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On Science & Technology
(ICST)-24 Mianwali

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BOOK OF ABSTRACTS

2nd International Conference on Science & Technology ICST-24 Mianwali

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ABSTRACTS



ICST-24-01 Green Synthesis Of Iron Oxide Nanoparticles Using *Portulaca Grandiflora* Leaf Extract And Their Characterization

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This work deals with the green synthesis of Iron oxide nanoparticles (NP) using *Portulaca grandiflora* leaf extract. The proposed research aims to address the growing demand for sustainable nanomaterial synthesis by investigating a green approach for producing Fe₂O₃ NPs from leaf extract of *Portulaca grandiflora*. The novelty of this work lies in utilizing this plant for the synthesis of Fe₂O₃ NPs as these nanoparticles have not yet been synthesized by extracting phytochemicals from this plant. This plant possesses phytochemicals that act as reducing and capping agents, converting iron precursor (FeCl₃.6H₂O) to Fe₂O₃ NPs. These phytochemicals also act as stabilizing agents and prevent nanoparticles from agglomeration. Furthermore, using this plant for nanoparticle synthesis offers a green method against the chemical process of synthesis, minimizing the use of hazardous reagents. Overall, this research offers an environment-friendly way for Fe₂O₃ NPs synthesis by providing a green way of synthesis to reduce environmental toxicity. These Fe₂O₃ NPs are characterized by using UV-visible spectroscopy, Fourier transform infrared spectroscopy (FT-IR), and Thermogravimetric analysis (TGA) for structural confirmations. The UV-visible absorption bands at 294.9 nm confirmed the production of Fe₂O₃ NPs. The peaks of FT-IR around 644.53 cm⁻¹ and 418.48 cm⁻¹ respectively suggested the Fe-O stretch and Fe-O vibration. By employing thermogravimetric analysis, the degradation of the phytochemicals attached to NPs was determined.

Key Words: Green synthesis, nanoparticles, Iron oxide, *Portulaca grandiflora*, characterization

ICST-24-02 Synthesis and Characterization of Novel Hetero Leptic Schiff Base Metal Complexes

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The current study focuses on the synthesis of potential novel hetero leptic Schiff base metal complexes using easily available precursor benzoic acid. The present work is carried out on Schiff base metal complexes due to their core importance in analytical, biological, and pharmacological areas especially in the chemotherapeutic aspect. The synthesis entailed a sequential process beginning with the esterification of benzoic acid to produce methyl benzoate, which reacted with hydrazine hydrate to form benzoyl hydrazide. Subsequently, this hydrazide was combined with salicylaldehyde, resulting in the formation of a Schiff base, which was further subjected to metal complexation, yielding important metal complexes for future use. This multi-step procedure has made it possible to economically convert these readily accessible reactants into the desired products. Conditions of temperature and pH were monitored throughout the experiment. Spectroscopic techniques (FT-IR and UV-VIS spectroscopy) and thermal analytical techniques (TGA) were employed to characterize the complexes. FT-IR peaks for Cu-N at 424 cm⁻¹ and 454 cm⁻¹, and peaks for Cu-O at 560 cm⁻¹ and 532 cm⁻¹ in spectra of [Cu(SBH)(Phen)(H₂O)₂] and [Cu(SBH)(8-HQ)(H₂O)₂] complexes confirmed their formation. Results of UV-VIS spectroscopy and TGA analysis also supported the synthesis of the complexes and suggested their octahedral geometry.

Keywords: Hetero leptic complexes, Schiff base, Schiff base complexes, Benzoic acid, multi-step procedure, esterification

ICST-24-03 Sustainable Cellulose Extraction from Agricultural Wastes for Eco-Friendly Paper Production

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This study demonstrates an innovative approach to extracting cellulose from agricultural wastes, specifically common grass, rice husk, and wheat husk, utilizing acid-base leaching. The methodology involved soaking raw materials in distilled water for 24 hours, followed by sequential treatments in HCl for 7 days and NaOH for 7 days. The extracted cellulose was then filtered through a metal wire sieve and dried, yielding a thick, skin-colored paper sheet.

The results showcase the feasibility of this eco-friendly method in recovering valuable cellulose from waste biomass, highlighting potential applications in sustainable paper production. The extracted cellulose exhibited excellent properties, including high purity and thickness, making it suitable for various paper-based products.

This research contributes significantly to waste reduction and resource recovery, aligning with global sustainability initiatives. The acid-base leaching process offers a cost-effective and environmentally benign alternative to traditional chemical pulping methods. The produced paper sheet's unique characteristics, such as its natural color and texture, enhance its market potential.

The findings of this study have implications for the development of sustainable materials and technologies, promoting a circular economy and minimizing environmental impacts. Future research directions include scaling up the extraction process and exploring diverse applications for the extracted cellulose.

Keywords: cellulose extraction, agricultural waste, acid-base leaching, sustainable paper production, eco-friendly materials.

ICST-24-04 Complete Statistical Analysis To Weather Forecasting

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This paper deals with problem of accurate prediction of weather forecasting of Austin, the capital of US state of Texas. Previous research included machine learning algorithms such as linear regression, functional regression, naive bayes, decision tree, multiclass support, vector machine, Autoregressive Integrated Moving Average model, data mining technique and normal equation method. But these approaches did not give the outstanding result of weather prediction. Here we utilize Gradient Boosting and Artificial Neural Network algorithms. In this process, 1305 sample features used in dataset. The average amount of temperature, pressure of sea level, humidity, dew point, visibility and wind-gust are used as features in dataset. With the aid of Gradient Boosting Machine we decrease the possibility of loss function. Artificial Neural Network is the foundation of Artificial Intelligence which gives future analysis by the processes of normalization and standardization we have compared both models on the basis of better result. As a result of research, we got efficient weather forecasting.

Keywords: Dataset, Gradient Boosting Classifier, Artificial Neural Network, Normalization, Standardization.

ICST-24-05 Prevalence and Molecular Identification of *Ascaridia galli* in backyard Poultry in district Kohat

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Ascaridia galli is one of the most important parasite that affect chickens in backyard poultry. *A.galli* is a gastrointestinal parasite belonging to the phylum Nematoda and cause infection in chickens called Ascariidiasis. Symptoms of ascariidiasis include hemorrhagic enteritis, anemia, weakness, ruffled feathers, diarrhea, and loss of appetite, decrease activity and dirty cloacal region. The current study was carried out to determine prevalence of *A. galli* in District Kohat and molecular detection of *A. galli* in the backyard chickens in Kohat District. The current study was conducted to investigate the prevalence of *A.galli* in backyard chickens from the May 2024 till the end of the October 2024 included examination of 150 local chickens in District Kohat. The total prevalence rate of *A.galli* was 43.33%. To detect *A.galli* by its morphology with the presence of three large lips and absences of posterior esophageal bulb. Results demonstrated that out of 150, 65 (43.33%) backyard chicken were positive for *A.galli* by targeting COX1 gene (533bp) by using conventional PCR. Further, the amplicon was sequenced which showed (99%) similarity with *A.galli* publically available in NCBI Gene Bank. Phylogenetic analysis of sequences of our isolated parasite indicated the closed relationship with *A.galli* isolated from backyard chickens. In summary backyard chickens may play key role in spreading and transmission of this parasite to domestic and wild birds. Therefore, strict biosecurity measures should be adopted especially for commercial poultry farms.

Key words: *A.galli*, backyard chicken, Ascariidiasis, morphology, molecular characterization

ICST-24-06 Extraction, Characterization, and Comparative Study of Wheat Husk-Derived Cellulose and its Nanocrystals for Adsorption of Methylene Blue

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Wastewater pollution from synthetic dyes presents significant environmental challenges, driving the need for sustainable treatment solutions. The present study investigates cellulose and cellulose nanocrystals (CNCs) derived from wheat husk as eco-friendly adsorbents for dye removal from wastewater. Cellulose was extracted using acid (HCl) and base (NaOH) treatments, followed by further acid treatment and bleaching to produce CNCs. Characterization via UV-Visible and FT-IR spectroscopy and TGA confirmed both materials structure and thermal stability. Batch adsorption experiments evaluated the effects of various parameters, including temperature, pH, time, adsorbent dose, and initial dye concentration. Results showed cellulose exhibited higher dye adsorption capacity than CNCs under optimal conditions. Adsorption followed a pseudo-second-order kinetic model, with cellulose achieving an R^2 of 1 and CNCs of 0.99. Freundlich isotherm models provided the best fit for both materials, with a higher correlation observed for CNCs. Thermodynamic analysis revealed that the adsorption process was endothermic and became spontaneous at elevated temperatures, with Gibbs energy and entropy changes more pronounced in cellulose. Additionally, cellulose demonstrated superior regeneration ability after recycling compared to CNCs. These findings suggest that cellulose, derived from agricultural waste, offers a cost-effective and scalable solution for wastewater treatment, with potential applications in addressing synthetic dye pollution through adsorption.

ICST-24-07 Phytochemical And Biological Evaluation Of Aerial Parts Of *Morus nigra* And *Ziziphus mauritiana*

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The present study comprises the phytochemical and biological evaluation of two medicinally important plants, *Morus nigra* and *Ziziphus mauritiana*. *Ziziphus mauritiana* is a vital plant due to its rich pharmacological properties, nutritional value, and ability to thrive in arid environments, making it essential for food security and traditional medicine in many regions. *Morus nigra* is significant for its diverse pharmacological properties, including antioxidant, anti-inflammatory, and antimicrobial effects, making it a valuable resource for traditional medicine and potential nutraceutical applications in preventing chronic diseases. These plants were collected from vicinity of Mianwali city and air dried. The crude extracts were taken in 80% methanol/water solution. The extract and fractions were tested for antioxidant activity and the result showed that the crude extract of *Morus nigra* leaves is most active while n-hexane extract of *Morus nigra* leaves is the least active among all the tested samples.

Key Words: Phytochemical evaluation, biological evaluation, *Morus nigra*, *Ziziphus mauritiana*, antioxidant activity, medicinal plants, crude extracts, fractionation, phytochemistry, natural products.

ICST-24-08 Contemporary Ethnobotanical Study Of Medicinal Plants Used For Treating Human Diseases In District Hangu, Khyber Pakhtunkhwa

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Background

Ethnobotany is the study of the interactions between humans and plants. It particular and broadly studies the observations, Identification and investigation of botanical diversity used in treating and preventing from the diseases that affect humans and livestock. Pakistan hosts a diverse range of 6,000 plant species. About 600–700 of these 6000 plant species have been used traditionally as medicines. District Hangu is bound by old customs and traditions, and its inhabitants are mainly farmers and agricultural laborers. Due to the lack of communication with modern civilization the people of district Hangu (especially women) have remained closely connected to nature, where they obtain many of their daily needs and medicinal plants are used to treat specific diseases. As the district Hangu has never previously been assessed ethnobotanically, the present study can be considered a first. The rationale behind the study is to document traditional knowledge of the study area and preservation of this previously undocumented information for future generation.

Keywords : Ethnobotany, Traditional knowledge, Indigenous communities, Use Value.

ICST-24-09 Investigating the Preservative Effects of Green Tea Extract to Mitigate the Toxic Effects imposed by Zinc Oxide Nanoparticles in Male Albino Rat

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Nanotechnology is the scientific discipline that deals with the development, discovery and evaluation of nano-scale structures. Nanoparticles are the particles having the diameter of about 1-100nm. Nanoparticles are regarded as valuable scientific tools extensively being utilized in biotechnology and pharmacology due to their extremely small size (nm) and enhanced surface area. Zinc oxide nanoparticles (ZnO-NPs) also find applications in cosmetics, coatings, pigments and electronic devices. ZnO- nanoparticles exhibit antibacterial properties. Their notable

antibacterial properties are attributed to a larger specific surface area, as smaller particle sizes enhance the surface activity. But, prolonged exposure of ZnO-NPs can contribute to tissue damage, cytotoxicity and chronic health conditions in humans. The oxidative stress caused by ZnO-NPs cause damage to lipids, proteins, and DNA. Animal studies have shown that exposure to ZnO-NPs during pregnancy can have adverse effects on fetal development and reproductive health in albino rats. Different plants parts and their extracts are used to mitigate the toxic effects of ZnO nanoparticles. Green tea is made from the dried leaves of the *Camellia sinensis* (tea plant) and is rich in polyphenolic compounds. Among all, catechins stand out as the components with the strongest antioxidant properties. Green tea extract have metal-chelating properties, which may reduce the bioavailability and toxicity of zinc ions released from ZnO-NPs. Green tea extract demonstrates anti-inflammatory effects by suppressing pro-inflammatory cytokines and mediators, and also promote tissue repair in albino rats exposed to ZnO nanoparticles. Keeping in mind all the aspects of literature, the following study was designed to study to investigate that how green tea extract can mitigate the toxic impacts imposed by prolonged exposure to zinc oxide nanoparticles.

Keywords: ZnO nanoparticles, severe health issues, remediation, *Camellia sinensis*: catechins, anti-inflammatory properties

ICST-24-10 Artificial Intelligence In Mathematics Education: The good, the bad, and the ugly aspects

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This conceptual article explores the good, bad and the ugly aspects of Artificial Intelligence in mathematics. We can use artificial intelligence (AI) to learn math, talks about the benefits and limitations of incorporating it, describing its unique possibilities for improving learning by means of customization and differential learning. Through an autoethnographic approach, the authors consider historical context and ethical implications of AI in educational environments. Overdependence on AI reduces the level of thinking and problem-solving skills of students and lack of real-time interaction between students and the system implores the inability to establish effective feedback. They argue for strategic AI use that provides better learning and does not violate pedagogical basics. AI would have been a mirage without mathematics. In the end, researchers argue that educators, policymakers and AI developers should come together to ensure AI effectively assists students in learning skills for a digital age. AI should be designed in such a way that its merits are maximized but key educational principles are not compromised in the process of preparing students for the demands of the modern world.

Keywords: Artificial Intelligence, Ethical, Autoethnographic, Pedagogical, Policymakers

ICST-24-11 Enhancing Post-Thaw Sperm Quality in Kajli Rams: The Power of Cinnamaldehyde-Enriched Semen Extender

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Cinnamaldehyde, a major component found in cinnamon bark extract, has demonstrated strong antioxidant properties, primarily by enhancing the activities of key antioxidant enzymes such as catalase, superoxide dismutase, and glutathione peroxidase in various cellular and animal models. These enzymes play a vital role in mitigating oxidative stress, which can otherwise compromise cell viability and function. In the context of reproductive biology, oxidative stress is a significant factor contributing to sperm damage during cryopreservation. This study sought to explore the protective role of cinnamaldehyde in preserving the quality of Kajli ram sperm during the critical stages of equilibration and freezing. Semen samples were collected from twelve healthy Kajli rams using an artificial vagina pre-warmed to 42°C. Each ejaculate was divided into five aliquots, with each sample extended in a tris-citric acid-based extender supplemented with varying concentrations of cinnamaldehyde (0%, 0.5%, 1.0%, 2.5%, and 5.0%). Post-thaw semen quality was evaluated by assessing parameters such as sperm motility, plasma membrane integrity, and sperm viability, which are crucial indicators of fertility potential. The results revealed that the extender containing 0.5% cinnamaldehyde provided significant protection ($P < 0.05$) to post-thaw sperm, particularly in terms of plasma membrane integrity and overall sperm viability, when compared to the control and other treatment groups. Higher concentrations (e.g., 5.0%) did not yield additional protective effects and may even have had a detrimental impact. In conclusion, the inclusion of 0.5% cinnamaldehyde in the semen extender effectively preserved the quality of cryopreserved Kajli ram sperm. These findings suggest cinnamaldehyde's potential as a valuable additive for improving semen preservation techniques in sheep. Further research is encouraged to determine whether these protective effects extend to long-term storage and to evaluate the efficacy of cinnamaldehyde in preserving semen quality across different species.

Keywords: Kajli ram, semen, cryopreservation, antioxidant, cinnamaldehyde

ICST-24-12 Advancements in Laser Physics and Nanotechnology for Next-Generation Photonic Applications: A Mini Review

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This review examines the recent advancements in laser physics and nanotechnology and their combined impact on the field of photonics. The integration of ultrafast laser technology, capable of producing femtosecond pulses, has transformed applications in spectroscopy and imaging, allowing for the detailed exploration of rapid molecular dynamics and electronic transitions. Additionally, supercontinuum generation facilitates broad-spectrum light production, significantly enhancing the sensitivity and specificity of spectroscopic techniques employed in biomedical diagnostics and environmental monitoring.

Nanotechnology further augments these advancements through the development of nanostructured materials that enable the fabrication of sophisticated nanophotonic devices. Utilizing phenomena such as surface plasmon resonance and photonic bandgap effects, these devices demonstrate enhanced light absorption, scattering, and emission properties. For example, plasmonic sensors are pioneering rapid and sensitive detection methods in medical diagnostics and environmental sensing.

In the domain of optical communication, the integration of laser technologies with nanomaterials is key to developing high-speed data transmission systems. By miniaturizing photonic components while maintaining efficiency, these innovations meet the increasing demands for bandwidth and speed in modern communication networks. The advancement of photonic integrated circuits and nanoscale light sources offers a pathway to creating compact and power-efficient devices that can significantly enhance data transmission capabilities.

Moreover, laser-enhanced nanotechnology holds substantial promise in medical imaging. Techniques such as optical coherence tomography (OCT) and multiphoton microscopy benefit from the precision offered by these advancements, providing non-invasive, high-resolution imaging of biological tissues and facilitating early disease detection and effective treatment monitoring.

Despite these advancements, challenges remain in scaling these technologies for widespread application. Key issues include the reproducibility of nanostructures, the stability of laser systems, and the integration of various components into functional devices. Continued interdisciplinary collaboration among physicists, engineers, and material scientists is essential to address these challenges and unlock the full potential of laser physics and nanotechnology in photonics.

Keywords: Laser Physics, Nanotechnology, Photonic Applications, Ultrafast Lasers, Supercontinuum Generation, Nanophotonic Devices, Optical Communication, Medical Imaging, Environmental Monitoring, Plasmonic Sensors.

ICST-24-13 Investigation Of Hunting And Public Perception About Cape Hare In District Bannu

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The Cape Hare (*Lepus capensis*) is a mammalian species belonging to Leporidae family of Lagomorpha order. It is found in the Northern areas of Pakistan including Khyber-Pakhtunkhwa (KP), Azad Jammu and Kashmir and foothills of Himalaya. This species is threatened by hunting pressure through both recreational sport hunting, as well as subsistence hunting for bushmeat and fur. This study was conducted to find out the distribution, hunting pressure and local communities' perception of Cape Hare in District Bannu.

Data was collected from three potential study sites of District Bannu (Gummati site, Baran Dam site and Jani Khel, Hindi Khel site). Five field visits were conducted to each study site to collect data about the distribution of Cape Hare. Live Trapping, Camera recording and Fecal pellets count methods were used to find out the distribution of the species. Meetings and gatherings were arranged with hunters to collect data about the hunting methods. Simple random sampling technique was used in the administration of questionnaires to envisage the views of local community about the Cape Hare.

The results indicated that the distribution of Cape Hare was very low in Gummati site as only 6 hares were live trapped while a total of 21 fecal pellets were collected from the site. Baran dam site showed moderate distribution as 9 hares were live trapped and 45 pellets were collected. 18 hares were live trapped from Jani Khel, Hindi Khel site and 60 pellets were collected during field visits. While shooting was found to be the most prominent method for hunting during meetings and interviews with various hunting groups, it was found that some experienced and professional hunters also used coursing by grey hounds and live trapping or net trapping. During Social survey, 50% of the local community was found to be well aware of Cape Hare. 30% of the respondents said that they are somewhat aware of the species. 20% of the public was not aware of the species at all. Only 15% of the respondents was found preferring Cape Hare meat over other meat sources while 45% of the respondents said they preferred other meat sources. 40% was found occasional consumers of Cape Hare meat. Hunting was found to be the major pressure exerted on the species as 60% of the respondents were found with the view that hunting has significantly decreased the population of species in the study area. 20% of the participants responded that hunting has moderate effects while 20% of the participants were found of the view that hunting has very minimum effects on the population of the species. This study concludes that hunting was the primary threat to the species population in the area. Local communities indicated that hunting has a moderate to significant impact on Cape Hare populations, highlighting the need for conservation efforts and the implementation of sustainable practices.

