affect the consistency and quality of food products.

Infrastructure Deficiencies: Inadequate infrastructure, including unreliable electricity and poor transportation networks, can hinder operations and increase costs.

Access to Finance: Many entrepreneurs struggle with securing funding and investment due to limited access to credit and venture capital.

Consumer Trust and Perception: Building and maintaining consumer trust can be challenging, especially for new brands. Ensuring food safety and quality is paramount.

Competition: The food industry is highly competitive, with numerous established players and new entrants constantly vying for market share.

Economic Instability: Economic fluctuations and inflation can impact purchasing power and consumer spending on non-essential items like dining out.

Cultural Preferences: While there is openness to new food experiences, deeply ingrained cultural preferences can sometimes limit the acceptance of innovative or non-traditional food products.

Effect of Mung Bean Protein and Ultrasonication in Enhancing the Shelf Life of Protein Shakes

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Protein shakes are valued for their convenience and nutritional benefits, including essential amino acids crucial for muscle maintenance and overall health. As consumer preference shifts towards plant-based options, mung bean protein emerges as a key ingredient due to its high protein content and natural antimicrobial properties. Mung bean protein not only provides a nutritious alternative to animal-based proteins but also contributes to enhanced microbial safety. To further improve shelf life and sensory attributes, ultrasonication—an advanced, non-thermal food processing technique—is employed. Ultrasonication uses high-frequency sound waves to disrupt microbial cells and enhance the extraction of beneficial compounds from mung beans, thus reducing microbial load and preventing oxidative deterioration. This method aligns with the increasing demand for natural, clean-label products by extending shelf life while preserving quality without synthetic preservatives. The integration of mung bean protein with ultrasonication represents a sustainable and effective strategy to enhance the safety, stability, and sensory appeal of protein shakes, meeting the evolving preferences for healthier and more sustainable dietary options.

Key Words: Protein Shakes, Mung bean; Ultrasonication, Shelf life

Homology Modeling

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Homology modeling is the most accurate computational structure prediction method, and one of the techniques used to infer the three-dimensional structure of proteins from their amino acid sequence. It is broken down into several simple phases that are simple to follow. The homology modeling process makes use of numerous servers and technologies. No single modeling program or server outperforms the others in every way. Optimizing the quality of homology modeling is essential because the model's functioning is reliant on the generated protein 3D structure's quality. Because drugs interact with primarily protein-based receptors, homology modeling plays a significant role in the drug discovery process. For example, homology modeling has been used to clarify protein interactions through the use of 3D structures of proteins constructed through homology modeling. This leads to the identification of novel drug candidates. Homology modeling plays an essential role in making drug development faster, easier, cheaper, and more practical. As new modeling approaches and combinations are introduced, the breadth of its applications grows.

Key words: Homology modeling, computational structure prediction, amino acid sequence, servers, optimization

Gene Therapy

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Gene therapy can be broadly defined as the transfer of genetic material to cure a disease or at least to improve the clinical status of a patient. One of the basic concepts of gene therapy is to transform viruses into genetic shuttles, which will deliver the gene of interest into the target cells. Not only have we learned a great deal about gene therapy in general, but we have also come to appreciate the persistent concerns in society, twenty years after the first gene therapy studies and more than 1700 approved clinical trials globally. Notwithstanding the challenges gene therapy has encountered, success stories are starting to surface. Instances of these include the EMA's favorable recommendation for the approval of a gene therapy product (Glybera) in the European Union and the successful trials conducted to treat ADA deficiency, SCID-X1, and adrenoleukodystrophy. However, as time goes on, more safety information becomes accessible, furthering our understanding and enabling the development of more effective gene therapy strategies. Additionally, as our knowledge of molecular medicine has grown, we have created more effective and targeted gene transfer vectors that are now yielding positive clinical outcomes.

Key words: Gene therapy, Genetic material, Disease cure, Clinical status

Relationship between healthy eating pattern and satisfaction with life among young adults in Pakistan

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The simple and essential act of food consumption is an important element of human existence. Recent researches highlight the substantial connection between food and psychological wellness. The purpose of this research is to assess the role of healthy eating patterns in satisfaction with life among young adults of Rawalpindi Islamabad. The research design of the study was cross sectional correlational in which convenient sample of 150 students participated from various universities of Islamabad and Rawalpindi (Male = n = 75, Female = n = 75) belonging to the age group 18-24 years. The two measures used in this present study were Healthy Eating Assessment (HEA: Harder Family practice, 2003), and Satisfaction with Life scale (SWL: Pavot, W., & Diener, E, 1985). Correlation analysis was performed to investigate the relationship among healthy eating patterns and satisfaction with life. The research findings suggested that healthy eating pattern has a significantly positive relationship with satisfaction with life. Furthermore, regression analysis showed that healthy eating pattern is significantly positive predictor of satisfaction with life ($\beta = .366$, $p < .01$). The R^2 value of (.134) revealed that healthy eating pattern explained a 13% variance in SWLS (satisfaction with life) with F (16.134). This study opens doors for future researches to develop prevention and intervention strategies to timely manage the eating patterns in young adults consequently improving their overall quality of life.

Keywords: healthy eating pattern, satisfaction with life.

Nutri-Cosmeceutical Product Development From Banana Waste

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Objective : To develop Nutricosmeceutical from waste of banana (*Musa paradisiaca* L.) and evaluate their in-vitro nutricosmeceutical application as a tooth protecting and whitening agent.

Method: "Nutricosmeceutical" is a merging terms for "nutraceuticals" and "cosmeceuticals." which define supplements, functional foods or products that contains active substances for the improvement of human attractiveness and health. Oral hygiene is essential to a person's attractiveness as well as overall health. To develop a nutricosmeceutical as whitening and healthy tooth formulation, *Musa paradisiaca* L banana waste (inner peel (BPI) and whole peel WBP) were used to prepared the extract and evaluated for their phytoconstituents. The extracts (WBP) and (BPI) were then used to prepare teeth whitening formulations T2 and T3. The formulations were evaluated with respect to their physico-chemical parameters, stability studies, *in-vitro* cosmeceutical use as tooth whitening agents and SEM image in comparison with the commercial standard formulation T4. Statistical results are expressed as : Mean $\pm$ S.E.M (n=10), the values $*P \leq 0.05$ is significant as compared to placebo, $**P \leq 0.01$ is very significant as compared to placebo, $***P \leq 0.001$ is highly significant as compared to placebo.

Conclusions: The inner peel of banana is most stable and effective for developing teeth protecting and whitening nutricosmeceutical formulation.

Keywords : "Nutricosmeceutical , Oral hygiene, teeth whitening formulation, (*Musa paradisiaca* L.)

Development, Characterization and Evaluation of Fluticasone/Cefadroxil Loaded Chitosan/PVA Nanofibers for Infected Wound Healing

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Burn injuries are at the fourth position on global burden of injuries and mortality rates are the highest in South-East-Asian region due to fire injuries. Existing therapies including transdermal films and ointments cause sluggish wound healing and hypoxia. Nanofibers based drug delivery is a non-invasive and painless method that utilizes less drug. Chitosan/PVA Nanofibers are biocompatible and biodegradable in nature. They serve a key role in medicine delivery and are widely employed in the healing of burn wounds. The electro spinning process was employed to produce Fluticasone/Cefadroxil nanoparticles from a Chitosan-PVA colloidal solution. For chemical composition and morphological studies such as SEM, FTIR, DSC, XRD, UV-Spectroscopy was performed. The wound healing property of the films was observed on rabbits for second and third degree burns. These PVA-chitosan nanofibers loaded with the drugs mixture containing Cefadroxil and fluticasone have shown tremendous potential as a wound dressing solution as they are more biocompatible, have better antibacterial activity, and promote faster wound healing

Keywords: Nanofibers, Chitosan/PVA, SEM, FTIR Cefadroxil, Fluticasone

New benzoxazole-based sulphonamide hybrids analogs as potent inhibitors of α -amylase and α -glucosidase: Synthesis and *in vitro* evaluation along with *in silico* study

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The development of drug resistance in diabetes mellitus is a growing clinical problem, creating many health challenges. Different researchers around the world have tried to synthesize potent anti-diabetic drugs. We have also designed and synthesized benzoxazole based sulphonamide derivatives as effective anti-diabetic drugs. SAR was established and it was revealed that among the tested series, analog **1** ($IC_{50} = 1.10 \pm 0.20 \mu M$, $1.20 \pm 0.30 \mu M$), showed promising anti-diabetic activity against α -amylase and α -glucosidase ($11.12 \pm 0.15 \mu M$ and $11.29 \pm 0.07 \mu M$ respectively) than standard drug acarbose. Moreover molecular docking and ADMET analysis were also conducted to explore binding interactions and drug likeness attributes respectively for potent scaffolds.

Keywords: Benzoxazole, alpha-amylase, alpha glucosidase, SAR & Molecular docking

Production of Mixed Fruit Drink Using (Grapefruits, Lemons, and Oranges) Citrus Fruits

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Citrus belongs to Rutaceae family, is one of the most significant fruit crops in the world. Citrus fruits are a nutritious and delicious source of vitamins, minerals, and antioxidants. They are a beneficial source of essential nutrients and help to maintain health. The fruits are also rich in fiber, vitamin C, boost the immune system and can reduce the risk of certain diseases. The antioxidants found in citrus fruits can protect against certain types of cancer. Keeping in view the importance of citrus fruits in daily life, the research was based on the production of mixed fruit drink with lemons, oranges, and grapefruits citrus fruits. Mixed fresh available citrus fruits were used for research. The data were collected for different parameters (color analysis, total soluble solids, pH, phenolic contents analysis and titratable acidity) and the sensory analysis was done for overall liking of product. The collected data was subjected to statistical analysis to check the reliability of experiment. The research would be helpful to make market valuable products at commercial level. The results of statistical analysis for all the characters under study were found to have significant differences from each other. Highest value of titratable acidity (%) was recorded in treatments T4 (0.9667 %). TPC and TSS values (17.370) was significantly higher in T4. Mean comparison between treatments showed that a maximum a^* value was recorded with the treatments T3 (20) The highest mean value was showed by T3 (15) treatment in case of color B. The treatments T0 (25.06) have the highest L^* values. Mean comparison between treatments showed that a maximum score for color/ appearance was recorded with the treatments T4 (7.33) treatment. Flavor was observed higher in the treatments T4 (7.33) Overall acceptability was recorded in T1 (8). Whereas, the treatments T1 and T5 had the highest score (8.333) and (8.00) for taste.

Keywords: Citrus, Fruit drink, antioxidants, Sensory Evaluation, Nutrients

Addressing Issues and Challenges in Smart Cities Through Sustainable Software Engineering: A Five-Dimentional Approach¹Islam Zada, ² Sara Shahzad

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The rapid evolution of smart cities presents both unprecedented opportunities and significant challenges. As urban areas become increasingly connected and dependent on technology, issues such as data security, privacy, infrastructure management, and sustainability become more pronounced. This research article explores the pressing challenges faced by smart cities and proposes solutions through sustainable software engineering. By leveraging the five dimensions of sustainability i.e. technical, economic, social, environmental, and individual. We can develop robust and resilient systems that not only enhance urban living but also ensure long-term viability and inclusivity. This comprehensive approach offers practical strategies to mitigate the challenges of smart city implementations, paving the way for more efficient, secure, and sustainable urban environments.

Keywords:- Smart cities, Sustainable software engineering, Five dimensions of sustainability, Urban challenges, Data security, Privacy, Infrastructure management

Zemist Attack Detection In Iot Using Graph Neural Network

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Abstract: The rapid proliferation of Internet of Things (IoT) devices has significantly expanded the attack surface for cyber threats, making effective security measures essential. Traditional anomaly detection techniques often struggle with the complexity and dynamic nature of IoT environments. This paper presents a novel approach for detecting Zemist attacks—sophisticated and stealthy cyber threats targeting IoT networks—using Graph Neural Networks (GNNs). Zemist attacks are characterized by their ability to mimic legitimate network traffic while covertly disrupting operations, posing significant challenges for conventional detection methods. Our approach models the IoT network traffic as a graph where nodes represent devices and edges represent communication channels, allowing GNNs to capture intricate dependencies and interactions.

We evaluated the proposed method using a comprehensive dataset of simulated IoT network traffic, including scenarios with both normal and Zemist attack patterns. The GNN-based detection system achieved an impressive detection accuracy of 94.7%, significantly outperforming traditional methods, which averaged around 82.3%. Additionally, the GNN approach demonstrated a reduction in false positive rates by 30% and an improvement in detection speed by 40% compared to existing techniques. Our results indicate that GNNs offer a robust and effective solution for identifying sophisticated attacks in increasingly complex IoT environments. This paper underscores the potential of advanced machine learning techniques in enhancing security mechanisms for IoT systems.

Keywords: Internet of Things (IoT); Zemist Attack; Graph Neural Networks (GNNs); Anomaly Detection; Cybersecurity; Network Traffic Analysis; Machine Learning; IoT Security; Attack Detection

Efficient Detection of Mango Leaf Diseases Using ConvNeXt Architecture

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Mango farming contributes to economic growth in many regions, especially in Pakistan. However, mango trees are sensitive to various diseases caused by fungi, viruses, and bacteria. Detecting these diseases at an early stage is essential to prevent their spread and minimize crop damage. Recent advancements in deep learning models for developing automated disease detection systems for crops are a hot research area. This research uses the ConvNeXt architecture, a next generation of convolutional neural networks, for mango plant diseases. The dataset employed in this study includes images of healthy mango leaves and leaves affected by various diseases such as anthracnose, bacterial canker, gall midge, and powdery mildew. The proposed model achieved a remarkable accuracy of 99.87%. The findings of this study suggest that ConvNeXt models can be effectively used for automated mango disease detection, helping farmers to identify and manage these diseases more efficiently. By reducing the time and effort required for manual diagnosis, this system can contribute to improving mango production and reducing economic losses caused by diseases.

Keywords: Mango, Leaf disease, Machine Learning, ConvNeXt model, Images

Synthesis and functionalization of a sorbent derived from post-consumer textile waste: application for better wheat (*Triticum aestivum* L.) growth and productivity grown in Cadmium contaminated soil.

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Cadmium (Cd) is a hazardous heavy metal that has been identified in trace concentrations in several soil and plants. Wheat, which is used up by 60% of the world's population, has the potential to absorb a significant amount of Cd over and done with its roots and translocate it to the shoots and grains, creating health hazards for humans. The most effective agronomic strategy for minimizing Cd uptake by wheat is to use organic amendments. Because of its better physical, chemical, and mechanical capabilities for heavy metal removal from soil, cellulose is one of the materials gaining interest. A novel sorbent was prepared using post-consumer textile waste and functionalized with environment friendly H₂O₂. To examine the effect of the prepared sorbent on Cd uptake in wheat plants, a pot experiment was undertaken at Government College University Faisalabad, Pakistan. The soil was contaminated with Cd at 5 mg kg⁻¹ as well as 10 mg kg⁻¹ W/W basis of Cd contaminated soil; the sorbent was mixed in at 0.5 and 1% levels in soil. After the wheat crop had reached maturity, it was harvested, and Cd concentrations were measured in the shoots, roots, and grains. The amount of residual Cd in the post-harvest soil was tested as well. Both levels of the Cd 5 mg kg⁻¹ and 10 mg kg⁻¹ had reduced the physical as well as physiological parameters of wheat plants at a large extent. The plant height and root length were reduced at 54% and 77% by 10 mg kg⁻¹ of soil respectively. The toxic effect of Cd on wheat plants was mitigated by applying our sorbent at both levels but more pronouncedly at 1% level. In conclusion, our prepared sorbent at 1 % level has a significant potential to enhance the wheat plant growth and productivity by reducing the poisonous effect of Cd through its immobilization in soil.

Keywords: heavy metals; food chain; toxicity; textile waste; recycling; sustainability; immobilization; food security

Allelochemicals Influence Crop Production

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Allelochemicals are essential for crop production as they affect many facets of plant development, growth, and their interactions in ecosystems. These substances are secondary metabolites that plants create, and they can affect nearby plants, pests, and microbes in both favorable and unfavorable ways. For sustainable agriculture and efficient crop management, it is imperative to comprehend the function of Allelochemicals.

Allelopathic effects, in which these substances influence the germination, growth, and development of surrounding plants, are an important feature of allelochemicals. Certain allelochemicals function as organic herbicides as they prevent seed germination. Resultantly weed competition is reduced and crops benefit from allelopathic interference, which raises yields. Furthermore, allelopathy could aid in the creation of crop varieties that naturally resist particular pests or illnesses.

Allelochemicals can also affect the nutrients cycling and the health of the soil. Certain plants change the microbial composition of the soil by releasing allelochemicals into it. This can encourage a healthy soil ecosystem by enhancing helpful microbes and reducing detrimental ones. Furthermore, certain allelochemicals influence nutrient availability, which in turn influences how well crops absorb and use vital nutrients. This may lead to higher agricultural output and enhanced nutrient efficiency.

