BOOK OF ABSTRACTS
First International Conference on Revamped Scientific Outlook of 21st Century
(RSO-21st Century, RWU)

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Prof. Dr. Anila Kamal
Vice Chancellor
Rawalpindi Women University, Rawalpindi

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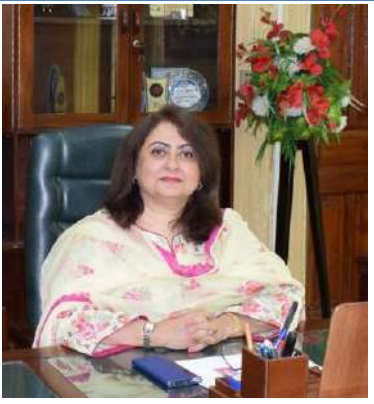
Message of Chief Organizer



Being a chief organizer and patron of The Rawalpindi Women. University, it is my great pleasure to welcome you all to the first International Conference, "Revamped Scientific Outlook of 21st Century." It is a matter of honor for me for joining this University as a first Vice Chancellor of the University since its establishment. The 70 years glorious history of old postgraduate college will definitely lead us to achieve higher ranks in academia and research in future. In this context, we feel honored to organize multidisciplinary conference and gather great minds from diverse fields of Botany, Chemistry, Mathematics and Zoology at one place to discuss their latest research findings and collaborate to solve the trials of the modern world together. This conference will certainly provide a platform to academicians, researchers, scientists, students and policy makers to discuss their recent work highlighting the global challenges and their solutions.

I fervently believe that this conference will not only promote research in the field of natural sciences, but also boost collaborations among the great minds of the academic fraternity in future. As scientific research is crucial to development of a country, I believe that academic institutions should encourage, support, and promote research culture and collaborations among all stakeholders so that not only we can address problems at national level but also be able to contribute in solving global challenges.

COVID-19 pandemic has shaken all the major economies and it has struck low-middle-income countries like Pakistan, drastically. Along with the challenges of the pandemic, recent unprecedented

flood in Pakistan have traumatized scientists, researchers, climate activists, and policy makers alike globally. Keeping the current challenges in mind, I encourage all participants to discuss the recent empirical work presented at the conference critically, as this is the high time to look for sustainable solutions to cope with the natural calamities.

The conference themes are aligned with The Rawalpindi Women University vision to enhance and strengthen interdisciplinary research and I am delighted to announce that scientists and researchers of international repute have shown interest in the conference as highlighted by the conference program.

I have full confidence that this international conference would not only provide the best opportunity for distinguished scholars to share their ideas but also the audience will benefit from listening to the great minds of our time.

Finally, I would like to thank distinguished keynote speakers, members of the scientific committee, sponsors, and participants for being part of this first conference, which will also be a guide post for such conferences in future.

Thank you

Prof. Dr. Anila Kamal
Vice Chancellor / Chief Organizer
Rawalpindi Women University

Message of Conference Organizer (Botany)

Glorification of knowledge associated with plants and allied organisms that lead to exploration of resources for the benefit of humanity. Department of Botany was established in 2019, the Department is privileged to have a faculty having excellence in academic and research skills. We are focusing on empowering our students with recent ideas, developments and innovative processes. This Conference is focusing on basic as well as applied fields of plant sciences like Plant Taxonomy and Systematics, Economic Botany, Nutraceutical, Environmental Biology, Molecular Biology, Plant Physiology, Tissue Culture, Anatomy and Agri-climatic Zones. We are proud to organize 1st International Conference on "Revamped Scientific Outlook of 21st Century" on 12th October, 2022.

Dr. Mamoona Munir
Head of the Department
Botany

Message of Conference Organizer (Chemistry)

The purpose of the international conference is to provide a forum for the top academic researchers, professionals, and academicians from all over the world to extend their collaboration in areas of shared interest during conference. The conference will serve as a platform for displaying and discussing the most recent developments, trends, and issues in the fields of chemical research, as well as the practical challenges they have faced and their solutions. The conference aims to give active researchers, both nationally and internationally, to exchange and discuss the most recent advancements in a variety of chemistry-related fields, such as advanced materials, green and environmental chemistry, nanomaterials and applications, sustainable energy, photo-catalysis, organic/inorganic, physical chemistry.

Dr. Naheed Kukab
Head of the Department
Chemistry

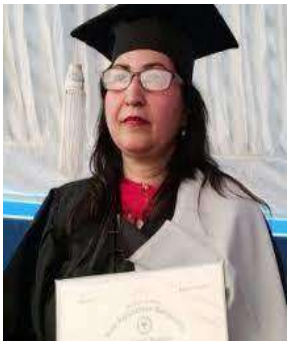
Message of Conference Organizer (Mathematics)

This conference aims to present a scientific picture of recent scientific developments in the field of Mathematics. The Mathematics Department of Rawalpindi Women University is providing opportunities for interested scholars to present their research, exchange ideas and nurture collaborations on computational mathematics, modelling and simulation, fluid dynamics, mathematical biology and pure mathematics.

The purpose here is to provide a platform to researchers from a wide variety of scientific areas with the common interest of finding applications of mathematics, especially in interdisciplinary fields.

Ms. Najma Rashid Mughal
Head of the Department
Mathematics

Message of Conference Organizer (Zoology)

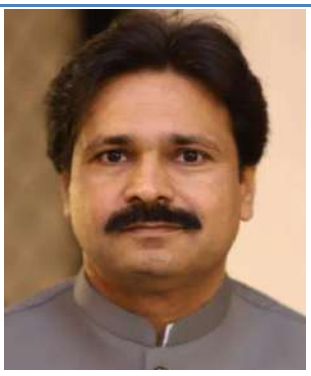


As a unique discipline in the field of Science, Zoology and its related disciplines such as Wildlife, Fisheries, Biochemistry, Biotechnology, Ecology, Animal Genetics and Health sciences are not only playing a fundamental role in changing the way nations live, interact, think to improve the economy, but also play an important role in the promotion of multidisciplinary research. To bring Zoologists from across the world to exchange their contributions and ideas for the growth and boosting of the nation we are holding the "1st International Conference of Revamped Scientific outlook of 21st Century".

I welcome all the delegates who have spared their precious time to share their research experience and outcomes at this forum. This event will boost the exposure and knowledge of our students and young researchers who will contribute to building the basis of national character and knowledge.

Dr. Shagufta Nighat
Head of the Department
Zoology

Preface

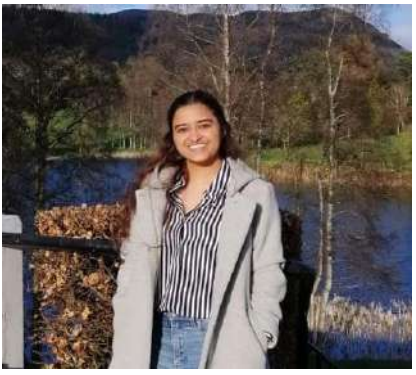


In the current scenario of increased population and industrialization, there is a dire need to address the issues of modern world through research. Towards expanding its engagements related to Research and Development, Rawalpindi Women University, Rawalpindi is going to organize the 1st International conference on "Revamped Scientific Outlook of 21st Century" (RSO-21st Century) on 12th October, 2022. The systematically designed conference themes will provide a wide array of professionals and students to come together with their visions for a better world. The diverse conference themes ranging from climate change to environmental hazards, pharmacology to fluid dynamics, biochemistry to photocatalysis, fresh water biology to wildlife management, cryptography to numerical analysis, and biodiversity to genetics sought collaborative efforts of all stakeholders at both national and international level. In this spirit, the conference organizers aim to brainstorm ideas and come up with solutions to minimize the adverse impact of various challenges of the modern world.

Our chief organizer, worthy Vice Chancellor of Rawalpindi Women University; Prof. Dr. Anila Kamal envisioned to organize multidisciplinary conferences and gathering great minds in one place to discuss their latest research findings and collaborate to solve the trials of the modern world together. The connections between researchers and academicians through this conference will open new avenues of research and development fostering benefit of mankind. We welcome all the participants and dignitaries to Rawalpindi Women University. We are also thankful to our sponsors specially PHEC, PASTIC, PSF, RaysTech, Alpha-genomics and Bestway cement for their support in making this event successful.

Dr. Motsim Billah
Conference Secretary

Acknowledgment



The current generation is witnessing the devastating impacts of climate change globally. Before COVID-19 pandemic halted socio-economic activities across the globe, catastrophic wild fires in both Australia and Amazon forests awaken the world leaders from their deep sleep and denial. However, the reality of climate change has hit us at home quite recently. Pakistan is among the least contributory nations in global warming but it is at the receiving end of the climate crisis. Leaders of the world are joining hands to deal with the cataphoric impacts of pandemics, climate change, and wars. It is with this spirit, that our worthy Vice Chancellor Prof. Dr. Anila Kamal has taken the initiative, first of many upcoming series of conference in the future, of multidisciplinary conference to discuss and brainstorm on the challenges of the world.

On behalf of the organizing team, i welcome and encourage all the participants and distinguished guests to utilize this platform to network, collaborate, and broaden their vision of interdisciplinary research. The conference organizing team is hoping that this one-day activity will engage the participants in active discussions that could help in devising policies at both national and international level.

Lastly, I appreciate the highly anticipated interest of our esteemed members of the scientific community and private sector in this conference which aims to establish and build linkages among all stakeholders to solve the challenges of the scientific research.

Enjoy the conference !

Dr. Rayna Sadia
Conference Secretary (Technical)

About PASTIC

Pakistan Scientific & Technological Information Centre (PASTIC) is a subsidiary organization of Pakistan Science Foundation (PSF), under the umbrella of Ministry of Science and Technology (MoST). PASTIC is a specialized premier organization in the field of S&T information handling and dissemination responsible for catering to information needs of R&D and industrial community across the country. The PASTIC National Centre is housed at Quaid-e-Azam University Campus, Islamabad having a network of 6 Sub-Centres at Karachi, Lahore, Peshawar, Quetta, Faisalabad and Muzaffarabad.

To begin with PASTIC supported research community across the country when S&T research infrastructure in Pakistan was at a nascent stage and provided facilities including supply of scientific and technical documents, abstracts and indexes, bibliographies, translations, patent information and patent indexes, science reference library service, technological information transfer service, dissemination of computer-based information services, reprographic and publication services.

OBJECTIVES

- National S&T/R&D Information Repository of indigenous information resources (databases)
- S&T/R&D information dissemination through contemporary reference information tools
- Strengthen National Science Reference Library for resource sharing & Inter-library collaborations (consortium) and empowerment of information professionals.
- Promotion of R&D based industrial development
- Facilitate printing of S&T/R&D Publications
- Capacity/skill development of researchers & entrepreneurs
- Develop collaborations with national and international information networks

ACTIVITIES/FUNCTIONS

PASTIC Online databases

- *Pakistan Science Abstracts (PSA):* National research published in Pakistani S & T Journals & Conference Proceedings etc.

— *PakCat:* Union online Public Access Catalogue (OPAC) of Books available in Science and technology Libraries of Pakistan.
— DSpace full text digital repository of indigenous S&T literature.
— *Database of R & D Projects* executed in Pakistan.
— *National Scientists Directory* (NSD)
— *Directory of Scientific Periodicals of Pakistan* (DSPP)
— Industry related databases.