Keywords: Cape Hare; Bannu; Baran dam; Live Trapping, Hunting

ICST-24-14 Synthesis, Molecular Docking, and Cytotoxic Studies of Curcumin Derivatives

ICST-24 Mianwali

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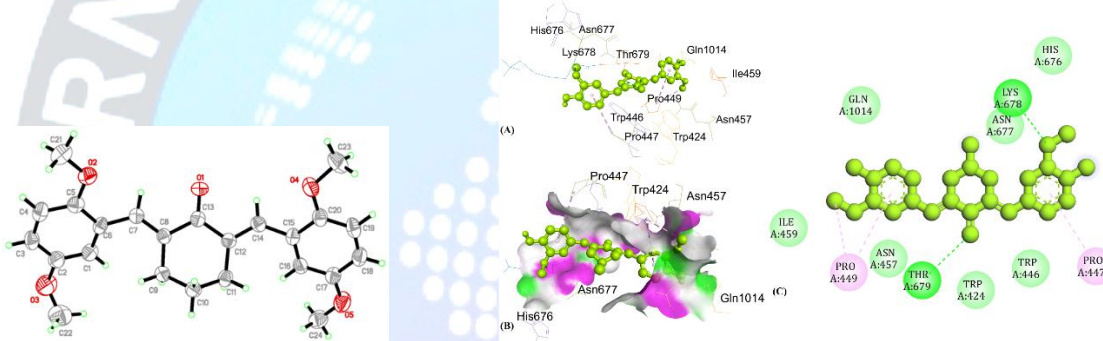
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Curcumin is a leading compound extracted from the dry powder of *Curcuma longa* (Zingiberaceae family), which possesses several pharmacological properties. However, *in vivo* administration exhibited limited applications in cancer therapies. Twenty-four curcumin derivatives were synthesized, comprising cyclohexanone **1-10**, acetone **11-17**, and cyclopentanone **18-24** series. All the curcuminoids were synthesized by acid or base-catalyzed Claisen Schmidt reactions in which the β -diketone moiety of curcumin was modified with mono-ketone. These curcuminoids **1-24** were screened against HeLa, K562, MCF-7 (an estrogen-dependent), and MDA-MB-231 (an estrogen-independent) cancer cell lines. Among them, acetone series **11-17** were found to be more selective and potential cytotoxic agents. Curcuminoids with feruloyl (4-hydroxy-3-methoxycinnamoyl) moiety with mono carbonyl group exhibited potential cytotoxic properties. Recently findings from the bioactive Malaysian Medicinal plants will be present in this conference.



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ICST-24-15 Assessment Of Heavy Metal In Water, Sediments In *Labeo rohita* At River Indus In Khushal Garh

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The contamination of river water with heavy metals poses significant ecological and health risks, when it exceeds the maximum permissible limit. This study evaluates the concentrations of heavy metals (Cu, Zn, Pb, Ni, Cd) in sediments, water, and *Labeo rohita* tissues and to determine the associated health risks for local populations.

Samples were collected from three sites—upstream, sewage, and downstream at River Indus in Khushal Garh analyze heavy metal concentrations in sediments, water, and fish tissues. The concentrations were assessed

using atomic absorption spectrophotometry, and the results were compared against maximum permissible limits set by international standards. The sewage site exhibited the highest concentrations of all analyzed metals in both sediments and water. Nickel concentrations were recorded high with values ranging from 47.54 mg/kg to 76.34 mg/kg in sediments and up to 4.56 µg/L in water. In *Labeo rohita* tissues, the liver showed the highest metal accumulation, while muscle tissue, the primary edible portion, had the lowest concentrations. Heavy metal concentrations in muscle tissue were found below the maximum permissible limits, suggesting minimal immediate health risks from consumption.

Although heavy metal concentrations in *Labeo rohita* muscle tissue were below international maximum permissible limits, extended high-level consumption could pose cumulative health risks, particularly for vulnerable populations. Continuous monitoring and regulations are recommended to mitigate long-term exposure effects and protect public health.

Keywords: *Labeo rohita*, heavy metals, fish, water, sediment, health risk

ICST-24-16 The Role Of Mathematics In Machine Learning

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This article outlines the need and critical use of mathematics in machine learning. Different mathematical concepts, including statistics, linear algebra, calculus, and probability, are carefully integrated to build good models for prediction, classification, and data analysis. It is further shown that statistics plays a fundamental role in estimating parameters and calculus is used for optimization of the model and making a model able to learn from the data. A good knowledge of linear algebra is necessary for handling large datasets while probability is important in making predictions about uncertain events. It illustrates interrelations between these mathematical disciplines and their applications within Machine Learning. The integration of mathematics into machine learning is a powerful enabler of progress. Ultimately, it emphasizes that a robust understanding of these principles is crucial for advancing machine learning technologies and ensuring their effective application across diverse industries. The interplay between mathematics and machine learning is not only fascinating but also essential for the advancement of technology. As data continues to grow exponentially, the need for sophisticated Machine Learning models that can analyze and interpret this data becomes increasingly critical.

Keywords: Probability, Integration, Exponentially, Datasets, Machine Learning

ICST-24-17 Enhancing Drought Resilience in Wheat: The Role of Magnesium Oxide Nanoparticles as a Biostimulant

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Wheat (*Triticum aestivum* L.) is a vital staple crop known for its adaptability to diverse agricultural conditions. However, recent climate changes have significantly impacted global wheat production, primarily due to increased drought stress. Drought adversely affects plant health, leading to inadequate water availability during critical growth stages and limiting yield potential. This study aimed to evaluate the efficacy of magnesium oxide nanoparticles (MgO NPs) as a biostimulant to enhance the morphological and physiological performance of wheat under progressive drought conditions. An experiment was conducted using a completely randomized design, incorporating seed priming with MgO NPs at a concentration of 30 ppm, with wheat seeds subjected to drought levels of 25%, 50%, and 75%. The findings revealed that drought stress significantly reduced growth parameters, biomass accumulation, and photosynthetic pigments. In contrast, drought conditions increased total soluble sugars and phenolic contents and antioxidants concentration in seedlings. Notably, the application of MgO NPs at 30 ppm effectively mitigated drought stress effects, leading to improved growth, photosynthetic efficiency, and chlorophyll content compared to untreated controls. In conclusion, MgO NPs demonstrate potential as beneficial biostimulants for enhancing drought resilience in wheat, supporting sustainable agricultural practices in a changing climate.

ICST-24-18 Synthesis and Characterization of Carbon Quantum Dots Coated Graphitic Carbon Nitride as a Nano Carrier for Targeted Drug Delivery in cancer Treatment.

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Cancer has been the second leading cause of death globally after cardiovascular diseases. The research emphasizes in the advancement of treatment technique by synthesizing a new synergistic nanomaterial in the field of nanotechnology by coating Carbon Quantum Dots on Graphitic Carbon Nitrides due to their excellent properties especially bio imaging and metal free respectively for biomedical Applications. The material is being further characterize by material based characterizations using various direct and indirect techniques like X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM), UV –Visible Spectroscopy, Particle Size Analysis, Energy Dispersion Spectroscopy (EDS). The material is further gone through application based characterization like anti-bacterial testing, cell-culture, anti-cancer cell Testing, zeta potential etc. The research will help in the advancement of cancer treatment by acting as a nanocarrier for targeted drug delivery and will be an advance material in future by further research and testing on advanced level. The results suggest promising prospects for targeted cancer therapy, indicating the nanocarrier potential as a flexible platform for advanced drug delivery techniques. This study represents a significant advancement in the field of cancer treatment, offering a promising avenue for the development of improved drug delivery systems with enhanced efficacy and specificity.

KEYWORDS: Carbon Quantum Dots, Graphitic Carbon Nitride, Nanotechnology, Targeted Drug Delivery, Cancer Treatment.

ICST-24-19 Synthesis of Functionalized MOFs for enhanced photocatalytic performance

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For the first time, a series of SO₃H-functionalized CuS/UiO-66 composites with different SO₃H-UiO-66 contents will be fabricated via a facile solvothermal method. The as-prepared composites will be characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM), transmission electron microscopy (TEM), UV–vis optical absorption spectroscopy and photoluminescence (PL) spectra. The CuS/SO₃H-UiO-66 composites should exhibit remarkable performance for the degradation of Rhodamine B (RhB) as compared to pure UiO-66 under visible-light irradiation. Moreover, the catalytic activity which would be related to the weight ratio of CuS to SO₃H-UiO-66 in the composites, as at certain value of weight ratio of CuS/SO₃H-UiO-66 composites should exhibit the highest photocatalytic activities. The improved photocatalytic activity can be contributed to the synergetic effect between CuS and SO₃H-UiO-66, which will facilitate the separation efficiency of photogenerated electron-hole pairs. The possible mechanism of the enhanced photocatalytic performance of the CuS/SO₃H-UiO-66 composites will also be discussed. This work will demonstrate that the CuS/SO₃H-UiO-66 composite is a promising photocatalyst for removing organic pollutants.

ICST-24-20 Enhanced Photocatalytic Performance of SiO₂-Based Nanocomposites with Quantum Dots Prepared via Stöber and P-SILAR Method

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This study presents a comprehensive approach for the synthesis of SiO₂ nanoparticles and SiO₂-based nanocomposites incorporating quantum dots (QDs) for enhanced photocatalytic performance. The Stöber method will be employed to synthesize SiO₂ nanoparticles, allowing for precise control over particle size and morphology. Subsequently, quantum dots will be deposited onto the SiO₂ nanoparticles using the Particle-by SILAR (P-SILAR) technique, facilitating improved stability, reduced agglomeration, and potential mitigation of toxicity concerns. The synthesized nanocomposites are characterized using various techniques including X-ray diffraction (XRD), scanning electron microscopy (SEM), transmission electron microscopy (TEM), UV-visible spectroscopy, and photoluminescence spectroscopy to elucidate their structural, morphological, and optical properties. The design of the nanocomposites aims to achieve efficient electron-hole separation, thereby enhancing photocatalytic activity. Expected results include superior photocatalytic performance, attributable to the effective utilization of photo-generated charge carriers for catalytic reactions. This research contributes to the development of advanced nanomaterials with applications in environmental remediation, energy conversion, and materials science.

ICST-24-21 Synthesis, Structural Elucidation, Antimicrobial And Antioxidant Activities Of Newly Synthesized Guanidines

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Guanidines are a class of organic compounds characterized by the presence of a guanidine functional group, which consists of a carbon atom doubly bonded to a nitrogen atom and singly bonded to two other nitrogen atoms (–C(NH)₂). This structure makes guanidines basic and versatile, often engaging in hydrogen bonding and other interactions due to the presence of multiple nitrogen atoms. Guanidines were synthesized by employing a standard guanylation method, starting with the reaction of benzoyl-phenyl substituted Thioureas with 4-methoxy aniline and 4-chloro aniline in equimolar ratios, dissolving in DMF with two equivalents of triethylamine. The temperature was maintained below 5°C using an ice bath. One equivalent of mercuric chloride was added to the reaction mixture with vigorous stirring. The ice bath was removed after 30 minutes and the reaction mixture was kept under continuous stirring for overnight. Reaction progress was monitored by TLC till completion. Chloroform (20mL) 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 (20mL), 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 chlorine 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 methoxy substituted guanidines through the guanylation method, with the aim of enhancing their biological properties. 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 agar tube dilution 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: Lipophylic guanidines, Antimicrobial activities, Guanylation method, Antioxidant activities.

ICST-24-22 Probability in real life: Understanding Risk and Uncertainty

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This study explains the applications of probability theory in understanding uncertainty and managing risk in real life. It is significant because it provides a clear framework for making informed decisions in different scenarios such as weather forecasting, the medical field, and everyday decisions. The challenge is that uncertainty often creates confusion in decision-making. Our approach involves a conceptual explanation of probability theory, focusing on real-life applications without delving into complex formulas or systematic processes. The result of the proposed work is that probability theory simplifies complex uncertainties, making them manageable. It shows that risk can be quantified, and decisions can be optimized using this understanding. This study shows how probability theory transforms complex uncertainties into actionable insights, enhancing decision-making processes. It enhances our understanding of decision-making, demonstrates its real-life applications, and increases the relevance of this work

Key words: Probability theory, Uncertainty, Risk management, Decision-making, Real-life applications

ICST-24-23 Synthesis, Characterization, Antimicrobial and DNA Interaction Studies of Hybrid Cross Linked Poly(cyclotriphosphazene-co-bis(methoxy)ferrocene) Microspheres

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Antibiotic resistance is a critical global health issue, driven by the overuse of antibiotics and the rise of multidrug-resistant (MDR) bacteria. Traditional antibiotics are losing effectiveness, emphasizing the urgent need for novel antimicrobial strategies to combat MDR pathogens.

To address this challenge, a facile approach was developed to fabricate hybrid cross-linked ferrocenylphosphazene microspheres by polycondensation between hexachlorocyclotriphosphazene (HCCP) and 1,1'-ferrocenedimethanol using the process of precipitation polymerization. The mean diameter of the microsphere was varied from 0.2-0.7 μm using a specific calculated molar ratio of both monomers. The morphology and structures of product was confirmed by various techniques such as FT-IR, ³¹P NMR, SEM, EDX, EDX-mapping and TEM. The interaction of these microspheres with DNA was investigated with the help of cyclic voltametric and viscometric measurements. The mode of interaction was proved to be electrostatic interactions. Binding parameters such as binding constant ($4.37 \times 10^3 \text{ M}^{-1}$) and free binding energy (-19.14 KJ/mol.) determined from cyclic voltammetric measurements, showed significant interactions. Viscosity measurement, an accurate test to determine binding within the solution, demonstrated that there was a change in length. These microspheres were also screened for anti-microbial activity and an inhibition agent against the enzyme, alkaline phosphatase EC 3.1.3.1 and were found as active inhibitors. This biomaterial can be employed in biomedical applications.

Keywords: Cross-linked ferrocenylphosphazene; Microsphere; DNA binding; Bactericidal; Fungicidal; Alkaline phosphatase EC 3.1.3.1

ICST-24-24 Optical modification of Activated Charcoal by divergent ZnS depositions for Photothermal Water Evaporation

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In this frontier, two nanocomposites (NC) have been synthesized, one using fresh precursors and the other using by-products. The first NC has been synthesized by depositing Zinc Sulfide (ZnS) on Activated Charcoal (AC) using the pseudo-successive Ion Layer Adsorption Method (pSILAR) method. Zinc ions (Zn^{2+}) and Sulphur ions (S^{2-}) are produced as by-products after the pseudo-successive ion layer adsorption reaction (p-SILAR) cycles. After mixing these byproducts, ZnS was again deposited on AC using the solution injection. These NCs were evaluated using different characterization techniques to study the morphology, photothermal, and electrochemical properties of the

photothermal evaporation of water. UV-visible spectroscopy showed the absorbance and reflectance performance of AC/ZnS via the p-SILAR and AC/ZnS via the solution injection are very similar to AC. Also, the photothermal spectroscopy revealed that the AC/ZnS (p-SILAR) showed the best performance for photothermal evaporation of water as it reached a temperature of 70 °C and evaporated almost 50 % of water in 2 h. At the same time, AC/ZnS (solution injection) reached a temperature of 68 °C in 2 h suggesting the NC made using decanted products also to be a potential material for photothermal evaporation of water.

Keywords: Wet-chemical; SILAR ;Solution Injection; Electrochemical; Photothermal

ICST-24-25 Green Synthesis of MnO Nanoparticles using *Eruca sativa* and *Spinacia oleracea* Leaf Extracts and Their Applications

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This research involves the green synthesis of Manganese oxide nanoparticles by using the leaf extracts of *Eruca sativa* and *Spinacia oleracea* as biocompatible reducing and stabilizing agents. These nanoparticles were examined using UV-visible spectroscopy, Fourier transform infrared spectroscopy (FT-IR), and Thermogravimetric analysis (TGA). The UV-vis spectroscopy confirmed the formation of MnO nanoparticles by the absorption peak at 274 nm. A change in color from light yellow to brownish black within 4 hours also confirmed them. FT-IR analysis indicated the presence of biomolecules and functional groups from the extracts on the MnO nanoparticles. The effectiveness of MnO nanoparticles synthesized from *E.sativa* and *S.oleracea*, along with the breakdown of attached phytochemicals, were determined through Thermogravimetric analysis (TGA). Manganese oxide nanoparticles showed effective antibacterial properties against the *Bacillus subtilis* (gram-positive) as well as *Klebsiella pneumoniae* (gram-negative) bacteria and the photocatalytic properties of MnO nanoparticles employed as a catalyst for photocatalytic degradation of Methylene blue dye under sunlight with the degradation percentage of 75 % within 120 minutes. The green synthesis approach serves the dual purpose of decreasing the environmental effects and improving the biocompatibility of the nanoparticles, making them suitable for applications in environmental remediation, biomedicine, and food preservation.

Key Words: Green synthesis, nanoparticles, Manganese oxide, antibacterial activity, photocatalytic degradation.

ICST-24-26 Role of Nutrition Education in Enhancing Women's Wellbeing

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The promotion of health includes education as a key component. To accomplish this, it is essential to determine the training requirements. Although knowledge is not a behavior in and of itself, it can influence how someone chooses to eat. There has been enough focus on the severity and effects of malnutrition among women in low income countries.

Lack of nutrition knowledge is a significant factor in women's malnutrition in developing period. Evidence showed that nutrition education during pregnancy has significant impact on the dietary habits of pregnant women. A very effective kind of approach used in nutrition care is nutrition schooling, which aims to better inform people on the nutrition they require, the nutritional issues they experience, how to address those issues, and how to choose the most effective approach. According to a report, nutritional knowledge may also have a substantial impact on how food aversions, craving and pica affects women's development. A theory suggests, women who are malnourished divert towards non-food items as an edible. The displacement impact of non-food substances may cause a reduction

in the consumption of nutrient-dense foods, resulting in insufficient dietary intakes of vital nutrients. Educating such women about nutrition knowledge should be necessary to lower the adverse effect on women's development and reduce morbidity of mother and child.

The aim of study was to evaluate the effect of an education intervention on the awareness of healthy nutrition in a group of women's development which can support behavior change and modify food choices to improve health and well-being with the aid of healthy plate model.

ICST-24-27 In Silico Exploration of Phakellistatin 1 & 11 for Enhanced Therapeutic Drug Discovery Against Lung Cancer Proteases with Hypoxia Inducible Factor 1-Alpha

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Hypoxia-inducible factor 1-alpha (HIF-1 α) allows the survival and proliferation of cancerous cells that respond to the body's low oxygen concentration causing the destruction of immune cells and promoting the tumor formation in the body. Marine Natural products can be utilized as phytochemical constituents for the prediction of drugs against many cancer diseases without having any consequences. Phakellistatins are marine natural products aimed as the best potential drug target against HIF-1 Alpha. This study employs a computational approach to evaluate a wide library of natural marine compounds for possible inhibitory potential against the proteases to get the binding affinities of phytochemical constituents against cancer cell proteases by using Auto Dock Tools 1.5.6. Phakellistatin 1 & 11 shows the binding energies of (i.e. -7.8 kcal mol⁻¹) & (i.e. -1.6 kcal mol⁻¹), respectively, against the HIF-1alpha (PDB: ID 1LQB). Phakellistatin 1 shows the best binding affinities and their stability would also be checked by Molecular dynamic simulations through cabs flex 2.0. This would provide the experimental validation and development for anticancer drugs using marine cyclopeptides.

ICST-24-28 Synergistic Effects of Cost-effective Nickel and Cobalt Sulfide-Based Electrocatalysts for Hydrogen and Oxygen Evolution Reaction

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Developing efficient and cost effective electrocatalyst for overall water-splitting is essential for sustainable hydrogen production. The Noble Metals Platinum Pt and Ruthenium oxide RuO₂ are the benchmark electrocatalyst properties for HER and OER, respectively. However, their prohibitive cost and restricted availability hinder their prevalent commercial use. In this study we investigated the bifunctional catalytic performance of Nickel Sulfide NiS₂ and Cobalt-Nickel Sulfide (CoNi₂S₄) for both hydrogen evolution reaction (HER) and oxygen evolution reaction (OER). The nano-flower like structure of NiS₂ shows effective HER performance due to its favorable hydrogen adsorption characteristics. The incorporation of cobalt into the nickel sulfide matrix to form (CoNi₂S₄) further improved the activity of charge transfer ability.

Electrochemical tests, including overpotential analysis, Tafel slope evaluation, and stability measurements through Chronoamperometry (CA), NiS₂ and (CoNi₂S₄) revealed the fast reaction kinetics and exhibited lower overpotential. The enhanced bifunctional activity of both NiS₂ and (CoNi₂S₄) make them a promising candidate for overall water-splitting and offering a cost-effective and earth abundant alternative to noble metal based catalyst. This work highlights the potential of transitional metal sulfides particularly NiS₂ and (CoNi₂S₄) in advancing the development of sustainable and scalable hydrogen production technologies.