Allelochemicals have effects on soil and plants, but they can also have an impact on disease and insect control. Certain plants generate substances that function as organic insecticides, discouraging or impeding the development of hazardous insects or diseases. By including these Allelochemicals into pest management plans, less synthetic pesticides will be used, encouraging sustainable and ecologically friendly agricultural methods.

Allelochemicals further add to the intricacy of plant-plant interactions in agroecosystems. They may have an impact on plant-to-plant communication, which may have an impact on the signaling pathways that control defense and stress responses. It is crucial to comprehend these relationships in order to create crop types that can flourish in a variety of settings and under a range of stress situations.

Conclusively, allelochemicals play a variety of roles in crop production and agricultural production. Aspects of crop growth and development such as weed control, soil health, insect management, and plant relationships are influenced by these chemicals. Using allelochemicals to their full potential in crop management techniques will help create agricultural systems that are more resilient and ecologically friendly, which will ultimately improve global food security.

In-Vitro Antibacterial Activity of Herbal Extract of Tulsi (*Ocimum sanctum*) Against Clinical Isolates of Methicillin Resistant *Staphylococcus Aureus*

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Objective: The aim of this study was to evaluate and screen the antibacterial activity of medicinal plant which were cultivated in ancient time. **Study Design:** Experimental Study. **Setting:** Microbiology department, Kohat University of Science and Technology, Kohat. **Period:** February 2024 to July 2024. **Material and Methods:** The fresh extract of *Ocimum sanctum* (Holy Basil) leaves against the clinically isolated MRSA by using agar well diffusion method. In this study, four selected different compound (Ethanol, Methanol, ethyl acetate and DMSO) were used at different concentration of (100%, 80%, 60 %, 40%, 20%, 10% and 5%) respectively for all compound against *S. aureus*. **Results:** All these concentration showed inhibitory effects towards Gram positive *S. aureus*. In this analysis, on comparison we observed that three compound (Ethanol, Methanol and Ethyl acetate) extract was more efficient and give maximum zone of inhibition on *S.aureus* (40mm), due to their high chemistry. Only DMSO compound showed less antibacterial activity on *S.aureus* as compared to other extracts, because they have less bioactive compound. **Conclusion:** The result of this study also elicits their efficacy of all these different compound

depends upon the concentration levels. The plant showed maximum zone of inhibition at 100%, 80%, and 60% rather than at 10%, 5% because on higher level they contain high bioactive compounds.

Key Words: *Ocimum sanctum* (*O. Sanctum*), Methicillin- resistant *Staphylococcus aureus* (MRSA), Antibacterial activity, Zone of Inhibition, Agar well diffusion method, Dimethyl Sulfoxide (DMSO),

Blockchain-based E-Traceability System in Mango Supply Chain

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In an increasingly interconnected global economy, supply chains play a pivotal role in ensuring the efficient movement of goods and services across various industries. However, traditional supply chain management systems have often been affected by challenges of opacity, lack of transparency, and vulnerability to fraud. These issues not only hinder the effectiveness of supply chains but also compromise consumer trust and pose security and ethical concerns. This paper introduces the methodological framework for developing an Ethereum-based decentralized application and evaluates the performance of the implemented system using mango supply chain as a case study. The system ensures that resource transactions and data records are securely stored and validated using smart contracts and blockchain-based decentralized ledger. This allows all participants of supply chain to instantly access information regarding the produce origin, quality, handling conditions, and specifics throughout the supply chain. It will reduce delays, minimize unnecessary handling, and enhance overall efficiency. This study introduces a novel framework aimed at addressing the prevalent issues of transparency and tracking in traditional mango supply chain systems. By implementing an online traceability system utilizing Ethereum blockchain and smart contracts, the study ensures secure, immutable, and transparent recording of each step in the supply chain. This innovative approach not only enhances the accountability of supply chain participants but also provides consumers with verifiable information about the origins and journey of their mango products. The integration of technology improved record-keeping, and enhanced collaboration can help ensure that food reaches consumers in optimal condition, with a stable shelf life and improved overall quality.

Keywords: blockchain technology, smart contract, food supply chain, traceability.

Antibiotics and Silver Nano Particles Synergistic Approach Against Various Bacterial Strains Isolated From Suppurative Otitis Media

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Background: Suppurative Otitis Media (SOM) is a persistent infection of the middle ear that can result in the buildup of pus and cause serious complications, including hearing loss and intracranial infections. In Pakistan, SOM poses a significant public health concern, further exacerbated by the growing resistance of bacterial pathogens to traditional antibiotics.

Objective: The objective of this research is to assess the combined antibacterial effects of antibiotics and silver nanoparticles (Ag NPs) against bacterial strains obtained from patients with SOM. This will be done using a 96-well plate technique.

Methods: Bacterial strains were obtained from patients with SOM and characterized using conventional microbiological methods and biochemical assays. The isolates underwent a disc diffusion test to assess their resistance to Tobramycin and Ciprofloxacin. The preservation of all strains was carried out using a cryostat. The synthesis and characterization of silver nanoparticles were conducted using UV visible spectrometry and dynamic light scattering (DLS). The individual and combined antibacterial activity of antibiotics (tobramycin, ciprofloxacin) and Ag NPs were evaluated using the 96-well plate technique to determine the minimum inhibitory concentrations (MICs). The evaluation of synergism was conducted using the checkerboard assay, and the fractional inhibitory concentration index (FICI) was computed.

Results: The bacterial strains obtained from the SOM patients were *Staphylococcus aureus* (*S. aureus*) with laboratory identification number OM4, *Pseudomonas aeruginosa* (*P. aeruginosa*) with laboratory identification number OM2, and *Escherichia coli* (*E. coli*) with laboratory identification number OM3. The MIC values of Tobramycin, Ciprofloxacin, and AgNPs against *S. aureus* were 64, 128, and 500 µg/mL, respectively. For *P. aeruginosa*, the MIC values were 4, 8, and 500 µg/mL, while for *E. Coli*, the MIC values were 16, 8, and 250 µg/mL, respectively. Tobramycin and Ciprofloxacin, when combined with AgNPs, exhibited notably reduced MIC values. The FICI values were 0.3 and 0.1 against *S. aureus*, 0.3 and 0.2 against *P. aeruginosa*, and 0.5 and 0.3 against *E. Coli*, respectively.

Conclusion: The research showed that the use of silver nanoparticles in antibiotics greatly improved their ability to kill bacteria strains that were taken from SOM. This collaborative strategy may aid in overcoming antibiotic resistance and enhancing treatment results for SOM. Additional clinical trials are necessary to confirm these results and investigate the practical use of this combination treatment in regular medical procedures.

Keywords: Antibiotics, Silver nanoparticles, Synergistic, Suppurative Otitis Media, *Staphylococcus Aureus*, *Pseudomonas Aeruginosa*, *Escherichia Coli*

Comparison of State-of-the-art Object Detection Models for Multi-Pest Detection with Emphasis on Small Insects

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Pest infestations greatly affect global agriculture, causing substantial crop loss and economic impact. The accuracy and efficiency of pest detection are crucial for effective pest management strategies to protect the environment from excessive pesticide application, especially for small pest species. As part of the present study, we compared the state-of-the-art object detection algorithms for real-time identification of five economically significant pests: fruit flies (*Bactrocera cucurbitae*, *Bactrocera zonata*, *Bactrocera dorsalis*), Pink Bollworm (*Pectinophora gossypiella*), and Fall Armyworm (*Spodoptera frugiperda*). In the agricultural fields, IoT-based smart traps were used to collect images of pests, totaling 17290 images and 50000 instances of five insect pests. A benchmark dataset called ‘Five-Pest’ was created to train and evaluate object detection models for detecting small pests, which appear as tiny entities within the images. We annotated the images using Roboflow which served as a basis for the algorithms’ evaluation. YOLOv7, YOLOv8, and the latest YOLOv9 were subjected to rigorous testing to determine their effectiveness in detecting these small insect pests. Various performance metrics were used to evaluate the

algorithms' detection capabilities, including computational time, precision, recall, F1-score, and confusion matrix. YOLOv9 achieved the highest mean Average Precision (mAP) of 0.929 than YOLOv8 (0.924 mAP), followed by YOLOv7 (0.899 mAP) on the same dataset. This comparative analysis aims to provide insights into the strengths and weaknesses of the latest object detection algorithms, thereby guiding future research and applications in the field of pest detection.

Keywords: yolo, single stage detector, PGI, GELAN, CNN, environment protection

Oleoresins: An untapped source of bioactive compounds

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Multidrug resistant microorganisms also known as “super bugs” are becoming a global threat to mankind. Oleoresins extracted from three different spices have been screened as novel antimicrobial agents to counter multidrug resistance *E. coli* and *S. aureus*. Among all ethanolic capsicum oleoresin extracted by Soxhlet method showed maximum yield 29.68%. The chemical fingerprints of oleoresins were performed using HPLC and GC-MS analytical techniques. For isolation of multidrug resistant bacteria, different growth media were used. 26 samples out of 30 had shown growth on the MacConkey agar plates. Gram staining was also performed for identification of multidrug resistant bacteria. For molecular identifications, 16S rRNA primer was used. Different biological and antioxidant activities of oleoresins were evaluated through a battery of assays like DPPH, TPC and TFC. Mean comparison and SD were calculated for each activity. Hemolytic activity and Ames assay were performed to document safety profile of selected oleoresins. Acetone capsicum oleoresin extracted through maceration had maximum percentage of hemolysis that was 60%. Ames and anti-inflammatory tests were not toxic. Antibacterial and MIC was also performed to document the ant-multidrug resistance potential of oleoresins against selected resistant bacterial strains with low MIC values. Biofilm production and characterization through different spectroscopic and microscopic techniques like FT-IR, UV-vis and SEM documented. At the end of study, it was concluded that due to antibiotic resistance, medicinal plant extracted oleoresins are alternative choice for chronic infection treatment. Ginger, turmeric and red chili oleoresins have significant antibacterial activity against multidrug resistance bacterial species.

Keywords: Oleoresins, multidrug resistance, antioxidant and antibacterial potential

Pharmacological Potential of Cumin Seed Essential Oils: A Comparative Study of Conventional and Superheated Steam Distillation Techniques

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Cuminum Cyminum is a famous spice used worldwide for imparting taste to diverse food provisions, culinary and medicinal purposes, and also for appetizing purposes due to its special aromatic effect. The goal of this research work is to estimate the yield of essential oil (EO), chemical composition, antioxidant and antimicrobial activity of *Cuminum Cyminum* EOs extracted by conventional methods hydro-distillation (HD) and steam distillation (SD) towards advanced method super-heated steam distillation (SHSD). The prominent results were observed on the yield of EOs, chemical composition, and biological activities of *Cuminum Cyminum* EOs. The maximum yield of EO was

obtained by SHSD as compared to HD and SD methods. Gas chromatography–mass spectrometry (GC-MS) analysis illustrated that cumin aldehyde (51.87-23.54%) and 3-carene-10-ol (15.34-12.15%) are found as major compounds in *Cuminum Cyminum* EOs. The antioxidant potential of EOs was assessed by using hydrogen peroxide scavenging exertion, ferric-reducing power test, and DPPH radical. Results revealed that the highest antioxidant potential was displayed by SHSD EO as compared to HD and SD EOs. The antimicrobial activity was determined using the resazurin microtiter plates test, microdilution broth experiment, and disc diffusion tests contradicting food pathogenic bacterial and fungal strains. The highest antimicrobial potential was observed by SHSD EO. The results indicated that SHSD is an efficient technique and an excellent method for the extraction of EOs from *Cuminum cyminum* seeds which also engages in biological activities.

Keywords: Super-heated steam distillation; *Cuminum Cyminum*; essential oil; antioxidant, antimicrobial potential.

Synthesis of Schiff base-metal complexes for Hydrogen generation through methanolysis of NaBH₄

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The depletion of fossil fuels and their harmful environmental impacts have caused the reorientation of research to more renewable and sustainable approaches such as hydrogen energy. Metal hydrides (NaBH₄, LiBH₄, NaBH₄, CaH₂, MgH₂, LiAlH₄ and NaAlH₄) are potential storage supplies of H₂; among them, NaBH₄ stands out prominently by displaying high H₂ capacity of 10.8 %, generation of nontoxic products ((NaB(OCH₃)₄) and H₂O besides H₂ on hydrolysis/methanolysis, and harmless nature (non-flammable). Herein, we synthesized a group of metallic catalysts: Salicyldehyde-aniline schiff base metal-complex (SALAN-M) catalyst (M=Co, Al, Ag), where initially Schiff base ligand (SALAN) is prepared through refluxing of salicyldehyde and aniline in alcoholic media for 2 h then the ligand is refluxed with various metals for 6 h to form co-ordination complexes in three probable oxidation states of +1, +2, +3 for Ag, Co, Al respectively. The generation of hydrogen is tested through water displacement method at 200 rpm. The Catalysts performed efficiently in methanolysis of NaBH₄ and all the reactions were completed within the 4 minutes, here the rates are taken as first minute Hydrogen generation rate; among SALAN-M complexes SALAN-Al showed highest HGR of 3000 ml/g. min at 30°C (0.1g NaBH₄, 10ml methanol, 0.04g catalyst), this was the highest performing catalyst and further characterized through SEM, XRD and EDX for surface morphology and structural analysis. This is a project in progress; All the samples have not been characterized and results have not been optimized yet.

Keywords: Schiff base, Hydrogen generation, Coordination complex, Sodium borohydride, Methanolysis.

Evaluation of drug related problems in Non-Dialysis Patients with Chronic Renal Disease at Northwest General Hospital Peshawar

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Background

Chronic Kidney Disease (CKD) patients usually have extensive comorbidities, and pharmacokinetic fluctuations make them vulnerable to the development of drug-related problems (DRPs). CKD patients are at high risk of DRPs due to polypharmacy, comorbidities, and the complexity of underlying health conditions; hence, DRPs have become an area of significant concern in the healthcare field. This was a cross-sectional analytical study that was conducted in the nephrology department of Northwest General Hospital in Peshawar, Khyber Pakhtunkhwa.

Objectives

The main goal of this study was to identify DRPs in non-dialysis CKD patients at Northwest General Hospital, a tertiary care hospital in Peshawar. The data gathered included the age of patients, their gender, comorbidities, prescription medications, and DRPs.

Methodology

DRPs were identified using Lexicomp Interact®, which is a reliable and credible tool designed to identify drug-drug interactions. A total of 198 CKD patients were evaluated for drug related problems. 157 patients fulfilled the inclusion criteria. In our study, we observed that 14.1% of the participants were taking more than seven medications, considered polypharmacy. 79.0% of the participants were hypertensive patients, whereas 50.0% were taking antidiabetics due to Diabetes Mellitus (DM). 157 prescriptions were evaluated for drug-drug interactions by using Lexicomp Interact®, for a period of six months. Most of the interactions, i.e., 69.29%, required therapy monitoring, 10.30% of medication interactions required therapy modification, 16.4% of medication interactions did not require any action, 3.63% of medication interactions were contraindicated, and 0.33% of the interactions were unknown.

Conclusion

This study disclosed a significant prevalence of drug-drug interactions in a tertiary care hospital. Continued research efforts and investigations are required to refine our findings with a larger sample size to fully understand the effects of DRPs in CKD patients.

Keywords: Chronic Kidney Disease, Drug Related Problems, Lexicomp Interact®, Drug-Drug interactions, Polypharmacy, Hypertension, Diabetes Mellitus.

To Elucidate the antioxidant and Anti-Inflammatory Properties of *Ocimum basilicum* and *Curcuma longa* in Gastric Ulcer

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Gastric ulcers are commonly caused by *Helicobacter pylori* infection, leading to chronic inflammation. The study explored the therapeutic potential of ethanolic extracts of *Ocimum basilicum* and *Curcuma longa* extracts in managing gastric ulcers, and evaluated the antimicrobial, anti-inflammatory and antioxidant properties of the selected plants. Using the agar well diffusion method, antibacterial efficacy against *H. pylori* was determined. Turmeric extracts showed dose-dependent zone of inhibition of 15-25 mm, while that of basil extracts ranged from 17-23 mm. The synergistic effect of both the extracts showed enhanced antibacterial activity with zone of inhibition up to 35 mm. Turmeric extract showed higher DPPH inhibition (48.92%) compared to basil (14.72%), indicating stronger antioxidant properties. Turmeric also had notably higher total flavonoid content (TFC) of 1079.93 µg CE/mL than basil (184.34 µg CE/mL). Total phenolic content (TPC) was 392.72 mg GAE/g for turmeric and 332.22 mg GAE/g for basil. Anti-inflammatory properties evaluated by bovine serum albumin assay showed that basil

extracts exhibited higher anti-inflammatory activity (97.3% to 99.8%) than turmeric extracts (95.8% to 97.7%). The synergistic effect of both extracts exhibited anti-inflammatory effects ranging from 95.8% to 99.6%. Overall, the study highlighted the therapeutic potential of basil and turmeric extracts as complementary therapies for managing gastric ulcers. The significant antibacterial activity against *H. pylori* suggested these extracts could be developed into effective treatments compared to conventional therapies.