S &T Publications

— *Technology Roundup:* Bi-monthly bulletin provides repackaging of latest global Trade and Technology information.
— *Union Catalogue:* Provide information on research materials (books/journals/conference proceedings/reports, etc) available in different S&T libraries of Pakistan.
— *Abstract Books of Conferences:* PASTIC support publication/printing of Abstract Books organized by various S&T universities (on request).

Promotion of Commercializable Technologies & Industrial Products

Organize STEM and IT Expo to promote local Research and Development, SMEs, technologies/products/services/industrial R&D challenges/issues as well as empowering youth and general public on new and faster ways of delivering and accessing information.

National Science Reference Library Facility

A state-of-the-art Traditional Library facilitating the researcher through following services: Reference & Referral Services; Reader Service; Internet Service, Journal Listings; Photocopying & Scanning Services.

Human Resource Development (Capacity Building)

Organize Seminars/Workshops /Trainings/ for capacity building of:

— Young Researchers on Data Analysis, Reference Management Tools (SPSS, EndNote, Mendeley) etc.
— Women Entrepreneurs on e-marketing and e business skills
— Library Professionals on Library Information Management Tools & techniques (Koha, D-space etc.)
— Researchers and entrepreneurs on Intellectual Property Rights, Media Information Literacy
— Scientific Community on latest health issues e.g., Breast cancer, COVID, Hepatitis etc.

Conference Schedule

Venue: Rawalpindi Women University, Rawalpindi

08:00 - 08:30	**Registrations**
08:30 - 08:45	Guests to be seated
08:45 - 09:00	Arrival of Chief Guest
09:00 - 10:30	**Inaugural Session**
09:00 - 09:05	Recitation from Holy Quran
09:05 - 09:10	National Anthem
09:10 - 09:20	**Welcome Address by** *Prof. Dr. Anila Kamal, VC, RWU, Rawalpindi*
09:20 - 09:30	**Keynote Address:** *Prof. Dr. Safia Ahmed, VC, SBBWU, Peshawar*
09:30 - 09:40	**Keynote Address:** *Prof. Zabta Khan Shinwari (TI, SI)* *UNESCO Laureate*
09:40 - 09:50	**Address by:** *Prof. Dr. M. Akram Shaikh, DG PASTIC*
09:50 - 10:00	**Remarks by:** *Prof. Dr. Shahid Mehmood Baig, Chairman PSF*
10:00 - 10:10	**Remarks by Chief Guest:** Prof. *Dr. Masoom Yasinzai (SI)* *Rector, IIU, Islamabad*
10:10 – 10:20	**Shields Distribution to the Chief Guest & Keynote Speakers by** *Prof. Dr. Anila Kamal VC, RWU, Rawalpindi*
10:20 - 10:25	Group Photo
10:25 - 11:00	**Tea Break**
11:00 - 01:00	**Parallel Sessions**
	Session IA: Botany (Fatima Hall)
	Session IB: Botany (CR201-Block A)
	Session IC: Chemistry (Webinar Room-Sheikh Rasheed Block)
	Session ID: Mathematics (Room 303-Sheikh Rasheed Block)
	Session IE: Zoology (Room 403-Sheikh Rasheed Block)

11:00 – 12:30	**Posters Display**
	Botany (Corridor-Block A)
	Chemistry (Gallery- Sheikh Rasheed Block)
	Zoology (Gallery 4th Floor- Sheikh Rasheed Block)
01:00 - 02:00	**Lunch & Prayer Break**
02:00 - 04:00	**Parallel Sessions**
	Session IIA: Botany (Fatima Hall)
	Session IIB: Chemistry (Webinar Room-Sheikh Rasheed Block)
	Session IIC: Mathematics (Room 303-Sheikh Rasheed Block)
	Session IID: Zoology (Room 403-Sheikh Rasheed Block)
04:00- 05:00	**Concluding Ceremony**
04:00 - 04:15	Concluding Remarks by *Prof. Dr. Habib Bukhari* *Vice Chancellor, Kohsar University, Murree*
04:15 - 04:30	Vote of Thanks by Chief Organizer: *Prof. Dr. Anila Kamal* *Vice Chancellor, The Rawalpindi Women University, Rawalpindi*
04:30- 04:45	Shield distribution
04:45 - 05:00	Tea for distinguished guests

Oral Presentations

Session IA: Botany (Fatima Hall) Themes: Microbiology, Biotechnology, Biocontrol, and Medicinal Plants **Time: 11:00am – 01:00 pm**	
Chair ***Dr. Muhammad Ramzan Khan***	*Principal Scientific Officer (NIGAB)*
Co-Chair ***Prof. Dr. M. Qasim Hayat***	*Associate Professor (NUST)*

Time	Keynote Talks
11:00 am - 11:19 am	**Preparing Energetic Herbarium (and other Museum) Specimens** Prof. Dr. Mary Barkworth. *(Utah State University)*
11:19 am - 11:34 am	**A Drift-Barrier Model Drives the Genomic Landscape of a Structured Bacterial Population** Prof. Dr. Gisèle Bronner (*University Clermont Auvergne, France)*

Time	Details of Oral Presentations
11:34 am- 11:43 am	**Assessment of Bioactive Metabolites for Antimicrobial and Antioxidant Activity using Indigenous Green Microalgae** Zahra, S. & Ali, M. I. *(Quaid-i-Azam University, Islamabad)*
11:43 am- 11:52 am	**Iron Oxide Nanoparticles can Improve the Growth of Peanut by Increasing Root Reduce Capacity Under Iron Deficiency Stress** Ali, H., Akhtar, S., Nayab, D., & Bangesh, N. (*UoG, Gujrat)*
11:52 am- 12:01 pm	**Cytotoxic and Antimicrobial Efficacy of *Alhagi maurorum*** Gilani, S., Bibi, Y. & Afzal, T. *(PMAS Arid Agriculture University, Rawalpindi)*
12:01 pm - 12:10 pm	**Conventional Folk Recipes and Ethnomedicinal Assessment of Shrubs in Tehsil Khairpur Tamewali, Punjab, Pakistan** Anwar, T., Asif, K., Qureshi, H., & Jamil, M. (*The Islamia University of Bahawalpur)*
12:10 pm - 12:19 pm	**Nickel stress on *Vigna radiata* and its Combat by using Plant Extracts** Akhtar, S., Shafqat, A., & Siddique, A. *(Minhaj University, Lahore)*
12:19 pm- 12:28 pm	**To mitigate the adverse effects of lead acetate on Brown Mustard (*Brassica juncea* L.) by foliar application of EDTA** Saman, R. U. *(Agriculture University Faisalabad)*

12:28 pm-12:36pm	***Pseudocaryopteris foetida*- A Potential Candidate Against Microbial Warfare** Afzal, T. Bibi, Y., Gilani, S.S., & Jabeen, A. (*PMAS Arid Agriculture University Rawalpindi)*
12:36 pm-01:00 pm	**Q & A session** Session Concluding Remarks by *Session Chair & Co-Chair* Shield & Certificate Distributions

Session IB: Botany (CR201-Block A) Themes: Forestry, Plant Pathology, Plant Ecology, and systematics **Time: 11:00 am – 01:00 pm**	
Chair ***Prof. Dr. Azra Yasmin***	*Chairperson / Dean, FJWU, Rawalpindi*
Co-Chair **Dr. Noshin Ilyas**	Associate Professor, PMAS AAU, Rawalpindi

Time	**Keynote Talk**
11:00 am - 11:14 am	**Salicylic Acid and *Cinnamomum verum* Enhance Resistance against Penicillium Rot of *Citrus reticulata Blanco* by Modulating the Expression of Defense Related Genes** Prof. Dr. Muhammad Naveed Aslam. *(IUB, Bahawalpur)*

Time	**Details of Oral Presentations**
11:14 am-11:24 am	**Morphological and Physico-chemical Changes Induced by Phytoplasma infection in *Brassica napus* Plant** Tanwir, S., Yaseen, S., & Ahmad, J. N. (*UAF, Faisalabad)*
11:24am-11:34 am	**Identification and diversification of mobile genetic elements in various plants genomes** Nouroz, F., Noreen, S., & Harisson, J. S. P. H. *(Hazara University, Mansehra)*
11:34 am-11:44 am	**Indigenous Utilization of Flora for Treating Cardiovascular Disorder by Local Community from Pattoki District Kasur** Shaheen, M., Harun, N., Arshad, F., Fatima, K., Shaheen, D., & Waheed, M. (*University of Okara)*
11:44 am-11:54 am	**Exploring physical characterization and different bio-applications of *Elagnus angusti* flora based nickel oxide nanoparticles** Abbasi, B. A., Iqbal, J., Yaseen, T., & Rehman, S. (*The Rawalpindi Women University, Rawalpindi)*

11:54am-12:04 pm	**Fuelwood Consumption Pattern and its Impacts on Forest Structure in District Bagh, Azad Jammu and Kashmir** Azad, B. *(University of Azad Jammu and Kashmir)*
12:04 pm-12:14 pm	**Comparative Studies on Antibacterial and Antifungal activities of Silver Nanoparticles synthesized by using Mint (*Mentha arvensis*) and Neem (*Azadirachta indica*) Leaves Extract** Saeed, J., Shahzadi, A., & Ashraf, M. A. *(University of Lahore)*
12:14 pm-12:24 pm	**Tissue Culture Optimization of *Fritillaria cirrhosa* D. Don Medicinal Plant from Azad Jammu and Kashmir** Akhtar, W., & Talib, S. *(University of Azad Jammu and Kashmir)*
12:24 pm-12:34 pm	**Digital Disease Mapping of Citrus Canker from Selected Citrus Orchards in Pothowar** Mehmood, A., Irshad, G., Zaman, Q., Raja, M.U., Zafar, N., & Akbar, T. *(PMAS Arid Agriculture University, Rawalpindi)*
12:34 pm-01:00 pm	**Q & A Session** Session Concluding Remarks by *Session Chair & Co-Chairs* Shield & certificate Distribution

Session IC: Chemistry (Webinar Room-Sheikh Rasheed Block)

Themes: Nanomaterials, Photocatalysis, Electrochemistry, & Renewable Energies

Time: 10:45 am - 12:45 pm

Chair ***Prof. Dr. Humaira Masood Siddiqui*** *QAU, Islamabad*
Co-Chair ***Prof. Dr. Sher Jamal Khan*** *IESE, NUST, Islamabad*

Time	Keynote Talks
11:00 am - 11:30 am	**On the Road to Computer Aided Drug Designing- A Travelogue** Prof. Dr. Farzana Latif Ansari. (Quaid-i-Azam University, Islamabad)
11:30 am - 11:43 am	**The Power of Chemistry: Some Personal Experiences** Prof. Dr. Jahangir Mirza (*York University, Toronto, Ont, Canada*)

Time	Details of Oral Presentations
11:43 am-11:51 am	**Development of an Ultra-Sensitive Enzyme-based Electrochemical Sensor for Urea Detection** Rafiq, K., & Hussain, K. *(The Islamia University of Bahawalpur-Bahawalnagar Campus)*