Keywords: NiS₂, CoNi₂S₄, HER, OER

ICST-24-29 Green Synthesis Of Silver Nanoparticles Using The Combinations Of *Curcuma zedoaria* And *Withania coagulans* And Their Antibacterial Activity

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Nanotechnology is a field of science and engineering that focuses on materials with dimensions on the scale of 100 nanometers or smaller. As nanotechnology advances, nanoparticles exhibit unique characteristics compared to bulk materials. The present study described the synthesis of silver nanoparticles through eco-friendly green process using polyherbal recipes such as (*Curcuma zedoaria* and *Withania coagulans*) exatract and their antibacterial activity. The green synthesized silver nanoparticles were characterized by Fourier-transform infrared (FTIR) spectroscopy, X-ray Diffraction (XRD) and, Scanning Electron Microscopy (SEM). With the use of a UV-VIS spectrophotometer, the optical characteristics of silver nanoparticles revealed an absorbance peak at 430 nm. FTIR studies confirm the presence of bio molecules and metal oxides such as the silver nanoparticles. The green synthesized nanoparticle from polyherbal recipes exhibited strong antibacterial activity against the *Escherichia Coli*, *Vibrio Cholera*. The silver NPs which was obtained from combination have good zone of inhibiton against *vbrio cholera* 27nm, which could be used as a potential antibacterial agent against bacterial disease.

Keywords: *Curcuma zedoaria* , *Withania coagulans*.

ICST-24-30 Green Synthesis and Characterization of Copper Oxide Nanoparticles and their Efficacy in Photocatalytic Dye Degradation

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Industrial dyes are harmful to human health and aquatic life and are difficult to remove due to their stable and durable nature. To tackle this problem, we proposed a method that was sustainable and cost-effective as compared to the physio-chemical method. This study presents a simple, straightforward, and energy-efficient route for synthesizing copper oxide nanoparticles using *Dalbergia sissoo* leaves as a reducing agent and copper acetate as precursors. Flavonoids, flavonols, and other biomolecules present in leaf extract were responsible for the reduction and stabilization of copper oxide nanoparticles (CuO NPs). Copper oxide nanoparticles have garnered attention due to their ease of synthesis, high surface area to volume ratio, and low cost compared to silver and gold.

We aim to synthesize CuO nanoparticles by using a green synthesis approach. The absorption peak at 226 nm in the UV-visible spectrum supported the biosynthesis of the CuO NPs. The stretching band in FT-IR at 607 cm⁻¹ confirmed the presence of biogenic CuO NPs. TGA analysis also supported the synthesis of copper oxide nanoparticles. The resulting copper oxide nanoparticles were photoactive catalysts and degraded the industrial dye (methylene blue). The catalytic activity of biosynthesized CuO NPs was confirmed by observation of reduction of absorbance in UV-visible spectrophotometer. The effect of different parameters such as pH, catalyst dose, dye concentration, and duration of sunlight exposure was also studied. Degradation of MB followed the pseudo-first-order reaction. The result demonstrated that CuO NPs degraded about 93 % methylene blue and can be employed to remove industrial dye.

Keywords: green synthesis, photocatalysts, copper oxide nanoparticles, degradation, methylene blue

ICST-24-31 Fabrication Of Titanium Doped Graphitic Carbon Nitride For The Colorimetric Detection Of Uric Acid

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Uric acid and its role as a metabolic waste product, uric acid has been proposed to be an important molecule with multiple functions in human physiology and pathophysiology and may be linked to human diseases beyond nephrolithiasis and gout. The kidney is an important regulator of circulating uric acid levels, by reabsorbing around 90% of filtered urate. Defective renal handling of UA is a frequent pathophysiologic factor underpinning hyperuricemia and gout. In the current study, Titania doped Graphitic Carbon Nitride based biosensor was developed to identify uric acid in blood serum samples from arthritis patients. Different characterization techniques, were used such as FTIR, SEM, TGA, EDX, XRD and BET, were used to characterize the prepared nanocomposite. In the presence of TMB H_2O_2 can catalyze the endogenous per oxidase-like behavior of the Titania doped Graphitic Carbon Nitride nanocomposite. Based on this phenomenon, Titania doped Graphitic Carbon Nitride based colorimetric sensor was prepared for the detection of uric acid. To achieve the best possible results, various optimized parameter were optimized such as the amount doping, H_2O_2 , pH, TMB, and uric acid. With a linear range from 1-81 μM , a low detection limit of 0.19 μM , a low quantification limit of 0.65 μM , and an R^2 of 0.9996, the suggested sensor as sensitive and selective for uric acid detection. Optimum time for the proposed sensor is 90 sec at room temperature. The proposed sensor has been successfully applied to arthritis patients blood serum samples for uric acid detection with a visible colorimetric change.

Key words:, Titania doped Graphitic Carbon Nitride, TMB, uric acid, colorimetric sensor.

ICST-24-32 Improving The Electrochemical And Photochemical Performance Of Laser-Induced Graphene (LIG) By Deposition Of TiO_2

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In this research, we have designed flexible electrodes using Laser-Induced Graphene (LIG) based nanocomposites (NCs) by deposition of metal oxide such as Titanium dioxide (TiO_2) under varying conditions on LIG using different processes. These electrodes have been investigated to study various properties for photoelectrochemical applications. Various characterization techniques have also been used to study significant differences in the properties of Polyimide (PI), LIG, TiO_2 powder, and LIG/ TiO_2 NC-based electrodes. A comparative analysis based on morphological changes has been made through different characterization techniques like Field Emission Scanning Electron Microscopy (FESEM) coupled with energy-dispersive Spectroscopy (EDX), X-ray Diffraction Spectroscopy (XRD), and X-ray Photoelectron Spectroscopy (XPS). Diffuse Reflectance Spectroscopy (DRS) was performed to study optical properties and confirmed LIG/ TiO_2 NC-2 as the best material among all the conductive samples. Also, the electrochemical analysis was performed using an Electrochemical workstation and it suggested that the LIG/ TiO_2 NC-2 is the best photocatalyst as it showed the highest capacitance in EIS, a perfect cyclic curve with no current decay during redox reactions in CV, and the best HER catalyst in LSV. Hence, the LIG/ TiO_2 NC-2 is a potential photoelectrochemical electrode for various applications.

KEYWORDS: Laser-Induced Graphene (LIG), Photoelectrochemical Electrodes

ICST-24-33 Development and Characterization of Metal Oxide based coatings for Camouflage Applications

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Rapid advancements in surveillance techniques require better anti-detection coatings in different spectral ranges. Camouflaging from hyperspectral cameras in Visual and Near-Infrared regions require spectral matching between the environment and camouflaging coatings in the said spectral regions. Chromium oxide (Cr₂O₃) is widely used for visual camouflage in green terrain owing to its green color as well as high physical and thermal stability. For Near-Infrared spectral matching, Zinc Oxide (ZnO) is a promising pigment due to its higher near-infrared reflectance as per requirement and its vast optical and morphological diversity. In this research work, we have synthesized various compositions based on Cr₂O₃ and ZnO for optimum spectral matching in green areas and thus enhanced camouflaging performance. Diffuse Reflectance Spectroscopy (DRS) was employed to study and compare spectral behavior of coatings and a standard green leaf sample in Visual and Near-Infrared region. Furthermore, SEM, XRD, EDS and FTIR were used to study morphology, crystallinity and composition respectively.

KEYWORDS: Camouflage; Cr₂O₃; ZnO; Visual; Near-Infrared; DRS; SEM; XRD

ICST-24-34 Green Synthesis Of Zno Nanoparticles From Leaves Extract Of *Portulaca grandiflora* And Their Anti-Bacterial And Photocatalytic Activity

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A nanoparticle (NP) ranges in size from 1 to 100 nm. Owing to their small size and large surface area, they are being analyzed for their captivating antimicrobial and catalytic properties. The proposed research aims to address the growing demand for sustainable nanomaterial synthesis by investigating a green approach for producing ZnO NPs from leaves extract of *Portulaca grandiflora*. The plant possesses phytochemicals that act as reducing agents and capping agents and prevent NPs from agglomeration. Additionally, utilization of this plant for nanoparticle synthesis offers a green method against chemical method of synthesis, minimizing the use of hazardous reagents. The synthesized NPs were characterized by UV-Visible spectrophotometer, FT-IR spectrophotometer, and TGA/DSC. The UV-Visible peak at 364 nm confirmed synthesis of ZnO NPs while the phytochemicals that were attached to NPs during synthesis were confirmed by FT-IR. The TGA curve also indicated the formation of ZnO NPs as the final product. The synthesized NPs exhibited significant zone of inhibition against *Acetobacter actri* and *Bacillus subtilis*. Furthermore, these NPs also demonstrated 72 % degradation of methylene blue on exposure to sunlight by adding 0.1 g of ZnO NPs to 30 mL of 10 ppm solution of methylene blue. Overall, this research offers an environment friendly way for ZnO NPs synthesis and also analyzes their anti-bacterial and photocatalytic activity.

Keywords: Nanoparticles, green synthesis, photocatalytic activity, *Portulaca grandiflora*, anti-bacterial activity

ICST-24-35 Synthesis And Characterization Of Cu(II) And Ni(II) Complexes Derived From Bromhexine Hcl

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The present study deals with the synthesis and characterization of Ni(II), and Cu(II) metal complexes with Bromhexine HCl (BRH), according to IUPAC it is 2-amino-3,5-dibromo-N-cyclohexyl-N-

methylbenzenemethanamine hydrochloride, which is a mucolytic agent used in the treatment of respiratory disorders associated with excessive mucus or viscid. The drug is official in IP and BP. The drug has been quantified by exploiting its chemical and physical properties because of its physiological importance. Metal complexes were synthesized by reacting Bromhexine HCl (BRH) with Copper(II) sulfate pentahydrate ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$) and Nickel(II) sulfate (NiSO_4). The 1:1 molar ratio of the reaction mixture was stirred for 1.5 h at 65 °C in 30 mL of ethanol. The structure metal complexes were evaluated by using UV-Visible spectroscopy and Fourier-transform infrared spectroscopy. The UV-Visible analysis provided insight into the electronic transitions within the complexes, indicating the formation of metal-ligand bonds. Electronic transitions $\pi \rightarrow \pi^*$ and $n \rightarrow \pi^*$ were observed in UV-Visible spectroscopy. These spectroscopic features are evidence of the successful coordination of Ni(II) and Cu(II) ions with the Bromhexine HCl ligand (BRH). FT-IR spectroscopy was employed to identify changes in vibrational frequencies of key functional groups in these complexes. Significant shifts were observed in the N-H stretching frequencies, confirming the involvement of nitrogen atoms in coordination with metal ions. This work contributes to the field of coordination chemistry by exploring the synthesis of Ni(II) and Cu(II) metal complexes using a pharmaceutical ligand. The successful synthesis and characterization of these metal complexes open areas for further exploration and understanding of their applications.

Keywords: Ni(II) complex, Cu(II) complex, bromhexine HCl, FT-IR Spectroscopy, UV-Vis Spectroscopy

ICST-24-36 Plant Mediated Synthesis Of CuO Nanoparticles Using Leaves Extract Of *Portulaca grandiflora* And Its Anti-Bacterial And Photocatalytic Activity

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This work effectively proved the use of *Portulaca grandiflora* extract in the green synthesis of copper oxide nanoparticles (CuO NPs), which is an economical, environmentally benign, and sustainable method. Copper nanoparticles are becoming more and more notable due to their antibacterial, optical, electrical, and reactive characteristics. CuO nanoparticles have been integrated using plant concentrates in a variety of exploration projects. The green combination strategy of CuO is thought to be a fair alternative to the chemical synthesis, which uses several hazardous synthetic compounds as covering. Novelty of this works lies in utilizing leaf extract of *Portulaca grandiflora* and synthesizing CuO nanoparticles. The phytochemicals present in this plant also acts as stabilizing agent. Overall, this research offers an environment friendly way for CuO NPs synthesis by providing a green way of synthesis to reduce environmental toxicity. The portrayal strategies utilized in this study incorporate UV-visible spectroscopy, Fourier change infrared spectroscopy (FTIR) and Thermo Gravimetric Analysis (TGA). The UV-visible absorption bands at 345 nm verified the production of CuO-NPs. The Peaks of FTIR around 518.4 cm^{-1} and 600.1 cm^{-1} respectively suggested the emergence of CuO nanostructure and Cu-O stretching. Antibacterial and photocatalytic activities of these nanoparticles are checked to confirm that NPs work effectively. CuO NPs demonstrated the strongest antibacterial action against *Acetobacter actri* and *Salmonella tryphi* bacteria.

Key Words: Green synthesis, nanoparticles, antibacterial activity, photocatalytic application, Copper oxide

ICST-24-37 Detection of Steroids and Heavy Metals in Antiasthmatic and anti-inflammatory diseases orally administered local herbal medicine

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Here in the present work we take four herbal medicine from local market of Kohat. The herbal medicines which are used for experimental work are Sundar, Tandani, Asthemia and Bazori. We make samples from all medicine for detection of steroids and heavy metal. For this purpose we used different concentration of sample. We used Concentrated and dilute sample. The proposed process by Reepmeryat et al GCMS will be used to detect the steroids in herbal medicines. The proposed process by Hina et al atomic absorption will be used to analyze to detect the heavy metals in herbal medicines. In this paper we demonstrate for the first time the detection of steroids and heavy metal in orally administered local herbal medicines related to the diseases like asthma and inflammation.

Keywords: Reepmeryat et al GCMS, Hina et al atomic absorption, Detection of steroids, Detection of heavy metals, Asthma, Inflammation

ICST-24-38 Green Synthesis Of Iron Oxide Nanoparticles Using *Terminalia arjuna* For Enhanced Dye Degradation And Antibacterial Potential

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The green synthesis of iron oxide nanoparticles (IONPs) is gaining attention as an environmentally friendly and cost-effective method, offering applications in both environmental and biomedical fields. *Terminalia arjuna* seed extract was employed as a natural reducing and capping agent to synthesize IONPs. The bioactive compounds in the extract played a key role in stabilizing the nanoparticles and controlling their size and morphology. Characterization techniques such as UV-vis spectroscopy XRD, EDX, SEM, and FTIR confirmed the crystalline structure, size distribution, and functional groups. The photocatalytic degradation of azo dye is observed with the help of UV-vis spectroscopy. Furthermore, they exhibited strong antibacterial activity against various bacterial strains, highlighting their applicability in antimicrobial treatments. The dual functionalities of dye degradation and antibacterial properties make these green-synthesized nanoparticles promising for environmental remediation and biomedical applications.

Keywords: dye degradation, antibacterial activity, IONPs, EDX, SEM, XRD

ICST-24-39 The Impact of Cyberbullying on Self-esteem and Mental –Wellbeing

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This study aimed to examine the relationship between cyber-bullying, self-esteem and mental well-being among university students. The sample consists of 200 university students, with an equal split of 50% men and 50% women, aged between 18-25 years. Random sampling technique was used to select the participants for this research. Data analysis was conducted using SPSS software. The research utilized Warwick-Edinburgh Mental Well-being Scale (Tennant, et al in 2007) with a reliability of (0.89), the Rosenberg Self Esteem Scale (Morris Rosenberg) with a reliability of (0.72) and the Cyber Victimization Scale with (Walter, et al in 2017) with a reliability of (0.93). H1: states a significant relationship between cyber-bullying and mental well-being, while H2: suggest there is negative relationship between cyberbullying and mental well-being. H3: states that there will be negative relationship between Cyber-bullying and self-esteem. The quantitative analysis revealed a negative significant link between cyber-bullying and mental well-being, supporting the research hypothesis. However, non - significant association was found between cyber-bullying and self-esteem. The study's results emphasize the importance of addressing cyber-bullying concerns among university students and recommend further research.

Keywords: Cyber bullying, Mental well being, Self –Esteem

ICST-24-40 Forces That Bind: A New Perspective on Physics through Attraction and Repulsion

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Background

Understanding the relationships between force, energy, and matter is essential for advancing our knowledge of physics and driving technological innovation. This research aims to clarify these connections, highlighting the principles that govern how physical interactions occur.

Research Objective

The main goal of this study is to develop new mathematical equations that reveal the relationship between forces of attraction and repulsion and their role in matter-energy interactions in physics.

Methodology

This research adopts an interdisciplinary approach that combines:

Theoretical Analysis: Utilizing established theories as a basis for exploration.

Mathematical Proof: Employing mathematical techniques to demonstrate how these forces relate to various physical phenomena.

Key Findings

The study presents equations that connect the concepts of physics with the forces of attraction and repulsion.

These equations are supported by mathematical proofs that validate their universality across different contexts.

The findings reconcile theoretical ideas with established principles in physics, offering new insights.

Implications & Contributions

The implications of this research are significant for multiple fields, including:

Quantum Computing: Providing a deeper understanding of force interactions that can enhance computational models.

Materials Science: Informing the development of new materials by examining the dynamics of forces at the atomic level.

Cosmology: Offering fresh perspectives on dark matter and cosmic forces, enriching our understanding of the universe.

This work unifies the dynamics of forces in various physical contexts, addresses long-standing questions, and enables better predictive modeling, making a valuable contribution to the field of physics.

Conclusion

In summary, this research concludes that "Every concept in physics is fundamentally linked to the forces of attraction and repulsion." By clarifying these connections, we improve our understanding of the physical universe and open the door for further exploration and discovery.

ICST-24-41 Hematological And Biochemical Feature Associated With Children With Intestinal Helminths In District Kohat

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Background: Intestinal helminth infections remain a significant public health issue, particularly in developing regions. Biochemical markers such as serum proteins, liver enzymes, and electrolyte balance were also examined,

and blood samples were drawn to assess a variety of hematological parameters like hemoglobin levels, white blood cell counts, and eosinophilia. High prevalence rates of helminth parasites are associated with inadequate personal hygiene, contaminated food or water consumption, inadequate environmental sanitation, and cohabitation with infected individuals. This study investigates the hematological and biochemical profiles of children diagnosed with intestinal helminthiasis in District Kohat, Pakistan.

Methodology: Blood samples will be taken from 50 intestinal helminths-infected children, as well as 15 from the control group will be taken from children who have negative for intestinal parasitic infection. The age group of children up to 12 years.

Results: Frequency counts, percentages, averages, standard deviations, and correlations analyzed the data. The total leucocyte of $11.7 \times 10^9/L$ falls within the normal reference range ($5-13 \times 10^9/L$), and the RBC count is $4.7 \times 10^{12}/L$, which is within the normal range ($4.0 - 5.80 \times 10^{12}/L$). The study aimed to assay some immunological markers and nutritional deficiency in children infected with single or multiple helminths resident in District Kohat.

Conclusion: Intestinal helminth infections significantly affect the hematological and biochemical health of children in District Kohat, leading to anemia, increased eosinophil counts, and biochemical imbalances. These findings highlight the need for effective deworming programs and improved hygiene practices to protect children's health in the region.

Keywords: Intestinal Helminths, Hematological Parameters, Biochemical Markers, Children's Health

ICST-24-42 Analyzing the Salvaging Products of TiO_2/PbS Solar Paint Production Process via Pseudo-SILAR Method

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The idea of solar paints have been recently introduced which deals with the advantage of covering no extra space but the paintable roofs or walls or windows of the buildings, making it possible to coat the surfaces which need to be converted to solar cells directly. For such application, TiO_2/PbS nanocomposite (NC) is the most extensively researched material so far, owing to the facile development (i.e. by successive ionic layer adsorption and reaction of PbS quantum-dots (QDs) on TiO_2 nanoparticles NPs)). However, by the synthesis of TiO_2/PbS nanocomposite involves substantial wastage of residual ionic precursors of Pb , S and Zn (from ZnS passivation layer) which is toxic at one end, while costly on the other. Parallel to many other investigations focusing on the salvaging of ionic products from these wet-chemical precursors, we have explored the development of ZnS , PbS and ZnS/PbS based by-product from SILAR and utilized them all as photocatalysts owing to their tendency to harvest ultraviolet and/or visible light. We employed scanning electron microscopy (SEM) and EDS for basic material characterization and did XRD, UV-Vis spectroscopy for connecting the revealed characteristics with photocatalytic dye degradation performance of ZnS , PbS and ZnS/PbS based salvaged products.