Green synthesis of MgO nanoparticles using Vitex tessellata leaf extract for the photocatalytic degradation of Methyl Red dye

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A cost efficient and novel approach for the synthesis of the magnesium oxide nanoparticles mediated using leaf extract of Vanda tessellata plant. For the synthesis of MgO nanoparticles we used an aqueous solution containing an extract of the plant Vanda tessellata. The nanoparticles were thoroughly characterized using XRD, FT-IR, UV-DRS, TEM, SEM, and EDX. The cubic structure of the nanoparticles, which have an average size of 27 nm, was validated by XRD examination. The biological substances in charge of the nanoparticles' production and binding were revealed by FT-IR analysis. Absorbance peaks among MgO bonds were identified at 280 nm. It was discovered through TEM and FE-SEM investigations that hexagon-shaped nanoparticles had formed. The photocatalytic and antimicrobial characteristics of the as-synthesized composites were also determined under visible light. These analyses demonstrated the maximum degradation of methyl red by 90% within 40 minutes with MgO nanoparticles in the presence of visible light. Interestingly, the study provides information on the efficiency of MgO nanoparticles synthesized by Vanda tessellata plant extract by exhibiting their productivity in environmental remediation and n and antifungal activities.

Keywords: MgO nanoparticles; Methyl Red, Photocatalysis; Green synthesis

Cereal-legume intercropping for sustainable agriculture: A Pakistan's perspective

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Intercropping is the practice of growing more than one species in the same field to rise per unit productivity per unit time. One of the environment friendly methods is intercropping such as cereals (wheat, maize, rice) with legumes (pea, chickpea, mungbean). Legume-cereal intercropping is a sustainable agricultural practice that offers numerous benefits, including reduced risk of crop failure, price stability, lower production costs, decreased incidence of diseases and pest attacks, and improved soil fertility. Intercropping is an important agricultural practice that improves diversification of food supply and gives high economic benefits. Intercropping is a best alternative to the herbicide use which reduces or suppresses the growth of weeds. Government College University, Faisalabad has been selected to participate in the EU-LEGUMINOSE Project in Pakistan. The major objective of the LEGUMINOSE research project is to identify obstacles to intercropping and enhance farmers' acceptance by providing knowledge and demonstrations that promote the economic, environmental, and social benefits of legume-

cereal intercropping. We have established 18 wheat-legume intercropping living labs across Pakistan. Among the 18 established living labs, two living labs are dedicated to studying pest and insect diseases, two living labs focus on economic analysis, and two living labs are centered around modeling. We initially set up 18 living labs but ended up getting data from 14 living labs, and at four living labs, involving chickpeas, we could not collect the grain data due to crop failure. In these living labs, most studies showed that the intercropping system resulted in better growth and development, increased biomass, and higher grain yield compared to the solo cropping system. Now, during the maize season, we have established five living labs primarily focused on maize-legume intercropping.

Legume-cereal intercropping explores the implementation and outcomes of these systems, highlighting their potential to contribute to sustainable agriculture in Pakistan and aiming to enhance the understanding and application of intercropping practices. Legume-cereal intercropping is very important in Pakistan because it supports sustainable agriculture by enhancing biodiversity, improving soil health, and reducing reliance on synthetic inputs, thus aligning with broader environmental and agricultural goals.

Effects of iron nanoparticles on maize growth, photosynthesis and lead (Pb) uptake under Pb stress

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Excess accumulation of lead (Pb) into soil is an emerging global issue which must be attended on urgent basis. This research was conducted to synthesize green ironoxide nanoparticles (FeONPs) with leaves extract of *Chenopodium quinoa* and evaluated their effects on Pb-uptake and growth attributes of maize (*Zea mays* L.). Findings showed that Pb stress adversely altered growth attributes and chlorophyll pigments of plants, while FeONPs clearly improved such factors. Pb alone improved targeted antioxidant enzymatic activity, leaf electrolyte leakage and hydrogen peroxide generation in plant leaves, while FeONPs bring-down EL and H₂O₂ levels and improved the antioxidant enzymatic activities in contrast to their treatments without FeONPs. Pb-alone treatments enhanced Pb absorptions and total plant Pb uptake in tissues. FeONPs exhibited lower Pb concentrations, as well as total Pb-uptake in plant shoots in comparison with control. The findings showed foliar-spray of FeONPs reduced Pb induced toxicity in maize via initiating the activity of antioxidant enzymes with lower oxidative-stress. FeONPs have sufficient ability to improve maize growth under Pb contamination. Further investigations should highlight the major traits like optimization of NPs synthesis, complete understanding of green-synthesized NPs and their positive mechanisms, and conduction of diverse crop tests at field levels.

Keywords: Lead; Nanoparticles; Abiotic stress; Cereals; Yield

Role of different electron acceptors and cell fractions in biotransformation of hexavalent chromium by *Bacillus cereus* strain B2 for the removal of chromium from wastewater

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Chromium (Cr) has applications in various industries such as textile dyeing, nuclear power generation, leather tanning, electroplating, and stainless-steel manufacturing. Industries directly dumped their hazardous waste in surface waterbodies. The presence of hexavalent chromium (Cr⁶⁺) in wastewater poses a potential risk to human and aquatic life. To remove Cr⁶⁺ from wastewater reverse osmosis, ion exchange, chemical reduction, precipitations, and other techniques are commonly used. These methods, however, are costly and produce hazardous byproducts. The

bioremediation of these metals like Cr^{6+} through biotransformation, bioaccumulation, and biosorption by *Bacillus* sp. might be environmentally sustainable approach. This study was carried out to elucidate the role of electron acceptors in the reduction of chromium (Cr^{6+}) by *Bacillus* sp. For this, glucose, tryptone, lactose, glycerol and acetone were used to evaluate their effects on the reduction of Cr^{6+} using *Bacillus* sp. through DPC method. Among these electron donors, maximum chromium reduction (96%) was observed in the presence of glucose after 72 hours of incubation with initial metal concentration of 50mM followed by lactose i.e., 92.3%. Chromium reduction was also evident in the presence of acetone, tryptone and glycerol i.e., 62%, 57% & 50% respectively but to a lesser extent as compared to glucose. Similar trend in chromium reduction by strain B2 was also observed in case of 12.5mM and 25mM Cr^{6+} . Permeable cells of strain B2 reduced the hexavalent chromium up to 48.97% whereas impermeable cells reduced Cr^{6+} up to 44.16% in 6 hours. Similarly, the cytoplasmic fraction of bacterial cell (strain B2) achieved a reduction of Cr^{6+} up to 30.06% in the same time frame. On the other hand, cell membrane fraction reduced hexavalent chromium up to 86% after 6 hours of incubation. This study demonstrated the potential of *Bacillus cereus* strain B2 in bioreduction of Cr^{6+} , with notable reductions seen under various conditions. However, further studies would be required to explore the biological, ecological, and practical aspects of strain B2 for the reduction of hexavalent chromium to develop better strategies to clean the environment.

Excellent photocatalytic and antibacterial activities of bio-activated carbon decorated magnesium oxide nanoparticles

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Green production of nanomaterials are restrict toxic substances and motivated the noxious free environment. Photocatalysis and antibacterial resistance are more promising and efficient fields for their chemical reductants and clean environment. Herein, we adopted a green and simple method for the biosynthesis of MgONPs using *Manilkara zapota* as a bio source. Recently, the green synthesis of magnesium oxide nanoparticles has been a keen interest amongst researchers and scientists due to its simplicity eco-friendliness, non-toxic, inexpensive and potential to perform as an antibacterial agent. Activated carbon/Magnesium oxide (AC/MgO) photocatalyst was blended through a simple solution evaporation method. The surface electron microscopy (SEM) study reveals that AC/MgO had smooth and aggregated particles. The Fourier transform infrared (FT-IR) and x-ray diffraction (XRD) study confirms the structural formation and incorporation of nanoparticles into the AC matrix. Results confirmed the flourishing integration of MgO NPs over the activated carbon matrix. The electron movement and valency of AC/MgO photocatalyst reduced the bandgap and their findings were characterized by ultra visible diffuse reflectance spectroscopy (UV-DRS) and x-ray photoelectron spectroscopy (XPS). The blended AC/MgO photocatalyst was analyzed for photodegradation of Rhodamine- B (Rh-B) dye using a UV-visible spectrophotometer. The degradation study projects that the AC/MgO photocatalyst degrades (Rh-B) dye with 99% efficiency under simulated solar irradiation. This efficient degradation of (Rh-B) dye by AC/MgO photocatalyst is ascribed to the synergetic AC as catalytic support and adsorbent and MgO as photocatalyst. Finally, the photocatalytic material shows a better bactericidal effect in both gram-positive bacteria *Escherichia coli*-745 and gram-negative bacteria *Staphylococcus aureus*-9779. The AC/MgO photocatalyst

is effectively used in bacteriocidal and photocatalytic removal of dyes and can be used for further development of water reuse and bio-medical fields. In addition, this research shows a viable method for synthesizing a cheap and effective AC/MgO for the photocatalytic destruction of organic pollutants.

Biosynthesized Cr₂O₃ Nanoparticles through Opuntia dillenii Extract for degradation of Rose Bengal dye under visible light

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Water contamination is still a serious problem, especially for developing and underprivileged countries. Organic pollutant degradation via photocatalysis is a powerful tool for reducing environmental damage and maintaining fragile ecological balance. Biosynthesis has great promise for tackling both dye contamination and waterborne bacterial illnesses. It is a promising method for generating nanoparticles in an economical and environmentally responsible way. The Opuntia dilleni plant extract is used in this study to provide a brand-new, environmentally friendly, and safe approach for biosynthesizing chromium oxide (Cr₂O₃) nanoparticles. The optical properties of the Cr₂O₃ NP were examined by following UV analysis. A transition from Cr²⁺ to Cr³⁺ inside the oxygen lattice was found with a 2.93 eV bandgap. XRD analysis claimed the rhombohedral structure of the Cr₂O₃ NPs and the inside morphology of the composite were observed in spherical shape through TEM analysis. FTIR and EDS analyses reported that bioactive compounds were present on the surface of the nanoparticles. In addition, a pseudo-first-order kinetics model was also applied to study the degradation performance of the rose bengal dye under visible light. This study highlights the potential of Opuntia dillenii extract-mediated Cr₂O₃ NPs as a promising candidate for environmental application.

Keywords: Green synthesis; Dye degradation, Photocatalysis; Opuntia dillenii

Prevalence and risk Factors of Acne Vulgaris Among Females in district Peshawar: A Cross-Sectional Survey

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The study aimed to investigate the prevalence of acne vulgaris among females in District Peshawar and identify the associated risk factors. Data was collected through a questionnaire-based method, with participants recruited from the dermatology outpatient department (OPD) at MTI Khyber Teaching Hospital (KTH) and through an online survey via Google Forms in District Peshawar. The study included 200 randomly selected participants, comprising both cases and controls, who were assessed for prevalence, risk factors, medications, treatments, and their effectiveness in managing acne. The results revealed that hormonal changes, particularly during adolescence (57.5%) and before or during menstrual periods (37.5%), significantly impacted the skin. Stress (15.5%) and anxiety (14%) were also identified as significant contributors. Additionally, 17% of participants with oily skin were more prone to developing acne. The study found that 24% of participants reported that the use of local cosmetic products could trigger acne, while 15% noted that oral isotretinoin is commonly prescribed by doctors. The study concluded

that the high prevalence of acne vulgaris is primarily driven by hormonal changes in the female body. Factors such as oily skin, psychological stress, and diet, which increase sebum production, also contribute to acne development. Furthermore, the use of whitening products containing harmful bleaching agents can exacerbate acne. The study emphasizes the importance of raising awareness among adults about the safe use of cosmetic and medicated products for acne management. Recommendations include regular moisturizing, staying hydrated, limiting makeup use, avoiding touching the face with fingers or nails, and reducing sun exposure.

Keywords: Acne vulgaris, Cosmetic products, Hormonal changes, Oily skin, Stress and anxiety, Skin health

Enzymatic and Microbial Synergies in Food Waste Bioconversion: Emerging Technologies for high-Value Nutraceutical Production

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In recent years, there has been a lot of interest in the bioconversion of food waste into nutraceuticals. The most recent developments in microbial and enzymatic methods for turning food waste into valuable bioactive chemicals are critically examined in this study. Recent advancements in enzyme engineering have produced more effective and substrate-specific biocatalysts, particularly for refractory biomass components. At the same time, the spectrum of recoverable metabolites has increased due to the construction of specialized microbial consortia. Notable innovations include utilising modified *Bacillus subtilis* strains to synthesise antimicrobial lipopeptides from starch-rich residues and engineered *Yarrowia lipolytica* strains to convert lipid-rich waste. The recovery of bioactive chemicals has greatly increased with the advent of new extraction and purification techniques such as membrane-based separations and subcritical water extraction. Utilizing sophisticated metabolomic profiling has made new nutraceuticals available that may be used in functional meals. Even with these developments, scaling up these technologies still presents difficulties. We talk about the present research gaps and suggest new lines of inquiry, such as combining artificial intelligence with synthetic biology to optimize processes.

Keywords: food waste valorization, enzymatic hydrolysis, microbial fermentation, bioactive compounds, process optimization

Prevalence and risk Factors for Cesarean Deliveries in Peshawar: A cross-Sectional Analysis

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Pregnancy is a natural physiological process that can be complicated by various factors, sometimes necessitating alternative delivery methods. A Cesarean section (C-section) is performed when a vaginal delivery is deemed unlikely or risky for the mother or baby, based on medical advice. This study aimed to investigate the prevalent risk factors associated with C-section deliveries. A cross-sectional study was conducted in various health centres in the Peshawar area, involving 350 female participants who had recently given birth. Data was collected through interviews and medical records. The results indicated that C-sections were the most common mode of delivery (71.4%) among the participants. C-sections were particularly prevalent among women with irregular blood pressure (80%), low haemoglobin (Hb) levels (81.8%), age under 30 (82.3%) or above 41 (73.6%), weight over 80 kg (84.3%), uterine fluid deficiency (89.5%), and those with better socioeconomic status (80.7%). There was no significant difference in C-section rates between educated and uneducated women. The study concludes that C-sections are more prevalent in this population due to significant risk factors such as irregular blood pressure, low Hb levels, uterine fluid deficiency, under or overage and overweight females. These findings underscore the importance of awareness and preventive measures to reduce the incidence of high-risk pregnancies and promote normal deliveries.

Keywords: C-section, delivery, haemoglobin, uterine fluid deficiency

A Comprehensive Review: The Impact of Nutritional Interventions on Mental Health

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The link between psychological health and diets has received a lot of attention in recent years. The most recent research on the relationship between nutrition and mental health is examined in this article, with an emphasis on how dietary changes may be able to lessen the symptoms of mental illnesses including anxiety, depression, and psychological loss. Certain nutrients, including magnesium and zinc, vitamins B & D, and omega-3 fatty acids, are critical for maintaining emotional balance and brain function. For example, for instance, a decreased incidence of depression and enhanced cognitive performance have been associated with the Mediterranean diet, which consists of fruits, vegetables, whole grains, and healthy fats. However, diets heavy in sugar, processed foods, and unhealthy fats appear to be associated with a higher chance of mental health issues.

The link between gut health and mental health is also examined in this review, with a particular emphasis on the gut-brain axis and how it affects behavior and mood. Improved mental health has been linked to probiotics and prebiotics, which boost gut health. Also investigate how nutrition might affect mental health, including inflammation, oxidative stress, and neuroplasticity. Customized nutritional methods, supported by trustworthy evidence, are proposed as a complementary therapy to traditional mental health treatments. Utilizing information from several research papers, this review highlights the significance of incorporating nutritional methods into mental health therapy. Developing complete treatment regimens that address both physical and emotional well-being encourages collaboration between dietitians, psychologists, and other healthcare professionals. In conclusion, nutrition is important for mental health and is a viable strategy for treating and avoiding psychiatric problems. Future research would delve deeply into the complex relationships between diet and mental health, paving the possibility for novel and comprehensive treatment approaches.

Keywords: Nutrition, Mental Health, Diet, Depression, Anxiety

Heterocycles as interesting motifs in the discovery and optimization of new, biologically active drug candidates

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Heterocyclic chemistry is the most interesting branch of organic chemistry and of highest practical and theoretical importance. As a result of this a great deal of research conducted in chemistry is devoted to heterocyclic chemistry. It is an expanding and vast field of chemistry due to obvious use of compounds derived from heterocycles in pharmacy, medicine, agriculture, plastics, polymers, and other areas.

Heterocycles are an important class of molecules, widely spread in nature of numerous significances. Due to their intriguing structures and wide range of pharmacological properties, research on heterocycles becomes highly significant. This property of heterocyclic compounds makes them as one of the prime interests in pharmaceutical industries. The heterocyclic compounds play an important role in regulating the biochemical process in living system. The compounds may be genetic material, hormones, and enzymes. The common heterocyclic compounds that serve as potential leading drug candidates include amino acid, vitamins, and coenzymes.