11:51 am - 11:59 am	**Development of Pd/Ba Nanoparticles (Pd/Ba-NPs@TiO_2) for Photocatalytic H_2 Generation from Water Splitting** Hussain, E., & Rafiq, K. *(The Islamia University of Bahawalpur-Bahawalnagar Campus)*
11:59 am- 12:07 pm	**Chromium (VI) Sorption by Layered Material** Faheem, L., Memon, S. Q., & Kazi, M. A. *(UoS, Jamshoro)*
12:07 pm - 12:15 pm	**Mechanically Robust and Highly Elastic Thermally Induced Shape Memory Polyurethane Based Composites for Smart and Sustainable Robotic Applications** Ahmad, N. (*Hazara University, Mansehra)*
12:15 pm - 12:23 pm	**Controlled synthesis of Co and Cu co-doped CdS@Phosphorous Doped g-C_3N_4 heterostructures** Khurshid, H., & Aamir, M. *(Mirpur University of Science and Technology (MUST), Mirpur*
12:23 pm- 12:31 pm	**Synthesis of Metal Halide Perovskites for Tunable Optical Properties** Nayab, F. & Aamir, M. *(Mirpur University of Science and Technology (MUST), Mirpur*
12:31 pm- 12:39 pm	**Turn-on Fluorescent Pyrene-based Probe for Highly Selective Detection of Trace Cr(III) in Aqueous Media for Live Cell imaging** Rasheed, L. (*University of Education, Attock Campus)*
12:39 -pm 12:47 pm	**Metal Halide Perovskites for Energy Conversion Applications** Aamir, M. (*Mirpur University of Science and Technology (MUST), Mirpur*
12:47 pm- 01:00 pm	**Q & A session** Session Concluding Remarks by *Session Chair & Co-Chairs* Shield & certificate Distribution

Session ID: Mathematics (Room 303-Sheikh Rasheed Block)
Themes: Fluid Dynamics, Computational Mathematics, Modeling and Simulations
Time: 11:00 am – 01:00 pm

Chair ***Prof. Dr. Tasawar Hayat***	*QAU, Islamabad*
Co-Chair ***Dr. Ahmed Zeeshan***	*IIU, Islamabad*

Time	Keynote Talk
11:00 am- 11:15 am	**Fundamental of Phase-field Models with its Applications in Science and Engineering** Prof. Dr. Abdullah Shah (*COMSATS University, Islamabad*)

Details of Oral Presentations	
11:15 am-11:30 am	**Multi Objective Convex Separable Programing and its Application to Portfolio Optimization Problem in Capital Market Structure** Shah, S., & Khan, I. U. (*COMSATS University, Abbottabad*)
11:30 am-11:45 am	**Transmission and Reflection of SV Waves at Micropolar Solid–liquid Interface with Dual-phase Lag Theory** Khan, A. A., & Tanveer, S. (*IIU, Islamabad*)
11:45 am-12:00 pm	**One-dimensional Optimal System of Lie Sub-Algebra and Analytic Solutions for a Liquid Film Fluid Flow** Jamil, B. (*Allama Iqbal Open University, Islamabad*)
12:00 pm-12:15 pm	**Subdomain Method for Solving Non-integer Order Differential and Integrodifferential Equations** Hussain, M., & Ahmed, N. (*HITEC University, Wah Cant.*)
12:15 pm-12:30 pm	**Thermo-fluidic Impact in Power Law Rheology with Mass Diffusion and Thermal Rates Including Hybrid Nanoparticles Simulated by Finite Element Approach** Saleem, S. (*King Khalid University, Kingdom of Saudi Arabia*)
12:30 pm-01:00 pm	**Q & A session** Session Concluding Remarks by *Session Chair & Co-Chairs* Shield & certificate Distribution

Session IE: Zoology (Room 403-Sheikh Rasheed Block) Themes: Microbiology, Environmental Biology, Marine Biology, Genetics **Time: 11:00 am – 01:00 pm**	
Chair	
Prof. Dr. Fariha Hasan	*Professor, Quaid-i-Azam University, Islamabad*
Co-Chair	
Dr. Naveeda Akhtar	*Associate Prof. Quaid-i-Azam University, Islamabad*

Time	Keynote Talks
11:00 am - 11:15 am	**Sperm Cryopreservation: Opportunities and Challenges for Zoologists** Prof. Dr. Shamim Akhtar. *(PMAS AAU, Rawalpindi)*
11:15 am - 11:30 am	**Biodegradation of Plastics: An Ecofriendly Waste Management Approach** Prof. Dr. M. Ishtiaq Ali *(Quaid-i-Azam University, Islamabad)*
Time	**Details of Oral Presentations**
11:30 am-11:40 am	**Distribution and Diversity Analysis of Finfish Species of Platycephalidae (flatheads) from Sonmiani Lagoon Waters Balochistan, Pakistan**

	Hawa, N., & Saher, N. U. (University of Karachi, Karachi)
11:40 am - 11:50am	**Shell Morphometry of Barnacles Species Chirona (Striatobalanus) Amaryllis (Darwin, 1854) Collected from Sonmiani Beach Balochistan, Pakistan** *Nasir, A., & Saher, N. U. (University of Karachi, Karachi)*
11:50 am- 12:00 pm	**Seasonal Variations in Microplastic Distribution in Sediments of Sandspit Backwaters Mangroves Area Karachi** *Shahwar, D. E., Ali, M., & Saher, N. U. (University of Karachi, Karachi)*
12:00 pm - 12:10 pm	**A Study on the Distribution and Shapes of Ossicles in the Muscles of Thymiosycia Arenicola (Holothuria: Echinodermata) Found along the Coast of Pakistan** *Ashfaq, N., & Saher, N. U. (University of Karachi, Karachi)*
12:10 pm - 12:20 pm	**Genetic Structure and Population Frequency Distribution in the Genus Metapenaeus Sp. (Penaeidae; Crustacea) Based on Isozyme Analysis** *Saher, N. U., & Noor, S. H. (University of Karachi, Karachi)*
12:20 pm- 12:30 pm	**A Novel Metabarcoded 18S Ribosomal DNA Sequencing Tool for the Detection of Plasmodium Species in Malaria Positive Patients** *Wahab, A., Hussain, M., & Khan, T.A. (KUST, Kohat)*
12:30 pm- 12:40 pm	**Genomic Characterization of ABC Transporter Gene Family in Tilapia Fish** *Mehboob, M., Hassan, F. U., & Rehman, M. S. U. (UAF)*
12:40 pm- 01:00 pm	**Q & A session** Session Concluding Remarks by *Session Chair & Co-Chairs* Shield & certificate Distribution

Session IIA: Botany (Fatima Hall) Themes: Plant Pathology, Tissue culture, Biotechnology, and Ethnobotany **Time: 02:00 pm – 04:00 pm**	
Chair	
Prof. Dr. Abida Akram	*PMAS - Arid Agriculture University, Rawalpindi*
Co-Chair	
Dr. Hassan Waseem	*MY University, Islamabad*

Time	Keynote Talk
02:00 pm - 02:15 pm	**Sustainable Use of Plant Biodiversity for Food, Health, and Energy Security in Pakistan** Prof. Dr. Mushtaq Ahmad. *(QAU, Islamabad)*

Time	Details of Oral Presentations
02:15 pm - 02:25 pm	**Microbiome Engineering and Soil Amendments for Sustainable Crop Improvement under Climatic change Scenario** Ilyas, N. (*PMAS Arid Agriculture University, Islamabad)*
02:25 pm - 02:35 pm	**Antioxidant and Antibacterial Activities of Plants used for Making Herbal Teas in District Haveli, Azad Kashmir, Pakistan** Shafi, H., & Mehmood, A. *(University of Poonch Rawalakot, Azad Kashmir)*
02:35 pm - 02:45 pm	**Current Trends in Ethnobotany and Antifungal profile of Selected Ethnomedicinal Plants of Tanawal area Pakistan** Bibi, F., Haroon, N., Nasir, M., & Kausar, R. *(Rawalpindi Women University, Rawalpindi)*
02:45 pm - 02:55 pm	**Curtaining Heavy Nitrogen Use by Integrated Nutrients Management Approach** Khan, R. A., Haider, S. I., Hayat, S., Hameed, A., & Ahmed, A. *(National Agricultural Research Centre, Islamabad)*
02:55 pm - 03:05 pm	**Characterization of *Pythium* and *Phytophthora* species associated with chili in the Pothwar Region of Pakistan** Mukhtar, T. *(PMAS Arid Agriculture University, Rawalpindi)*
03:05 pm - 03:15 pm	**Impact Assessment of Overgrazing Practices on the Socio-Economic Wellbeing of Rural Communities in Southern Punjab, Pakistan** Nazir, S., & Mehboob, S. (*UAF, Sub Campus Burewala)*
03:15 pm - 03:25 pm	**Evaluation of anatomical Diversity among some selected species of Family Apocynaceae: an experimental and in Silico approach** Shaheen, S., Naveed, Z., Khalid, S., Sonia, R., & Hanif, U. *(Lahore College for Women University, Lahore)*
03:25 pm - 03:35 pm	**Control of *Parthenium hysterophorus* by Aqueous Extract of *Anagalus arvensis*** Jabeen, N., Marium, R., & Javaid, A. (*Minhaj University, Lahore)*
03:35 pm - 04:00 pm	**Q & A session** Session Concluding Remarks by *Session Chair & Co-Chairs* Shield & certificate Distribution

Session IIB: Chemistry (Webinar Room-Sheikh Rasheed Block) Themes: Environmental Chemistry, Medicinal/Organic Chemistry, & Biomedical Applications **Time: 02:00 pm-04:00 pm**	
Chair **Prof. Dr. Naveed Janjua**	*Quaid-i-Azam University, Islamabad*
Co-Chair **Dr. Safeer Ahmed**	*Quaid-i-Azam University, Islamabad*

Time	Keynote Talk
02:00 pm - 02:15 pm	**Mxenes as Versatile Materials for Energy applications** Prof. Dr. Mudassir Iqbal *(NUST, Islamabad)*

Time	Details of Oral Presentations
02:15 pm - 02:25 pm	**Photoelectrochemical studies of PbO-ZnO Composite Thin Films Developed from {ZnPb(OAc)(TFA)$_3$(THF)$_2$}n Complex by AACVD for Water Splitting** Batool, M., Gill, R., Munawar, K., & Mazhar, M. *(Fatima Jinnah Women University, Rawalpindi)*
02:25 pm - 02:35 pm	**Low Temperature, Solution Processed Spinel $NiCo_2O_4$ Nanoparticles as Efficient Hole Transporting Material for Mesoscopic n-i-p Perovskite Solar Cells** Bashir, A. *(Fatima Jinnah Women University, Rawalpindi)*
02:35 pm - 02:45 pm	**Cellulose Based Hydrogels for Tissue Engineering Applications** Nazir, F. & Iqbal, M. *(Department of Chemistry, School of Natural Sciences, NUST, Islamabad)*
02:45 pm - 02:55 pm	**In vitro Evaluation of Phthalimideoxadiazole – Benzenesulfonamide Conjugates as Inhibitors of Dengue Virus Protease** Khan, B. & Hamdani, S. S. *(University of Azad Jammu and Kashmir)*
02:55 pm - 03:10 pm	**Synthesis, Characterization, In vitro Tissue-Nonspecific and Intestinal Alkaline Phosphatase Inhibition Assay as well as Docking Evaluation of 1,3-Thiazoles** Aziz, H., & Bhatti, A. S. *(RWU, Rawalpindi*)
03:10 pm - 03:20 pm	**Synthesis, Characterization and Mechanical Properties of Nacre Inspired Flame Retardant Multilayered Coatings** Batool, S., & Gill, R. (*RWU, Rawalpindi)*
03:20 pm - 03:30 pm	**One pot multicomponent synthesis of symmetrical bis-imidazole derivatives and their biological applications** Rafique, H., & Shehzadi, G. *(University of Gujrat, Gujrat)*
03:30 pm - 03:40 pm	**Albumin Binding and Anticancer Studies of trimethyl-, tributyl- and triphenylstannyl derivatives of Sodium deoxycholate** Shaheen, F. (*Allama Iqbal Open University, Islamabad)*
03:40 pm - 03:50 pm	**Fabrication of Molecular Imprinted Polymer based Sensors for the Early Detection of Lung Cancer Biomarkers** Asghar, N., & Mustafa, G. *(RWU, Rawalpindi)*
03:50 pm- 04:00 pm	**Q & A session** Session Concluding Remarks by *Session Chair & Co-Chairs* Shield & certificate Distribution