KEYWORDS: Salvage of p-SILAR, ZnS/PbS nanocomposites, photocatalysis

ICST-24-43 Fabrication And Characterization Of $Co(III)$ And $Zn(II)$ Complexes Derived From Bromhexine Hcl

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This study deals with the fabrication and characterization of Zn(II) and Co(III) metal complexes using bromhexine HCl, a well-known mucolytic agent. The complexes were synthesized using a reflux method, a well-established technique that facilitated the coordination of Co(III) and Zn(II) ions using bromhexine HCl. The synthesis involved heating the metal salts and bromhexine HCl under controlled conditions (such as time and temperature) in a suitable solvent to form stable metal-ligand complexes. The choice Zn(II) and Co(III) was motivated by their distinct coordination chemistry and their potential for diverse applications like antimicrobial agents, anticancer therapies, catalysts, and other fields. The resulting compounds were purified and subjected to extensive characterization to confirm their structure and properties. The metal complexes were characterized using Ultraviolet-Visible (UV-Vis) and Fourier Transform Infrared (FT-IR) spectroscopy. The UV-Vis analysis provided insight into the electronic transitions within the complexes, indicating the formation of metal-ligand bonds. The electronic transitions ($\pi \rightarrow \pi^*$ and $n \rightarrow \pi^*$) were observed. These spectroscopic features are evidence of the successful coordination of Co(III) and Zn(II) ions with the bromhexine HCl ligand. FT-IR spectroscopy was employed to identify changes in vibrational frequencies of key functional groups in these complexes. Significant shifts were observed in the N-H stretching frequencies, confirming the involvement of nitrogen atoms in coordination with metal ions. This work contributes to the field of coordination chemistry by exploring the synthesis of Zn(II) and Co(III) metal complexes using a pharmaceutical ligand. The successful synthesis and characterization of these metal complexes open areas for further exploration and understanding of their applications.

Keywords: Co(III) complex, Zn(II) complex, bromhexine HCl, FT-IR spectroscopy, UV-Vis spectroscopy

ICST-24-44 Enhanced Photocatalytic Hydrogen Production Using CdS/LIG Nanocomposites

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The growing demand for clean energy solutions has motivated research into photocatalytic water splitting for hydrogen generation. In this study, Cadmium Sulfide (CdS) nanoparticles were synthesized using Chemical Vapor Deposition (CVD) and then deposited onto Laser-Induced Graphene (LIG) through the aerosol method to create a CdS/LIG nanocomposite. The resulting composite demonstrated significantly enhanced photocatalytic activity compared to CdS alone, making it a promising candidate for sustainable hydrogen production. Scanning Electron Microscopy (SEM) and Energy Dispersive Spectroscopy (EDS) confirmed the morphology and elemental composition of the materials, while X-ray Diffraction (XRD) revealed their crystalline structure. Fourier Transform Infrared Spectroscopy (FTIR) identified molecular bonding characteristics, and Electrochemical Impedance Spectroscopy (EIS) highlighted the improved charge transfer properties in the CdS/LIG nanocomposite. The reduced charge transfer resistance and enhanced electron mobility contributed to the superior photocatalytic efficiency of the composite in solar-driven water splitting. The integration of CdS with LIG provides a scalable and cost-effective approach to hydrogen production, addressing the critical need for clean fuel alternatives.

KEYWORDS: Cadmium Sulfide (CdS), Laser-Induced Graphene (LIG), CdS/LIG, Photocatalysis, Water Splitting, Hydrogen Production, Renewable Energy

ICST-24-45 Biogenic Synthesis And Characterization Of Silver Nanoparticles For Colorimetric Detection Of Antibiotics And Biological Activities

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In this study, novel biogenic silver (AgNPs) were developed using a green approach with *Dryopteris juxtaposita* aqueous extract. The prepared materials were characterized and their applicability for colorimetric detection of antibiotics, antibacterial and anti-oxidant activities were comprehensively evaluated. The biosynthesis was confirmed by UV-visible spectroscopy and the size and shape of AgNPs were determined by Scanning Electron

Microscope (SEM). The crystallinity was determined by High-Resolution X-ray Diffraction (XRD) and the chemical and elemental compositions were determined by Fourier Transformed Infrared Spectroscopy (FTIR) and Energy Dispersive X-ray Spectroscopy (EDX) respectively. The notable efficacy of the AgNPs in antibacterial activity including minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) suggested the AgNPs are noteworthy materials for the biomedical applications. AgNPs exhibited greater ability towards calorimetric detection of antibiotics in water. The antioxidant property by free radical scavenging (DPPH) assay of synthesized AgNPs was very promising for their bio applications. Conclusively, the synthesized AgNPs were found to have good bioactivities with capability to apply for detection of antibiotics in water.

Keywords: *Dryopteris juxtaoposita*, silver nanoparticles, antibacterial activity, calorimetric detection of antibiotics, antioxidant potentials

ICST-24-46 Stable Curcumin Nanoemulsion For Local Treatment Of Cutaneous Leishmaniasis

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Cutaneous leishmaniasis (CL), a neglected tropical parasitic skin infection is endemic in various parts of Pakistan, characterized by deep skin parasitic infestation resulting in necrotic lesions. Curcumin has recently been reported to exert an excellent antiprotozoal effect on promastigotes *in vitro*. This study aimed to develop a stable curcumin-based nanoemulsion as a possible strategy for local treatment of CL. Propylene glycol (PG), tween 80 (T-80), polyethylene glycol 400 (PEG-400), and liquid paraffin (LP) were selected as an oil phase and surfactants, while distilled water as an aqueous phase. Trials were initiated by formulating blank nanoemulsions via high-speed homogenization by varying concentrations of all excipients to get a stable nanoemulsion, and results showed that nanoemulsions having 5% PG, 25% T-80, 7% PEG-400, 8% LP, and 54.9% water remained stable for 2 months and devoid of any defect. The curcumin was then loaded into the above formulation by varying the curcumin contents between 0.5 mg/ml, and 3 mg/ml, and tested for size, PDI, and zeta potential, where all drug-loaded formulations had droplet size in the range of 93.605 to 142.6 nm, PDI in the range of 0.3235 to 0.2655, and zeta potential in the range of -16.4 to -3.31, and remained stable for 1 month. The drug contents of all formulations were in the range of 87% to 95% showing minimal drug loss during preparation, with encapsulation efficiency up to 92% showing maximal drug entrapped within the emulsion droplets. High drug loading with minimal loss is envisaged to reduce the applied dose and produce a maximal local therapeutic effect.

Keywords: Curcumin, cutaneous leishmaniasis, stable nanoemulsion, optimization, skin delivery.

ICST-24-47 Investigate The Impact Of Climate Change On Wheat (*Triticum Aestivum* L.) Productivity Across The Kohat Division Using Dssat Model

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Climate change poses significant risks to the future sustainability of food production, particularly in semi-arid regions where water resources are scarce and irrigated agriculture dominates. Therefore, it is essential to quantify the potential effects of climate change on agriculture to support food security. This study evaluates the climate change impacts on wheat production in the Kohat Division using the DSSAT crop model and downscaled data from 21 global climate models (GCMs) under two greenhouse gas emissions scenarios (SSP2-4.5 and SSP5-8.5). Results from the GCMs show an increase in annual mean temperatures and a decline in total annual precipitation. Climate changes have led to earlier wheat phenology, and the simulations suggest a maximum reduction in wheat yields of

16.02%. Varying temperatures had different impacts on crop yields and water use efficiency (WUE), with clear threshold effects observed. Higher temperatures reduced wheat yields and negatively affected WUE. Water consumption for wheat crops is projected to rise under future climate conditions, largely due to reduced precipitation during the growing season. This will increase wheat's irrigation demands by 12.65 mm. In light of these findings, climate change is expected to exacerbate water scarcity in the Kohat Division, making it crucial to maintain agricultural productivity. Reducing the cultivation of water-demanding crops may be a viable strategy to balance water usage and crop yields in the region.

Keywords: Climate change; Wheat production; Water use efficiency (WUE); Irrigation demands; Kohat Division

ICST-24-48 Antileishmanial Potential Of Secondary Metabolites From *Juniperus Excelsa* M. Bieb

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It is well accepted that medicinal plants have important properties that may be considered for new drug discoveries. *Juniperus excelsa* M.Bieb (JE), is one of the most well-known species with numerous medicinal properties, due to the presence of various classes of metabolites. This plant is used traditionally for various diseases including skin problems. The study was designed to isolate natural antileishmanial agents against *L. tropica* by using *In-vitro* and *In-silico* approaches. The plant was collected, identified, dried and macerated to obtain the crude extract followed by fractionation process in increasing order of polarity to get the resultant fractions. The extracts were initially screened against *L. tropica* through MTT assay and methanolic fraction was found to be the most bioactive fraction with IC₅₀ value of 11.97 µg/mL. Bioguided isolation was carried out from crude fraction and with the aid thin layer and a column chromatography, **RI6** compound was purified with solvent system i.e., 4.5% ethyl acetate-*n*-hexane. Compound purity was checked through UV and by using locating agents like ceric sulphate. Compound structure will be identified by various spectroscopic methods including ¹HNMR and ¹³CNMR and by comparison with previously published literature. To confirm pure compound antileishmanial potential in vitro MTT assay and molecular docking studies against Leishmanolysin (GP63) is ongoing. The study will set a pathway for drug discovery of natural anti-leishmanial from *Juniperus excelsa* M.Bieb

Key words: *Juniperus excelsa* M.Bieb, Crude extract, Secondary metabolites, Antileishmanial activity potential.

ICST-24-49 Modified Green Synthesis Of Zinc Oxide /Iron Oxide Nanocomposite As Efficient Photocatalyst Under Uv-Visible Irradiation

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Nanomaterial synthesis using eco-friendly methods has attracted significant interest due to its potential for reducing negative environmental impacts and costs. Many researchers have opted for the green synthesis routes for developing such materials by having control over the nature of the reactants and attention due to their environmental friendliness, cost effectiveness, and sustainability. In this study, ZnO is synthesized by wet chemical whereas Fe₂O₃ is synthesized by green synthesis method and ZnO/Fe₂O₃ NC was synthesized by novel method of green synthesis. Cinnamon extract is used as a reducing agent non-toxic and eco-friendly alternative to traditional chemical synthesis methods. Scanning electron microscopy with energy-dispersive spectroscopy (SEM-EDS) was performed to observe the morphology and elemental composition of the nanoparticles, X-ray diffraction (XRD) was performed to identify the phases, while Fourier Transform Infrared Spectroscopy (FTIR) was utilized to identify the functional groups, UV-Visible spectroscopy was performed to assess the optical properties and band gap energies of the NMs which show that ZnO serves as UV active materials and Fe₂O₃ will be visible light absorbing material and there ZnO/Fe₂O₃ NC efficient in UV visible as 3.2 eV, 1.9 eV and 2.4 eV are observed band gap respectively. Combined

solar range application testing, Electrochemical Impedance Spectroscopy (EIS) was performed, showing that ZnO/Fe₂O₃ NC have better performance compared to ZnO and Fe₂O₃ individually. This effective combination of ZnO with Fe₂O₃ NP indicates the potential of the resulting NC for productive use in photocatalytic activities.

ICST-24-50 Synthesis Of Silver Nanoparticles Using *Allium Sativum* L. (Garlic G1) Extract And Evaluation Of Their Antimicrobial Efficacy Against Multidrug-Resistant Pathogenic Bacteria

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In response to the urgent need for novel antimicrobial agents to combat multidrug-resistant (MDR) bacteria, this study focuses on the synthesis of silver nanoparticles (AgNPs) using *Allium sativum* L. (Garlic G1) extract and evaluates their antimicrobial efficacy. Unlike conventional chemical and physical methods that produce toxic byproducts, the green synthesis method using garlic extract is eco-friendly and biocompatible. The synthesis of AgNPs was confirmed by a color change to dark brown and characterized using UV-visible spectroscopy, X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM), and energy-dispersive X-ray (EDX) analysis. SEM revealed irregularly shaped nanoparticles with an average size of approximately 100 nm. The antimicrobial efficacy of AgNPs was evaluated through disc diffusion assays against MDR strains of *Escherichia coli*, *Klebsiella pneumoniae*, and *Staphylococcus aureus*. The AgNPs, both alone and in combination with antibiotics, significantly enhanced antimicrobial activity. The zone of inhibition for AgNP-coated antibiotics was observed to be 22 mm for *Klebsiella pneumoniae* and 20 mm for *Staphylococcus aureus*, compared to non-coated antibiotics. Additionally, the minimum inhibitory concentration (MIC) values for the AgNPs ranged between 12.5–25 µg/ml, demonstrating potent antimicrobial action. These findings suggest that garlic-mediated AgNPs present a promising alternative for treating MDR bacterial infections, particularly in resource-limited settings. The use of plant-based synthesis methods for AgNP production offers a sustainable and cost-effective approach, reducing environmental impact while effectively addressing the growing threat of antimicrobial resistance. Statistical analysis confirmed the significance of the results, with a p-value of <0.05.

Keywords: MDR, Antibiotic, AgNPs, XRD, FTIR, SEM, EDX, UV-Visible, MIC

ICST-24-51 Evaluation of Antileishmanial potential of *Euphorbia serpens* Kunth

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Leishmania is a vector-borne, obligate intracellular protozoan parasite belongs to the Trypanosomatidae family that causes cutaneous, mucocutaneous, and visceral disease. Cutaneous leishmaniasis (CL) is a problematic skin infection that results in skin lesions, deformity, and inflammation. *Leishmania tropica* is a species from the Leishmania subgenus that causes several types of leishmaniasis. Euphorbia plants have been utilized to treat problems with the skin. *Euphorbia Serpens* Kunth showed a wide range of pharmacological actions including: antimicrobial, antioxidant, insecticidal, and cytotoxic activities; however the anti-leishmanial potential of *Euphorbia serpens* kunth is not well documented against *Leishmania tropica*. The study was aimed to characterize crude extract through GC-MS and evaluate its antileishmanial properties both in vitro and in silico. The plant was shade-dried, grinded into powder, and macerated in methanol for two weeks. The methanolic extract was concentrated using a rotary evaporator at 40°C. The crude extract was subjected to GC-MS analysis and confirmed the presence of 15

compounds. The five compounds namely **M1, M2, M3, M4, M5** which have obeyed the Lipinski rule of 5 are selected for molecular docking using Pyrex software. Additionally the selected fraction will be subjected to MTT antipromistogote assay for furthered validation. The investigative attempt might result in the discovery of natural anti-antileishmanial substances from *Euphorbia serpens* kunth.

Key Words: *Euphorbia serpens* kunth. Crude Extarct, GC-MS Analysis, Molecular docking and MTT assay

ICST-24-52 Effect Of Light Emiting Diode (Led) On Growth And Antioxidant Activity Of Sunflower Sprouts

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Plant growth is influenced by light. The employment of artificial light sources in a controlled setting, rather than natural light, has piqued the interest of the scientific research field. Due to its low energy usage compared to other anthropogenic sources, Light Emitting Diodes (LEDs) emitting light of various wavelengths have shown considerable uses. Furthermore, the function of LEDs as a promoter of germination and seedling development is well-known. The goal of this study was to see how a affected sunflower in a control setting with White, Red, and Blue LEDs. Under the three different LEDs was used as an experimental therapy. Controls included distilled water and under LED white, blue and red fluorescent light. The root length increases in Red LED light, while the shoot length increases in Blue LED light. Under the Red LED light, the data also show an increase in chlorophyll concentration fiber analysis, total soluble protein and total soluble sugar. As a result of this study, it can be stated that LEDs light has greatly aided overall development of sunflower LEDs irradiation of seedlings enhances plant biomass, nutrient levels, antioxidant activity and secondary metabolites. Red and blue LEDs play a crucial role in these effects. However, more detailed scientific studies are necessary to understand the effect of different spectra (using LEDs) on plants physiology. Technical innovations are required to design and realize an energy efficient light source with a spectrum tailored for optimal plant growth in specific plant species.

Key words: LED, sunflower, germination, seedling development.

ICST-24-53 Development Of Perovskites Metal/Oxide Nanocomposite For Antibacterial Application

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In this proposed research work, sonication method was used to make CsPbBr₃ nanoparticles (NPs) and then electrostatic self-assembly covered them with TiO₂ to create nanocomposite (NC). The structural and morphological properties of the perovskite nanoparticles (PNPs) were examined using Field Emission Scanning Electron Microscopy (FESEM). Fourier Transform Infrared Spectroscopy (FTIR) was used to verify the NC's composition and structure. This investigation focuses on biological testing, notably cell viability and antibacterial activity studies. The CsPbBr₃ NC was less hazardous than the TiO₂/CsPbBr₃ NPs in seven day cell viability assay. Experiments showed that *Xanthomonas campestris* exposed tomato plants accumulated proline, which changed their responses to treatments. However, TiO₂/CsPbBr₃ treated plants showed considerably lower proline levels (1.91 mg/g FW) than CsPbBr₃ treated plants (1.51 mg/g FW). However, untreated sick plants exhibited the highest proline accumulation (2.53 mg/g FW), indicating that they were more susceptible to stress. The lowest proline level in

healthy plants was 1.83 milligrams per gram of floral weight. These findings further support the conclusion that the $\text{TiO}_2/\text{CsPbBr}_3$ nanocomposite has balanced antibacterial activity in plant systems with low toxicity and stress induction.

KEYWORDS: CsPbBr_3 , Perovskite, $\text{TiO}_2/\text{CsPbBr}_3$, antibacterial applications

ICST-24-54 Synthesis of chicken egg shells extracted CaO and rice husk extracted SiO_2 powder (CaO: SiO_2) for wastewater treatment

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Chicken egg shells and rice husks are the main ingredients for composite formation employed for wastewater treatment. Photocatalysis is considered one of the best methods due to the easy recovery of photocatalysts and relatively less time consumption on operation. So, this project aims to extract CaO from egg shells and SiO_2 rice husk to CaO decorated SiO_2 composite to treat methylene blue in the water. This research evaluates a composite CaO- SiO_2 material for its ability to treat wastewater. The composite material was developed to improve its ability to adsorb and catalyze the breakdown of pollutants from water. A series of batch experiments were carried out to test the effectiveness of the material against heavy metals and organic contaminants for varying contact time, pH, and pollutant initial concentrations. The results showed that it is possible to increase the removal efficiencies when compared to treating each component individually, it indicates that the CaO- SiO_2 composite is beneficial. The results suggest that this composite material is a feasible candidate material for possible sustainable wastewater treatment strategies forming alternative and economical means of pollution remedial measures.

Key words: Photocatalysis, composite nanoparticles, wastewater treatment, CaO: SiO_2

ICST-24-55 Isolation and Characterization of Pathogenic Fungi Associated with Freshwater Zig-Zag Eel Fish of Pakistan

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Fish contribute to biodiversity and are important markers of the health of aquatic habitats, making them essential parts of the ecosystem. *Mastacembelus armatus*, (zig-zag eel) is an interesting species of freshwater and is identified by its long, snake-like body and striking zig-zag patterns. In aquatic environments, fungal infections are reported continuously with high prevalence.

Objective: The aim of this study was focused on the isolation, identification, and characterization of fungal isolate that infect zig-zag eel fish, because early detection and intervention can help to control the spread of the infection and improve the chances of recovery for effected individuals and perhaps may help to improve the aquaculture strategies.

Material and Methods: Using tape touch method the isolated fungal cultures were examined microscopically under 10x and 40x lens and were identified using keys and literature. Using methanol and ethyl acetate as organic solvents, the metabolites were extracted by a solvent extraction process and checked their activities against different bacteria.

For molecular identification, DNA was extracted using PCI method. The extracted DNA was then subjected to PCR using 18s rRNA primers. The PCR amplified product was then sent for sequencing.

Results: Pour culturing of fungal isolates from infected zig-zag eel fish showed four (4) different pathogenic fungal species. The isolated fungi were identified as three types of genera like *Aspergillus sp.*, and *Neurospora Crassa* isolated from head, operculum, scales and tail, of the fish, while *Penicillium sp.* was isolated from eyes and brain of fish.

Conclusion: This study effectively isolated and identified four pathogenic fungal species associated with infections in the zig-zag eel fish (*Mastacembelus armatus*) in Pakistan, including *Aspergillus sp.*, *Neurospora crassa*, and *Penicillium sp.* The identification of these fungi across different body parts of the fish underscores the significance of fungal pathogens in freshwater environments. These findings emphasize the need for early detection and targeted intervention to manage fungal infections, which can improve fish health and support sustainable aquaculture practices.