One of the more interesting groups of heterocyclic compounds are azoloazines. They are biological interesting molecules, and their chemistry is receiving considerable attention.¹⁻³ Furthermore, the multiple biological activities of pyrazole and its annelated derivatives are of increasing interest as antimycotics⁴, antidepressants⁵, fungicidal⁶ or herbicidal agents⁷. For example compounds containing the pyrazolo[4,3-*e*][1,2,4]triazine moiety have attracted considerable attention due to their anticancer and antibacterial activity⁸⁻¹⁰. The most important members in this family of naturally occurring purine analogues are pseudoiodinine⁸, nostocine A⁹ and fluviols A-E¹⁰ produced by *Pseudomona fluorescens* var. *pseudoiodinine* and *Nostoc spongiaeforme*, respectively. Despite the fact that pyrazolo[4,3-*e*][1,2,4]triazines have been less studied in the group of condensed pyrazolotriazines, some of them show moderate inhibition of purine nucleoside phosphorylase¹¹ and cytotoxic activity in A549 lung carcinoma cell line at submicromolar range¹², induction of caspase-dependent cell death, and inhibition of cyclin-dependent kinase 2 (CDK2)¹³. Moreover, this system is structurally related to pyrazolo[4,3-*d*]pyrimidin-7-one present in the structure of sildenafil and its methyl ether analogues which were found to show tyrosinase inhibitory effect, apart from its well-known orally effective properties for the treatment of male erectile dysfunction^{14,15}.

To sum up, it should be emphasized that heterocycles are clearly essential in the discovery and optimization of novel, biologically active drug candidates and organic chemists' understanding of their properties is continuing to expand. This expansion will provide not only structural diversity in drug candidates, but also the ability to fine tune compound properties beyond simply potency using these building blocks.

A Retrospective Analysis of Medication Errors Among Type-II Diabetes Diagnosed Patients with Hypertension in DHQ Hospital KDA Kohat

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The World Health Organization (WHO) reports a substantial rise of almost 170% in the prevalence of diabetes among those living in impoverished countries. The management of several chronic illnesses in patients with Type-II diabetes and hypertension may be greatly affected by medication mistakes, leading to major impacts on patient outcomes. Gaining insight into the incident and characteristics of these mistakes is essential for enhancing patient safety and effectiveness of therapy. Patients with Type-II diabetes and hypertension typically have an increased number of drug-related issues because they are often prescribed many drugs and have multiple coexisting medical conditions. The purpose of this retrospective investigation is to identify prevalent medication mistakes in this specific group and provide measures to avoid them. A retrospective cross-sectional study was conducted at DHQ Hospital KDA Kohat to evaluate the frequency and intensity of interactions between medications in adult patients with type-II diabetes and hypertension. An assessment of Drug-Related Problems (DRPs) was carried out using the Pharmaceutical Network Care Europe (PCNE) program. A grand total of 300 patients were discovered, with a cumulative count of 281 DRPs. Among them, 93.6% exhibit the presence of at least one DRP. The DRPs that were recognized as the most encountered were drug choice problem at 60.5%, Adverse drug events were 17 (6%), Unnecessary drug treatment 65 (23%) and Unclear problems were 27 (9.6%). Micromedex, the drug information database labeled the most interactions are as Major (56.2%), followed by Moderate (41.8%) and Contraindicated (1.8%) in smaller amounts. The majority of these interactions (77.9%) had a beginning that is Not Specified, followed by Delayed interactions (16.6%) and Rapid interactions (5.3%). The bulk of interactions have a documentation quality rating of Fair (70.4%), with a lesser percentage of interactions receiving ratings of Good (23.5%) and Excellent (5.9%). The prevalence of medication-related problems among patients with Type-II diabetes and hypertension underscores the need for enhanced strategies in managing medications. Ensuring patient safety and treatment outcomes is of utmost importance, achieved through effective management of drug interactions, informed decision-making, and proper dosing. To ensure the accuracy of our findings and collect further data, future research should conduct a thorough investigation with a significant sample size, including various areas of Pakistan.

Keywords: Retrospective analysis, Medication errors, Diabetes, Hypertension, Drug-related problems, pharmaceutical network care Europe.

Evaluation of Mosquitocidal Activity of Copper Nanoparticles Synthesized From the *Bacillus* Bacteria

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Introduction: Microbial synthesis of Copper nanoparticles is more advantageous and is eco-friendly to control different mosquito borne illnesses like malaria and dengue which are endemic in Pakistan.

Objectives: This study aimed at the green synthesis of copper nanoparticles (CuNPs) and their larvicidal and ovicidal activity against *Aedes aegypti* and *Anopheles stephensi*.

Materials and Methods: CuNPs were synthesized using *Bacillus* species that were isolated from District Kohat. The CuNPs were characterized using UV–visible spectrophotometer, Fourier Transform Infrared Spectroscopy and scanning electron microscopy (SEM)) followed by investigated for their mosquitocidal activity against larvae and eggs of *A. aegypti* and *A. stephensi*. The data of bioassay was statistically analyzed by using analysis of variance (ANOVA) and the means were compared using Fisher LSD test.

Results: The shape of CuNPs was spherical, with an average size of 22 nm. CuNPs showed potent larvicidal activity against *A. stephensi* with LC50 value of 12.5 µg/mL and LC90 value of 52.4 µg/mL, followed by *A. aegypti* with LC50 – 19.5 and LC90 - 64 µg/mL. It is concluded that the microbes-mediated CuNPs possess promising larvicidal activity against mosquito larvae and thus, could be used as a biocontrol agent to mitigate mosquito population.

Conclusion: The results demonstrate that the *Bacillus* strain synthesized nanoparticles has high mosquitocidal activity and suggest it can be helpful in controlling of vector borne diseases. Metal nanoparticles synthesized by microorganism is a cheap, simple, safe, environmentally beneficial process, and without using high energy, pressure and toxic chemicals.

Keywords: *Anopheles aegypti*, vector-borne diseases, synthesized nanoparticles, Ultraviolet-Visible spectroscopy, Fourier transform infrared (FTIR) scanning electron microscopy (SEM)).

Assessment of Therapeutic Effects of *Euphorbia hirta* Leaf Extracts and Nanoparticles

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Humans and plants have a strong relationship depending on their requirements. People rely on plants for a variety of reasons including food, medicine and shelter. *Euphorbia hirta* belong to a family of *Euphorbiaceae*, that have antioxidant, antibacterial, antidiabetic, anti-asthmatic, antifungal, hemolytic and antimalarial activities. Methanol, *n*-hexane and aqueous extracts of leaves of *Euphorbia hirta* were used along with chitosan based nanoparticles. Total phenolic contents and total flavonoid contents in extracts were 430.32± 1.61 to 559.40 ± 1.45 mg GAE/100mL and 116.76 ±2.94 to 603.23±2.94mg CE/100mL along with 24.52% - 58.43% DPPH radical activities. Alpha-amylase inhibition by *n*-hexane, methanolic, aqueous extracts and aqueous nanoparticles of *E. hirta* were 7.49 %, 24.54 %, 88.09 % and 48.89 % respectively. In hemolytic activity *n*-hexane, methanol, aqueous extracts and aqueous nanoparticles showed % hemolysis of 28.35±1.66 %, 25.87±1.65 %, 41.12±1.66 % and 11.93±0.165 % respectively. Anti-inflammatory activity showed *n*-hexane, methanol, aqueous extracts and aqueous nanoparticles as 31.42%, 20.95 %, 50 % and 26.38 % respectively. Antimicrobial activity was checked by agar diffusion method using two bacterial strains *E. coli* and *S. aureus*. *E. hirta* showed antibacterial activity with inhibition zone of 33 mm for *E. coli* and 40.3 mm for *S. aureus*. Zeta size of aqueous nanoparticles was 300.9 nm with 14.5 mV zeta potential. Functional groups identified by Fourier Transform Infrared Spectroscopy were fluorides, alkanes, carboxylic acids, sulfones, alcohols, ether, primary and secondary amides and sulfates. This research indicated that extracts and nanoparticles of *Euphorbia hirta* have extraordinary pharmacological properties and in-depth studies are required to further evaluate the therapeutic properties of nanoparticles of this plant.

Screening of HSP110 and BAT-26 Microsatellite Instability Biomarkers in Pakistani Population

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Microsatellite instability (MSI) occurs either due to mutation in mismatch repair (MMR) genes or slippage of DNA polymerase resulting in widespread length polymorphism. Globally, mismatch repair deficiency is detected by

immunohistochemistry and MSI based molecular assays. MSI testing is not available in Pakistan due to lack of screening facilities and high detection cost. MSI markers of Bethesda and Pentaplex panel are reliable but expensive assessment tools. The current study was designed to develop a baseline data of melting temperatures of BAT-26 and HSP110 microsatellite instability markers. A total of 50 samples were collected from different ethnic groups of Pakistan. Average melting temperatures for BAT-26 and HSP110 measured through HRM-PCR were 77.94 °C and 78.86 °C respectively. Significant differences between the average melting temperatures of different ethnic groups was not noted. Pearson correlation coefficient performed between different demographic parameters and microsatellite markers yielded moderate but negative correlation ($r = -0.438$, $p = 0.0014$) between gender and ethnicity and positive ($r = 0.524$, $p < 0.0001$) correlation between BAT-26 and HSP110 markers. The study suggested that melting temperatures can be used as surrogate marker to determine the fragment length of microsatellite markers within tumor tissues. The database of Tm of normal population will eliminate the need to run an extra test each time with a tumor tissue and will thus reduce the testing cost.

In Vitro and In Silico Antibacterial Activity of Trichoderma harzianum against Staphylococcus aureus

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The rise of antibiotic-resistant bacteria, such as *Staphylococcus aureus*, underscores the urgent need for new antimicrobial agents. Although *Trichoderma harzianum*, a well-known bio control agent, has antifungal capabilities, nothing is known about its ability to combat *S. aureus* bacteria. Through both in vitro and in silico methods, the antibacterial activity of *T. harzianum* against *S. aureus* is to be assessed in this study. The antibacterial activity of *T. harzianum* against *S. aureus* was tested in vitro using different concentrations of *T. harzianum* extracts to find the minimum inhibitory concentration (MIC). Molecular docking experiments were conducted as part of the in silico research to anticipate the interaction between *T. harzianum* compounds and important pathogenic proteins of *S. aureus*. Computational methods were used to analyze the binding affinity and stability of these interactions. Significant antibacterial activity of *T. harzianum* against *S. aureus* was shown by the in vitro experiments, with distinct inhibition zones of up to 12.3 ± 0.2 . Strong binding affinities of *T. harzianum* compounds to the pathogenic proteins of *S. aureus* were shown by the in silico analysis, which corroborated these results and suggested possible mechanisms of antibacterial activity. These findings demonstrate *T. harzianum*'s potential as a source of novel antimicrobial compounds, providing a viable substitute for treating bacterial infections resistant to antibiotics.

Keywords: Antibiotic resistance, Minimum Inhibitory Concentration (MIC), *Trichoderma harzianum*, *Staphylococcus aureus*

Comparative study on Locusts diversity in wet and dry soil areas of Quetta district (Kuchlak) of Balochistan

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Populations of locusts can spread swiftly to catastrophic proportions, resulting in enormous devastation in a short period of time. A study from July 2021 to June 2022 was conducted to find out the diversity of locusts in wet and dry soil areas of Quetta district (Kuchlak) of Balochistan. A total of 250 locusts were collected in the present study.

The (14) species belonged to the order Orthoptera with 2 families (Pyrgomorphidae and Acrididae) and (12) genera were observed. (155) locusts were found in wet soil areas and (95) in dry soil areas. Captured locust's species includes *Chrotogonus trachypterus*, *Sphingonotus rubsences rubsences*, *Poeciloceris pictus*, *Aiolopus thalassinus*, *Chrotogonus armatus*, *Heteracris littoralis*, *Anacridium aegyptium*, *Acrida cinerea*, *Pyrgomorpha conica*, *Aiolopus thalassinus tamulus*, *Schistocerca gregaria*, *Diabolocatanops innotabilis*, *Acrotylus patruelis*, *Oxya hyla*. In the present research the Acrididae appeared as a richest family. From the present study, it can be concluded that both wet and dry soil areas are suitable for locusts diversity.

Keywords: Catastrophic, Locust, Kuchlak, collected, richest.

Bioanalytical characterization of *Origanum vulgare* leaves Extract and Its Nanoparticles

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Plants have always been a common source of medicines, either in the form of traditional preparations or as pure active ingredients. In current study, *Origanum vulgare* (oregano) leaves extracts were prepared along with nanoparticles. Methanol, *n*-hexane and distilled water were used as solvents to prepare extracts. Methanolic extract of *O. vulgare* showed higher total phenolic contents and total flavonoid contents than aqueous and *n*-hexane extracts. While total phenolic contents and total flavonoid contents for nanoparticles were 16.34 ± 1.61 mg GAE/mL and 1133.13 ± 1.69 μ g CE/mL respectively. Maximum free radical scavenging activity was showed by aqueous extract ($70.77 \pm 0.48\%$). Percentage antiradical value of nanoparticles was $21.58 \pm 2.41\%$. Antimicrobial activity was evaluated using agar well diffusion method. Maximum zone of inhibition (35.6 ± 1.52 mm) against *S. aureus* was given by methanolic extract and minimum zone of inhibition (17 ± 1 mm) against *S. aureus* was observed for aqueous extract. Against *E.coli* maximum zone of inhibition (22.33 ± 1.24 mm) was showed by aqueous extract and minimum zone of inhibition (16.66 ± 1.24 mm) was showed by *n*-hexane extract. Percent hemolysis result of *n*-hexane extract was higher than aqueous and methanolic extract. Anti-inflammatory activity was tested by using BSA denaturation method. Maximum inhibition against inflammation was showed by *n*-hexane extract and minimum inhibition against inflammation was showed by aqueous extract. Nanoparticles showed $87.38 \pm 1.5\%$ inhibition against inflammation. Antidiabetic activity was examined through alpha-amylase assay. Aqueous extract showed highest value of alpha amylase inhibition as compared to methanolic and *n*-hexane extracts. Fourier Transformed Infrared Spectroscopy results showed the presence of alcohols, alkynes, aromatics, aromatic amines, carboxylic acids and aldehydes. Charge on Chitosan loaded nanoparticles was positive with 407.9 ± 182.1 nm size and 23.7 ± 1.1 mV zeta potential. Overall every extract and nanoparticles showed good results of all the bioactivities but more studies are required to use oregano on industrial scale.

Enhancing Food Packaging, Safety, and Nutrient Bioavailability via Nanotechnology Utilization

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Compared to new technologies, nanotechnology is an rising discipline that conforms to new and more advanced uses in food systems, even though its broad application in agriculture, biochemistry, medicine, and numerous other industries. With a smallest amount length dimension of 1-100 nm, structures, devices, and materials are premeditated through construction, characterization, manufacture, and handling in this technology. Other methods to food processing have been made possible by nanotechnology, which has improved the physicochemical properties of food while also boosting nutrient stability and bioavailability. Furthermore, nanotechnology includes identifying food-related illnesses, creating appropriate diet plans for a variety of target audiences, including the elderly population, geriatric patients, and special situations, and using nanoencapsulation to ensure the sustainability of food production. Moreover, nutrition nanotherapy can create unique goods through food fortification and intelligent, smart systems for controlled nutrient delivery. Nanodevices or nanosensors combined with polymers are used in smart (intelligent) food packaging to identify food infections and pollutants, chemicals, and toxins during storage and transportation activities.

Keywords: Nanotechnology, Uses, Methods, Bioavailability

Molecular Identification of Babesiosis in The Dog Population of District Bannu

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Babesiosis is a tick transmitted disease of dogs, cattle and small ruminants caused by protozoan parasites of species *Babesia* species. Two *Babesia* species infects dogs which are economically important in tropical and subtropical regions of the world, including Southern Africa (*B. canis*) and *B. gibsoni*. The endemic condition of canine babesiosis in a specific geographic region is related with presence of a vector capable to transmit the infection and the enzootic stability condition depends of the interaction established between tick, parasite and dog. The aim of the study was to determine the prevalence of Canine Babesiosis in the dog's population of district Bannu. 43 blood samples were collected by attending different veterinary hospitals of district Bannu. Samples were analyzed through microscopy out of which 24 (55%) were positive for *Babesia* by microscopic examination. The prevalence rate of babesiosis was very high in Bannu city and Domail of district Bannu. The Female population was more infected (54%) with babesiosis than the Male population (45%). Over all the infection of *B. canis* was higher as compared to the infection of *B. gibsoni*. It was concluded from the present study that *Babesia* species has high prevalence rate in Dogs Population of district Bannu. Moreover, it is necessary to prescribe better treatment to avoid the infection of Babesiosis in the Dogs of the study area and also some awareness campaigns are needed in the area due to lack of relevant education. Additionally in the current study we had used simple microscopy for identification it is suggested that for more Accurate result Advance and easily available techniques can be practiced like ELISA.