Session IIC: Mathematics (Room 303-Sheikh Rasheed Block) Mathematics Session II Themes: Numerical Analysis, Fluid Dynamics, Mathematical Biology **Time: 02:00 pm-04:00 pm**	
Chair	
Prof. Dr. Sohail Nadeem	*Quaid-i-Azam University, Islamabad*
Co-Chair	
Dr. Hina Sadaf	*College of EME, NUST, Islamabad*

Time	Keynote Talk
02:00 pm-02:15 pm	**Modeling and Simulation in Process Engineering and Computational Fluid Dynamic** Prof. Dr. Shamsul Qamar (*COMSATS University, Islamabad*)

Time	Details of Oral Presentations
02:15 pm-02:35 pm	**Multiple Solutions with Cattaneo-Christov Double Diffusion Model of Carreau Fluid Flow** Sardar, H., & Khan, M. *(RWU, Rawalpindi*)
02:35 pm-02:45 pm	**Cross Fluid Model Impact on Peristaltic Motion in the Presence of MHD and Viscous Dissipation Effects** Sadaf, H., & Ijaz, S. (*NUST, Islamabad*)
02:45 pm-03:00 pm	**Mixed Convective Flow of Jeffrey Nanofluid Over an Inclined Stretching Sheet** Malik, R., & Siddiqua, A. *(IIU, Islamabad)*
03:00pm-03:15 pm	**Analysis of Sensitivity of Thermal Conductivity and Variable Viscosity on Wall Heat Flux in Flow of Casson Fluid Over a Wedge** Zeeshan, A., & Farooq, M. U. *(IIU, Islamabad)*
03:15pm-03:30 pm	**Slip Flow of Couple Stress Casson Fluid with Cattaneo-Christov Heat Flux Model** Bibi, H., Rana, S., & Mehmood, R. *(University of Wah, Wah)*
03:30 pm-04:00 pm	**Q & A session** Session Concluding Remarks by *Session Chair & Co-Chairs* Shield & certificate Distribution

Session IID: Zoology (Room 403-Sheikh Rasheed Block) Themes: Biotechnology, Wildlife and Fisheries, Health Sciences **Time: 02:00 pm - 04:00 pm**	
Chair	
Dr. Ibrar Ahmed	*CEO Director, Alpha Genomics, Islamabad*
Co-Chair	
Dr. Farha Masood	*Assistant Prof., COMSATS University, Islamabad*

Time	Keynote Talks
02:00 pm - 02:10 pm	**Application of Natural Media for Isolation and Culturing of Oligodendrocyte Precursor Cells from Neonatal Quail Brain** Dr. Asghar Shabbir. *(COMSATS, Islamabad)*
02:10 pm - 02:20 pm	**Plankton Diversity in the High Throughput Era** Dr. Leocadio Blanco-Bercial *(BIOS, Bermuda)*

Time	Details of Oral Presentations
02:20 pm - 02:30 pm	**Role of Big Data in Health Care Industry: An Empirical Evidence from Pakistan** *Qaiser, T., & Fatima, I. (Riphah International University, Lahore Campus)*
02:30 pm - 02:40pm	**3D Structure Prediction of TANK Binding Kinase 1-Binding Protein 1 by Using Different Online Tools (I TASSER, Alpha Fold and Robetta)** *Sawal, H.A., Safdar, T., & Anees, L. (The Rawalpindi Women University, Rawalpindi)*
02:40 pm - 02:50 pm	**Protective Effect of N-Acetyl Cysteine Against Sodium Arsenite Induced Toxicity in Laboratory Mice** *Aziz, T., & Qureshi, I. Z. (Quaid-i-Azam University, Islamabad)*
02:50 pm - 03:00 pm	**Protective Effects of Tephrosia Lupinifolia dc. Against Cadmium Induced Renal Toxicity in Sprague Dawley Rats** *Rashid, U., Rahat, Z., Aslam, I., Jannat., & Mushtaq, S. (Quaid-i-Azam University, Islamabad)*
03:00 pm - 03:10 pm	**Identification of A Novel Homozygous Missense (c.443A>T:p.N148I) Mutation in*BBS2* in a Kashmiri Family with Bardet-Biedl Syndrome** Ali, G., Sadia., & Batool, S. A. U. (*University of Azad Jammu and Kashmir Muzaffarabad, Pakistan)*
03:10 pm - 03:20 pm	**Investigation of Mitochondrial Calcium Exchange in Ionomycin-Induced Neutrophil Degeneration** *Tariq, M., Ali, S. G., & Alam, M. R.(Quaid-i-Azam University, Islamabad)*
03:20 pm - 03:30 pm	**Iron Nanoparticles Inhibit Growth in High Altitude Endemic Murree Hills Frog (Nanorana Vicina)** *Maqbool, I., Rais, M., Iqbal, M. N., Naeem, S., & Gill, S. (PMAS Arid Agriculture University, Rawalpindi)*
03:30 pm - 03:40 pm	**First Record of Ampulex Compressa (Fabricius, 1781) (Hymenoptera: Ampulicidae) from Pothwar Region of Pakistan** *Fareen, A. G. E., Bodlah, M.A., Bodlah, I., & Rasheed, M.T. (PMAS Arid Agriculture University, Rawalpindi)*

03:40 pm - 03:50 pm	**Spatial Distribution of Malaria and its Vectors in Five Selected Districts of Khyber Pakhtunkhwa, Pakistan** *Noreen, S. & Gul, M.* *(Hazara University, Mansehra)*
03:50 pm - 04:00 pm	**Q & A session** Session Concluding Remarks by *Session Chair & Co-Chairs* Shield & certificate Distribution

Poster Presentations

(11:00 am - 12:30 pm)

Theme: Botany

Venue: Corridor- Block A

Judges	
Prof. Dr. Rehmatullah Qureshi	*Department of Botany, PMAS Arid Agriculture University, Rawalpindi*
Dr. Mubin Mustafa Kiyani	*Associate Professor, Shifa Tameer E Millat University, Islamabad*
Dr. Zaffar Hashmi	*Associate Professor, COMSATS University , Islamabad*
Dr. Yamin Bibi	*Assistant Professor, Department of Botany, PMAS Arid Agriculture University, Rawalpindi*

Code	Title
PBOT-01	**Evolutionary Descent of Different Bacteria from a Common Ancestor based on Bioinformatics Tools** Batool, S. Z., Rehman, M., & Khan, N. A. *(Abbottabad University of Science and Technology)*
PBOT-02	**Eco-friendly Approach to Utilize Nanoparticle along with Ascomycetes Fungal Strains to Enhance Lignin Degradation Process** Parveen, S., & Jamal, A. (*Quaid-i-Azam University, Islamabad)*
PBOT-03	**Ethnopharmacological Approach of Stinging nettle (*Urtica Dioica* L.) among the Local Inhabitants of District Rawalpindi, Province of Punjab, Pakistan** Kanwal, A., & Habib, D. *(RWU, Rawalpindi)*
PBOT-04	**Optimization of In-situ Biogas Up-gradation by CO_2 -to-CH_4 Bioconversion in Two Stage Attached Growth Reactor** Shah, W. A., Khan, A., Hamayat Ullah., & Badshah, M. *(Quaid-i-Azam University, Islamabad)*
PBOT-05	**Assessment of Antidepressant Potential of *Ziziphus nummularia* in Sprague Dawley Rats** Jan, S., Rashid, U., Khan, M. R., Bokhari, J., Ismail, H., & Mirza, B. *(Abasyn University, Islamabad)*
PBOT-06	**Study of Cytotoxic Activities of Different Fractions of *Periploca aphylla* Decne** Rashid, U., Khan, M. R., Bokhari, J., & Jan, S. *(Abasyn University, Islamabad)*

PBOT-07	**Physiological and Biochemical Response of Mutated M3 Cotton *(Gossypium hirsutum)* to Different Level of Salt Stress** Rana, U. S., Khan, M. A., Bilal, H., & Khan, A. *(UAF)*
PBOT-08	**Electro-chemical Activity and Diversity Profiling of Enriched Electricigens from Sewer Contaminated Soil Sediments in Dual Chamber Microbial fuel cell** Zafar, Z., Ayaz, K., & Ali, N. *(QAU, Islamabad)*
PBOT-09	**Comparison of Different Mobile Application of FJWU Flora Mall, Rawalpindi, Pakistan** Khan, L. A., Ilyas, H. B., Khan, L. A., Nayab, A., Safdar, N., Yasmin, A., & Iqbal, H. *(Fatima Jinnah Women University, Old Presidency, The Mall Rawalpindi)*
PBOT-10	**Novel Report of *Fusarium oxysporum* Causing Dry Rot of Carrot in Pakistan** Ghuffar, S., Riaz, M., Saeed, S., Abbas, W., Mehmood, N., Irshad, G., Sabtain, U., Hassan, Z., & Qayyum, A. (*Vegetable Research Station, Sahiwal)*
PBOT-11	**Elucidating the Role of Antioxidant Enzymes in Stripe Rust Resistant and Susceptible genotypes** Zainy., Fayyaz, M., & Farrakh, S. *(COMSATS University, Islamabad)*
PBOT-12	**Screening of Chilli Germplasm for Resistance to Bacterial Foliar Pathogens** Akhtar, S., Raja, M. U., Mukhtar, T., & Mehmood, R. *(PMAS-Arid Agriculture, Rawalpindi)*
PBOT-13	**New insights on Distribution and Molecular Characterization of Sugarcane Bacterial Diseases in Pakistan** Tasaddaq, S., Raja, M. U., Mukhtar, T., Zakria, M., & Farooq, M. A. *(PMAS-Arid Agriculture, Rawalpindi)*
PBOT-14	***Vigna radiata* Chromium Stress-Induced Oxidative burst & its Management by Indigenous Plant Extracts** Javaid, A., Akhtar, S., & Hassan, N. *(Minhaj University, Lahore)*
PBOT-15	**Development and Evaluation of Dry Powder Sachet Formulation from *Grewia asiatica* (Phalsa)** Ishtiaq, S. (*The Standard College for Girls, Sialkot)*
PBOT-16	**Treatment of Abbotair's Wastewater by Using Integrated Approach** Nauman, A., & Ahmed, M. *(QAU, Islamabad)*
PBOT-17	**Documentation of Traditionally used Medicinal Plants by Local Communities of District Okara** Riaz, A., Harun, N., Arshad, F., Fatima, K., Ijaz, R., & Waheed, M. (*University of Okara)*