Key Words: Zig-Zag Eel, *Mastacembelus armatus*, *Aspergillus sp.*, *Neurospora crassa*, and *Penicillium sp.*

ICST-24-56 Synthesis Of Some New Saccharide Based Schiff Bases

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Schiff Bases comprise a wide array of compounds distinguished by the existence of a double bond connecting carbon and nitrogen atoms. Traditionally, Schiff bases were synthesized by the reaction between primary aliphatic or aromatic amines and carbonyl compounds, resulting in nucleophilic addition to form a hemiaminal, which subsequently undergoes dehydration to produce an imine. Keeping in mind the utility of these Schiff bases, a new strategy was designed to prepare some new eco-friendly and cost effective Schiff bases using carbohydrates as reactants. The reaction proceeds by the synthesis of osazones from sugars using hydrazine hydrate. These prepared osazones are then subsequently reacted with different aldehydes under reflux to prepare the desirable Schiff bases.

ICST-24-57 Developing Electrochemically Proficient Composite of Laser-Induced Graphene and NiCo₂O₄ for Flexible Electrode Applications

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The research is based on synthesizing laser-induced graphene (LIG) utilizing a polymeric substrate known as polyimide (PI). This synthesis is achieved through laser scribing, employing a 405nm blue-violet laser source. The primary goal of this research endeavors the flexible nature of the LIG. A fusion is established between LIG and another redox-active substance, namely Nickel Cobalt Oxide (NCO) to generate a flexible electrode. The NCO particles required for this amalgamation are produced through microwave synthesis and are deposited on LIG using Electro-Phoretic Deposition (EPD). Structural and compositional analyses using SEM and EDS confirmed the formation of LIG, while NCO particle formation was verified through SEM, EDS, and XRD, revealing a cubic spinel structure with an average crystallite size of 38.7 nm. Electrochemical characterization including cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS) demonstrated the conductive and capacitive

nature of both LIG and its composite with enhanced electrochemical performance. The outcomes of these characterizations underscore the suitability of the electrode to be used in flexible electronics and electrochemical applications.

Keywords: LIG; NiCo₂O₄; Flexible electrode; Pseudo-capacitors; Supercapacitors; Graphene

ICST-24-58 Comparative Electrochemical Performance of NiCo₂O₄ and NiCo₂O₄/ZnO Nanocomposites for Photocatalytic Water Splitting

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This study explores the synthesis, characterization, and electrochemical performance comparison of NiCo₂O₄ and NiCo₂O₄/ZnO nanocomposites for photocatalytic water splitting, a promising method for sustainable hydrogen production. Both nanocomposites were synthesized via Wet Chemical and Sonochemical methods and characterized using SEM, EDX, UV-Visible Spectroscopy, XRD, and FTIR, revealing uniform nanoparticle distribution and desired elemental composition. Electrochemical tests, including EIS, CV, and LSV, were conducted to assess catalytic efficiency. NiCo₂O₄ exhibited a higher specific capacitance (589.47 F/g) compared to NiCo₂O₄/ZnO (286.15 F/g) and showed a lower overpotential, indicating superior performance in Hydrogen Evolution Reaction (HER) and Oxygen Evolution Reaction (OER). This comparison underscores NiCo₂O₄'s and its nanocomposites' potential for efficient photocatalytic hydrogen production.

ICST-24-59 Vultures' Extinction: A Review

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Vultures, also known as avian scavengers, are classified into two families: *Accipitridae* (Old World vultures) and *Cathartidae* (New World vultures). Both belong to the same order *Accipitriformes*. They cleanse the ecosystem by providing crucial and balancing environmental services. The documented estimates of last 30 years show disastrous decline in vultures' population mainly in Asia. About 73% population has become critically threatened while 77% of the population is declining rapidly. Although the population decline in Asia has been observed timely and actions are taken while noticing the causes, present population numbers, effects and conservational strategies. According to an IUCN survey conducted in 2016-2017, an estimate of about 500-600 vultures were found in Islamkot and Nagarparkar areas of Tharparkar. The main causes of vulture disappearance are use of diclofenac and poisoned baits followed by illegal killing, hunting, execution and electrocutions. Kidney damage caused by diclofenac use leads vultures to their death. Vultures also work as a barrier for zoonoses between animals and humans by eradicating the diseases through their highly efficient digestive system which other avian scavengers failed. Their decline has caused a burst of infectious diseases in human populations as well as dead animals' bodies are also remained exposed in the environment which leads to other number of problems. There is a need for immediate conservation of vultures, ban on the use of diclofenac, restriction on killing and many more beneficial actions in order to maintain the ecosystem.

Key Words: scavenger, disastrous decline, diclofenac use, barrier for zoonoses, conservation

ICST-24-60 Synthesis Of Cobalt Oxide And Cobalt Sulphidenanoparticles For Harvesting Solar Thermal Energy

ICST-24 Mianwali

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Nanotechnology has become an emerging field to harness solar energy. Nanoparticles are of particular interest due to the diversity of structural motifs and morphologies and applications. Solar energy is the most abundant source of renewable energy which can be an everlasting solution to energy crisis. The aim of this study was to synthesize Cobalt oxide and Cobalt sulphide nanoparticles for harvesting solar thermal energy. To synthesize Cobalt oxide (Co₂O₃) nanoparticles, CoCl₂ · 6H₂O (4 g) was dissolved in distilled water. Then, 6 mL ammonia solution was added drop by drop into the salt solutions. The mixture was stirred for 3-hours, filtered and cleaned with water. Then to remove chloride impurities, the precipitates were dried in an oven at 100 °C. The dried precipitates were calcined in the furnace at 450 °C for five hours. Similarly, for the preparation of cobalt sulfide nanoparticles, equimolar quantities of cobalt(II) salt solution and sodium sulfide solution in distilled water was sonicated for 2 hrs. Formation of black precipitate confirmed the formation of nanoscale cobalt sulfide. Further, nanoparticles were characterized by UV-Visible spectroscopy. Moreover, the cobalt oxide and cobalt sulphide nanofluids exhibited excellent solar thermal activity and gave successful results.

Key words: Cobalt Oxide Nanoparticles, Cobalt Sulphide Nanoparticles, Solar Thermal Activity

ICST-24-61 The Climate Change: Unraveling the Causes, Impacts and Mitigation Strategies

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Climate change poses an unprecedented threat to environment and humanity which requires immediate attention and collective actions for ecosystem management to mitigate changes in climate. Havocs caused by climate change can be visualized in all around the world. Climate change refers to long term shift in patterns of climate, mainly due to emission of greenhouse gases (GHGs) by both natural causes and anthropogenic activities. Anthropogenic activities are the main facilitator of climate change as these activities triggers the emission of greenhouse gases such as CO₂, nitrous oxide and methane. Anthropogenic activities causing climate change include burning of fossil fuels, deforestation, land clearing for irresponsible agricultural practices, misapplication of fertilizers and farming livestock particularly cattle farming is significant contributor to emission of GHGs. Climate change is marked by altered rainfall pattern, warmer temperature, droughts, ecosystem disruption and environmental degradation. Climate change affects human health both directly and indirectly through degraded air quality, weather crises, population migration, food insecurity and thermal stress. Climate change disturbs the biodiversity by affecting behavior, migration and reproduction of wild animals. It also increases the effectiveness of various pathogens. So, climate change mitigation is crucial for safeguarding our ecosystem and biodiversity conservation. Several mitigation tools are used such as ecosystem restoration and conservation, afforestation or reforestation and CCS (Carbon Capture and Storage) technologies. Bioenergy with Carbon Capture and Storage (BECCS) is the best solution for decarbonizing sectors. BECCS technology is aiming to reduce CO₂ level to net zero emission in future. BECCS involves the process of capturing and permanently storing CO₂ during the conversion of biomass into energy or fuel. Currently, only about 2 Mt (million tons) of CO₂ are captured annually from biogenic sources mainly in bioethanol applications. Further research is necessary for refining and immediate deployment of these mitigation measures to address knowledge gaps in climate change science and to ensure sustainable future.

Keywords: Climate change, GHGs, Environmental degradation, BECCS, Sustainable Future

ICST-24-62 Food Packaging Wonder: Bionanocomposite Material. Pioneer innovation, Concept and Prospects”

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Packaging materials play an important role in our lives since they are used on a regular basis in grocery shops, supermarkets, restaurants, medicines, and other businesses. Packaging is essential for preserving items throughout handling, transportation, and storage. Similarly, it helps to preserve and extend product shelf life. This review discusses the need for sustainable packaging. Bionanocomposite offer premium, eco-friendly, eco conscious, light weight characteristics that can stand non-biodegradable plastic packaging. Biopolymers include polysaccharides including nanosized inorganic compounds, polymer nanocomposites, Cellulose nanocrystals (CNC). Nanomaterials can increase thermal, mechanical, and gas barrier qualities while remaining sustainable and innocuous. Most efficient and impactful nanomaterial are Silver nanomaterial, Zinc oxide based nanomaterial and Gold nanomaterial as well. Improved barrier qualities of packing films can prevent penetration of oxygen, carbon dioxide, and taste chemicals. Nanomaterial can provide dynamic and insightful attributes to food packaging materials, including microbial inhibition and indicating exposure to harmful features such as inadequate temperature and scarcity of oxygen level. Bionanocomposite can be used in various packaging applications due to their degradability, thermal stability, and antibacterial properties. Achieving compatibility between polymer and nanomaterial remains an overriding hindrance in developing efficacious bionanocomposite and ensuring uniform distribution of nanoparticles. In this review, we are interested in the advancement of packaging material's performance.

Key Words: Bionanocomposite, nanomaterial, eco-friendly packaging, antibacterial properties, biopolymers.

ICST-24-63 Behavior Of Elephant

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Little attention has been paid to the resting and sleeping behavior of zoo elephants so far. An important concern is when elephants avoid lying down, due to degenerative joint and foot disease, social structure, or stressful environmental changes. Inability or unwillingness to lie down for resting is an important welfare issues, as it may impair sleep. We emphasize the importance of satisfying rest in elephants by reviewing the literature on resting behavior in elephants (*Loxodonta africana* and *Elephas maximus*) as well as the documentation of four cases from European zoos and our own direct observations in a zoo group of four female African elephants during 12 entire days. The common denominator in the case reports is the occurrence of a falling bout out of a standing position subsequently to a cessation of lying rest for different periods of time. Although well-known in horses as episodic collapse , "or "excessive drowsiness, " this syndrome has not been described in elephants before. To enable its detection, we recommend nocturnal video monitoring for elephant-keeping institutions. The literature evaluation as well as own observational data suggest an inverse relationship between lying rest and standing rest. Preventative measures consist of enclosure modifications that facilitate lying rest (eg., sand hills) or standing rest in a leaning position as a substitute. Anecdotal observations suggest that the provision of appropriate horizontal environmental structures may encourage safe, sleep- conducive standing rest .we provide drawings on how to install such structures. Effect of providing such structures should be evaluated in the future.

ICST-24-64 Association Of HK2 And LDHA Over Expression With Aggressive Breast Cancer Subtypes And Metastasis

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HK2 and LDHA are important glycolytic enzymes that play crucial roles in tumor initiation and progression. In present study, role of HK2 and LDHA in breast cancer patients of Pakistan has been explored and associated with clinico-pathological parameters. Freshly excised tumors along with their background healthy tissues (n=100) were collected and processed for RNA isolation and cDNA synthesis, followed by qPCR analysis. Significant over expression of HK2 (2.78 folds) and LDHA (3.5 folds) was observed in tumors versus controls and significantly associated with metastasis (p<0.05). Differential expression HK2 and LDHA was observed among intrinsic breast cancer subtypes with significant up regulation in TNBC and HER2 enriched subtypes (p<0.05). Henceforth, expression profiling revealed potential roles of HK2 and LDHA in tumor progression as well as metastasis, and may be considered to be used as biomarker(s) and/ or therapeutic target(s) in breast cancer.

Key Words: HK2, LDHA, expression, breast cancer, metastasis, subtypes

ICST-24-65 Assessment of Antibiotic Prescribing Pattern at Outpatient Pharmacy Using World Health Organization (WHO) Prescribing Indicators

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Substantive and nonrational use of antibiotics has been the leading cause of antimicrobial resistance emerging these days, in addition to the increase not only in treatment cost but also make patients prone to adverse effects. This study assessed the antibiotic prescribing pattern according to WHO prescribing indicators at the outpatient pharmacy at the Rehman Medical Institute (RMI) of Peshawar, KP, Pakistan. Prescription data for the past 6 months was retrieved retrospectively, from the scanned copies of prescriptions at the pharmacy department. Data was correlated with the WHO-recommended prescribing indicators for the rational use of drugs, and data was then subjected to statistical analysis. Results showed that among a total of 300 patients, 579 different drugs were prescribed by the practitioners, with an average of 1.7/prescription. Among all prescribed drugs, antibiotics amounted to 70% of the total prescribed drugs, whereas 7% were parenteral. Moreover, co-amoxiclav was found to be the most prescribed antibiotic amounting to 80% of total prescriptions, followed by azithromycin (72%), amoxicillin (31%), ciprofloxacin (14%), and metronidazole (10.2%). A total of 92% of drugs were found to be prescribed from the essential drug list, but not generic. The ratio of prescribed antibiotics was found to be not at par with WHO recommendations for antibiotics as per suggested indicators, implying that antibiotics were irrationally being prescribed and used. Additionally, injectables, branded polypharmacy, and antibiotics prescribed from the national essential drug list were found to be the least contributing factors for deviation from WHO-recommended indicators. The study concluded that antibiotic use must be rationalized as per WHO standards in the healthcare systems.

Keywords: Antibiotics, antimicrobial resistance, prescribing indicators, prescribing patterns

ICST-24-66 Foliar Spray Of Plasmodiophora Brassica Infected With Modified TMV Having P-29 And P-48 For Club Root Disease Management.

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Club root disease is caused by Plasmodiophora brassica and severely impacts Brassica crops (broccoli, cauliflower, cabbage etc.) worldwide. Plasmodiophora brassica belong to phylum plasmodiophorida which is group of protists. This study explores the efficacy of foliar spraying P. Brassica infected with modified TMV having P-29 and P-48 suspension as a biocontrol strategy for Club root and future to make brassica crops resistive against different fungus diseases Sclerotinia sclerotium that cause (stem root) and Mycosphaerella brassicicola (Ring spot). P-29 encode a protein involved virus replication and transcription. P-48 encodes protein that interest with fungal protein modulating virulence and growth. These viral protein can induce resistance mechanisms within the host plant. Foliar spray will apply at 10^8 CFU/ml concentration, twice weekly for four weeks. Field trials will demonstrate significant reductions in disease severity (up to 90%) and P. brassicae biomass (up to 80%). TMV-induced gene silencing targeted P. brassicae genes, activating plant defense responses. This environmentally friendly approach offers a sustainable solution for club root management.

Keywords: Plasmodiophora brassica, club root disease, Tobacco Mosaic Virus (TMV), biocontrol, foliar spray, gene silencing.

ICST-24-67 Development of a Novel Drug against Scabies Disease

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Scabies is a parasitic skin disease caused by *Sarcoptes scabiei* which is affecting over 200 million people. The purpose of our study is to design a drug using medicinal plants. Close personal contact associated with crowding in communities and scabies patients facilitates the transfer of mites from infected to uninfected individuals. Scabies results in itchy bumps on male genitalia, female breast, fingers, wrists, legs and arms. The clinical signs are small papules or pustules and small raised or flattened burrows which confirm the presence of mite in epidermis. Oral Ivermectin and permethrin are used for scabies treatment. Current treatment faces limitation due to resistance and lack of ovicidal activity. We will investigate the inhibitory potential of plant phytochemicals against parasitic receptor proteins. We will employ the computational approach to identify phytochemicals from the extract that would serve as drug candidate against these parasites. We will proceed by molecular docking and then identify a lead compound. This drug will provide protection against scabies with less or no side effects. It will reduce disease morbidity and improve quality of life for infected individuals and communities. Further studies will focus on clinical trials, scalability and accessibility to ensure global availability.

Keywords: Scabies, *Sarcoptes scabiei*, molecular docking, phytochemicals, drug, medicinal plants

ICST-24-68 Isolation And Characterization Of Tyrosinase Producing Halophilic Bacteria For The Removal Of Phenol Contaminants From Wastewater

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The toxicity and durability of phenol pollutants, which are frequently found in industrial effluent, make them serious environmental threats. Using microbial enzymes to biodegrade phenolic chemicals provides an efficient and environmentally beneficial approach. The present study aim to isolate and characterize tyrosinase-producing halophilic bacteria that can break down phenol in saline wastewater. A total of 20 bacterial isolates were checked for the production of tyrosinase enzyme. High tyrosinase activity isolates (SI2 and S24) were selected for molecular, biochemical, and morphological characterization, including as 16S rRNA sequencing. The selected bacterial isolates ability to degrade phenol was evaluated under different environmental condition like pH, and temperature. The results showed that even under extreme conditions, the isolated halophilic bacteria could efficiently break down phenol, which makes them attractive options for saline wastewater bioremediation. The study demonstrates the possibility of employing halophilic bacteria that produce tyrosinase as an effective and sustainable method of removing phenol pollutants from industrial effluents.

Keywords: Phenol pollutants, halophilic bacteria, bioremediation, 16s rRNA sequencing

ICST-24-69 Use of Microalgae for Biofuel Production (Biodiesel, Bioethanol, Biohydrogen) As a Safe alternative to Mitigate the Challenges Occurring due to Conventional Fuel Consumption”

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Our demands of fuels for transportation, running machineries and industrialization is increasing day per day. The fuels (like petrol, diesel, gas) which we use conventionally has many associated problems for instance greenhouse gas production which leads towards global warming. Global warming is the most challenging issue of the world. To mitigate these challenges, some alternative must be practiced. The suitable and sustainable alternative for conventional fuel is to use biofuels, being obtained from living organisms. Among biofuels, third generation biofuel (biofuel production from microalgae) is seeking attention now a days for its low or no emission of hazardous gases. Microalgae is being used as third generation biofuel as a save alternative of conventional fuels. Being photosynthetic, they don't need additional sources for deriving energy but use sunlight for energy production and growth in photo bioreactor or fermentation tank. Microalgae is the potential source for production of biodiesel, bioethanol and bio hydrogen from its lipid, carbohydrates and residual contents. Various factors like light availability, temperature, level of oxygen and carbon dioxide are associated with culturing of microalgae which either suppress or enhance algal growth. After cultivation, biofuels can be harvested by centrifugation, flocculation and ultrasound techniques. In this review, we will go through that how microalgae can be cultivated and how biofuel can be derived from it, various techniques for harvesting and analyzing the biofuel produced after harvesting microalgae.

Keywords: Conventional fuels, Global warming, Mitigation, Biofuel production, Microalgae

ICST-24-70 A Review On Status Of Microplastic Prevalence In Aquatic Ecosystems Microplastic As A Potential Threat To Our Aquatic Fauna

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Microplastics have been found everywhere in the environment due to anthropogenic activities. Firstly, it was made for man's ease but now it proves drastic for the environment. Due to their small size (5mm), they are distributed in diverse environments, resulting in contaminated air, soil, and water. Microplastics vary in size, shape, and color. Degradation of plastics results in two types of Microplastic residue; primary and secondary Microplastic. There are different sources of microplastic. Due to its abundant distribution in the environment, they enter the food chain and transfer to different trophic levels of the food web. When they enter the food chain they adversely affect the living organisms of each trophic level and damage their physiological activities. The harmful effects of microplastics have been discussed in plankton, sponges, corals, mollusks, and fish species. Different methods of microplastic degradation such as filtration, bioremediation, coagulation, magnetic separation, floatation, photocatalytic degradation, hybrid treatment, and adsorption prove to be helpful to a limited extent. Detection and identification of microplastic is a challenge due to its tiny size, some advanced techniques such as morphological and analytical analysis used to detect and identify have been described. Most fish guts have been proven to be a suitable tool for microplastic detection. Therefore, targeted studies must be designed and conducted on freshwater and marine fish to detect the status of microplastic. It is mandatory to use biodegradable alternatives to microplastic to prevent our planet from being degraded to an irreversible extent.

Keywords: microplastic, fish, biodegradable, aquatic fauna

ICST-24-71 The Pathophysiology of Botulism: From Transmission to Treatment and Control"

Muhammad Usman, Akasha Khan, Malik Hashim.