Key Words: Babesia, Babesiosis, Veterinary, Protozoan, canines, Ticks, Prevalence

Molecular Identification and Evaluation of Antifungal Activity of Clinical Bacterial Isolates Against *Candida albicans*

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Background: *Candida albicans* is a prevalent opportunistic fungal pathogen causing a spectrum of infections, from superficial to severe systemic conditions, particularly in immunocompromised individuals. Conventional antifungal

treatments face significant challenges due to drug resistance and adverse effects, necessitating novel therapeutic approaches. This study evaluates the antifungal potential of bacterial isolates against *C. albicans*, aiming to discover new bioactive compounds for treatment.

Objectives: To isolate and identify *C. albicans* from infected human patients. To assess the antifungal activity of bacterial isolates through in vitro bioassays. To molecularly identify fungal and bacterial isolates using 16S or 18S rRNA sequencing techniques.

Methodology: Clinical samples will be collected from DHQ, KDA, Kohat, and processed using conventional culturing techniques. Fungal isolates will be identified morphologically using microscopy and molecularly using PCR and sequencing. The antifungal activity of bacterial isolates will be tested by measuring inhibition zones in agar plates where *C. albicans* plugs are placed.

Results: Successful isolation and identification of *C. albicans* and bacterial isolates. Identification of bacterial strains with significant antifungal activity against *C. albicans*, evidenced by substantial inhibition zones compared to controls. Molecular characterization of the fungal and bacterial isolates, confirming their identities and potential bioactive properties.

Conclusion: This study aims to identify bacterial isolates with antifungal properties against *Candida albicans*, addressing the challenge of antifungal resistance. By isolating and testing bacterial strains, and characterizing them molecularly, we seek to discover new, effective antifungal agents. The findings could offer safer, more efficient treatment options and enhance our understanding of microbial interactions in combating fungal infections.

Keywords: *Candida albicans*, antifungal activity, bacterial isolates, drug resistance, bioactive compounds, in vitro bioassays, molecular identification, 16S rRNA sequencing, 18S rRNA sequencing, microbial interactions

***Panax Ginseng* effects on male reproductive health and its curative properties in male reproductive disorders**

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Panax ginseng, also known as Korean red ginseng is a well known herbs used for its numerous health benefits, used mostly in China, Korea and other East Asian countries. Besides its others health outcomes it has been demonstrated as a better clinical value in male reproductive health MRH. Red ginseng is considered the best herb for health, because of the richness in ginsenosides, volatile oils, polysaccharides and amino acids, peptides and other compounds with high nutritional values. The active compound in red ginseng is ginsenoside, which is triterpenoid saponin, it functions to improve the Nitric oxide levels in the body and leads to the dilation of blood vessels causes improved blood flow and nutrient supply in the body especially to the reproductive area, alleviating its nutritional deficiencies. Based on the clinical research red ginseng besides its medicinal power is a safe functional food can effectively improve erectile function in patients with ED, restore semen quality in patient with male infertility, and protects from the diseases of prostate. Number of studies on the role of red ginseng in the male reproductive disorders are done on animals and humans. It is tested in comparison with medicine, placebo and no treatment groups and ginseng responded significantly positive as compared to other groups. In clinical trials its association has been found with reduction of oxidative stress, regulation of sex hormones, spermatogenesis and its anti-inflammatory effects. Moreover, it's potential to contribute in comorbidities like male infertility, prostate diseases and erectile dysfunction is confirmed in the clinical trials. In number of studies reviewed, positive association is found between

the use of ginseng and improving the IIEF (International index of erectile function) status, orgasmic satisfaction, sexual satisfaction and erectile rigidity. Its dosage ranges between 800-3000 mg per day depending on the review of the several studies on red ginseng. Red ginseng is also found to reverse the damages caused by different medications. Panax ginseng combined with other supplements like tocopherol and L-arginine better enhances the sperm quality parameters and reduced apoptosis indicators in rats. In conclusion all of the human and animal studies indicated, red ginseng is known to improve the antioxidant levels, spermatogenesis, IIEF status and improves male fertility. But the exact mechanism of the action of red ginseng is still unknown to the researchers. Further researches are required to explore the exact mechanism of the action of the red ginseng in improving MRH.

Keywords: Red ginseng, panax ginseng, erectile dysfunction, MRH

Valorization of rapeseed oil industry waste for the production of nutraceutical products

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A substantial opportunity exists to enhance agricultural sustainability and monetary price through the valorization of rapeseed oil commercial business waste into nutraceutical products. Rapeseed is grown for its oil-rich seeds, that are used as a cooking oil. Oil extraction is a multi-degree process that starts with pre-cleansing to do away with impurities, maintains with crushing the seeds to launch their oil, then actions on to solvent extraction to increase manufacturing. The final derivative of oil extraction, that is every so often seen as trash, incorporates precious additives inclusive of proteins, fiber, and bioactive materials. Modern methods, including enzymatic hydrolysis and fermentation, can convert these in protein. Hydrolysis by using enzymes simplifies proteins by way of lowering them to less difficult peptides and amino acids, making them less difficult to digest and growing their usefulness. Another choice is fermentation, which makes use of microbes to enhance the protein's bioactivity and dietary profile. The protein-wealthy byproducts provide several effective fitness effects, including improved nutritional profiles with sufficient of protein and important amino acids, wound healing abilities, and anti-inflammatory, antihypertensive, and antioxidant residences. Because of these advantages, they're exceptionally prized for utilization in a variety of food objects, so that you can result in a greater environmentally pleasant and health-aware meals gadget.

Keywords: Sustainability; Extraction; Enzymatic Hydrolysis; Nutritional Profiles

Development of a Caffeine-free Drink in Place of Tea

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Caffeine's well-known adverse health effects have led to the development of caffeine-free beverages as customer preferences have shifted in favor of healthier options. In order to satisfy customer needs for a safe option without sacrificing flavor and sensory experience, this research attempts to develop an innovative and enticing caffeine-free

beverage substitute that is similar to favored caffeinated drinks like tea and coffee. This study was guided by three main research questions: examining consumer preferences for caffeine-free beverages; determining appropriate formulations for caffeine-free drinks based on consumer preferences for sensory similarity to tea and coffee; and evaluating consumer acceptance through sensory evaluations of flavor, aroma, and overall palatability. The purpose of this study was to create a beverage that will satisfy the desire of individuals for healthier beverage options and wellness- focused lives by utilizing the inherent properties of beetroot, such as its color and flavor profile.

Heteroatoms ternary-doped porous carbons derived from poly (cyclotriphosphazene-co-4,4-aminophenylether) microspheres as electrodes for supercapacitors

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Polyphosphazenes (PPNs) are considered as an ideal class of inorganic-organic hybrid materials with structural stability inherited from inorganic backbone (-P=N-). PPNs are being employed as precursors for co-doped porous carbon materials which are highly suitable for energy production and storage due to their intrinsically enriched heteroatoms like phosphorous, oxygen and nitrogen. PPNs-based codoped carbon materials owe micro- and mesoporous structures, outstanding pore-volume, high surface area, exceptional ions transportation, good surface wettability, and high capacitive performance, which is pre-requisite for energy storage applications. With this inspiration, we prepared codoped porous constructed simply by adjusting the ramp-conditions with better char yield, disordered structure, ultra-high surface area of 3407.8 m²/g, and ~ 10–13% heteroatoms content. The codoped porous carbon microspheres (PZM-MS) were elucidated by XRD, Raman spectroscopy, XPS analysis, and Brunauer–Emmett–Teller (BET) method. The fabricated intrinsically doped N, P, and O carbon material provides a good capacitance out-put of 265.0 F/g at 0.5 A/g current density in a 6M-KOH electrolyte in the symmetric-electric-double-layer capacitors (EDLCs). The PZM-MS delivers 75% columbic efficiency and 91% cycling stability after 10,000 GCD cycles with a 5.0 A/g current density. The codoped material delivers 6.5 W·h/Kg energy density at a power density of 24.68 W/Kg at a 0.1 A/g and surges down with an upsurge of power density.

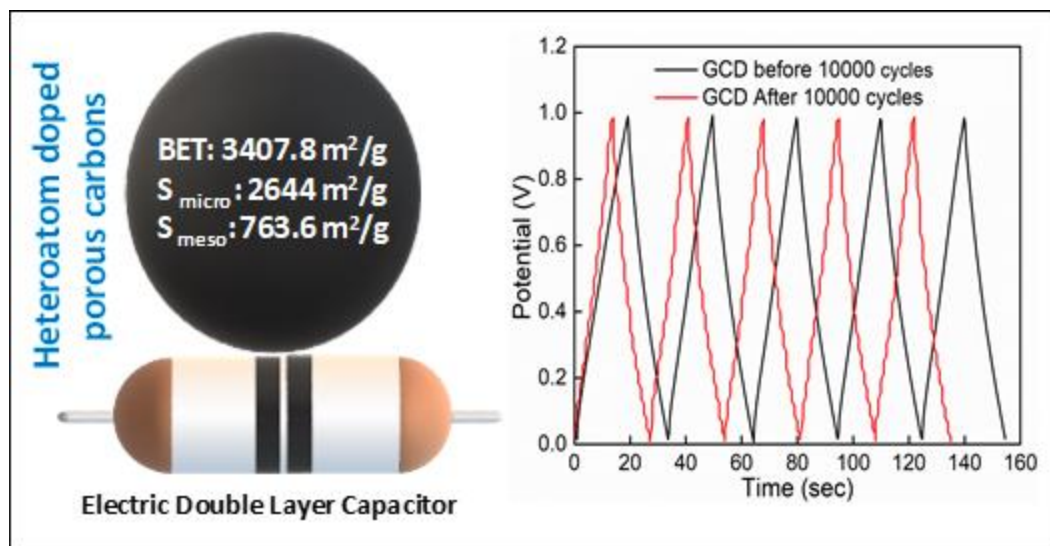


Figure 1. Graphical abstract of the PZM-MS derived codoped carbon materials applied in EDLCs.

Green Synthesis of Copper Oxide Nanoparticles Using Asplenium Ceterach Extract and Their Antimicrobial Activities

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Nanotechnology, through the green synthesis of nanoparticles using plant extracts rich in bioactive compounds, significantly enhances various fields such as health, agriculture, and medicine, offering sustainable and precise solutions that revolutionize drug delivery, precision agriculture, and eco-friendly medical technologies. This study explores the green synthesis of copper oxide nanoparticles (CuO-NPs) using *Asplenium ceterach* extract and evaluates their antimicrobial potential. Aimed at synthesizing and characterizing CuO-NPs, the research investigates their efficacy against fungal and bacterial pathogens. Copper oxide nanoparticles were synthesized by mixing *A. ceterach* extract with Cu (NO₃)₂, followed by characterization using X-ray Diffraction (XRD) and Scanning Electron Microscopy (SEM). Antimicrobial activity was assessed through well diffusion assays against fungal and bacterial strains. The synthesized CuO-NPs exhibited significant antifungal effects against *Fusarium mangifera*, *Alternaria alternata*, *Aspergillus niger* and *Penicillium italicum*, showing inhibition zones ranging from 15.6 mm to 18.8 mm at concentrations of 300 µg/mL. Antibacterial assays demonstrated effective inhibition against *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Klebsiella pneumoniae* and *Acinetobacter baumannii*, with zones ranging from 17.5 mm to 22 mm. SEM revealed spherical nanoparticles with an average size of 40 nm, while FTIR confirmed the presence of functional groups involved in nanoparticle synthesis. CuO-NPs synthesized from *A. ceterach* extract exhibit potent antimicrobial properties, suggesting their potential as effective agents against microbial infections. This research underscores the biomedical potential of green-synthesized nanoparticles in

combating antimicrobial resistance and highlights the ecological benefits of utilizing natural resources for nanoparticle synthesis. Further investigate the mechanisms of action and explore synergistic effects with conventional antibiotics to enhance the efficacy of CuO-NPs against multidrug-resistant pathogens.

Keywords: Green synthesis, copper oxide nanoparticles, A. ceterach, antimicrobial activity, biomedical applications.

Synthesis and Characterization of New Amides by using Coumarin 3 Carboxylic acid and their Biological Evaluation

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The amide functional group is important in biological field and industry; every protein molecule on the planet contains amide linkages, and the backbones of the nylon family of polymers contain amide bonds. The amide functional group consists of a central carbonyl group with a nitrogen atom single bonded to the carbonyl carbon (R-CONR₂) which are synthesized by the one pot reaction of different anilines with coumarin 3 carboxylic acids followed by halide formation by using triethyl amine (Et₃N) as coupling agent. Coumarin and its derivatives display a wide variety of biological activities, such as antitumor, anticoagulant, antispasmodic, antidiabetic, antibiotic, and antioxidant activities. Coumarin carboxamide compounds, as important coumarin derivatives, have attracted much attention of researchers in organic synthesis and drug research because of their outstanding biopharmaceutical properties. The compound was isolated by thin-layer chromatography, preparative thin-layer chromatography, and column chromatography. Characterized by single crystal analysis, ultraviolet-visible Spectroscopy, infrared, Mass Spectrometry, and Nuclear Magnetic Resonance Spectroscopy. This approach ensures coverage of all the most common chemical transformations that yield new amide bonds.

Keywords – amide functionality, carbonyl compounds, biological activities, antimicrobial, antioxidant, antitumor

Dementia Prediction by using Machine Learning

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Dementia is a mental condition that primarily affects old aged and there is still no cure or therapy available to cure it. Dementia symptoms may start to manifest up to ten years before the disease is officially diagnosed. Therefore, based on symptoms, machine learning (ML) researchers have proposed a number of strategies for dementia early diagnosis. These methods do, however, have one significant drawback. The problem is in the bias that the dataset's unequal classes introduce into ML models. Previous studies did not adequately handle this problem and did not adopt proactive measures to avoid danger. To demonstrate this bias, many machine learning models were created. In order to mitigate bias, we implemented a synthetic minority oversampling method (SMOTE) to ensure that the suggested machine learning model's training process was balanced. Experimental findings reveal that the suggested learning system outperforms eleven similar systems which were proposed in the literature. In this proposed model we use different machine learning algorithm for the prediction of dementia by using dataset available from kaggle. The model achieved the best AUC of 0.75 and Recall of 0.75 by using the LR. The achieved accuracy is not enough and in future we plan to improve the accuracy by using different feature selection method and also to implement this methodology with large dataset.

Establishing a Genetic Diagnosis for a Proband in a Family with Stargardt Disease Using Whole Exome Sequencing

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Stargardt disease (STGD) is a hereditary retinal disorder causing progressive vision loss and yellow retinal spots. It is a major cause of blindness, particularly in Pakistan, where it accounts for 14.7% of cases. Limited medical resources make genetic diagnosis crucial. STGD has three types linked to different genes (*ABCA4*, *ELOVL4*, *PROM1*). This study utilized Whole Exome Sequencing (WES) to identify genetic causes in a proband from a family with STGD, overcoming traditional diagnostic limitations. Ethical approval was obtained from the KUST Research Ethical Committee. Clinical examination confirmed STGD phenotypes in the proband, including blurry vision, light sensitivity, and bilateral central vision loss. The proband has five unaffected members (parents and three siblings) and two affected siblings with similar phenotypes. WES data underwent filtration based on homozygosity, non-synonymous changes, and allele dosage. Variants with a minor allele frequency >0.01% in databases such as gnomAD and the 1000 Genomes Project were excluded. Variants associated with disease phenotypes in OMIM, HGMD, Pubmed, and Clinvar databases were prioritized. Seven potential genetic variants

associated with eye disorders were identified. A homozygous frameshift variant [Chr1 (GRCh38): g. 94578566 - 94578567: NM_000350.3: c.123G>A, p. (W41X)] in *ABCA4*, a typical cause of STGD, was identified. The variant showed a moderate level of evolutionary conservation (PhyloP score= 5.828) and a very low allelic frequency (MAF= 0.0000006238) in gnomAD. The variant was classified as "pathogenic" according to American College of Medical Genetics and Genomics (ACMG) criteria, confirming the STGD diagnosis in the proband. Genotype-phenotype correlation is recommended for this family based on the variant's pathogenicity.