PBOT-18	**Screening of Maize Hybrids and Lines against Stalk rot (*Fusarium verticillioides*)** Hasam, M., Masroor, A., Akhtar, S., Rasool, Z., & Ahmed, G. M. (*University of Agriculture Faisalabad, Sub-campus Burewala Vehari)*
PBOT-19	**Plant Disease Survey of Burewala, District Vehari** Asghar, S., Masroor, A., & Akhtar, S. (*University of Agriculture Faisalabad, Sub-campus Burewala Vehari)*
PBOT-20	**Assessment of Genetic Diversity Among Different Populations of Taxus baccata from Neelum Azad Kashmir, Pakistan**
	Akhtar, W., Qammar, K., & Munir, A. (University of Azad Jammu and Kashmir Muzaffarabad, Pakistan)

Theme: Chemistry

Venue: Gallery-Sheikh Rasheed Block

Time: 11:00 am -12:30pm

Poster Judges
Prof. Dr. Ishrat Jabeen *Department of Science, National University of Sciences and Technology (NUST), Islamabad*
Dr. Faroha Liaqat *Department of Chemistry, Quaid-i-Azam University, Islamabad*

Codes	Title
CHM-01	**A Facile Solution based Chemical Method to Fabricate Black titania (B-TIO_2)** Fatima, A., & Akhtar, J. *(Mirpur University of Science and Technology, Mirpur)*
CHM-02	**Niobium and Titanium doped Nickel rich $LiNi_{0.8-x}Co_{0.1}Mn_{0.1}O_2$ (x = 0.01, 0.1and 0.2) as efficient cathode materials for energy storage applications.** Ain, N. U., Rehman, Z. U., & Darr, J. A. *(The Rawalpindi Women University, Rawalpindi)*
CHM-03	**Synthesis of Cd^{2+}/ Ti^{3+} Doped Copper Oxide Nanostructured Material** Adeel, M. *(Mirpur University of Science & Technology, Mirpur)*
CHM-04	**Development of a Novel Electrochemical Sensor for the Sensitive Detection of Metanil Yellow using Square Wave Voltammetry** Noor, M., Rizwan, A., Munir, A., & Shah, A. *(RWU, Rawalpindi)*
CHM-05	**Prospects for Hydrogen in the Future Energy System** *Ain, N. U. (Quaid-i-Azam University, Islamabad)*

CHM-06	**Treatment of Rubber and Textile Processing Wastewater with Advance Oxidation Processes** Yasir, A., Rauf, A. A., Kausar, F., & Shamshad, J. *(The Rawalpindi Women University, Rawalpindi)*
CHM-07	**Saccharum munja Biochar Loaded with Hematite Nanomaterial for Remediation of Cadmium from Aqueous Media** Iqbal, T., Iqbal, S., & Batool, F. *(RWU, Rawalpindi)*
CHM-08	**Electrochemical Performance of Carbon Modified $LiNiPO_4$ as Li-Ion Battery Cathode: A Combined Experimental and Theoretical Study** Nasir, M. H., Janjua, N. K., & Santoki, J. *(RWU, Rawalpindi)*
CHM-09	**Deposition of ZnO Doped Thin Films by AACVD Method for Water Splitting Applications** Khan, H. K., Tahir, A. A., & Akhtar, J. *(RWU, Rawalpindi)*
CHM-10	**Enhanced Photo Catalytic Removal of Eosin Y and Methylene Blue by using TiO_2 / GO/ PA as Photo Catalyst** Afifa, R., Misbah, N., Azeema, M., & Afzal, S. *(RWU, Rawalpindi)*
CHM-11	**Study of Physicochemical Properties of Soft drinks and Energy drinks Available in Local Market of Lahore, Pakistan** Gul, I., Saleem, F., & Mehboob, S. (*Government Queen Mary Graduate College, Lahore)*
CHM-12	**Estimation of Vitamin c in Tropical and Stone Fruits by Comparative Analysis of Titration and UV- visible & FTIR** Aslam, A., Khurshid, A., Inayat, S., & Mehboob, S. *(Government Queen Mary Graduate College, Lahore)*
CHM-13	**Estimation of Daily Intake of Heavy Metals Pb, Cd, Cr, Cu through Food in Ravi Road and Manawan, Lahore, Pakistan** Sohail, Z., Mughal, A. J., & Mehmood, S. *(Government Queen Mary Graduate College, Lahore)*
CHM-14	**Comparative Study of Different Adulterants in Tetra-pack and Fresh Milk Samples Collected from West Lahore** Ahmed, A., Saeed, N., & Meh *Government Queen Mary Graduate College, Lahore)*
CHM-15	**A Comparative Analysis of Physico-chemical Parameters and Heavy Metals in Government Filter Water plants and Tap Water to Evaluate the Quality of Drinking Water in Three Residential areas Jallo More, Bhagbanpura, and Islampura in Lahore, Pakistan** Shahzad, K., Butt, Z. T., Ain, N. U., & Mehboob, S. *(Government Queen Mary Graduate College, Lahore)*

CHM-16	**Physiochemical Properties of Fluoride Toothpaste, Herbal Toothpaste in Comparative To Non Herbal Toothpaste and Analysis of Heavy Metal in Fluoride Toothpaste, Herbal and Non Herbal Toothpaste** Begum, F., Abbas, S., Inayat, S., & Mehboob, S. *(Government Queen Mary Graduate College, Lahore)*
CHM-17	**Determination of Alpha Tocopherol in Grains and Nuts by UV-VISIBLE Spectroscopy and FTIR Spectroscopy** Ayesha, S., Mehreen, A., & Saliha, M. *(Government Queen Mary Graduate College, Lahore)*
CHM-18	**Surface Modification of Composite Polyamide Nanofiltration (NF) membrane by Immobilizing Ag-doped TiO_2 Nanoparticles for Water Purification** Habib, Z., Khan, S. J., & Shahzad, H. M. A. *(The Rawalpindi Women University, Rawalpindi)*
CHM-19	**Noble Metal Doped rGo-ZnS Nanocomposites for Adsorption and Photocatalytic Degradation of Environmental Pollutants** Naeem, H., Bhatti, N. K., & Siddiq, M. *(The Rawalpindi Women University, Rawalpindi)*
CHM-20	**Evaluation of Toxic (Pd,Cd) and Essential (Cu, Cr) Heavy Metals in Foodstuff by AAS and their Health Risk Assessment in Manawan and Ravi Road, Lahore, Pakistan** Mughal, A. J., Inayat, S., & Mehboob, S. *(Government Queen Mary Graduate College, Lahore)*

Theme: Zoology

Venue: Gallery, 4th Floor-Sheikh Rasheed Block

Time: 11:00 am -12:30 pm

Poster Judges
Prof. Dr. Irfan Zia *Department of Zoology, Quaid-i-Azam University, Islamabad*
Dr. Tariq Mahmood *Department of Zoology, Wildlife and Fisheries, PMAS University of Arid Agriculture, Rawalpindi*
Dr. Muhammad Sajid Nadeem *Department of Zoology, Wildlife and Fisheries, PMAS University of Arid Agriculture, Rawalpindi*

Code	Title
ZOO-001	**Prevalence and Associated Risk Factors of Premenstrual Syndrome among Female Population of Peshawar City** *Sapna, Ejaz, R., Shamas, S., Nighat, S., Azam, A., Maqsood, I., & Qadeer, S.* *(The Rawalpindi Women University, Rawalpindi)*

ZOO-002	**Monthly Distribution of *Planilizasubviridis* (Perciformes, Mugilidae), Collected from Sonmiani Bay, Balochistan-Pakistan** *Musarrat-ul-Ain, Saher, N.U., Aziz, N., & Qureshi, N. A. (University of Karachi, Karachi)*
ZOO-003	**Analysis of SNP of Kisspeptin Gene in Diabetes Mellitus Type 2 Patients in District Gujrat, Punjab** *Israr-ud-Din, Shamas, S., Farooq, A., Ejaz, R., Roshan, S., & Nighat, S. (The Rawalpindi Women University, Rawalpindi)*
ZOO-004	**Removal of Antibiotic Resistant Bacteria and Associated Resistant Genes from Hospital Wastewater by Employing Strategic Optimization of 2-Phase Anaerobic Digestion Process** *Kiani, H. S., Ali, M. I., & Waseem, W. (Quaid-i-Azam University, Islamabad)*
ZOO-005	**Comparative Study of Liver and Kidney Functions in Broiler and Domestic Chicken (*Gallus gallusdomesticus*)** *Ambreen, F., Tahir, M., Bibi, R., & Sajid, H. (The Rawalpindi Women University, Rawalpindi)*
ZOO-006	**Autosomal Recessive Transmission of a Rare HOXC13 Variant Causes Pure Hair and Nail Ectodermal Dysplasia** *Mehmood, S., Raza, S. I., Bokhoven, H. V., & Ahmad, W. (Quaid-i-Azam Islamabad)*
ZOO-007	**Impact of Pro-Inflammatory Mediators on Agonist-Induced Platelet Aggregation** *Fatima, S., Shehwar, D., & Alam, M. R. (Quaid-i-Azam University Islamabad)*
ZOO-008	**Prevalence of Myopia in Young Females** *Imran, A., Shakeel, M., Bibi, M., Nayab, A., Masood, N., Yasmin, A., & Iqbal, H. (Fatima Jinnah Women University, Rawalpindi)*
ZOO-009	**Time Spent on Social Media by University Graduates** *Ajaz, A., Zulfiqar, M., Munawrah, Z., Nayab, A., Yasmin, A., & Iqbal, H. (Fatima Jinnah Women University, Rawalpindi)*
ZOO-010	**Prevalence and Risk Factors of Gestation Diabetes Mellitus in Twin Cities** *Satti, R. K., & Nayab, A. (Fatima Jinnah Women University, Rawalpindi)*
ZOO-011	**Habits of Junk vs. Healthy Food in University Graduates** *Abbasi, T. I., Nisar, K., Sheraz, A., Nayab, A., Yasmin, A., & Iqbal, H. (Fatima Jinnah Women University, Rawalpindi)*
ZOO-012	**Effect of COVID-19 Vaccination on Female Health** *Bibi, M., Zahra, S. A., Shahid, E., Nayab, A., Yasmin, A., & Iqbal, H. (Fatima Jinnah Women University, Rawalpindi)*

ZOO-013	**Morphological Appraisal of Acanthocephalan parasite *Polymorphus minutus* Infecting *Anas platyrhynchos*** *Sarwar, H., Wenting, Z., & Aslam, S. (The Rawalpindi Women University, Rawalpindi)*
ZOO-014	**Molecular and Genetic Analysis of Hotspot Exon (10) *GBA* Gene in Pakistani Families Affected with Gaucher's Disease** *Sattar, F., Hassan, S. W., & Gul, B.* *(University of Wah, Wah Cantt, Rawalpindi)*
ZOO-015	**De-sizing of Cotton Fabric with Amylase Produced by Indigenously Isolated *Bacillus Cereus*AS2s** *Rehman, A., Saeed, A., Rehman, M., Hayat, A., & Khan, I. (Abbottabad University of Science and Technology, Havelian, Abbottabad)*
ZOO-016	**Mitochondrial Transplantation Attenuates Ischemia-Reperfusion Injury** *Barki, S., khan, S., & Alam, M. R. (Quaid-i-Azam University, Islamabad)*
ZOO-017	**Expressional Alteration of MicroRNAs in Papillary Thyroid Carcinoma** *Baig, R. M., Kainat, N., Afzal, A., & Khan, R. (PMAS Arid Agricultural University, Rawalpindi)*
ZOO-018	**First Record of Trirogmacaerulea Westwood, 1841 (Hymenoptera: Ampulicidae) from Pothwar region of Pakistan** *Gull E Fareen, A., Bodlah, M. A., Bodlah, I., & Rasheed, M. T. (PMAS Arid Agriculture University, Rawalpindi)*

ABSTRACTS
OF
INVITED
KEYNOTE TALKS

Theme: Botany

Medical bioremediation: Prospects for the application of microbial catabolic enzymes for several major age-related diseases

Prof. Dr. Safia Ahmed

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Abstract−Age-Related Storage Diseases are caused by catabolic insufficiency of our indigenous lysosomal enzymes which are unable to break down certain recalcitrant compounds generated because of normal body processes. When these compounds cross a threshold level at old age results in disease conditions like atherosclerosis and Age-Related Macular Degeneration (AMD). Atherosclerosis is affiliated with the build-up of cholesterol and its oxidation products markedly 7-ketocholesterol (7-KC) in the arterial linings while AMD is caused due to the aggregation of lipofuscin material, mainly the pyridinium bisretinoid A2E and Cycloretinal (all-trans retinal dimer). Medical bioremediation is a unique strategy of targeting these pathogenic compounds with an exogenous enzyme of microbial origin.