Botulism is an illness mediated by the bacterium, *Clostridium botulinum*. A bacterial, neurotoxin-mediated illness caused by paralysis of muscles and leading to respiratory failure usually due to contaminated food, wounds or infant exposure. The spores of *Clostridium botulinum* germinate and start producing the botulinum toxin. This toxin cleaves the SNARE proteins and interferes with neurotransmission. There are four types of botulism; Foodborne botulism, Infant botulism, Wound botulism, Adult intestinal colonization botulism, Inhalation botulism. This spreads through inhalation of an aerosolized toxin. It can also be transferred in contaminated particles or droplets. Globally, there are fewer than 1,000 cases of botulism reported annually. In the US approximately 145-200 cases are reported each year. Some common symptoms/manifestations include; doubled or blurred vision, lowered eyelids, slurring of speech, inability to swallow, and failure in respiration. Botulinum toxin can be treated by proper handling and bottling of botulism toxin. Proper practices should be followed in canning, with ventilation and air filtration systems to avoid botulism. Giving honey should be avoided in children under one year of age. It can be controlled through vaccination in high-risk groups. (Conjugate vaccines). Botulism can be treated with proper hospitalization, rehabilitation therapy, ventilatory support, using antitoxins.

Key Word: *Clostridium botulinum*, contamination, neurotransmission, vaccine, antitoxin.

ICST-24-72 Probiotics In Aquaculture: Importance And Future Perspectives

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Like their well-established usage in animal husbandry, probiotics are being used more and more in aquaculture to increase productivity. When consumed, these live cells or compounds help aquatic animals' immune systems, digestion, growth, and general health. Additionally, they assist preserve pond habitats and improve the quality of the water. This study summarises what is currently known about probiotics in aquaculture, including their uses, methods of action, possible advantages, and drawbacks. While pointing out that this topic is still in its infancy, it highlights earlier studies on probiotics, namely in the culture of finfish and shellfish. The study highlights the necessity of additional thorough research to completely comprehend the efficacy of probiotics in aquaculture environments. Overall, probiotics appear to have potential for enhancing aquaculture methods; nevertheless, further research is needed.

ICST-24-73 Sources of Microplastics (MPs), their Trophic Transfer, Different Degradation Methods along with Corresponding Mechanism and Recent Research Status in Biotechnology

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Microplastics (MPs) are widely distributed and emerging contaminant in the world due to huge consumption of plastic and plastic derived products. Due to excessive use and improper discard methods, they are heaping up in environment. As these MPs are very of small size (5mm or less) when ingested by living organisms, they get accumulated in their bodies and pose several physiological abnormalities to aquatic life and humans which ultimately contribute to alteration of ecosystem balance. Degradation of microplastics is the utmost need of recent time. In order to degrade microplastics, various physical (coagulation, membrane based filtration, adsorption), chemical (advanced oxidation processes, photocatalysis) and biological methods (microbes especially bacteria and algae) have been designed. Biological method is used preferably due to its more efficiency of degrading microplastics and converting them into the forms which can easily be used by microbes as source of their energy. During biological degradation, enzymes secreted by microorganisms mainly act upon polyethylene terephthalate (PET), polystyrene (PS), polyethylene (PE) and degrade them into carbon dioxide and water. The efficiency of degradation process is influenced by type of polymer and strain being used in the process. This paper summarizes basic sources of microplastics, their distribution in environment and in different trophic levels, methods for degradation of MPs, mechanism for degradation of microplastics and recent biotechnological approaches towards advancing the following process.

Keywords: Microplastics, heaping up, degradation of MPs, biological method, energy derivation and reduction of MPs level

ICST-24-74 Flavonoids from *Opuntia ficus-indica*: An Overview of In Vitro, In Vivo, and In Silico Studies on Antidiabetic Activity

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Opuntia ficus-indica, commonly known as the prickly pear cactus, has garnered attention for its potential antidiabetic properties attributed to its flavonoid content. This review synthesizes current knowledge from in vitro, in vivo, and in silico studies examining the antidiabetic effects of flavonoids extracted from *O. ficus-indica*. In vitro studies demonstrate that flavonoids can enhance insulin sensitivity, inhibit α -glucosidase, and promote glucose

uptake in muscle cells, indicating their role in glycemic control. In vivo investigations, utilizing diabetic animal models, show that these compounds significantly lower blood glucose levels and improve lipid profiles, suggesting protective effects against diabetes-related complications. Furthermore, molecular docking and computational analyses reveal the mechanisms by which flavonoids interact with key enzymes involved in glucose metabolism, providing a deeper understanding of their pharmacological potential. This overview collectively proposes that flavonoids from *O. ficus-indica* exhibit promising antidiabetic activity through multiple pathways, including antioxidant effects and modulation of metabolic pathways. Despite these encouraging results, further research is warranted to elucidate the bioavailability, dosage optimization, and long-term effects of these flavonoids in humans. This should necessitate for the modified approaches combining traditional knowledge with modern scientific methodologies to fully exploit the therapeutic potential of *O. ficus-indica* in managing diabetes.

Keywords: *Opuntia*, Diabetes, Phytochemicals, Medicinal Plants, Metabolites

ICST-24-75 Green Synthesis of ZnO Nanoparticles using *Eruca sativa* and *Spinacia oleracea* Leaf Extracts: Antibacterial and Photocatalytic Application

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Spinacia oleracea and *Eruca sativa* leaf extracts were used to synthesize zinc oxide nanoparticles, which were analyzed using Ultraviolet-Visible Spectroscopy (UV-Vis), Fourier Transform Infra-Red Spectroscopy (FT-IR), and Thermal Gravimetric Analysis (TGA). The antibacterial behavior and the photocatalytic activity to degrade the Methylene Blue (MB) dye of the *S.oleracea* and *E.sativa* based ZnO NPs were also seen. A color change from light yellow to dark brown within 90 seconds and the surface plasmon resonance peak at 290 nm in the UV-Visible spectra indicated the formation of *S.oleracea* and *E.sativa* based ZnO nanoparticles. FT-IR spectroscopy was used to analyze the nanoparticles and they reported an incorporation of the biomodule biomolecules and functional groups had been loaded into the nanoparticles. The efficiency of the *S.oleracea* and *E.sativa* based ZnO NPs and the degradation of the phytochemicals bound on them was established using Thermogravimetric analysis. In the present study, the synthesized *S. oleracea* and *E. sativa* based ZnO NPs showed antibacterial activity against both the gram-positive and gram-negative bacteria through the formation of inhibition zones. The absorptive and photocatalytic investigations confirmed that the nanoparticles provided 75% decolorization of MB dye in 120 min of sunlight exposure. Therefore, *S.oleracea* and *E.sativa* ZnO NPs can be prospective candidates for antibacterial and photocatalytic degradation uses.

Key Words: Green synthesis, nanoparticles, antibacterial activity, photocatalytic application, zinc oxide

ICST-24-76 The Role of Probiotics in Enhancing Sustainable Aquaculture Practices for Fish Health and Growth

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Due to growing health and environmental concerns, many countries have restricted the use of chemotherapeutic drugs in aquaculture. Probiotics, beneficial live bacteria, offer a promising alternative to conventional pharmaceutical treatments. Since their initial use in the 1980s to support the growth of aquatic species, probiotics have proven effective in enhancing water quality, maintaining the microbial balance, and preventing bacterial infections. By promoting fish growth, immunity, disease resistance, and gut health, probiotics help to reduce the need for antibiotics and mitigate their associated negative effects. Numerous commercially available probiotic products, containing strains such as *Bacillus*, *Lactobacillus*, *Enterococcus*, and *Saccharomyces cerevisiae*, are currently being used in fin and shellfish aquaculture along with many other organisms. Probiotics are essential for safe and efficient aquaculture, a rapidly expanding industry focused on sustainable protein production and eco-friendly practices. This review critically examines host-specific probiotics in aquaculture, with attention to challenges related to environmental stability, storage, distribution, and potential disadvantages. Addressing these challenges is vital for advancing sustainable aquaculture methods, ultimately contributing to increased protein production and broader agricultural benefits.

Keywords: Probiotics, aquaculture, sustainable protein, environmental stability.

ICST-24-77 Biosurfactants- Production Analysis and Application

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Recent trends in biotechnology has shifted the concern of researchers to use biological compounds instead of synthetic ones in various industries. Biosurfactants are microbially produced compounds. Members of the bacterial genera *Bacillus* and *Pseudomonas* are important in producing biosurfactants. They reduce surface and interfacial tension between two liquids or between liquid and solid by accumulating in between them. Their amphipathic structure allows them to play role in detergency, lather formation, emulsification and dispersion of oil activities; required in different industries. Recently, biosurfactants got attention in biotechnology industry owing to their primacy over manufactured surfactants in terms of producing environment friendly goods and providing environmental sustainability services. Their production is analyzed through site sampling and sample collection. Pure culturing is used for enumeration, isolation and identification of bacteria producing biosurfactants. Oil utilization test and blood hemolytic tests are significant for screening bacterial isolates. Biosurfactant activity is analyzed through Drop collapse test, Emulsification capacity test and oil spreading methods. In pharmaceutical and cosmetic industry numerous varieties of biosurfactants are produced while other types are proved to be useful in agriculture, food and petroleum industry.

Keywords: Biosurfactant, detergency, emulsification, environmental sustainability services, oil utilization test

ICST-24-78 Flavonoids from *Opuntia ficus-indica*: An Overview of In Vitro, In Vivo, and In Silico Studies on Antidiabetic Activity

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Opuntia ficus-indica, commonly known as the prickly pear cactus, has garnered attention for its potential antidiabetic properties attributed to its flavonoid content. This review synthesizes current knowledge from in vitro, in vivo, and in silico studies examining the antidiabetic effects of flavonoids extracted from *O. ficus-indica*. In vitro studies demonstrate that flavonoids can enhance insulin sensitivity, inhibit α -glucosidase, and promote glucose uptake in muscle cells, indicating their role in glycemic control. In vivo investigations, utilizing diabetic animal models, show that these compounds significantly lower blood glucose levels and improve lipid profiles, suggesting protective effects against diabetes-related complications. Furthermore, molecular docking and computational analyses reveal the mechanisms by which flavonoids interact with key enzymes involved in glucose metabolism, providing a deeper understanding of their pharmacological potential. This overview collectively proposes that flavonoids from *O. ficus-indica* exhibit promising antidiabetic activity through multiple pathways, including antioxidant effects and modulation of metabolic pathways. Despite these encouraging results, further research is warranted to elucidate the bioavailability, dosage optimization, and long-term effects of these flavonoids in humans. This should necessitate for the modified approaches combining traditional knowledge with modern scientific methodologies to fully exploit the therapeutic potential of *O. ficus-indica* in managing diabetes.

Keywords: *Opuntia*, Diabetes, Phytochemicals, Medicinal Plants, Metabolites

ICST-24-79 Prediction of genetic responses to Chemical Shift Perturbations (CSP) by Using a model for drug discovery

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Genetic and transcriptional responses to perturbations are key factors in drug discovery and have a fundamental role in understanding disease processes. In drug discovery, the screening process of compounds relations is unfeasible and difficult. So instead of using other processes, a generative model could be used that will predict the transcriptional responses to gene perturbations and hence we could improve disease screening in this way. Recent publications have shown that researchers have already developed a model PRnet that is being used for prediction of transcriptional responses to chemical shift perturbation (CSP) and it has been proved to be good for analysis because it contains drug candidates for almost 233 diseases. The limitation to model is that it only works on CSP. So instead of going through another exhaustive process of making another model, we could improve this model to also have a work on gene perturbations which will proved to be game changing in the field of drug discovery. Moreover, it should also have a broad biological knowledge of the compounds so as to predicts various relations like phenotype, genotype, genetic relations to compounds, ligands relations binding to proteins, ligands stability etc. So it will be more feasible to use this model in future in drug discovery because with current trends in this field, it will be proved to be more helpful in disease screening and predicting not only transcriptional responses but various other responses like DNA damage, oxidative stress etc. By comprehending this model, it will be easy to check drug feasibility against a specific disease.

Keywords: Drug discovery, Chemical Shift Perturbations, Transcriptional responses, Genetic perturbations, Generative model

ICST-24-80 An Exploration Of Premature Graying Of Hair: Causes, Consequences, And Potential Therapeutic Interventions.

ICST-24 Mianwali

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Premature graying of hair which is also known as "premature canities". PGH occurs among young adults; starting in Caucasians before the age of 20 years and in Africans before the age of 30 years. PGH effects socio_ cultural spheres of individual life. Individuals effected with PGH have to face low self-esteem and various psychological issues. Genetics, malnutrition, smoking, medical conditions, stress, hormones, environmental factors contribute to onset of premature graying of hair. The purpose of study is to investigate the prevalence, underlying causes and consequences of PGH on individuals under age of 20-35 years and identification of factors like environmental or genetic that influence. Melanogenesis associated gene regulating melanin production and melanocyte activity playing a central role in graying process as a reduction in melanogenically active melanocytes in the hair bulb is the primary factor of haircolor loss. Difference in expression of keratin and its associated genes between white and pigmented hair is also the contributing factor to hair loss. Researchers are utilizing genetic data including whole exome and targeted next generation sequencing to predict individual susceptibility to PGH and develop personalized interventions. Using ionizing irradiation induced hair graying as a research model to evaluate the effectiveness of interventions targeting oxidative stress and DNA damage prevention. Certain drugs such as lantanoprost, erlotinib, imatinib, tamoxifen and levodopa stimulate melanogenesis. Clofazimine accumulates within tissues leading to repigmentation. Essential vitamins and minerals such as vitamin B12, vitamin D, vitamin E, copper and iron will support the repigmentation. We will also use l- methionine to suppress methionine oxidation and restore the methionine-sulfoxide that prevent graying of hair. This study will investigate PGH among young adults by exploring its prevalence, causes and consequences and then we will utilize genetic data and NGS to predict individual susceptibility and develop effective and personalized interventions.

Key words: Canities, melanogenesis, Clofazimine, NGS, oxidative stress

ICST-24-81 Characterization And Antimicrobial Activity Of Hyperbranched Epoxy Cross-Linked Polymers From Bisimides And Phenolics

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A series of hyperbranched polymers were synthesized from bisimides phenolics and epoxy resin , tetraglycidyl 4-4'-diaminodiphenyl-methane (TGDDM). Imides were synthesized by reacting phthalic anhydride with o/p amino phenol. The synthesized imides based phenolics and polymers were characterized by Fourier Transform Infrared (FTIR) spectroscopy .Thermal stability of synthesized hyperbranched polymers were evaluated by Differential scanning calorimetry (DSC) and glass transition temperature were evaluated by Thermal gravimetric analysis (TGA) technique with respect to their linear polymer and for molecular weight Gel permeation chromatography (GPC) is carried out .The disc diffusion and agar well methods were used to carry out its antimicrobial activity.

KEY WORDS; Diimides based phenolics, imides based phenolics and antimicrobial coatings.

ICST-24-82 Role Of Mirna In The Treatment Of Neurodegenerative Disorders.

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Neurodegenerative disorders are the serious disorders affecting more than 15% of world's population. Unveiling the role of miRNA in the treatment of such disorders can be a useful approach. Conventional medicines are ineffective in treating neurodegenerative disorders such as Huntington's disease, Parkinson's disease, Alzheimer's disease, amyotrophic lateral sclerosis, and prion disease. This highlights the necessity of using different therapy modalities. In this regard, gene-based treatments have gained acceptance as potentially viable substitute treatments, with the microRNA (miRNA) strategy seeing a significant surge in recent years. MiRNAs are being extensively researched as potential diagnostic and prognostic biomarkers, medication response predictors, and therapeutic agents due to their demonstrated involvement in the pathophysiology of a number of illnesses, including neurological diseases. We can discuss the benefits and limitations of miRNA-based therapy, assess the viability of direct and indirect miRNA mimics and inhibitors for the regulation of neurodegenerative-related genes in both in vitro and in vivo models, and provide an overview of the pertinent methods and strategies tried to deliver miRNAs to the central nervous system for therapeutic purposes, with special attention to exosomes. We also provide a novel strategy that has enormous potential for treating a variety of illnesses, including neurodegenerative diseases. The goal of this strategy is to improve the amount and calibre of miRNA that is packed and transported to the central nervous system and other sites of action by addressing the inclusion of miRNAs into exosomes.

Keywords: Neurodegenerative disorders, miRNA discovery , exosomes, miRNA based therapy.

ICST-24-83 The Intersection of Climate Dynamic and Fish Biodiversity at Chashma Lake, Mianwali

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Monitoring freshwater ecosystems is vital for sustainable resource management and environmental legislation, especially in Pakistan, where wetlands cover 9.7% of the total area. Indus River is the country's longest river, featuring significant infrastructures like the Tarbela Dam and six barrages. Freshwater is essential for human needs, agriculture, and industry, where aquatic biodiversity is declining due to pollution and climate change in recent years. Pakistan hosts 171 freshwater fish species, but these ecosystems are increasingly threatened due to various environmental factors. This study investigated the effects of climate change on fish biodiversity and abundance in the Chashma Reservoir located at Mianwali, Punjab. Sampling was conducted for six months starting from December 2023 to May 2024. It involved monthly sampling at the Fish Biodiversity Hatchery Chashma and fortnight measurements of physicochemical parameters at four GPS-marked sites of Chashma Lake. Key findings indicated that electrical conductivity, water temperature, ammonia, calcium, and magnesium levels significantly fluctuated over six months, suggesting a significant impact of climate change on the water quality of the study area. Notably, variations in fish size among different species were also observed during this study. The study highlights the need for further analysis to understand climatic effects on freshwater stocks and emphasizes the need to regularly upgrade native biodiversity indices to advise conservation strategies. Overall, comprehensive monitoring is essential to mitigate threats to aquatic ecosystems and their biodiversity.

Keywords: Chashma lake, Biodiversity, freshwater, climate change

ICST-24-84 phylogenetic analysis of leishmanai tropica based on ITS2 GENE IN District Hangu

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Leishmania is the obligatory intramacrophage protozoan that causes leishmaniasis, a disease spread by vectors. With a frequency of 12 million infections, leishmaniasis is one of the most significant human protozoan parasitic illnesses worldwide. Leishmaniasis is thought to afflict more than 350 million people worldwide, with 2 million cases reported each year in tropical and subtropical regions. The current investigation was carried out to identify the leishmaniasis epidemic and to build a phylogenetic tree using the leishmania ITS2 gene sequencing. In all, 50 samples that tested positive for Cutaneous Leishmania (CL) were collected from Hangu district Khyber Pakhtunkhwa (KP). By using the ITS2 gene PCR, they were all verified. Of the 50 patients, there were 29% female and 71% male youngsters. 89% of the children were in the 1–12 age range, while 11% were teens. After amplification of the ITS2 gene, 5 randomly selected samples were sent for Sanger sequencing out of 50 samples. One main strain Leishmania Tropica were reported in the Hangu districts of Khyber Pakhtunkhwa, according to an ITS2 based sequence analysis. The Leishmania ITS2 gene sequences were chosen for the investigation of Leishmania Tropica phylogenetic analysis. In this investigation, all sequences (from GenBank) were analysed. Every Leishmania Tropica ITS2 sequence has different locations in the alignment. Leishmania tropica species was shown to be closely related to L. infantum from China. The alignment of the sequences that form the five groups of the L. tropica specie revealed the SNP alterations. The KP Hangu district is crucial for monitoring potential leishmaniosis incursions.

ICST-24-85 Climate Change And Its Impact On Animal (Aves) Migration Pattern In Chashma Lake, Indus River

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Chashma Lake, situated alongside of Indus River, plays a very influential role as a habitat for a number of migratory species especially Aves which travel through central Asia and south Asia. This abstract explore the impact of climate change in region of Chashma Lake. Climate change such as rise in global temperature, change in precipitation patterns, and alteration in habitat have an effect on timing, route and destinations of these migratory birds. Many studies were conducted to estimate the number of various species as these migratory species in Chashma Lake were the sign of change in climate. The line transect methods were used to study the avifauna diversity at the study site from September to March in year 2017-2018 and 2018-2019. 16371 individuals were observed belonging to 11 families, approximately 38 species. As migratory birds indicate a freshwater ecosystem, greater number of these species indicates a healthy habitat while decline in the number of these migratory aves indicates a degraded environment. Studies conclude that the number of migratory species is greatly declining at Chashma lake region. The possible reasons regarding this decline are deforestation, illegal hunting and polluted freshwater lake. So there is need to protect the avifauna diversity for the proper functioning and a sustainable ecosystem.