Investigation of 1,2,4 Triazole derivative in morphine induced dependence; A Simulation and molecular

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In many cases, the limiting factor in the utilization of this drug for the management of pain is the development of analgesic tolerance as well as reliance on morphine. As a result, the purpose of this study was to evaluate the potential advantages of the natural molecule 1,2,4 TRIAZOLE in the treatment of morphine dependency in mice. Biochemical testing included assays for mRNA expression, nitrite levels, and antioxidants, as well as immunohistochemical investigations. Behavioral paradigms included hot plate and tail-flick (for tolerance), observation of withdrawal signals (for dependency), and other similar procedures. Based on the results of behavioral testing, it was shown that administration of 1,2,4 TRIAZOLE considerably reduced the level of morphine dependency in mice. During the course of the biochemical study, it was discovered that rats that were treated with 1,2,4 TRIAZOLE had a decrease in the mRNA expression of inducible nitric oxide synthase (iNOS) and NR2B, which is a subtype of NMDA. In addition, the administration of 1,2,4 TRIAZOLE resulted in lower levels of nitrite in the mouse hippocampus compared to the administration of morphine alone. Furthermore, 1,2,4 TRIAZOLE increased the levels of neuronal innate antioxidants such as glutathione-S-Transferase (GST), glutathione (GSH), and catalase (CAT) in mouse brain tissues, while simultaneously reducing the levels of lipid peroxidase (LPO). Immediately following the injection of morphine, antioxidant actions may provide the necessary neuroprotection protective. Because of these facts, it is necessary to do more research into the potential benefits of 1,2,4 TRIAZOLE as a new agent in the process of overcoming the formation of physical dependency that occurs after the use of morphine.

Keywords: 1,2,4 TRIAZOLE; morphine; tolerance; dependence; NMDA; nitric oxide.

Addressing Protein-Energy Malnutrition in Pakistan: Challenges, Strategies, and Pathways to Sustainable Solutions

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Protein Energy Malnutrition (PEM) remains a critical public health issue in Pakistan, affecting vulnerable populations across the nation. The current scenario of PEM in Pakistan presents very alarming situation, highlighting its prevalence, contributing factors, and the efforts undertaken to address this pervasive nutritional challenge. Despite economic growth and advancements in healthcare, Pakistan grapples with alarmingly high rates of malnutrition, with PEM standing out as a prominent concern. Factors such as poverty, food insecurity, inadequate access to healthcare, lack of nutritional education, and cultural practices contribute significantly to the prevalence of PEM in Pakistan. Children under the age of five are particularly vulnerable, with chronic malnutrition stunting growth and cognitive development, and acute malnutrition increasing susceptibility to infections, leading to high mortality rates. Additionally, women of childbearing age often enter pregnancy in a malnourished state, perpetuating the intergenerational cycle of malnutrition. Governmental and non-governmental organizations have initiated various interventions to combat PEM in Pakistan. These include nutrition supplementation programs, maternal and child health initiatives, community-based education campaigns, and the promotion of breastfeeding practices. However, challenges such as inadequate funding, infrastructural limitations, and socio-cultural barriers persist, hindering the effectiveness of these interventions. To effectively address the current scenario of PEM in Pakistan, a multifaceted approach is imperative, encompassing policy reforms, targeted interventions, community engagement, and sustainable development efforts. By prioritizing nutrition-sensitive policies and fostering collaboration between stakeholders, Pakistan can strive towards achieving significant reductions in PEM prevalence, ensuring a healthier future for its population.

Keywords: Protein Energy Malnutrition, Nutritional challenge, Food insecurity, Child health, Poverty

IoT Security in Real-Time Healthcare: A Comparative Framework Analysis

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IoT (Internet of Things) into e-health systems, particularly emphasizing the security challenges associated with sensor-generated data. Our research proposes a security framework using CoAP (Constrained Application Protocol) and HTTPS to ensure data confidentiality, integrity, and authenticity across different layers of IoT-based health monitoring systems. Many studies also highlight the layered architecture of IoT systems in e-health and the necessity of securing each layer individually. However, they often focus on specific layers or technologies, such as secure data transmission at the network layer or encryption techniques at the application layer. The approach

described in this abstract stands out by offering a comprehensive security framework that spans across all layers, integrating both CoAP and HTTPS for end-to-end security. Furthermore, while other studies have proposed frameworks that rely heavily on encryption and authentication mechanisms like AES or RSA, the integration of CoAP alongside HTTPS is relatively novel. This combination not only addresses the energy efficiency concerns of IoT devices, which is often overlooked in other research, but also provides a lightweight solution that can be easily implemented on resource-constrained devices. Some focus more on the interoperability of different IoT protocols rather than on security. However, we emphasis on using CoAP and HTTPS as complementary protocols to enhance security presents a more holistic approach to IoT security in e-health. While there is no one-size-fits-all solution, the choice of security framework should be driven by the specific requirements and constraints of the healthcare application. The comparative analysis presented provides a comprehensive understanding of the strengths and limitations of various security approaches, offering valuable insights for researchers and practitioners aiming to secure IoT-based healthcare systems.

Keywords: *e-health; IoT and data privacy; IoT layered architecture; CoAP, AES, RSA.*

Histopathology of Shielding Effects of Pomegranate Juice Against Benzo-Alpha-pyrene Induced Colorectal Carcinoma

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Background: Pomegranate (*Punica Granatum L.*) is a fruit-bearing, highly adaptable, ornamental and edible plant originated in Iran and native to central Asia. The colorectal carcinoma is the second most leading cause of death in the world.

Introduction: The polycyclic aromatic hydrocarbons like like BaP are considered as most common dietary pollutants and are group I human carcinogens. Human Interaction to BaP mainly occurs via grilled and smoked food. BaP can be produced by pyrolysis during cooking process

Materials & Methods: 72 Sprague Dawley rats were obtained and control group was established. The given sample set was exposed to the Benzo-alpha-pyrene (BaP) and the findings were recorded. Then treatment with pomegranate juice was done on half of BaP fed rats (PomeBaP Group) while one set remained treatment deprived (BaP Group).

Results: Histochemical examination reveals the mucin depletion and tissue damage by BaP Fed rats. Intestinal Crypts were intact in both groups of rats. The BaP group rats had oval basally situated nuclei, high N/C ratio, dark basophilic cytoplasm along with focal areas of dysplastic and hyperplastic changes. While these changes were markedly reduced in the PomeBaP group.

Conclusion: The increased N/C Ratio and other indicators suggest that untreated rats were prone to Colorectal cancer, as compared to pomegranate juice treated rats. The relation of Microbiome and metabolome clusters could be further used for metabotype prediction and the discovery of biomarker which is good for healthy gut

Brain tumor classification using Deep Learning with SMOTE

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Brain tumors are considered one of the most challenging diseases worldwide due to their complexity and heterogeneity. Therefore, early and accurate diagnosis of headaches is important. On the other hand, accurate classification of brain lesions remains challenging due to the currently available variety of tumor types and imbalanced image data. This discrepancy is due to the model performance bias, which reduces the overall classification accuracy in favor of the majority category. To overcome these challenges, we propose a deep fusion-based approach that incorporates multiple deep learning models to improve the accuracy of brain tumor classification. In the first step, we reprocess, resize, scale, and normalize the image dataset to make the dataset stable and the model adaptive to any changes. In an attempt to achieve class balance, we used several state-of-the-art resampling techniques including SMOTE. Interestingly, SMOTE can balance the dataset by creating instances of the wrong minority classes. To improve the classification performance, we combine multiple convolutional neural networks (CNNs) to provide a more accurate representation of the feature. This approach achieves much higher accuracy, precision, and recall than the baseline model using balanced datasets to train the fusion model. The accuracy, precision, and recall scores were 98.35%, 96.71%, and 90.93%, respectively, indicating its use in the diagnosis of brain disorders.

Nutritional disorders in autistic children in Khyberpakhtoonkha Pakistan

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Autism spectrum disorder (ASD) is a complex neurodevelopmental disability that is frequently associated with food refusal, limited food repertoire and high-frequency single food intake mainly among children with ASD. Children with autism or autism related symptoms are at heightened risk for malnourishment. In general, autistic children also reported to have lower serum levels for the reference ranges for pantothenic acid, biotin, folate, vitamin B12, vitamin D and vitamin E.

In current study, after informed consent, total 18 families having a child or children (under 20 years of age) affected with autism or autism spectrum disorder (ASD) from Abbottabad (4), Mansehra (5), Alae (5) and Swat (4) were registered for the study. Parents/guardians were interviewed and information was recoded through a questionnaire and telephonic calls. Demographic characteristics, knowledge about proper dietary and nutritional needs of these children were recorded. Weight and BMI was calculated. It was observed that participants had limited knowledge related to the proper dietary and nutritional needs of the children on spectrum. None of participant knew about the 'Pakistan Dietary Guidelines for better Nutrition' (PDGN). Different types of eating disorder were observed in these children. Most prominent was avoidant and restrictive food intake disorder (ARFID). Out of total 18, 67 % (12) children were having a limited diet in terms of range and quantity. Most of them were having sensory issues while 28 % (5) were observed with Binge eating disorder (BED). They were regularly eating large amounts of food in a short period until feeling uncomfortably full and observed to be overweight and obese. These children were eating too many calories from carbohydrates and proteins (dairy products, potato, sugar and eggs). Only one child showed less problem in eating habits and adequate weight. A comprehensive study with large sample size should be carried out. Professional advice, early intervention and support, therapies and medication can help manage eating disorders. PDGN provide a comprehensive country-specific recommendations for adopting healthy eating practices and reducing the risk of infectious and chronic diseases. Also it provides a free course for adopting healthy eating practices to prevent and reduce malnutrition, nutritional deficiencies is available.

Cross-Lingual Transfer Learning Techniques for Low-Resource Languages in NLP

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Natural Language Processing (NLP) has advanced rapidly due to the availability of massive volumes of annotated data and the development of sophisticated models, particularly for high-resource languages such as English, Chinese, and Spanish. However, the benefits of these developments have not been evenly dispersed, with low-resource languages—those with little linguistic resources and annotated datasets—continuing to confront major obstacles. This mismatch has spurred an increased interest in cross-lingual transfer learning, an approach that aims to improve NLP performance in low-resource languages by leveraging information and models produced for high-resource languages.

This work looks at many cross-lingual transfer learning algorithms and their applicability in enhancing NLP tasks for low-resource languages. The primary focus is on multilingual pre-trained models, such as mBERT (Multilingual BERT), XLM (Cross-lingual Language Model), and mT5 (Multilingual T5), which have been trained on large multilingual datasets. These models learn shared representations across languages, allowing them to transfer knowledge between high- and low-resource languages and also explores data-centric methods like data

augmentation, synthetic data generation, and translation-based data transfer to overcome data scarcity in developing effective Natural Language Processing (NLP) models for low-resource languages.

This study also explores zero-shot and few-shot learning in cross-lingual transfer, highlighting their potential to improve natural language processing (NLP) outcomes for low-resource languages. These methods, leveraging shared linguistic features, can overcome data limitations, promoting more inclusive and effective NLP technologies for a wider range of languages.

Exploring Pyrazole based Derivatives from Mefenamic Acid: Multicomponent Synthesis, Characterization, and Comprehensive In Vitro and In Silico Antibacterial Evaluation

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Multicomponent reactions (MCRs) are efficient tools for creating complex molecular structures. Building on previous work on 1,2,4-triazole, thiazole, chalcone, and thiazolidinone derivatives, this study synthesized pyrazole Schiff derivatives of mefenamic acid using MCRs. Mefenamic acid was used as the starting material due to its versatility and biological activity. The synthesis involved condensing mefenamic acid with various aldehydes and hydrazine derivatives, resulting in novel pyrazole Schiff derivatives. These were characterized using ¹H NMR and ¹³C NMR. The antibacterial activity of the derivatives was tested against Gram-negative (*Escherichia coli*) and Gram-positive (*Staphylococcus aureus*) bacteria. Compounds 8a, 8b, and 8h showed excellent inhibitory activity. Molecular docking studies indicated that these compounds had the highest docking scores at the active site of flavohemoglobin (flavoHB), suggesting their potential as flavoHB inhibitors. These findings provide a foundation for developing novel antibacterial agents.

Keywords: Mefenamic acid, heterocyclic compounds, characterization, antibacterial activity, Pyrazole derivatives.

Detecting Threatening Language in Urdu Text Using a Deep Sequential Model

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The Urdu language is commonly used across various social media platforms like Twitter, WhatsApp, Facebook, and YouTube. However, the absence of dedicated Urdu Language Processing (ULP) libraries makes it challenging to detect threats from Urdu textual and sequential data on these platforms. To address this, there is a need to preprocess Urdu data with the same efficiency as English by developing specific stemming and data-cleaning libraries. While

several lexical and machine learning-based techniques have been proposed in the literature, they are limited by the lack of an available online Urdu vocabulary. This research introduces an Urdu language vocabulary, including a stop words list and a stemming dictionary, to preprocess Urdu data as effectively as English. This approach reduces the input size of Urdu sentences and eliminates redundant and noisy information. Finally, a deep sequential model based on Long Short-Term Memory (LSTM) units was trained on the efficiently preprocessed data, evaluated, and tested. Our proposed methodology achieved strong prediction performance, with an accuracy of 82%, surpassing existing methods.

Heart Disease Classification Using a Deep Learning Approach Optimized by Crow Intelligence

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Deep learning (DL) approaches offer predictive analysis capabilities for heart-related diseases (HRD), enabling early detection of patterns and identification of associated risk factors. Additionally, nature-inspired algorithms have proven effective in optimizing complex challenges, such as risk prediction, treatment planning, and resource allocation in disease management. This paper, therefore, proposes a hybrid approach that integrates DL techniques with a nature-inspired algorithm. Specifically, the Crow Search Optimization Algorithm (CSOA) is combined with DL methods for HRD classification. The classification is carried out using deep neural network (DNN) and convolutional neural network (CNN) algorithms. Experiments were conducted on two datasets: the Cardio dataset, which contains numeric HRD data, and the NIH chest X-ray image dataset, which includes HRD-related X-ray images. Several optimizers, including Stochastic Gradient Descent with Momentum, RMSProp, Adam, Adagrad, Follow the Regularized Leader, and Nadam, were evaluated for the classification task. Notably, integrating CSOA with the DNN model (CSOA-DNN) significantly improves the DNN model's performance on the Cardio dataset. Overall, the Adam and Nadam optimizers consistently outperformed others across various performance parameters during both training and validation phases. Using the Adam optimizer, classification accuracy reached 96.6% during training and 92.2% during validation, with precision at 91%, recall at 95.5%, and an F-score of 93.2%. Similarly, the Nadam optimizer achieved comparable results, with 96.5% accuracy during training, 93.3% during validation, 91.7% precision, 95.7% recall, and a 93.7% F-score. These findings highlight the superior performance of the Adam and Nadam optimizers across various metrics in both DNN and CNN models. The integration of CSOA significantly enhances the performance of the DNN model, leading to improved classification accuracy and other performance metrics.

Development and Quality Evaluation of Apricot Carbonated Drink

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Apricot fruit, a desirable summer fruit, is a climacteric fruit that ripens even after it has been harvested. Its sweet taste and soft texture make it a popular fruit. Apricot is a perishable fruit with a shelf life of 1 to 5 days. The present study was conducted with the objective of utilization of apricot fruit in the production of carbonated drink and also evaluation of different properties such as physico-chemical and sensory characteristics with respect to the different apricot juice concentrations 20%, 30% and 40% of juice. The extracted fruit juice subjected to carbonation. The physicochemical factors such as viscosity, TSS, acidity, pH, color, specific gravity and ascorbic acid were studied and the changes were observed. The prepared drink was analyzed for 0,7 and 15 days of storage. The sensory evaluation study was done with hedonic scale to find the best combination of juice concentration and TSS. The obtained results of physiochemical and sensory attributes showed that apricot carbonated drink level at 30% (Sample T2) found to be superior among all with respect to sensory qualities. In conclusion, the comprehensive evaluation indicated that the carbonated beverages derived from apricot, specifically sample T2, indicated a decrease in pH and specific gravity while increase in titratable acidity and exhibited superior physicochemical attributes and generally demonstrated favorable sensory properties. This suggests that it has the potential to serve as a viable substitute for artificial soft drinks.

Keywords: Apricot, Carbonated drink, Carbonation, Physico-chemical characteristics, Sensory evaluation

Extraction of natural color from Beet Root (*Beta Vulgaris*) and its Utilization in Ice Cream

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Color is a significant sensory feature of foods which frequently serves a vital part in the acceptance of food commodity in market and frequently utilized by the consumers as an gauge of a multiple of quality attributes of the food product like appearance, safety, flavor, nutritional value etc. Beet root is one of the best source of natural color. Beetroot not only adds a deep red color to foods but also enhances their nutritional profile. The present study was conducted to extract color from beet root by Soxhlet extraction, cold extraction and ultrasonic extraction. The extract produced from these three techniques were further assayed for total phenolic content (TPC), antioxidant activity (DPPH), total yield %, color (L*, a* and b*) and betalains contents. The results of these techniques revealed

that the extract obtained from soxhlet extraction has more phenolic contents 244.11 (GAE mg/100g), enhance antioxidant activity value 23.41%, better color results and significantly more yield 48.05 % as compared to other techniques. But the contents of betalains observed more in extract obtained from ultrasonic extraction which is about 399.47 (mg/L). The extract obtained from beet root was further utilized in ice cream to check its acceptability in food products in comparison with artificial color. Six samples of ice cream were made having different ratios of sugar beet derived color and artificial color. Control ice cream (T₀) was prepared which only contain artificial color. In a similar manner, another batch of ice cream (T5) will be made by replacing the Artificial color with a beetroot derived color. The other treatments (T1), (T2), (T3) and (T4) contain a combination of both natural and artificial color with different proportions. Various quality parameters of ice cream were studied like pH, acidity, brix, melting rate, specific gravity and texture analysis. The result signifies that addition of sugar beet color don't have considerable effect on these attributes. Sensory characteristics including color, mouth coating, flavor, aroma, texture and overall acceptability of T5 which only contain sugar beet color shows more acceptance and significance results as compared to other treatments which contain artificial colors.