Microbial strains were tested for biodegradation potential to biodegrade both bisretinoids and showed ability to biodegrade both A2E and Cycloretinal analysed visibly as well as by HPLC, ESI-MS and GCMS. β-Ionone and 2,4 dimethylbenzaldehyde were identified as major degradation products of Cycloretinal while β-ionone was identified as a major degradation product of A2E. 7-Ketocholesterol (7KC) is a major atherogenic compound causing atherosclerosis, which is a major contributor towards heart attack and stroke. Bacterial isolates, showing good catabolic activity towards 7-KC, were isolated using enrichment technique. Enzymes from these stains were cloned and produce for the application in bioremediation.

This research work provides the key initial findings that can pave the way towards execution of the aspiring proposal called enzymatic degradation of lipofuscins (A2E and Cycloretinal) and oxysterol (7-KC), a new strategy for the treatment of Age Related Maccular Degeneration (AMD) and atherosclerosis. These encouraging results suggest further work to design a drug delivery system targeted at lysosomal compartments that can work in vivo. This enzyme may become future first choice biotechnology therapeutics for this currently untreatable disease.

Keywords: Bioremediation, Application, Catabolic Enzymes, Age-related Diseases

Access to Scientific & Technological Information Services of PASTIC

Prof. Dr. Muhammad Akram Shaikh

Pakistan Scientific and Technological Information Centre (PASTIC), Islamabad
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Abstract−Information is an asset necessary for the development and prosperity of a society. It is an essential material required for making decisions from the government to the personal level. Development across all spheres (scientific and technological, industrial, social, economic) is dependent on access to S&T information and its sharing is an effective and empowering means of enabling progress and growth. In this regard it is essential to build a national capability for acquiring, processing and disseminating scientific and technical information.
Pakistan Scientific & Technological Information Center (PASTIC) realizing the need of time had adopted the modern techniques of information handling and dissemination for providing speedy access to all types of scientific and technological information. This talk will shed some light on the role of PASTIC, its services and S&T knowledge resources developed by PASTIC
Keywords: Scientific, Technological, Information Services, PASTIC

Drug Discovery; Interdisciplinary: Synthetic Biology as an Example

Prof. Dr. Zabta Khan Shinwari

UNESCO Laureate
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Abstract−Pakistan with 220 million people inhabiting about 796,000km2 space is a populated country. Being an agricultural country, Pakistan strives hard to alleviate poverty through its productivity and industrial development. In rural area health care system is still primitive and use of medicinal plants is a necessity. But due to rapid loss of floristic and cultural diversity, the plants are becoming rare and poor people are suffering. Our inherent strength of unani and traditional systems of medicine can be optimally utilized through biotechnological interventions. Realizing that the present century would greatly depend on medicines from plan-based systems, development of new molecules, drugs, prospecting of new genes and the whole field of pharmacogenomics is a mission. The real issue is: how does science cater to the poor? Misidentifications or adulteration of materials lead to reduced effectiveness of herbal products or accidental poisonings. Current research in the lab is focused on molecular barcoding of medicinal plants, therapeutic applications of medicinal plants, bio-synthesis of nanoparticles. Biotechnology is a bigger business in 21 st century. Genetically engineered business was 2% of American GDP in 2017. Pharmaceuticals and crops, contributing $137bn and $104bn respectively. Industrial biotechnology, is much less visible but more lucrative, worth $147bn.

Synthetic Biology is "Applying engineering principles to biological systems", because DNA synthesis technology has made "biology easier to engineer". This has already started changing everything. Now, it is a way of controlling flows of energy on every scale from that of the smallest living cell to that of the whole living planet. Internationally, this discipline is growing so fast that more than 300 teams from 42 countries took part in the annual International Genetically Engineered Machine (iGEM) competition there 2019 with 3500 participants. The synthetic biology is the ability to write new chemical messages on to fresh bits of tickertape, rather than just move nature's old messages from genome to genome. No longer limited by the genes they found in nature, biologists were able to get cells to work in whole new ways to reprogram them. This was made possible because of a) computer and internet revolution; b) the low price of DNA sequencing technology c) ability of synthesize compounds cheaply. Gene from a number of different organisms can be used to build new pathways, and making molecules beyond the reach of chemistry for less than the cost of harvesting them from plants, an example is that of artemisinin (malaria drug). Synthetic Biology may play a role in reprogramming cells to do helpful therapeutic things. Immune-system cells are the most obvious candidates, to help in overcome crises like corona virus. Possibilities of synthesizing cannabinoids and morphine. Cannabinoids with wide number of forms, some psychoactive, some therapeutic. A set of cannabinoid-synthesizing pathways offers therapeutic and recreational possibilities. Another 20-protein pathway capable of producing morphine and its relatives, developed by a company, Antheia. This will help to get cheaper pain relief, and also to make opiates that are less addictive. Companies are also developing products that mimic the taste and texture of meat. "Gene drives"—genetic systems which, seemingly paradoxically, use sexual transmission to spread sterility—offer a way that CRISPR technologies might be used to try to wipe out disease vectors, such as the species of mosquito that spread malaria.

Keywords: Unani medicine system, cannabinoid-synthesizing pathways, Gene drives, Genetically Engineered Machine

Preparing Energetic Herbarium (and other Museum) Specimens

Mary Barkworth

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Abstract−Herbarium and museum specimens are inanimate objects, carefully stored to ensure their preservation and continued value for research. They come alive, metaphorically, when used to help us understanding the world's biodiversity and its evolution and interactions, whether by demonstrating the increasing density of leaf venations over time or the relationship between leaf size and annual precipitation. Research biologists have welcomed innovative technology to help them learn more from old specimens. Today, digital technology challenges us to incorporate its use into the collection of new specimens, our research, and our teaching. Doing so can be challenging, but it is becoming easier. An excellent place to start learning to incorporate digital technology into biodiversity research is by learning to preparing "energetic specimens", specimens prepared in ways that conform to the higher standards required if they are to have their maximum value to one's own research and teaching and that of others. It also calls for development of new collaborations within and between institutions and individuals and new combinations of abilities by students and young faculty. For older and emeritus faculty, it means learning to understand how recent technologies, such as digital technology, can help their students contribute in ways that were impossible when they were in college. As an emeritus faculty member, I am envious of what is now possible but delighted for the resources and opportunities that digital technology makes possible, including for those for whom knowing and understanding the floristic diversity of a region is their passion.
Keywords: Energetic Herbarium, Specimens, Museum, Digital technology

A Drift-Barrier Model Drives the Genomic Landscape of a Structured Bacterial Population

Gisèle Bronner

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Abstract−Thanks to the development of increasingly powerful sequencing techniques (Roche 454, Illumina, PacBio), work devoted to the study of microbial diversity has undergone extraordinary development during the last decade through metagenomics and single cell genomics. Efficient high-throughput metagenomic data processing chains and genome-based environmental genomic studies now allows for the study of microbial populations and communities in the wild. This has led to a renewal of our view on how microbial assemblage evolve and interact

in aquatic environments. In this context, the analysis of 87 Single Amplified Genomes of co-occurring populations of the marine Prochlorococcus HLII ecotype, shed light on how bacterial populations differentiate over time and space through the reshaping of their pan-genome. However, the evolutionary processes that govern the pan-genome dynamics remain controversial.

Keywords: Drift-Barrier Model, Genomic Landscape, Bacterial Population, sequencing techniques

Salicylic Acid and *Cinnamomum verum* Enhance Resistance against Penicillium Rot of Citrus *reticulata Blanco* by Modulating the Expression of Defense Related Genes

Muhammad Naveed Aslam

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Abstract−*Penicillium digitatum* (green mold) and *Penicillium italicum* (blue mold) are threatening post-harvest pathogens of citrus fruit causing huge economic loss. In this study salicylic acid (SA) and *Cinnamomum verum* were tested to suppress the infection of *P. digitatum* and *P. italicum*. Methanolic extracts of five plants were tested in vitro for antifungal activity where *C. verum* exhibited the highest colony growth inhibition of green and blue mold, respectively. Moreover, during In Planta assay the combination of SA and *C. verum* caused the lowest disease incidence and severity of green and blue mold respectively compared to stand-alone treatments with no effect on fruit quality. Furthermore, an upregulation in the activity of peroxidase (POD), polyphenol oxidase (PPO), and phenylalanine ammonia lyase (PAL) encoding genes of citrus fruit was recorded during transcriptional profiling. The highest expression of defense genes was recorded in fruit treated with *C. verum* and SA in combination than healthy control. The spectrophotometric quantification of corresponding gene products also revealed similar results. The study unveils the fact that the increased expression of defense-related genes might be associated with the enhanced disease suppression. Conclusively, our results indicate that *C. verum* and SA in combination can suppress green and blue mold of Citrus by modulating the expression of defense genes. The combination of botanical extracts and resistance inducers is a safer alternate to chemicals for the suppression of green and blue mold.