Keywords: Climate Change, Ramsar Site Chashma, Water Fowls, Chashma Lake, Migratory Birds

ICST-24-86 Computational Designing and Optimization of Lactase Enzyme for Improved Lactose Digestion in Lactose-Intolerant Individuals

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Lactose intolerance is discomfort condition caused due to the inability to digest the lactose sugar found in the dairy product that affects millions of people around the globe. Traditional lactase enhancement methods often overlook computational design advantages focusing on microbial production. *In silico* techniques aim to provide rapid, cost-effective optimization before experimental testing. This study explores the *insilico* approach to design and optimize β -glycosidase (lactase) for improved lactose hydrolysis and specifically targets structural modifications to improve enzyme resilience under acidic gastrointestinal conditions, allowing it to function efficiently when ingested, offering a potential solution for lactose-intolerant individuals. Using computational tools, we selected and analyzed the sequence and structure of β -glycosidase, followed by structural refinement and mutagenesis to enhance its catalytic efficiency and stability under gastrointestinal conditions. Molecular docking and dynamics simulations were performed to assess lactose-binding affinity and enzyme stability. The modified enzyme was subjected to further *in silico* validation, including predictions of toxicity and allergenicity, to confirm its compatibility for human application. Our findings highlight key modifications at the enzyme's active site, which could lead to increased enzyme efficiency and safer therapeutic use. This *insilico* enzyme model presents a promising foundation for the experimental validation and future development of oral enzyme supplements, potentially improving dietary options and quality of life for lactose-intolerant patients.

Keywords : Lactase enzyme, Lactose intolerance, Digestive health, Biocatalysis, Molecular docking, MD simulations

ICST-24-87 Fish As A Functional Food: Nutritional Composition And Its Therapeutic Potentials For Human Health

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Fish is a valuable nutrient-rich food source that supports public health and economic growth. Macronutrients are nutrients required in larger amounts, and providing energy for tissue formation. Macronutrients found in fish include protein, lipids and carbohydrates. Fish have high-quality protein, containing all the essential amino acids. This makes a fish, a complete set of protein which is important for muscle growth, tissue repair, immune function, and enzyme production. Fish also contain antioxidants and bioactive peptides that facilitate the immune health and may contain anti-inflammatory and anticancer properties. Fish are a source of saturated and unsaturated fats. The unsaturated fats, particularly omega-3 polyunsaturated fatty acids (PUFAs) like EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid), are beneficial. These fats contribute to heart health, reduce inflammation, promote brain health, and can help to reduce the risk of chronic diseases such as cardiovascular diseases and prevent colon cancer. Micronutrients in fish consist of vitamins and minerals required in smaller amounts but are essential for various physiological functions. Fish are rich in several key vitamins, such as A, D, and B which support vision, provide strength to bones and regulate many other metabolic processes. Fish also contain minerals such as calcium, iron, zinc, phosphorus, Selenium, and iodine which are useful for many biological functions. This review provides

clarity about the nutritional composition of fish and its role in promoting health thus focusing the fish as a dietary component with therapeutic benefits.

Keywords: Fish, Nutrients, Human health, PUFA, Vitamins, lipids.

ICST-24-88 Yogurt as a Vehicle for Biotin Fortification Through Microbial Fermentation

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Biotin, a vital B complex vitamin, plays a crucial role in metabolism. This study explores the potential of yogurt as a substrate for microbial fermentation to enhance biotin production. The *Lactobacillus acidophilus* and *Bifidobacterium bifidum* strains were used to ferment yogurt, resulting in a significant increase in biotin content. Optimization of fermentation conditions including temperature, PH and incubation time, further elevated biotin yields. The biotin-rich yogurt demonstrated improved nutritional values and potential health benefits. This sustainable and cost-effective approach offers a promising solution for enhancing biotin production contributing to human nutrition value offering a sustainable and cost-effective solution to address biotin deficiency. This innovative approach provides a valuable contribution to food science and human nutrition with potential applications in enhancing nutrition and health benefits for consumers, particularly those with restricted diets or impaired nutrient absorption.

Keywords: Biotin, Yogurt, Microbial fermentation, *Lactobacillus acidophilus*, *Bifidobacterium bifidum*, Nutritional enhancement.

ICST-24-89 Myco-Sunshield: Exploring the UV-protective properties of Black Fungus-Derived Melanin for Natural Sunblock Development

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UV rays from the sun or artificial sources can negatively impact human health causing skin cancer, eye irritation, and allergies. The aim of this study is to investigate the potential of using black-fungus derived melanin as a natural UV-protective agent for developing effective and sustainable sunblock products. Black fungus (*Cladosporium sphaerospermum*) derived melanin is a natural UV protective agent and can be used in sunblock. Black fungus melanin will be extracted by using Pressurized Liquid Extraction (PLE), because depending upon its aptitude this technique will be ideal for this tough specie and then purified with the help of high performance liquid chromatography and characterized for its UV-absorbing properties. We will formulate a topical sunblock cream incorporating the fungal melanin, evaluating its sun protection factor (SPF), Ultra violet A (UVA) and Ultra violet B (UVB) protection and stability. The possible results will show that black fungus derived melanin have significant UV absorption capabilities, with an SPF 15-50+. The formulated sunblock demonstrated excellent UVA and UVB

protection, outperforming commercial synthetic sunblock. We will assess the in vitro and in vivo toxicity to confirm the safety and biocompatibility of the fungal melanin-based sunblock. This innovative, eco-friendly approach to sun protection offers a promising alternative to synthetic UV filters, leveraging the natural UV-protective properties of black fungus melanin. Our findings pave the way for the development of effective, sustainable, and environmentally responsible sunblock products.

Keywords: Black fungus, Melanin, Natural sunblock, UV protection, Sustainable sunblock.

ICST-24-90 Allelopathic Effect of *Euphorbia Helioscopia* Aqueous Seed Extract and Heavy Metal (HgCl₂) on Maize

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The current investigates that all allelochemicals have great ability to stimulate and inhibits the growth and germination of all the surround plants of different and same species in the fields, because the allelopathic plants always compete for the nutrients and survival with other near plants. The allelopathic plants have more survival chances as compared to other plants due to their toxicity. In this connection, the experiments were conducted to investigate the allelopathic effects of *Euphorbia helioscopia* aqueous seed extract on the germination and seedling of maize. Aqueous seed extract of *Euphorbia helioscopia* significantly not suppressed the pre-germination and growth of nearby plant species. The seedling of maize can't decrease when the pure aqueous seed extract of *Euphorbia helioscopia* were applied. The heavy metal (HgCl₂) and aqueous seed extract of *Euphorbia helioscopia* combinedly inhibit and suppressed the growth or germination of maize and reduced the shoot and roots fresh or dry weight. The *Euphorbia helioscopia* aqueous seed extract has much potential to use as source of weed management. So further this study revealed the pharmacological importance of aqueous seed extract of *Euphorbia helioscopia*. The seed were extracted and evaluated for the pharmacological activity. The *Euphorbia helioscopia* aqueous seed extract tested against the two popular bacterial strains (*Staphylococcus aureus*) and (*E. coli*). The aqueous seed extract of *Euphorbia helioscopia* significantly not showed the zone of inhibition against both bacterial strains.

Keywords: Allelopathic, *Euphorbia Helioscopia*, Bacterial Strains, Heavy Metal, Maize

ICST-24-91 Unlocking Nature`s Arsenal: *Apis Mellifera* Venom as a Natural Tool for Combating Against *Staphylococcus Aureus*

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Bee venom, an odorless and acidic liquid secreted by *Apis mellifera*, has attracted attention for its therapeutic properties; particularly its antimicrobial potential. This study evaluates the antibacterial efficacy of honey bee venom (apitoxin) against bacterial pathogens, specifically a clinical isolate of *Staphylococcus aureus*. In this study, venom was collected from natural colonies at Kohat University of Science and Technology and processed for purity. Using the agar well diffusion method, bee venom demonstrated significant antibacterial activity with a mean inhibition zone of 22.33 mm, highlighting its efficacy in inhibiting bacterial growth. The Minimum Inhibitory

Concentration (MIC) and Minimum Bactericidal Concentration (MBC) of bee venom were determined, with MIC (9.11 mm inhibition zone) and MBC completely halting bacterial growth with a mean inhibition zone of 17.22 mm. Synergistic testing demonstrated that combining bee venom with ciprofloxacin significantly enhanced antibacterial efficacy, increasing the inhibition zone to 57.97 mm, suggesting a potential to boost ciprofloxacin's effectiveness. On the other hand, an antagonistic effect was observed when combined with penicillin, yielding a lower-than-expected inhibition zone of 45.77 mm. A time-kill assay revealed a sustained antibacterial effect of bee venom over 24 hours, reducing bacterial viability, with absorbance measurements dropping from 0.80 in the control to 0.04 with venom treatment. These findings suggest that bee venom is a promising natural antimicrobial agent, effective even against antibiotic-resistant strains of *Staphylococcus aureus*. Further research should investigate the mechanisms behind its synergistic interactions with antibiotics, as well as its potential applications in treating resistant bacterial infections.

Key words: Bee venom, *Staphylococcus aureus*, antimicrobial activity, Bee venom extract, MIC, MBC

ICST-24-92 Effect Of Quercetin And Boronic Acid Complex On Wound Healing In Diabetic Rat Model

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Diabetes is a disease that occurs when body does not produce enough insulin to control the blood glucose level. In Diabetes high blood glucose level effects, the functioning of immune system, so the patient suffers from different skin infections. Diabetic foot infections are common infection that results in amputation, osteomyelitis and eventually death. To control the increasing disease burden of diabetic foot infections new therapeutic approaches are needed. The major objectives of the present study were to check the antimicrobial potential of Quercetin and Boronic acid complex (QB complex) in diabetic wound healing in a diabetic rat model. Pus samples were collected from different patients suffering from diabetic foot infections. The samples were inoculated on different growth media such as MSA (Mannitol Salt Agar), PCA (Pseudomonas Cetrimide Agar) and nutrient broth, growth of bacteria was observed on all media after incubation. Yellow colonies of *Pseudomonas aeruginosa* were observed on PCA. Quick test strip 12(QTS-12) was used for further confirmation of bacteria.

Antibiotic susceptibility testing was performed by Kirby Bauer Disk Diffusion Method and Agar Well Diffusion Method. The findings show that *Pseudomonas aeruginosa* were one of the most prevalent bacteria species in diabetic foot ulcer. These bacterial strains were multidrug resistant. Diabetic animal model was designed as per following protocol: Six male Albino Wister rats were taken and divided into two groups: experimental and control group. In experimental group, diabetes was induced by intra-peritoneal injection of Alloxin (120g) twice a day, then wound was created and 100µl of bacterial cultures were injected in wound for pus formation.

After two days QB complex was given to infected rats, Mycitracin were used as commercial drug. Rats treated with QB complex showed efficient wound healing than the rats treated with Mycitracin. Rats finding reported that bacterial infections in the diabetic wounds were more difficult to be healed. Faster healing of wound indicated good antimicrobial potential of QB complex. Present study reported that QB complex had effective antimicrobial potential against multidrug resistant strains of *Pseudomonas aeruginosa* and may have a promising effect in controlling the diabetic complication and to treat chronic infections.

ICST-24-93 Colorimetric Sensing, Photocatalytic And Biomedical Applications Of *Blepharis edulis* Pers Hydrogel Based Silver Nanoparticles

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Abstract

Blepharis edulis pers hydrogel (BEP hydrogel) was utilized to synthesize *Blepharis edulis* pers silver nanoparticles (BEP-Ag NPs), which were characterized through UV-Visible spectroscopy (UV-Vis), Fourier Transform Infrared Spectroscopy (FTIR), Scanning Electron Microscopy (SEM), X-ray Diffractometer (XRD), Energy dispersive X-ray (EDX), Zeta Potential (ZP), and Particle size distribution. The antioxidant, anti-inflammatory, antibacterial, colorimetric sensing, and photocatalytic degradation properties of Methylene blue (MB), Methyl orange (MO), and 4- Nitro phenol (4-NP) dye with these BEP-Ag NPs are also assessed. A color transformation from light yellow to dark brown in 90 seconds and a surface resonance peak at 450 nm in the UV-visible spectra proved that BEP-Ag NPs had formed. The incorporation of many biomolecules and functional groups into BEP-Ag NPs was verified by FTIR spectroscopy. The average diameter of the spherical shaped BEP-Ag NPs as given by the SEM micrographs was 69.1 ± 2.5 nm. XRD pattern also explains the planes of FCC structure of BEP-Ag NPs. EDX justified the weight of Ag in BEP-Ag NPs was 70.08 %. ZP exhibited the synthesized BEP-Ag NPs was -24.3 mV which confirms that the synthesized BEP-Ag NPs were very stable. The particle size distribution evaluated the BEP-Ag NPs show the sharp peak at 94.33 nm. BEP-Ag NPs have been observed to limit the development of both gram-positive and gram-negative bacteria, as shown by the formation of inhibition zones. The antioxidant activity of the BEP-Ag NPs was shown through the DPPH, TPC, and TFC examinations. The maximum concentration of BEP-Ag NPs (250 g/ml) showed 92.90% anti-inflammatory action, whereas the lowest concentration (500 g/ml) caused denaturation of albumin at a 54rate of 53.83%. The colorimetric sensing of metal ions demonstrated the Hg^{2+} and Fe^{3+} ions have determined LOD was $6.0810 \mu M$ and $3.2346 \mu M$. The absorptive and photocatalytic studies of BEP-Ag NPs have also shown the % dye degradation of MB, MO and 4-NP was 94%, 87% and 98% with in 60, 120 and 180 min of sunlight irradiation respectively. Therefore, BEP-Ag NPs may assist as potential aspirants as antibacterial, antioxidant, anti-inflammatory and degradation of photocatalytic activity.

ICST-24-94 Seasonal Variations in the Antibacterial Activity of Honey against *Escherichia Coli*

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Honey's antibacterial and therapeutic qualities have made it a beloved natural sweetener and medical cure throughout history. This study aimed to evaluate the antibacterial efficacy of various honey types—Acacia, Ziziphus, Polyflora, and Eucalyptus—harvested from the KUST Model Bee Farm, Kohat, over different years (2018–2024) and seasons, against *Escherichia coli*. The antibacterial activity and minimum inhibitory concentration (MIC) of these honey samples were assessed using the agar well diffusion method, comparing older honey (2018–2023) with fresh honey (2024). The results indicated that Eucalyptus honey exhibited the highest antibacterial activity, both in older (mean inhibition zone of 16.97 mm) and fresh (23.77 mm) samples, attributed to its high phenolic and hydrogen peroxide content. Ziziphus honey exhibited strong antibacterial effects, whereas older Acacia honey showed weakest activity, suggesting the degradation of bioactive compound over time. MIC tests further highlighted the dose-dependent antibacterial effect of Eucalyptus honey, with full-strength honey showing the greatest inhibition. These findings confirm that honey's antibacterial efficacy depend on its botanical origin, freshness, and concentration. Fresh honeys, especially Eucalyptus, possess more robust antibacterial properties due to the retention of key bioactive components like methylglyoxal and hydrogen peroxide. This study underscores the potential of honey as a natural agent against multidrug-resistant *E. coli* and highlights the importance of seasonal and botanical factors in optimizing honey's therapeutic use.

Keywords: Honey, Honey extract, Bioassay, *Escherichia coli*, MIC

ICST-24-95 Characterization of Bee Pollen and Effects of its Supplementation on Chicks Growth

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The honey bee *Apis mellifera* collects bee pollen from stamen of flowers, both gymnosperm and angiosperm. It serves as a vital food source, particularly for young larvae during their early developmental stages. It is a highly nutritious, packed with carbohydrates, proteins, vitamins, minerals, amino acids, enzymes and phenolics essential for plant growth and development. The aim of current investigation was to determine the chemical composition of bee pollen collected from Bee farm, Kohat university of Science and Technology and examine its impact on chicks' growing performance. The collected bee pollen were analyzed using Gas Chromatography-Mass Spectrometry (GC-MS). The analysis revealed a diverse range of chemical compounds, including hydroxyl, carbonyl, amino, nitroso, and ether groups. Notable compounds identified were dihydroxyacetone, 5-hydroxymethylfurfural, and homoserine, all contributing to the bioactive profile of the pollen. A chick feeding experiment was conducted to evaluate the growth-promoting effects of bee pollen supplementation. Chicks were divided into four groups, with three experimental groups receiving varying levels of bee pollen and millet, and one control group. The results showed

that the highest growth rate was observed in Group A (40 g of bee pollen and 20 g of millet), with a mean weight of 191.5 g after four weeks. When compared to the control group, all experimental groups showed statistically significant weight gain, with bee pollen supplementation enhancing growth performance. This study highlights the nutritional and bioactive potential of bee pollen and its positive effects on the growth of poultry.

Keywords: Bee Pollen extract, Characterization, GC-MS analysis, Ethanolic extracts, Checks, supplementation

ICST-24-96 Alternative Use of Beebread as an Antibiotic against *Streptococcus Pneumoniae*

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Beebread is a nutrient-rich substance created by honey bees through the fermentation of pollen mixed with nectar and enzymes. It is generally rich in protein, carbohydrates, vitamins, minerals, and also contains antioxidants, antibacterial and anti-inflammatory properties. Similarly *Streptococcus pneumoniae* is a Gram-positive bacterium that causes pneumonia, meningitis, and other invasive diseases. Limited research exists on beebread's antibacterial activity and chemical composition, particularly in Pakistan therefore this study investigates the potential of beebread as a natural antibacterial agent against *S.pneumoniae*, and also focuses on characterizing the chemical composition of beebread collected from the KUST Model Honey bee farm through Gas Chromatography-Mass Spectrometry (GC-MS) analysis, revealing a diverse array of bioactive compounds, including amino acids, lactones, aldehydes, alcohols, and polyols. The antibacterial efficacy of beebread extract was assessed against *S.pneumoniae* using the agar well diffusion method, demonstrating a significant dose-dependent antibacterial effect. The highest concentration of beebread extract (30 mg/ml) resulted in a mean zone of inhibition of 21 mm, while lower concentration also exhibited notable antibacterial activity. Statistical analysis confirmed the significance of these results, suggesting that beebread possesses substantial antibacterial properties that could be harnessed as a natural alternative to conventional antibiotics. This research underscores the potential of beebread as a promising candidate for addressing the growing challenges of antibiotic resistant in human pathogens.

Keywords: Beebread, GC-MS analysis, Beebread Composition, Antibacterial Activity, *streptococcus pneumoniae*.

ICST-24-97 Accessing The Status, Threats And Conservation Strategies For The Endangered Indus River Blind Dolphin In Pakistan

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The Indus River Blind Dolphin (*Platanista gangetica minor*) is an important mammal and world's second most endangered freshwater river dolphin found only in Pakistan and India. In Pakistan, it is predominantly located in lower and middle reaches of Indus River primarily between Guddu and Sukkur barrages in Sindh and Chashma

barrage in Punjab province. This abstract provides an overview of current situation of Indus River Dolphin, the challenges it faces and analysis of conservation strategies. The WWF conducted a comprehensive survey which recorded 1200 dolphins in Indus River in 2001. Currently, approximately 2000 dolphins have been recorded in Indus River which is an improvement but not enough. The dolphins are currently confined to only 20% of their natural habitat range mainly due to construction of several dams and barrages alongside the Indus River. The construction of multiple barrages has divided the dolphin population into several isolated segments, with some being too small for the dolphins to thrive. The population is declining due to several reasons such as habitat fragmentation, water pollution and worsening climate changes. Poaching, accidental capturing in fishing nets and stranding in irrigation canals are additional threats. Recommended conservation strategies include complete elimination of fishing nets, population monitoring, habitat protection, reducing pollution and rescuing stranded dolphins. Additionally, it is crucial to educate local fishing communities about dolphin conservation to promote sustainable fishing practices. These combined strategies are meant to protect the Indus River Blind Dolphin for long term and help restore its ecosystem.

Key Words : Endangered, WWF, Dams, Barrages, Natural habitat range, Education, Population monitoring, Ecosystem.

ICST-24-98 Biomedical Applications of Biogenic Selenium Nanoparticles by Geranium wallichianum Leaves Aqueous Extract

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The current study provides an eco-friendly and affordable method for synthesizing selenium nanoparticles (SeNPs) using *G. wallichianum* leaf extract. UV-Vis analysis confirmed SeNPs formation at 386 nm an XRD analysis showed hexagonal structure of SeNPs. SEM analyses revealed spherical nanoparticles with approximately 45.9 nm in size. Dynamic Light Scattering (DLS) proactively shown their stability with zeta potential of - 38.47 mV. The biosynthesised GW@SeNPs possessed extensive biological properties such as improved antibacterial properties against gram positive and gram negative bacterial strains, *Escherichia coli*, *Staphylococcus epidermidis*, *Pseudomonas aeruginosa* & *Listeria monocytogenes* the inhibition zones 28, 28, 29, and 24 mm, superior antioxidant activity comparable to standard. In addition, GW@SeNPs had hemolysis rate (3 % at 50 µg/mL), significant anticoagulant properties, and considerable thrombolytic activity. These results highlight the potential of GW@SeNPs for a wide range of biomedical applications, particularly as antibacterial, antioxidant, and anticoagulant agents, making them promising candidates for pharmaceutical and therapeutic uses. The study emphasizes the advantages of biogenic nanoparticle synthesis for safe and sustainable medical applications.