Keywords: ultrasonic extraction, betalains contents, artificial color, antioxidant activity.

Moringa seed oil: a sustainable and eco-friendly alternative

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Moringa seed oil has become a popular and environmentally friendly alternative in several industries due to its remarkable physical and chemical features, including great resistance to oxidation, capacity to break down naturally, and lack of toxicity. Moringa seed oil has several possible uses, it demonstrates replacement of conventional, damaging materials in various industries including biofuel manufacturing, wastewater treatment, and lubrication. It has demonstrated significant potential as a cutting fluid in the industry due to its exceptional lubricating properties and capacity to tolerate high temperatures. This makes it an excellent alternative to traditional cutting fluids derived from petroleum. The inherent viscosity and exceptional heat absorption capabilities of the oil contribute to efficient cooling and lubrication during machining processes, resulting in a substantial reduction in tool wear, energy consumption, and environmental impact. The moringa seeds have a high oil yield and a beneficial fatty acid composition, which allows for the generation of biodiesel that fulfills global fuel requirements. This sustainable biofuel not only decreases dependence on limited fossil resources but also significantly decreases greenhouse gas emissions, in line with worldwide environmental sustainability standards. In addition, the flexibility and environmental advantages of moringa seed oil are demonstrated by its natural coagulant and antibacterial properties in wastewater treatment. The ability of the process in purifying polluted wastewater provides a more

environmentally friendly option compared to traditional chemical coagulants. It offers an effective and sustainable approach to improving the quality of water. Ultimately, moringa seed oil plays a crucial role in the change towards more environmentally-friendly industrial methods. Due to its wide range of uses and its positive impact on the environment, it plays a significant role in the worldwide change towards sustainable and renewable energy sources in several sectors.

Keywords: Moringa seed oil; sustainable alternatives; eco-friendly; biodiesel; wastewater treatment.

Consanguinity as a potential risk for childhood deafness in selected districts of Khyber Pakhtoonkhwa Pakistan

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Deafness is a sensory impairment that can range from mild to profound, affecting individuals across all age groups. Congenital deafness is present at birth, and acquired deafness occurs later in life due to various factors such as illness, injury, or exposure to loud noises. Deafness is a significant health concern in Khyber Pakhtoonkhwa, Pakistan, and this clinical investigation aims to examine the prevalence, causes, and characteristics of deafness in the region to improve understanding and guide appropriate interventions and support for affected individuals. A representative sample of individuals with hearing problems was selected, and data on demographics, potential causes and social implications collected through surveys, medical records, and interviews. For genetic analysis, 5ml blood sample has sent to UCL UK. Quantitative data was analyzed using descriptive statistics, while qualitative data statically.

The study involved 100 patients (after informed consent) with 52 females and 48 males, all suffering from deafness. The participants were primarily within the age range of 11 to 15 years. Geographically, the majority of patients (71%) were from Abbottabad, followed by Mansehra (22%) and Battagram (7%). The gender distribution was relatively balanced, with slightly more female patients (52%) than male patients (48%). A potential association between consanguine marriages and deafness observed. Out of these 100 patients, 73% were from families having consanguine marriage and this trend in these families was high. The study also explored the association of deafness with speech impairment (speech apraxia) and epilepsy. Speech apraxia was relatively common among the deaf patient population studied, while epilepsy was less prevalent. The findings suggest a genetic basis for deafness in these families. In order to increase public knowledge of the risks associated with consanguinity, appropriate health education, counseling, and promotion initiatives should be developed and implemented at the community level.

Synthesis, characterization, Antioxidant, DNA Binding and molecular Docking Study of new Ferrocenyl Schiff Bases and Their Complexes

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Two ferrocene bases Schiff bases were synthesized i.e N-(2,3,4-Trimethoxy benzylidene)-4-ferrocenyl aniline and N-(2,3,4-Trifluoro benzylidene)-4-ferrocenyl aniline and their complexes were also prepared. Schiff bases and their metal complexes were characterized by elemental analysis, UV VISIBLE, IR and NMR spectroscopy. Ligands and their metal complexes were screened for antioxidant, DNA binding and molecular docking activities. The compounds demonstrated moderate to significant activities. DDPH was used as free radical in antioxidant activity. DNA binding was determined by UV Visible spectroscopy and MOE program was used for molecular docking. The ligand interact with guanine amino acid residue of DNA Via imine N through H acceptor fashion with binding distance of 3.23Å and binding energy of -2.2kcal/mol. The complex interact with cytosine and guanine amino acid residue of the DNA Via Ferrocene atom through metal ionic contact with bind distance of 2.43, 2.34Å And binding energy of -1.3Kcal/mol and - 3.5Kcal/mol respectively.

Keywords: Schiff bases, Complexes, Antioxidant, DNA binding, Molecular docking

Band gap engineering via co-doping for tuning the structural and optical properties of bismuth oxide to degrade levofloxacin

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Organic pollutants are oftenly degrade using various type of metal oxides. One of the popular approach to enhance the photocatalytic efficiency of the metal oxides is co-doping. The band gap of bismuth oxide is fine-tuned by co-doping of silver and vanadium using different ratio of both elements. The substitutional type of doping and tetragonal structure of doped bismuth oxide is confirmed by PXRD. The FE-SEM confirmed the nanoflake-like morphology and EDS analysis indicated the presence of desired elements. The optoelectronic properties of co-doped Bi₂O₃ were determined by PL spectroscopy and UV light induced photocatalytic degradation of levofloxacin (LFX) by co-doped Bi₂O₃ is carried out. The comparative analysis indicated that co-doped bismuth oxides are better photocatalysts than bare Bi₂O₃. Further, scavenging tests indicated that BO-1 (3 mol% Ag and 1 mol% V co-doped bismuth oxide) showed maximum degradation, and O₂^{•-} and [•]OH are the reactive oxygen species which are

responsible to cause photocatalytic degradation. The pseudo-first-order kinetic model best fits for all synthesized nanomaterials and reusability tests confirmed their stability.

Significance of Biotechnology for Future Food Lipids

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Biotechnology has provided revolutionary possibilities in the advancement and improvement of future food lipids, managing the growing worldwide need for healthier food items and the growing need for sustainable agriculture methods. The development of genetic modification and advanced biotechnological techniques has allowed the manipulation of lipid synthesis in plants and microorganisms. It results in the creation of dietary lipids that have better nutritional profiles and improved functional qualities. These advancements have the potential to effectively address the increasing consumer need for functional foods that are abundant in critical fatty acids such as DHA (Docosahexaenoic acid) and EPA (Eicosapentaenoic acid). The incorporation of genetically modified organisms (GMOs) in food production remains limited due to legislation and public doubt, which prevents the extensive use of these technologies. Moreover, growing and processing of lipid-rich crops require advanced techniques to assure consistent expression of desirable features and compliance with food safety regulations. In microbial biotechnology, cultivation of microalgae and other microorganisms, that are rich in lipids, has gained importance over time. These organisms provide a renewable and expandable supply of lipids for food, which can be grown in controlled conditions, reducing the environmental effects on food production. To introduce these technologies in the commercial market involves significant challenges such as improved production efficiency and technological limitations, affecting the reliability of these lipid sources. In short, Biotechnology has the potential to significantly impact the future of food lipids. However, there are various limitations that need to be overcome in order to maximize its benefits and create sustainable food systems.

Keywords: Biotechnology; food lipids; genetic modification; sustainability; microalgae

Recent Advances Techniques for Food Preservation and Nutrient Enhancement

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In this era of revolution, new methods have been introduced for food preservation and enhancement of nutrients. The techniques of canning, freezing, and dehydration, which were used in the past as the primary methods of food preservation are being substituted or combined with ultra-modern techniques including high pressure processing, pulse electric fields, and ultrasonic preservation. These methods assist to expand the time frame of produced aliment and preserve the taste, texture, color, and nutrient composition of the food products. High-pressure processing (HPP) has quickly gained popularity as another technique to kill microorganisms and avoid the damage to nutrients caused by heat. In Pulsed electric fields (PEF) technology, the impact of high voltage on food for short intervals is measured, in order to disrupt the cell walls of microorganisms and boost extraction of useful ingredients. Ultrasonic preservation is based on physical and chemical principles in which sound waves are used to cause alterations in food products by killing their microbes and enhancing food texture. In addition to this, modern innovations in packaging like the active and intelligent packaging are also helpful in the preservation and determination of the quality of food items. Bio-fortification entails the enhancement of the nutritional density of crops through plant breeding. The incorporation of prebiotics, probiotics, and phytochemicals as food ingredients for health boosting, continue to enjoy acceptance. In general, these particular approaches for food processing and nutrition modulation have greatly contributed to the food industry.

Keywords: Food preservation, HPP, PEF, ultrasonic preservation, food processing

Synthesis of Superparamagnetic Iron Oxide Nanoparticles Using *Melia azedarach* Stem Bark Extract and Their Application for Sensing Oxalic Acid

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Oxalic acid naturally exists in different vegetables and foods which readily interacts with calcium and iron to generate insoluble oxalates. Their chelation can lead to a variety of renal diseases in the form of kidney stones. In this study, we developed a colorimetric sensor for the detection of oxalic acid using superparamagnetic iron oxide nanoparticles (SPIONs). Using UV-Vis spectroscopy, the SPIONs were synthesized and monitored, revealing a plasmon resonance region at 298–301 nm. Energy Dispersive X-ray Spectroscopy (EDX), Fourier-Transform-infrared (FTIR), X-ray diffraction (XRD), and scanning electron microscopy (SEM) were used to characterize the produced SPIONs. Furthermore, for the synthesis of the SPIONs, important factors such as the effect of concentration, temperature, contact time, and pH were optimized. As a sensor for oxalic acid, the colorimetric change in the TMB solution from colorless to blue-green was measured using UV-Vis spectroscopy. Different effecting parameters, including pH, Nanoparticle effect, TMB concentration, and time, were optimized for optimal

colorimetric response. The synthesized SPIONs-based sensor was used for sensing oxalic acid, which provides a linear range of 5-25mM and an R^2 value of 0.99 with a low detection limit of 0.19 μ M. The proposed colorimetric sensor is acceptable for a point-of-care diagnostic by the naked eye.

Keywords: colorimetric sensor, oxalic acid, SPIONs, TMB, XRD, FTIR,

Impact of Managerial Mindset on Innovation Performance

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This study explores the critical relationship between managerial mindset and innovation performance within the context of the technology sector. Understanding how the beliefs and attitudes of managers influence a company's ability to innovate is crucial for fostering advancements in food technology. The research employs a quantitative approach to assess how different mindsets—specifically growth versus fixed mindsets—affect innovation outcomes. The study also examines the moderating role of transformational leadership in this relationship.

Our findings reveal that a growth mindset among managers significantly enhances innovation performance, driving the development of new processes, products, and technologies. Conversely, a fixed mindset tends to hinder innovation, although this negative impact can be mitigated through the adoption of transformational leadership practices. The study underscores the importance of cultivating a growth-oriented managerial mindset to accelerate innovation in the technology sector.

By providing empirical evidence on the influence of managerial mindset, this research offers valuable insights for industry leaders seeking to enhance their organization's innovative capabilities. Future research could extend this analysis to other sectors, management levels, and cultural contexts to further understand the dynamics at play in fostering innovation.

Key words: Innovation, Growth Mindset, Managerial Mindset, Transformational Leadership

Medicinal Natural Products of Peppers: Properties, Bioactivities and Characterization

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The use of bioactive phytoconstituents is an important area in phytochemistry and biomedical fields. *Piperaceae* family is famous for containing beneficial indigenous plants used as folk medicine. This presentation is an attempt to review new discoveries related to chemical constituents and how these are characterized along with biological

potential of phytoconstituents from *Piper* species. It outlines the insecticidal, antimicrobial and anticancer activities with reference to drug discovery of this species. Bioactive constituents/ extracts from this genus are tested and showed that these have clinical importance: displaying pronounced efficacy as antioxidant, for the treatment of various diseases of respiratory tract viz. cough, bronchitis, asthma as well as it has anti-inflammatory, antiamebic, antiapoptotic, antifeeding, anti-colon toxin, antibacterial, antifungal, antiplatelets, cytotoxic, antiplasmodial, antidepressant, antidiarrheal, antimutagenic, anti-metastatic activity, helping body to fight inflammation associated with chronic diseases like Alzheimer's, Parkinson's, arthritis, antihypertensive, antispasmodic, antispermatogenic, antitumor, antimalarial anticancer, antimicrobial, antithyroid, cold extremities, gastric ailments, hepatoprotective, intermittent fever, larvicidal activity etc. are manifested by these plants. The amides piperine, chabamide, guineensine, piperlongumine and pellitorine, inhibited the growth of cancer cell lines. These secondary metabolites also improved the efficiency of chemotherapeutic drugs showing minimal systemic toxicity for normal cells during cancer therapy. The king of spices *Piper nigrum* Linn., common name black pepper is a member of family Piperaceae. These plants are utilized in many traditional medicinal systems. One of the major metabolites, piperine influenced and increased serum concentration, activated the biomembrane to absorb various active agents, reduced mutational events, inhibited tumor activity etc.

The characterization techniques are also discussed that how these secondary metabolites are elucidated.

Hypolipidemic Potential of Olive Oil

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The prevalence of fatty liver disease is rising in developed nations due to urbanization and changes in lifestyle. It can also arise as a consequence of the metabolic syndrome, which is more common in industrialized countries and is characterized by hyperglycemia, obesity, dyslipidemia, hypertension, and cardiovascular disease. Hyperlipidemia is a common disease that primarily causes coronary heart disease in developed countries. It is caused by modifications to lipid metabolism, plasma lipoprotein synthesis and degradation, or plasma lipid transport. Many academics and medical experts are interested in it since it is a crucial public health concern. Currently, the most efficient and clinically proven methods to control and reduce the progression of this illness are to adopt healthy diet and lifestyle practices. Plant-based medicines are receiving greater attention despite recent medical advances because they are more broadly available, less costly, more convenient, and have less side effects than synthetic drugs. Extra virgin olive oil (EVOO) is a fruit oil that is high in monounsaturated fats and potent antioxidants. Because of the hypolipidemic effects of EVOO, there was a significant decrease in plasma lipid levels after treatment. By lowering inflammation and reversing abnormal lipid metabolisms, olive oil supplementation significantly reduces the deposition of fat droplets in the liver of experimental animals and lowers serum triglycerides and liver enzyme

indicators. Extra virgin olive oil may prove to be a beneficial dietary source of antioxidants that lower the risk of cardiovascular disease and liver damage.

Keywords: Extra virgin olive oil, triglycerides, cardiovascular, hyperlipidemia

Antimicrobial and catalytic potential of Ag-NiO₂ nanoparticles stabilized with PVA for wastewater treatment

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Wastewater treatment has become critical need of the hour. For the purpose, current study has been designed to develop cost-effective material for the removal of dyes and inhibition bacterial growth. Silver and nickel based nanocomposite (Ag-NiO₂@PVA) was fabricated by chemical reduction method. Polyvinyl alcohol (PVA) was used as a stabilizing agent. Characterization of nanocomposite (NC) was done by different analytical techniques to confirm synthesis, structure and morphology of NC. Catalytic degradation of different azo and anthraquinone dyes including methylene blue (MB), methyl orange (MO) and eosin yellow (EY) was carried out using NC. The degradation of MO, MB and EY was recorded in 20, 16 and 20 min with percentage removal 89.26, 95.88 and 96.56% respectively. Antibacterial potential of the NC was assessed against different bacterial strains (*Bacillus subtilis*, *Staphylococcus aureus* and *Escherichia coli*) and NC exhibited strong zone of inhibition against all types of bacterial strains. Nanocomposite was recovered and analyzed after dye degradation as well as the antibacterial studies have confirmed stability and recyclability of the nanocomposite. Results of the current study strongly recommend the composite for wastewater treatment applications *i.e.* removal of different dyes and pathogens. Silver and nickel based nanocomposite can be synthesized as well as modified followed by stabilizing with PVA for different applications in material sciences.