Keywords: Salicylic acid, *Cinnamomum verum*, resistance, *Penicillium* rot of Citrus, *Reticulata Blanco*

Sustainable Use of Plant Biodiversity for Food, Health, and Energy Security in Pakistan

Mushtaq Ahmad*, Muhammad Zafar, Shazia Sultana

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Abstract−Energy, food and health are three important necessities of life. In current era due to fast climatic changes the energy, food and health security are important topics of discussion around the world and Pakistan particularly. Scientists in the World exploring alternative energy, food and health resources for sustainable development. Innovations and emerging technologies are the solution to find out sustainable utilization of plant diversity. Pakistan is host to three of the world biggest and most spectacular mountain ranges, the Himalaya, the Karakoram and the Hindukush (HKH). This project confined to explore the commercial products obtained from plant diversity which play an important role in socio-economic welfare and sustainable development of livelihood in Pakistan. This area is endowed with a great diversity of flora and fauna due to variations in altitude, rainfall, and climate. The native communities have centuries old knowledge about the plant resources utilization and depends upon directly or indirectly on these resources to meet their daily needs in the form of biomass energy, biofuels, nutraceuticlas, pharmaceuticlas, vegetables, fruits, medicines, wood, timber, fodder, nuts, honey, spices, food and many other NTFPs. Currently, biodiversity in this region is strongly influenced by dynamic climatic changes like rise in global temperature, pollution, fluctuation in rainfall, population pressure, agricultural expansion, deforestation, extensive livestock grazing, resource demand, and commercial timber extraction that intensify the rates of habitat loss, habitat degradation, and wildlife exploitation. Species richness and threats suggest that this area needs strong and prompt conservatory management of biodiversity. The study recommends the development of national parks, wildlife sanctuaries, botanical gardens and herbaria based on in-situ and ex-situ conservation strategies in Northern areas of Pakistan to protect regional biodiversity for global acceptance. Indeed, conservation of biodiversity is fundamental to achieving sustainable development in this area particularly and world generally. Maintaining biodiversity is not only crucial for the sustainability in agriculture, energy, forestry, fisheries, wildlife, tourism, health, irrigation and power sectors Pakistan, but is also lifeline for the downstream people in other parts of Pakistan.
Keywords: Sustainable, Plant Biodiversity, Food Security, Pakistan

Theme: Chemistry

On the Road to Computer Aided Drug Designing- A Travelogue

Prof. (R) Dr.Farzana Latif Ansari (TI)

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Abstract—Traditionally, drugs were discovered by synthesizing compounds in a time-consuming multi-step processes against a variety of in vivo biological screens. The promising candidates were investigated for their pharmacokinetic properties, metabolism and toxicity. Such a development process has resulted in high failure rates attributed to poor pharmacokinetics lack of efficacy, toxicity, adverse effects in humans and miscellaneous factors.

Today, the drug discovery process has changed profoundly by the adoption of computational methods helping the design of new drug candidates more rapidly and at lower costs. Computer aided drug designing (in silico drug design) consists of a collection of tools helping to make rational decisions at different steps of the drug discovery process, such as the identification of a disease target, the selection or the design of new lead compounds and their modification to obtain better affinities followed by their synthesis, pharmacokinetic and pharmacodynamic properties. Some interesting milestones reached during an excursion between the wet and dry labs will be shared.

Keywords: Glassy carbon electrodes, Urea hydrolysis, Biosensor

The Power of Chemistry: Some Personal Experiences

Jahangir Mirza, Ph. D. (Inorganic Chemistry)

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Abstract—In this study, we have modified glassy carbon electrodes (GCE) with amine groups (−NH2) to produce aminated GCE that can effectively detect current changes during urea hydrolysis. The silk fibroin (SF) scaffolds are employed to place enzyme near the surface of the aminated GCE. The as-fabricated electrode is employed for electrochemical urea sensing that could be monitored via cyclic voltammetry and amperometric techniques. Our developed biosensor has displayed rapid detection response (~1 min) and sensitivity (112.3 μA mM-1 cm-2) with linear correlation (0.3–8.4 mM) between the current and urea concentrations. Moreover, the analogous sensing responses obtained via SF scaffold discs (generated and functionalized) in the urease/SF/aminated GCE assuring the suitable platform for the urea sensing application devices.

Keywords: Glassy carbon electrodes, Urea hydrolysis, Biosensor

Mxenes as Versatile Materials for Energy applications

Prof. Dr. Mudassir Iqbal

Department of Chemistry, School of Natural Sciences, National University of Sciences & Technology (NUST)
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Abstract—In this study, we have modified glassy carbon electrodes (GCE) with amine groups (−NH2) to produce aminated GCE that can effectively detect current changes during urea hydrolysis. The silk fibroin (SF) scaffolds are employed to place enzyme near the surface of the aminated GCE. The as-fabricated electrode is employed for electrochemical urea sensing that could be monitored via cyclic voltammetry and amperometric techniques. Our developed biosensor has displayed rapid detection response (~1 min) and sensitivity (112.3 μA mM-1 cm-2) with linear correlation (0.3–8.4 mM) between the current and urea concentrations. Moreover, the analogous sensing responses obtained via SF scaffold discs (generated and functionalized) in the urease/SF/aminated GCE assuring the suitable platform for the urea sensing application devices.
Keywords: Glassy carbon electrodes, Urea hydrolysis, Biosensor

Theme: Mathematics

Modeling and Simulation in Process Engineering and Computational Fluid Dynamics

Shamsul Qamar

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Abstract- This talk gives a brief overview of mathematical models simulating chemical engineering processes and two-phase flows in computational fluid dynamics.
In the first part of the talk, we briefly introduce population balance modeling in chemical and biochemical engineering, especially its applications to crystallization processes and biological cells dynamics. In chemical and pharmaceutical industries, crystallization is used to produce solids from liquids. The process is capable to provide high purity products and offers a potential to adjust the operating conditions for achieving the desired product properties. To enhance the product quality and the process efficiency, it is essential to understand the process and the impact of process variables. The mathematical modeling of the process is helpful to achieve the desired goals and to investigate the effect of different operating conditions. This will be demonstrated by analyzing specific challenging crystallization processes. Furthermore, modeling and simulation of liquid chromatographic process is introduced. This separation process has a wide

range of industrial applications, e.g. to produce pharmaceuticals, food ingredients, and fine chemicals.
In the second part of the talk, we give a brief overview of mathematical models describing compressible two-phase flows. In two-phase flows two materials of different densities are mixed together. Such flows are encountered in various scientific and engineering fields related to environmental research, chemical engineering processes, nuclear energy and advanced heat transfer systems. The modeling and simulation of such flows are the most challenging tasks in computational fluid dynamics.
We summarize our current achievements and list possible future research directions relevant to these fields of research.

Fundamentals of Phase-Field Models with its Application in Science and Engineering

Abdullah Shah

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Abstract- In recent years, there are growing scientific interests in developing methods for studying the phase transition effects and interfacial dynamics in a mixture of different fluids. However, several physical properties like surface tension, nonlinearity, topological variations, density, and viscosity differences with discontinuous initial data make such flows difficult to solve analytically or numerically. From a mathematical point of view, such problems are called moving boundary or free surface flows where the sharp interface has varying behavior due to the physical properties of different fluids.
In my talk, I will review some of the numerical methods for simulating moving interface problems with an emphasis on phase-field methods. Simulation of some examples will be presented to illustrate its application in diverse field of science and engineering.

Theme: Zoology

Biodegradation of Plastics: An Ecofriendly Waste Management Approach

Muhammad Ishtiaq Ali

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Abstract—Plastics are high molecular weight polymers. Considering the increasing load in the environment, biodegradation of plastics by microorganisms and enzymes seems to be the most effective process. Oxidative enzymes play significant role in biodegradation of recalcitrant materials. Fungi are important among microorganisms for the production of extracellular enzymes. Limited production and slow release of the particular enzymes are the limiting factor. The study was aimed for enhanced production, molecular characterization of oxidoreductases for plastic biodegradation. Molecular examination as well as the heterologous expression of ligninolytic enzymes i.e. laccase and lignin peroxidase were carried out. These enzymes are mainly produced under nutrient starved condition i.e. carbon or nitrogen limited medium. Microscopic examination of these enzymes producing organism showed that they are filamentous, coenocytic, aseptate and spore producing organisms. An experiment was set up by adding the PVC polymer in the MSM media and inoculating the respective enzymes after screening and purification. The Fourier transform infrared (FTIR) spectroscopy and Scanning electron microscopy (SEM) results of enzyme treated plastic films revealed the structural changes as compared to control (without enzyme treatment). Enzyme assay of both enzymes such as laccase and lignin peroxidase were carried out with vertryl alcohol and DMP as substrates. Current study results suggested, that Microorganisms have the potential for biodegradability of recalcitrant plastic waste and can be used for bioremediation at large scale
Keywords: Biodegradability, Lignin peroxidase, FTIR

Sperm Cryopreservation: Opportunities and Challenges for Zoologists

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Abstract—Sperm cryopreservation enables long term preservation of male germ plasm for future use in assisted reproduction, like artificial insemination (AI) and in vitro embryo production /transfer across the species. The ultimate aim of sperm cryopreservation for AI is genetic improvement of farm animals, controlled/desired breeding of valuable pet breeds and conservation of endangered species. A lot of efforts have been made for genetic improvement of

dairy cattle through artificial insemination using cryopreserved semen. Therefore, protocols have been standardized for cattle and with some modifications for buffalo. Bull semen is actually the most studied sample for germplasm cryopreservation. Since zoologists deal with conservation of germplasm across the species, they have the opportunities of sperm cryopreservation across the species for sperm cryobanking for futuristic use in conservation breeding programs. In this context, fish sperm cryopreservation is of relevance for reducing inbreeding issues, genetic drift, synchronous breeding and transport of cryopreserved milt at distant hatcheries. However, fish sperm cryopreservation needs a lot of efforts for development of species-specific protocols. Amphibian and reptiles are most neglected group and many species of these groups are in danger of extinction. Conservation of amphibians and reptiles through gene banking is direly needed and Zoologists have the opportunity to work and develop sperm banks for conservation breeding programs. Avians and mammals are relatively well studied group, however many species need attention, specifically the endangered species and some breeds of livestock that are ignored due to excessive exploitation of commercially important breeds. All such avenues / opportunities and challenges for the Zoologists in the field of sperm cryopreservation will be discussed in the invited lecture.

Keywords: Sperm cryopreservation, Artificial insemination, Fish sperm, Endangered species

Plankton Diversity in the High Throughput Era

Leocadio Blanco-Bercial

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Abstract—One of the major difficulties when modeling any system are constraining the magnitude of the uncertainties. In oceanography, the uncertainties in the biogeochemical models regarding the planktonic contribution are significantly large. My research is focused on quantitatively investigating how diversity is responsible for a portion of those uncertainties, and identifying how the nature of the open ocean environment shapes diversity. Assessing diversity in the planktonic environment has historically been complicated and time-consuming, due to the high diversity and the tridimensional nature of the oceans. In the last few decades, high throughput systems are providing a wealth of data unrivaled by any research done up to this era. In this presentation, I will show how two sources of high-throughput data, molecular and semi-automated image techniques, are allowing us to deepen in our understanding of the interaction between diversity and open ocean function. To do so I will highlight two projects that show: 1) how the planktonic community is organized seasonally in the Sargasso Sea, how these communities respond to environmental parameters, and how this contributes to the regulation of the local biogeochemical cycles, especially to the biological pump, and 2) how the mesozooplankton community

respond to latitudinal gradients and associated variation in environmental conditions. I will finally give some examples of other applications of how high-throughput genomic data, which helps us understanding how plankton populations are connected in the ocean, how they are responding to the warming of the oceans, and how we could link these data to modeling efforts in the oceans.
Keywords: Biogeochemical cycles, Planktonic environment, Mesozooplankton

Application of Natural Media for Isolation and Culturing of Oligodendrocyte Precursor Cells from Neonatal Quail Brain