ICST-24-99 Caralluma Edulis Extract Mediated Synthesis Of Silver Nanoparticles And Investigation Of Their Catalytic Performance In Dye Degradation

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This study explores the biosynthesis of silver nanoparticles (AgNPs) using *Caralluma edulis* extract, a sustainable and eco-friendly approach. The green synthesis approach utilized the phytochemicals present in the extract to reduce silver ions and stabilize the nanoparticles. The synthesized AgNPs were characterized using UV-Vis spectroscopy,

X-ray diffraction (XRD), Scanning electron microscopy (SEM), and Fourier Transform Infrared (FTIR). The catalytic efficiency of AgNPs was investigated in the degradation of methylene blue (MB), a model pollutant. The results showed that the AgNPs exhibited excellent catalytic activity, degrading 95% of MB within 20 minutes. The catalytic performance was attributed to the small particle size (10-20 nm) and high surface area of the AgNPs. The effects of pH, temperature, and catalyst concentration on the degradation process were optimized. The findings suggest that *Caralluma edulis* extract-mediated AgNPs are a promising catalyst for environmental remediation applications, offering a green and efficient solution for wastewater treatment.

Keywords: *Caralluma edulis*, biosynthesis of silver nanoparticles, catalytic degradation, methylene blue, environmental remediation.

ICST-24-100 From Scavengers To Scarcity: The Case Of Vultures Population Decline

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Vultures the nature's cleaning crew are the most successful nutrient vector. These entities offer a broad spectrum of ecological, economic and cultural services. These scavenging raptors scavenge the decaying flesh of large mammals, usually ungulates. These birds possess remarkable adaptations to their lifestyle; such as acidic PH of stomach that helps them to digest harmful bacteria found in dead decaying tissues, hooked beak for tearing flesh, broad wing for scanning for carrion, sharp feet for grasping and tearing tissues, bare neck helps them to dig their head into their food without getting dirty. Though vultures provide diverse range of ecosystem services, yet their population has collapsed worldwide. Notable decline has been observed in Asian and African continents, once recognized as hotspot for vulture diversity. The collapse started in early 1990s and continued up to at least 2003. Pakistan has more than 10 vulture species. Recent report by WWF Pakistan reports a drastic decline of 95% in the population of Oriental White-rumped Vulture (*Gyps bengalensis*) and Long-billed Vulture (*Gyps indicus*) across most of their range since the mid-1990s. According to the IUCN's 2016-2017 survey, Tharparkar's Nagarparkar and Islamkot regions are strongholds for Pakistan's vulture, with around 500-600 birds. Non-steroidal anti-inflammatory drug (NSAID) diclofenac use for veterinary treatments has played a key role in declining the population of these flesh eater birds. Necropsy findings revealed that majority of dead vultures had visceral gout, resulted from renal damage caused by diclofenac toxicity. Other reports also uncover that the problems related to the habitat, reproduction, feeding behavior, environmental factors such climate change, temperature fluctuations, changing precipitation patterns might also be contributing in devastating the population of these scavenging raptors. To address this, it is recommended to start different conservation breeding programmes, protecting nesting sites, test pharmaceutical products to make sure that similar issue are not repeated, scale and use of pesticides should be strictly regulated.

Key Words: Scavenger, WWF, IUCN, Diclofenac, Raptors, Ecosystem, Birds, Asia, Africa, Carrion.

ICST-24-101 Green Synthesis of Selenium Nanoparticles Mediated by *Equisetum diffusum* D for Enhanced Nanofertilizer and Antibacterial Activity

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Nanotechnology has emerged as a transformative tool in various fields, including agriculture and microbiology. This study explores the green synthesis of selenium nanoparticles (SeNPs) using an aqueous extract of *Equisetum diffusum* D (ED) and evaluates their dual applications as nanofertilizer and antibacterial agents. The synthesized

SeNPs were characterized via UV-Vis spectroscopy, FTIR, XRD, SEM, EDX, DLS, TGA, and DSC, confirming their stability, spherical morphology, and high purity. The UV-Vis spectrum established a peak at 371 nm, and SEM analysis revealed an average particle size of 18.66 nm. The zeta potential measurement of -52.34 mV indicated excellent dispersion stability. The impact of SeNPs on plant growth was assessed through a five-week experiment with *Solanum lycopersicum* plants. Plants treated with low and medium concentrations of SeNPs (Group 3 and Group 4) showed significant improvements in growth parameters, with 120.75 % and 120.03 %, respectively, compared to 101.37 % in the negative control. Leaf length and width also demonstrated notable enhancements. Furthermore, the antibacterial activity of SeNPs was tested against *Listeria monocytogenes*, *Staphylococcus epidermidis*, *Pseudomonas aeruginosa*, and *Escherichia coli*. The SeNPs exhibited substantial inhibitory effects, with zones of inhibition measuring 31 mm, 24 mm, 36 mm, and 24 mm, respectively. The MIC values ranged from 20 to 30 μ L, and the MBC values ranged from 30 to 40 μ L. These results have shown the potential of green-synthesized SeNPs as effective nanofertilizer that enhance crop productivity and as potent antibacterial agents, offering a sustainable and environmental friendly alternative for agricultural and microbial management applications.

Keywords: Green synthesis, Selenium nanoparticles, Nano-fertilizer, Antibacterial activity, *Equisetum diffusum* D.

ICST-24-102 Antibacterial Activity of Catfish (*Clarias batrachus*) Skin Mucus Against Multidrug-Resistant Bacteria

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The increasing prevalence of multidrug-resistance (MDR) bacteria has emerged as a critical challenge in aquaculture in global health, necessitating the search for alternative antimicrobial agents. This study explores the antibacterial properties of skin mucus from catfish (*clarias batrachus*) against *Aeromonas hydrophila*, a major aquaculture pathogen. The objectives were to evaluate the bactericidal potential of catfish skin mucus and to compare the antimicrobial efficacy of its ethanolic, methanolic, and aqueous extracts. Using the agar well diffusion method, the antibacterial activity was assessed by measuring zones of inhibition. The ethanolic extract demonstrated the most significant antibacterial activity (17 to 18mm), followed by the methanolic extract (12 to 13mm), while the aqueous extract exhibited no detectable activity. a standard antibiotic (positive control) produced an inhibition zone of 25mm, while Sterile distilled water (negative control) showed none, confirming the specificity of the antibacterial activity. the experimental procedures were conducted in triplicate to ensure reproducibility and reliability. these finding underscore the potential of ethanolic and methanolic extracts of catfish skin mucus as natural antimicrobial agents, particularly against *A. hydrophila*. This study contributes to the growing body of evidence supporting fish derived bioactive compounds as a sustainable alternative to conventional antibiotics in aquaculture, providing strategies to combat MDR bacterial infections in aquaculture.

Keywords: Aquaculture, *Aeromonas hydrophila*, *Clarias batrachus*, Antibacterial, Antibiotic, Ethanolic, Methanolic, Aqueous

ICST-24-103 Extraction of Lipase from Lipolytic Bacteria and Evaluation of their various Industrial Applications

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Lipases, being versatile in nature, are being widely used in research and industrial purposes. Lipases can be extracted from plants, animals and microorganisms like bacteria, fungi. Due to higher stable nature, easy cultivation methods, being cost effectiveness and wide range of their applied properties, lipase extracted from lipolytic bacteria are considered as the most important biotechnological product as enzymes. Lipases are highly substrate specific and more efficient in their enzymatic activity, lipases are being used in various industries i.e. as detergent to remove oil stains from clothes, in medicine formulation, in agriculture purposes to enhance plant growth, as to enhance dyeability, bio-diesel production and treatment of wastewater. Role of lipase for removing oil stains from clothes is the most prominent application at household and industrial level. Wastewater treatment by using lipase as a catalyst can be performed as lipase degrade all the excess oil and fats content present in water. This approach also helps in controlling the pollution level in our aquatic environment. Lipase also play very essential role in enhancing dyeability of fabrics when cotton fabric is treated with common dyes i.e. Basic red and reactive red dyes along with lipase. The role of lipase in bio-fuel production is the most prominent and demanding aspect as biofuels (Bio-diesel, Bio-ethanol, Bio-gas) are sustainable alternative for conventional fuels like petrol, diesels which imparts environmental hazards like global warming, green house gases production. The biodiesel with less emission of harmful gases and good engine performance can be produced from Karanja plants by controlling several reaction parameters. The quality of biodiesel produced from these inexhaustible feedstock can be analyzed by different techniques to further enhance the quality of biodiesel. To study the various applications of lipase, lipolytic bacteria were cultured in lab at selective media of trybutyrin agar with 1% mustard oil. The isolates were identified by morphology, colony characterization and microscopic studies and then compared with Bergy's manual of Bacteriology. Screening of most efficient microbial strains was done by investigated by using all the cultivated pure cultures of isolates. Pure cultures M1 and M5 being the most active strains were used for further studies.

Keywords: Lipase, detergent, wastewater treatment, dyeability, biofuel production, experimentation

ICST-24-104 Integrating Herbal Extracts for Extended Shelf Life in aquaculture

Ayesha Bibi, Imrana Amir

The shelf life is the duration in which food retains its original taste and texture, safe for use of human. Fish starts to deteriorate soon after few hours of harvesting due to oxidation, change in pH and microbial activities in flesh. Various process such as modified atmosphere process (MAP) and vacuum packaging (VP) have been used to reduce the microbial growth and oxidation reaction by removal of O₂ and CO₂ is added in MAP processing to decrease microbial growth. Most potent method to increase shelf life is to store the fish at -18C but due to ice crystal formation its muscle structure is destroyed. In addition, de-icing also requires time before cooking. Chemicals like sodium benzoate, potassium sorbate, lactic acid, acetic acid and ascorbic acid are used in spray form prior to store at freezing temperature of 4°C. Most impactful biological method is the use of lactic acid bacteria(LAB) to increase shelf life up to 12 days but LAB require standard conditions to grow and also produce antimicrobial compounds such as bacteriocins, lactic acid and hydrogen peroxide. Natural preservatives such as essential oils like clove oil, cinnamon oils and thyme oil are harnessed to increase fish shelf life. These methods besides destroying the taste and texture of fish also have some potential health risks. The aim of this review is to assess the available literature on shelf life of fish by using herbs such *taraxacum officinale*, *Urtica dioica*, and *Silybum marianum*. There is a need to use sustainable and biodegradable sources to increase shelf life of fish with potential antimicrobial and antioxidant properties.

Key words: shelf life, chemicals, preservation, lactic acid bacteria, Essential oils, Herbs

ICST-24-105 Biodiesel Production from Non-Edible Karanja Seeds by Soxhlet Apparatus Using Lipase as a Catalyst”

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In the recent years, the production of biofuels has become necessary due to the depletion of natural reserves of conventional fuel and increasing global climatic changes imposed by them. Biodiesel production is preferred to conventional fuel as it is renewable alternative, being less toxic and green technology to mitigate all the global environmental changes being caused by burning of conventional fuels i.e. petrol, diesel and natural gas. Biodiesel can be derived from edible plants but it compete with food sources and cause “food vs. fuel dispute”. To avoid these all disputes, non-edible crops like Karanja, Jatropha, rice bran and wild mustard has been greatly used as alternative feedstock for biodiesel production. Moreover, they are cost effective being cheap and are easily available. Karanja, (*Milletia pinnata*) perennial tree indigenous to Asia, is oil-rich seeded plant which favours it to be used for biodiesel production. In addition, Karanja plant can tolerate high salinity and drought conditions, so can be cultivated easily. Extraction of oils from seeds can be done by many methods like blending, thermal cracking, pyrolysis and micro

emulsions. But several disadvantages of conventional processes like high viscosity and poor engine performance led towards the development of more precised method which is transesterification where lipase is used as a catalyst. The extracted oils then converted to biodiesel via Soxhlet apparatus using methanol and n-hexane. The biodiesel with less emission of harmful gases and good engine performance can be produced from Karanja seeds by controlling several reaction parameters. The quality of biodiesel produced from these inexhaustible feedstock can be analyzed by different techniques like FTIR to further enhance the quality of biodiesel.

Keywords: Conventional fuels, global climatic changes, biodiesel, non-edible plant (Karanja), transesterification

ICST-24-106 Exploring Proteolytic Bacteria: Versatile Enzymes for Industrial and Environmental Applications

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Proteolytic bacteria yield proteases which are potent to hydrolyze the proteins. Proteases are obtained from animals (like calf stomach), plants (like fig, pineapple and papaya) and microbes. But the most commonly proteases are obtained from microbes because of large scale production, low cost and ability to work in different conditions. Various genera of proteolytic bacteria like *Bacillus*, *Staphylococcus*, *Pseudomonas*, *Flavobacterium*, and *Brevibacterium* have been traced in soil of hen hutch, deteriorating plant and animal proteinous materials, animal intestine and feces. The most common strain of proteolytic bacteria like *Bacillus subtilis* can tolerate high temperature about 60 to 70 °C and extreme pH, making well-suited for treatment of biological waste such as meat industry waste, dairy waste, poultry waste, agro-industrial waste and food industrial waste. *Bacillus subtilis* secretes proteases which degrades proteins present in biological waste into amino acids and smaller peptides, optimizing nutrient recycling and decreasing odors in waste management. Besides waste management treatment proteases are used in detergent industry to remove blood and curry stain from clothes, in degumming of silk, silver recovery and to dissolve blood clot. The aim of this review is to explore the available literature on proteolytic bacteria, highlighting the wide applications. There is a critical need to explore and develop sustainable, cost-effective microbiomes strains to address future challenges.

Key words: proteolytic bacteria, biological waste, *bacillus subtilus*, industrial applications, sustainable microbiomes

ICST-24-107 Nature's Antioxidants: The Potential of Medicinal Plants in Preventing Oxidative Stress and Chronic Diseases

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In recent times, there has been a rising interest in utilizing plant extracts, mainly because of their antioxidant properties and the positive impacts they have on human health. These properties of extracts are linked to the abundance of vitamins, minerals and various phenolic compounds found in plants. They serve as a natural therapeutic agent for diseases such as diabetes, cancer, heart disease, and neurological disorders. These diseases have been linked to free radicals' production. These free radicals, known for their high reactivity, trigger a chain of reactions resulting in cellular damage. Unfortunately, it is anticipated that the most widespread chronic diseases indicated above will significantly rise by 2023. The World Health Organization (WHO) reports that 80% of people worldwide get their primary health care from traditional medicine, and these antioxidant phytochemicals are a significant source of treatment for a variety of therapeutical purposes. For scientific advancements worldwide, plants have been investigated for their therapeutic properties due to their strong pharmacological effects, low toxicity, and economic viability. Important antioxidant-rich plants are moringa, pomegranate, asparagus, blueberries, green tea, ginger, ginkgo, and goji berries. Bioactive substances with strong antioxidant properties, such as polyphenols, anthocyanins, isoflavones, and flavonoids, such as quercetin and catechins, are found in these plants. The review highlights these plants' potential as important natural antioxidant sources with potential health benefits such as anti-cancer, antimicrobial, anti-diabetic, anti-obesity, anti-inflammatory, anti-asthmatic, hepatoprotective, and cardiovascular effects are a few of the many pharmacological activities that have been investigated for these plants.

Keywords: Medicinal plants, free radicals, antioxidants, bioactive substances, health benefits

ICST-24-108 Antifungal potential of isolated compounds from gallium tricornutum

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Superficial and cutaneous aspergillosis exclusively affects the outer auditory canal, nails, and the skin superficial layers. *Aspergillus niger* is a filamentous ascomycete fungus found throughout the environment and has been linked to opportunistic human illnesses. *A. niger* is also inexpensively significant as a fermentation bacterium that produces citric acid. *Aspergillus parasiticus* toxins can cause serious liver problems, hepatic malignancy, and developmental impairments in children and adults. *Galium tricornutum* is a species of the genus *Galium*, is found in northern Pakistan. Locally, it is utilized as a folk treatment for skin

infections, painful diseases, and as a diuretic in kidney ailments. The study was aimed to isolate and evaluate the antifungal properties of bioactive compounds from *Galium tricorneratum*. The plant was shade-dried, grinded into powder, and macerated in methanol for two weeks. The methanolic extract was concentrated using a rotary evaporator at 40°C. With the aid of thin layer and a column chromatography, caffeic acid compound was purified from methanolic fraction with solvent system i.e.; 6% ethyl acetate-n-hexane. Compound structure and antifungal research is ongoing. The investigative attempt might result in the discovery of natural anti-fungal substances from *Galium tricorneratum*.

Keywords: *Galium tricorneratum*, Secondary metabolites, Antifungal Activity

ICST-24-109 Iron And Zinc Oxide Co-Doped MXene Nanocomposite As A Peroxidase Mimic For Colorimetric Sensing Of Dopamine

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A material based on MXene has been found to be effective in binding enzyme and to have significant potential for use in biosensing application. MXene nanosheet are abundant in surface functional group and having high surface area which make it easier to modulate their ability to absorb biological material. Iron oxide is a material that is used as nanozymes for sensing and its properties can be improved by substituting specific metallic ion in interstitial site. Dopamine is fundamental neurotransmitter that is found in body tissues and fluids. This project shows the colorimetric techniques for dopamine detection depend on iron and zinc oxide co-doped MXene nanocomposites. The nanocomposites were characterized by Fourier transform infrared (FTIR) spectroscopy, X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM), Thermal gravimetric analysis (TGA), and Energy dispersive X-Ray analysis (EDX). With the use of UV-Vis spectroscopy, the characteristics peak at 318nm reveal the synthesis of iron and zinc co-doped MXene nanocomposites. The measurement of the peroxidase-like activity was done by colorimetric detection of dopamine with TMB as a substrate. According to this method, tetramethylbenzidine (TMB) is turn to blue-green when H₂O₂ oxidize it, and back to colorless when dopamine is added. This colorimetric development was detected by UV-Vis spectra and by human eye. This colorimetric method was also used for optimizing different parameters including pH, concentration of nanocomposites, concentration of TMB, concentration of hydrogen peroxide, time, and temperature through UV- spectra.

Keywords: MXene, Dopamine, sensing, parameters, iron and zinc oxide Nps.

ICST-24-110 Colorimetric Detection of Ascorbic Acid using Copper Oxide Nanoparticles Stabilized by Epichlorohydrin-crosslinked Chitosan

Nazish kanwal ¹ Dr.Amir badshah Dr.saeed khan Dr umar nishan

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.

ICST-24-111 Self Medication Of Non-Prescription Drugs In Urban And Rural Population Of Kohat, Pakistan

Mukhtar Ullah, Nauman Rahim khan, Shabnum nazir

Objective: This study was conducted to determine the prevalence and underlying factors influencing the self-medication practices of non-prescription based painkillers and antacids among the urban and rural populations of Kohat, Pakistan.

Method: The questionnaire primarily concentrated on demographic data, non-prescription self-medication habits, motivations for self-medication, sources of medicine supply, and knowledge and awareness of self-medication. Inferential statistics were applied using Fisher's Exact test and the Chi-Square test to explore relationships between variables.

Results: Out of 602 participants, our findings indicated a prevalence rate of (506) 84.05%, higher in male gender (n = 414) as compared to female (n = 188). The age group with marked self-medication was 21-30 years (n = 288). Moreover, the people having formal knowledge about self-medication exhibited self-medication behaviour upto 35.5%. Self-medication of Painkillers showed a prevalence of 79.44% while antacids followed with a prevalence of 16.28%. About 73.91% of the participants exhibited knowledge about the safety of self-medication while 26.09 % failed to do so. Mostly self-medication occurred due to previous success of the use of medicines and tablets and syrups was the frequently used dosage form for self-medication. The association between self-medication practices and participants' characteristics, such as gender, residence, and education level, was statistically significant, with a p-value of <0.005.

Conclusions: Self-medication by painkillers displayed higher prevalence, followed by antacids by rural and urban population while a significant percentage showing no awareness about possible side-effects or their management. The study recommends intervention by the concerned authorities to regulate the non-prescription drugs use and

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community programs focussing upon safe use of medications. A community pharmacist might play a significant role in this regard.

Keywords: Self Medication, Non-Prescription, Urban and Rural Population, painkillers.