A Hybrid Approach to Fruit Ripeness Classification Using Convolutional Neural Networks and Advanced Image Processing

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An assessment of the maturity of fruits is important so as to have quality fruits and minimize losses that may occur after the fruits have been harvested. A new approach for the determination of the ripeness of fruits using image processing and, particularly, deep learning is proposed. The first step is Gaussian averaging and symmetric sampling of the fruit images to pre-process the images so as to clear the features of the images. The high frequency boundaries are decomposed by using multi-resolution analysis, and the filtering based on shape recognition is used to extract fine shape-related features. Another aspect is added to the assessment by the color histogram analysis because color details are excluded from other characteristics and considered separately. To model deep features, the choices include Convolutional Neural Networks (CNNs) like VGG-19, GoogLeNet, and EfficientNet with outliers in complex chromaticity and visual patterns of ripeness stages. In order to overcome these limitations, the Bag-of-Visual-Words model incorporates the local, global and color features in a single system. This integration enhances the accuracy of the category and also the speed of the search. Several studies prove the effectiveness of the proposed models, with an increase in ripeness assessment using Fruit-360, Food-101 and Fruits dataset. This approach offers a very effective means of establishing an automatically controlled fruit quality assurance system and it effectively overcomes problems typically associated with the application of automated technology in food production factories.

***Stevia Rebaudiana*, Natural Sweetener Source for Diabetic Patients**

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In recent past the nature and artificial synthesised sweeteners are becoming the basic requirement of the present day population suffering from diabetics, obesity and other cardiac diseases. To address the following demand artificial sweeteners are available in the market which are utilized by the patients but they are proving to be harmful for the body. The natural sweeteners specially based upon the stevia species can be utilized as alternative to synthesised sweetener which also contains antioxidant and antibiotic potential that can be helpful in the treatment of multiple diseases like obesity, hypertension, cancer, dental cavities, renal and other non-communicable diseases. Dried leaves of stevia plants contain multiple metabolites to treat diabetes that have antihyperglycemic, insulin-mimetic and insulinotropic properties. In diabetic Patients the stevia leave extracts can be used to lower the Blood glucose level which can significantly reduce it up to 35 percent.

Stevia Rebaudiana contains the potential attributes as therapeutic medicine and natural sweetening phytochemicals including rebaudioside, stevioside and isosteviol. In United States of America and other countries, as approved by FDA, Stevia leaves powder and liquid extracts are used as dietary supplements that provides the potential amount of minerals, essential amino acid, vitamins, alkaloids, essential oils, phytosterols and tannins that is essential for the regulation of metabolic function of the body including its defence mechanism. Stevia cultivation is going to perform

in the different areas of Punjab to assess its potential growth level to give an awareness in the farmers community and young entrepreneurs that can be good business model and also address the concept of modern organic medication. In addition to its cultivation, safe and advance extraction techniques and utilize able packaging will also be utilized to make it more market competent. Hopefully this data will boost the young minds to hire the multidirectional approaches to address the present food and health challenges.

Keywords: (*Stevia rebaudiana*, antidiabetics, Supplement, Natural Sweetener, Phytochemicals)

Prevalence and Multidrug Resistance in ESBL Producing *E. Coli* Isolated from Meat Samples in Faisalabad

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Food-borne infections caused by consuming contaminated meat are a major health concern these days, and *E. coli* plays a significant role in food-borne illnesses. The main goal of this cross-sectional study carried out in years 2023 and 2024 was to estimate *E. coli* prevalence rates and resistance patterns in raw meat in Faisalabad. This research also evaluated the distribution of ESBL-encoding genes in *E. coli* isolates. Various meat samples (chicken, beef, mutton, and fish) were collected from local retail shops. The positive isolates were confirmed via morphological and biochemical properties as well as through PCR. The antimicrobial resistance profile was determined through the disc diffusion method, and ESBL genes distribution was also confirmed by conventional PCR. Around one third (32.5%) of samples were positive for *E. coli*, of which 45% were chicken, 31% were mutton, 19% were beef while 5% were fish samples. 77% of isolates were multidrug-resistant (MDR) and 13% of isolates were possibly extensive-drug resistant (pXDR). The highest resistance was observed against penicillins (80%), followed by glycopeptides (78%), and macrolides (70.5%). However, the lowest resistance was recorded against carbapenems (12.5%). Fifty-nine percent of isolates were positive for the *bla*TEM gene, 13% for CTX-M1, 7% for CTX-M15, and 5% for the SHV-1 gene. These results verify and strengthen the concept of animal food serving as a potential reservoir of pathogens that are received by man through consumption or handling of contaminated meat. In their animal hosts, these pathogens tend to develop resistance after which these are transferred to humans where they cause untreatable infections. The meat samples collected in this study can be regarded as possible ESBL- *E. coli* reservoirs which pose a serious threat to human health.

Keywords: *E. coli*, antimicrobial resistance, ESBL, MDR, XDR

Real-Time Face Mask Detection and Crowd Sensing

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The rapid spread of the COVID-19 pandemic has caused substantial disruptions in global trade and transportation, leading to the adoption of new norms such as wearing face masks and maintaining social distance. In this context, face mask detection and crowd sensing have emerged as crucial tasks in supporting the global community. The proposed model aims to address these challenges by leveraging Image Processing techniques and popular libraries such as TensorFlow, Keras, and OpenCV.

The suggested approach offers a streamlined solution for accurate face detection in real-time video streams and determining whether individuals are wearing masks or not. Additionally, the model incorporates crowd sensing capabilities, detecting instances where there are more than two people in close proximity to the camera. By employing optimized parameter values derived from Haar Cascade and Convolutional Neural Network models, the proposed system ensures adherence to the World Health Organization's mandated Standard Operating Procedures (SOPs). This model serves as a valuable tool in promoting public safety and compliance with health guidelines. By automating the process of face mask detection and crowd sensing, it reduces the burden on manual monitoring and enables efficient enforcement of SOPs.

Image-Based Dietary Assessment: Tackling Health Challenges through CBIR and Feature Extraction

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The expansion of prolonged health disorders, for instance hypertension, cardiovascular disease, sleep apnea, osteoporosis, type 2 diabetes, and some types of cancer, is also related to poor diet and physical laziness worldwide. Food journaling is crucial for tracking nutritional intake and maintaining a healthy lifestyle to stave off illness. Food cataloguing has been automated using computer vision techniques to classify images and track nutritional intake.

Retrieval of images for the said problem should be in a timely, efficient, and productive manner. To reflect the visual attributes with less time consumption for content-based image retrieval (CBIR), crude picture markings are essential. Increasing the recognition accuracy with varying input image size spatial pyramid pooling strategy applied through highlight vectors ought to contain sufficient image data by means of shape, objects, color and spatial data viewpoints to recognize image class is suitable applicant. An inventive content-based image retrieval strategy has been combined to recover extremely accurate results utilizing deep convolutional neural networks responding to visual features of a picture to the greatest extent possible. For this purpose, a diversity of ResNet, NASNet and

EfficientNet generated signatures with the addition of spatial pyramid pooling at higher layers that are proficient with visual features like texture, color, and object detection. Because spatial pyramid pooling allows the backbone network to learn more quickly and accurately, ResNet, NASNet and EfficientNet are applied to extract deep features of an image it overcomes the scale constraints when importing images to enhance feature extraction so firstly we applied it. Secondly, we compute the maximum response for the texture pattern by using the MRF (Markov Random Field) classifier. After that, cascaded samples are run via FREAK (Fast Retina Keypoint), a descriptor that mimics the human retinal system, to find equivalent key points throughout the image, then color components are obtained using a correlogram. The proposed method is experimentally applied to stimulating datasets including UNICT-FD889 dataset, FoodX-251, Food-11, Food-101, and RawFooT-DB. Remarkable precision results are obtained by breaking the limitations of input size images with the use of spatial pyramid pooling. Our results concluded that CBIR features can be effectively used for categorizing food item images, which can help in disease prevention by empowering healthier dietary choices.

Amino Substituted *o*-Anisic Acid Based Schiff Base: Antimicrobial Activity And Cross-Linking Ability For Epoxies

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The novel Schiff base 4-(4-hydroxybenzylideneamino)-2-methoxybenzoic acid, was synthesized through the chemical reaction between 2-methoxy-4-amino benzoic acid and 4-hydroxy benzaldehyde. The molecular structure was effectively identified using Fourier transform infrared spectroscopy (FTIR), ultraviolet-visible (UV/VIS) spectroscopy and nuclear magnetic resonance (NMR) techniques. A series of polymers (B1-B3) was obtained by curing DGEBA with synthesized Schiff base (1, 2, 4eq). In order to compare structure of curing agent with the curing behavior of DGEBA, MABA and HBA were used to cure DGEBA to obtain B4 and B5 polymers respectively. The structural analysis of these polymers were conducted through FTIR. Its thermal stability was evaluated by thermogravimetric analysis, all the polymers showed good thermal stability. Antimicrobial activity of each polymer was checked. All the synthesized polymers had good antibacterial and antifungal activity against different microbes but HBA and B2 exhibit excellent antimicrobial activity.

Cross-Dataset Evaluation of Machine Learning Models for Breast Cancer Prediction

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Breast cancer has been a leading cause of cancer-related deaths worldwide. The underlying cause of this malady is that it is mostly revealed in late stages after a certain time of its occurrence making it difficult to treat. Another significant characteristic of breast cancer is that it can reoccur after its treatment. Therefore, early prediction of its occurrence and re-occurrence is the best solution to decrease the death-rate. This can be achieved through using machine learning based predictive models. This study aims to forecast the breast cancer outcome using machine learning classifiers including Logistic Regression, K-Nearest Neighbor, Support Vector Machines, Gaussian Naïve Bayes, Decision Trees and Random Forests. The generalization ability and robustness of these distinct classifiers is evaluated on Breast Cancer Wisconsin (Original), Breast Cancer Wisconsin (Diagnostic) and Breast Cancer Wisconsin (Prognostic) datasets from UCI repository. We analyzed cross-dataset performance in aspects of accuracy, precision, F1 score and ROC to identify the most reliable models for accurate breast cancer prediction and to highlight potential dataset-specific biases. The results indicate significant variations in algorithm performance across different datasets. This comparative study not only provides insights into the relative strengths and weaknesses of each machine learning approach but also emphasizes the importance of evaluating predictive models across diverse datasets to ensure their effectiveness in real-world scenarios. Our findings contribute to the development of more reliable and generalizable breast cancer prediction tools, enhancing early detection and treatment strategies.

Keywords: Breast Cancer Detection, Breast Cancer Prediction, Machine Learning Models, Cross-Dataset Evaluation, Performance Comparison, Predictive Modeling

Designing and Green Synthesis of Novel Nanomaterials to Achieve Sustainable Development Goals

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United Nations (UN) 2030 Agenda has been presented to achieve Sustainable Development in developing countries. This agenda is based on 17 Sustainable Development Goals (SDGs) that provide comprehensive roadmap focusing four main pillars: social, economic, environmental, and governance. There are few SDGs that have been interconnected with applications of different nanomaterials. There are many reports describing the role of nanomaterials in health and well-being (SDG-3), water treatment and sanitation (SDG-6), affordable and clean energy (SDG-7) and industry/ innovation (SDG-8). There are number of publications describing nanoparticles for antimicrobial, antioxidant, antifungal, anticancer, drug delivery applications. Nanoparticles have been extensively used for environmental remediation in terms toxic pollutants removal and CO₂ conversion to useable chemicals. Remarkable role of nanomaterials in electronics, energy storage devices and solar energy harvesting applications has been reported by many researchers. Versatile role of nanomaterials in achieving different SDGs can be credited to

characteristics of nanomaterials that depend on many factors including methods of synthesis. Green methods for the synthesis of many nanomaterials (monometallic/ bimetallic nanoparticles, ternary nanocomposite, perovskite etc) have been employed followed by applications in all domains of sciences. Green methods are cost effective, easy to handle and especially sustainable in nature. These green synthesized nanomaterials can surely be promising candidate in achieving Sustainable Development Goals.

Deep Learning Applications in IoT-Based Bioinformatics and Medical Informatics

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Machine learning (ML) has significantly advanced, particularly in medical and bioinformatics, where deep learning (DL) techniques are vital for handling complex, real-time data, enhancing healthcare outcomes, and efficiency. DL's applications in IoT-based bioinformatics include diagnosis, treatment recommendations, clinical decision support, image analysis, wearable monitoring, and drug discovery. Study synthesizes existing literature on DL in IoT-driven bio- and medical informatics, categorizing advanced solutions into five DL techniques: convolutional neural networks, recurrent neural networks, generative adversarial networks, multilayer perceptrons, and hybrid methods. It examines key features, challenges, and the state-of-the-art research, aiming to inspire further advancements in the field. The review also highlights evaluation criteria such as accuracy, sensitivity, specificity, F-score, latency, adaptability, and scalability.

Sunscreen Formulation Containing Zinc Oxide Nanoparticles Using *Calotropis gigantean* Leave Extract

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Nanoparticles show unique properties as compared to other materials . A lot of research work has been done on zinc oxide nanoparticles (ZnO NPs) used in cosmetics products and sunscreen due to its unique features such as photostability, high UV absorption and filtering properties,. The main objective in this research work was to formulate a non- toxic and less allergic sunscreen containing ZnO nanoparticles by green synthesis using *Calotropis gigantea* leaves extract. ZnO NPs the important component of sunscreen was prepared from *calotropis gigantea* leaves extract (a medicinal plant) .The leaves were washed ,dried & crushed in distilled water with the ratio of (1;100).It was then placed in water bath for an hour and then filtered. Filterate was placed in a flask on hot plate for magnetic stirring and ZnCl₂ salt (0.2mol/dm³) was added drop wise with constant sitirring for half an hour.Afterthat, the mixture was centrifuged at 6000rpm for 15 min. Finally we got ZnO Nps after evaporation technique (in Oven) at about 80 deg Celsius. The characterization of ZnO nanoparticles was done by UV

spectrometry and SEM technique. To prepare sunscreen Shea butter and coconut oil was heated together in a pan, on cooling, walnut extract oil and aloe vera gel was added, fine powder of ZnO NPs were added in the above mixture and placed in a cream bottle for 2 hours. Prepared sunscreen was tested on the skin of Rabbits .we needed five rabbits named as T₁,T₂,T₃,T₄ and T₅. Test substances like prepared sunscreen (0.5 g solid or 0.5 ml liquid), prepared ZnO NPs, ZnO NPs from lab, commercially prepared sunscreen, and dried extract of Calotropis gigantea leaves will be applied on T₁,T₂,T₃,T₄ and T₅ rabbits respectively on the small area (~6 cm²), and then the treated site will be covered with a patch. The patch will be removed after 4 hrs. Signs of any skin irritation like erythema and edema, and the responses will be recorded. Sunscreens containing metal oxide nanoparticles remains on the surface of the skin of healthy adult and considered safe for and provide excellent protection against sunburn caused by UV radiation In summary, the sunscreen contained ZnO nanoparticles prepared in this work possessed great potential as an effective sunscreen for UVA and UVB protection on human skin.

Colorimetric Sensing of Ascorbic Acid Using Epichlorohydrin Crosslinked Chitosan Stabilized Copper Oxide Nanoparticles

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This study **presents** the synthesis and characterization of **chitosan-copper oxide** (Chitosan-CuO) nanoparticles for ascorbic acid biosensing. The nanocomposite was prepared by doping chitosan with copper oxide and optimized for pH, polymer **concentration** and time to achieve **high-throughput detection**. Characterization **techniques** including X-ray diffractometry (XRD), energy dispersive X-ray (EDX), Fourier transform infrared (FTIR), and scanning electron microscopy (SEM), Thermogravimetric analysis (TGA) and elemental **analysis** confirmed the successful synthesis of the nanocomposite. Chitosan-CuO nanocomposite **showed** excellent **ascorbic acid** sensing **properties**, with high **sensitivity** and **selectivity and** linear response to ascorbic acid **concentration**. The biosensor showed a detection limit of [insert detection limit], making it suitable for clinical diagnosis and monitoring of ascorbic acid levels. The proposed biosensor **has** several advantages over existing methods, including simplicity, low cost, and rapid detection. The **chitosan-CuO** nanocomposite is biocompatible, **non-toxic** and environmentally friendly, making it an attractive material for biosensing applications.

Comparative conventional and microwave assisted synthesis of heterocyclic oxadiazole analogues having enzymatic inhibition potential

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A comparative microwave assisted and conventional synthetic strategies were applied to synthesize heterocyclic 1,3,4-oxadiazole analogues as active antienzymatic agents. Green synthesis of compound 1 was achieved by stirring 4-methoxybenzenesulfonyl chloride (a) and ethyl piperidine-4-carboxylate (b). Compound 1 was converted into respective hydrazide (2) by hydrazine and then into 1,3,4-oxadiazole (3) by CS₂ on reflux. The electrophiles, N-alkyl/ aralkyl/aryl-2-bromopropanamides (6a–p) were synthesized and converted to N-alkyl/aralkyl/aryl-2-propanamide derivatives (7a–p) by reaction with 3 under green chemistry. Microwave assisted method was found to be effective relative to conventional method. ¹³C-NMR, ¹H-NMR and IR techniques were availed to corroborate structures of synthesized compounds and then subjected to screening against lipoxygenase (LOX), α -glucosidase, acetylcholinesterase (AChE) and butyrylcholinesterase (BChE) enzymes. A number of compounds presented better potential against these enzymes. The most active compounds against LOX and α -glucosidase enzymes were subjected to molecular docking study to explore their interactions with the active sites of the enzymes.