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Abstract—Oligodendrocytes are myelin forming cells in the central nervous system (CNS). They also provide metabolic support to neurons which they cover. Oligodendrocyte death leads to demyelination and hence myelin associated disorders like multiple sclerosis. *In vitro* studies, involving isolation and growth of oligodendrocyte precursor cells (OPCs) provide new insight related to neuron-oligodendrocyte interaction, demyelination, remyelination, proliferation and differentiation etc. In the present study we have used a new animal model and media to isolate and grow OPCs. The brains of newly hatched chicks of Japanese quails were used to isolate neuronal stem cells. These cells were then grown in media comprising of quail's egg yolk and glucose. After two weeks of growth, OPCs were isolated from mixed neuronal cell culture using orbital shaker after overnight centrifugation. OPCs separate from the mixture and were isolated for further growth. Isolated OPCs were then grown using different combinations of egg yolk and glucose. These cells converted into mature myelinating oligodendrocytes after two weeks of growth. Our findings confirm the successful application of natural media for OPCs isolation and growth which can potentially contribute towards future therapeutic approaches in neuroscience.
Keywords: Oligodendrocytes, Neuroscience, Neonatal quail brain

Theme: Botany

Assessment of Bioactive Metabolites for Antimicrobial and Antioxidant Activity Using Indigenous Green Microalgae

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Abstract—Antibiotics resistance is rising day by day. Microorganisms increased their resistance to antibiotics present in market which is a main health problem because antibiotics losing their effectiveness at an alarming rate. Treatment of infections caused by resistant microorganisms is quickly becoming one of world's biggest health-care concerns. Nature is the major medicinal source for treatment of broad range of diseases. With the beginning of 19th century, new approaches for discoveries of bioactive compounds started and these bioactive compounds are known as natural products. Microalgae present in nature are reservoir of natural source with huge importance which are not fully discovered until now, that makes way towards the discovery of natural products that have pharmaceutical importance. The aim is to discover bioactive metabolites and assessment of antimicrobial ability of bioactive metabolites from green microalgae *Closteriopsis acicularis* as well as investigation of biological activities like antioxidant, total phenolic content, and total flavonoid content. In this present study the test organisms' indigenous green microalgae were collected dried and grinded. The dried and grinded samples were treated with different solvents. The antimicrobial activity of crude extract of different solvents were tested against 6 ATCC pathogenic strains of bacteria *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Bacillus subtilis*, *E. coli*, *Salmonella enterica* and *Pseudomonas aeruginosa*, and 2 fungal strains *Candida albicans* and *Aspergillus niger* by agar well diffusion method. Ethanolic extract shows better results at a concentration of 1mg/ml, then through column chromatography purification of ethanolic extract was done and fractions were tested for antimicrobial activities. The Characterization for validation of pure compound was done by TLC, FTIR, GC MS and NMR. The compounds which were confirmed from this analysis were ester compounds which were responsible for antimicrobial and antioxidant activity.

Keywords: Microalgae, Metabolites, Antimicrobial, Antioxidant

Iron Oxide Nanoparticles can Improve the Growth of Peanut by Increasing Root Reduce Capacity under Iron Deficiency Stress

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Abstract—Iron deficiency is a widespread problem in plants, that leads to interveinal chlorosis. High pH and high bicarbonate ions in calcareous soils make iron physiologically unavailable to plants, despite its abundance in nature. Various methods are in practice to cope with the problem of iron deficiency in plants that are expensive and less effective. Nanotechnology has emerged as an innovative field with vast applications in different fields of life including agriculture, military, and medicine. Green synthesized iron oxide nanoparticles have the potential to reduce iron from Fe^{3+} to Fe^{2+}, hence making it available to plants. The present study demonstrated the effects of iron oxide nanoparticles (3mg/L, 25mg/L and 50 mg/L) on the alleviation of iron deficiency induced chlorosis in the peanut (*Arachis hypogaea* L.). Iron oxide nanoparticles were synthesized from *Eucalyptus globulus* L. leaves by green synthesis. At 298nm wavelength, UV-VIS spectroscopy indicated the formation of Iron oxide nanoparticles that were later confirmed by the FTIR analysis. Different concentration of nanoparticles in solution form improved the symptoms of iron deficiency as compared to control in hydroponics experiment. The root fresh and dry weight, shoot dry and fresh weight, root and shoot lengths enhanced with 50mg/L concentration ($p<0.05$). Changes in the physiological i.e., chlorophyll a (96% with 50 mg/L conc.) and biochemical parameters such as CAT, POD, SOD, POD, chlorophyll content, ferric reductase and active iron significantly increased as compared to control. SOD and POD showed 67% enhanced activity with 50mg/L Fe nanoparticles ($p<0.05$). Iron oxide nanoparticles with concentration 50mg/L proved most effective results. Genotype 15465 was resistant to Fe deficiency with highest roots reducing capacity at 4,8,10 and 14 days after iron deficiency.

Keywords: Iron deficiency**,** Peanut, Iron oxide nanoparticles, Roots reducing capacity

Cytotoxic and Antimicrobial Efficacy of *Alhagi maurorum*

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Abstract—Medicinal plants have long been studied due to their anticancer effects and use of them is commonly increased as a complementary and alternative medicine among patients with cancer. As drugs obtained from plants are cheap, safe to use, available without any difficulty, more effective, easy to store, and rarely have side effects. *Alhagi maurorum*, a member of family Fabaceae contained many secondary metabolites and used in folk medicines as laxative, purgative, diaphoretic, expectorant and diuretic. Extracts were prepared by cold maceration technique. Different extracts (Crude, Methanol, Ethyl acetate and n-Hexane) of *A. maurorum* from aerial part were screened for Total Phenolic, Tannins, Alkaloids content, Antibacterial, Antifungal and Cytotoxic activities. n-Hexane extract showed high TTC, TPC and TAC content. Cytotoxic properties were examined by Brine Shrimp Lethality Assay. Different concentrations (1000, 750, 500, 250, 100 and 50 µg/mL) of Methanol, Ethyl acetate and n-Hexane extract were tested against 10 nauplii. Cytotoxic activity was dose dependent. LD50 of following extracts was 381.40 ppm, 160.27 ppm and 385.72ppm respectively. The antimicrobial activity was determined against 4 pathogenic bacterial strains (*Staphylococcus aureus, Staphylococcus epidermidis, Escherichia coli, Pseudomonas sp.)* using Agar Well Diffusion Method. All extracts showed concentration dependent inhibition against tested strains. The maximum Zone of Inhibition was observed by Crude (11.3±1.1, 10.3±0.5) and ethyl acetate (10.3±0.5, 10±1.0) at 100µg/ml against *Staphylococcus aureus, Staphylococcus epidermidis* respectively. Antifungal action of Methanol,and n-Hexane,extracts (10, 25, 50µg/ml) were examined by Agar Tube Dilution method against *Fusarium* and *Alternaria sp.* At 50µg/ml highest percentage inhibition was observed by Methanol extract for both the strains i.e. 91.8% for *Alternaria sp.* and 80% for *Fusarium sp.* The present study revealed that *A. maurorum* carries powerful antimicrobial and remarkable cytotoxic activities, could be a potential source of antibiotics and anticancer compounds. This plant ought to be considered for additional phytochemical examination and pharmacological assessment.
Keywords: *Alhagi maurorum;* Cytotoxicity; Antimicrobial activity

Conventional Folk Recipes and Ethnomedicinal Assessment of Shrubs in Tehsil Khairpur Tamewali, Punjab, Pakistan

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Abstract—Folk medicinal recipes had played a significant role in the global population's healthcare system, especially in developing nations. For this purpose, an ethnomedicinal study of wild shrubs was conducted during September 2021 to May 2022 in Tehsil Khairpur Tamewali, Punjab, Pakistan. Data was collected using semi-structured questionnaire and Rapid Appraisal Approach (RAA) involving face to face interviews. A total of three hundred and four informants comprising of 43 women and 257 men were interviewed. During this study, shrubs were collected, identified and persevered. Twenty wild shrubs from ten plant families were collected for folk medicinal recipes. Mostly, shrubs were perennial. Shrubs belonging to plant families i.e., Fabaceae (25%) and Amaranthaceae (20%) were significantly dominant. In folk recipes, shrub leaves were most significant plant part used in in extractions. The highest value of Informant Consensus Factor (ICF) was calculated for cholesterol and heart diseases i.e., 0.99 and 0.98 respectively. The highest Use Value (UV) was determined for *Alhagi maurorum* and *Parkinsonia aculeata* i.e., 0.68 and 0.66 respectively. The highest Fidelity Level (FL) was calculated for *Alhagi maurorum* (68%) and *Parkinsonia aculeata* (66%) against cough and fever respectively which corresponds to the abundance of these two ailments in Tehsil Khairpur Tamewali. The highest Jaccard Index (JI) value was documented for tehsil Ahmadpur East (10.9), District Rahim Yar Khan (6.89), Pind Dand Khan (8.59), and Nigeria (1.13) which correspond to the similarity index with said areas. Following seven shrubs were identified with novel folk recepies viz. *Suaeda fruticosa, Withania somnifera, Aerva Javanica, Salsola imbricata, Caligonum polygonides, Crotalaria burhia* and *Camphorosma monospelica*. The current research would be beneficial for the isolation of innovative phytotherapeutic chemicals.

Keywords: Folk recepies, Ethnomedicinal, Plants, Phytotherapeutic, Questionnaire

Nickel Stress on *Vigna radiata* and its Combat by Using Plant Extracts

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Abstract—Mung bean ranks 3rd largest and an essential edible crop after wheat and rice. Unfortunately, in Pakistan mung bean yield is very low as compared to worldwide production. There are many biotic & abiotic factors which hampered the mung bean production one of the distractive abiotic factors is heavy metal stress such as "Nickel Chloride". In the present research work the impact of plant extracts (Neem, Java plum & Aloe vera extracts) on the growth of mung bean plant grown under the stress of nickel (Ni) was studied in pot experiment. The experiment was decided in five different sets. Set 1: Aloe vera gel extract (2%, 4%, 6%) + 350 mg kg-1 Ni, Set 2: Java plum leaf extract (2%, 4%, 6%) + 350 mg kg-1 Ni, Set 3: Neem leaf extract (2%, 4%, 6%) + 350 mgkg-1 Ni, Set 4: 30 ml of 350 mgkg-1 Ni (+ive control), Set 5: Negative control that received only tap water. Moreover, the experiment was comprised of eleven treatments having three replicates with completely randomized design. Different growth parameters such as plant height, root, shoot length and biomass (fresh & dry) were studied after 15 days of seed germination. Moreover, various physiological attributes such as total chlorophyl content (TCC) & reducing sugar (SUG) were studied. Furthermore, biochemical traits i.e., total protein content (TPC), catalase (CAT) and per oxidase (POX) activity were also studied. The result revealed that the soil amendments with neem extract at different concentrations (2, 4, 6%) significantly ($P \leq 0.05$) increased the growth of the mung bean plant as compared to the respective positive control (350 mg kg^{-1}) while applications of java plum exhibited negative impact on the growth of mung bean plant over negative and +ive control. Hence, neem extracts could be caused to minimize the toxic effect of nickel in soil. So far, further details studied are required in field level too for the better yield of mung bean plant.

Keywords: Heavy metal, Nickel, Mung bean, Stress, Plant Extract

To mitigate the adverse effects of Lead acetate on Brown Mustard (*Brassica juncea* L.) by Foliar Application of EDTA

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Abstract—Brown Mustard (*Brassica juncea* L.) is an edible-oil yielding crop that belongs to Brassicaceae family and is used for different commercial purposes. The species is valued highly because of its ability to store heavy metals like Lead (Pb), present in the polluted soil. Lead (Pb) toxicity imposes a number of morphological and biochemical changes in the plants being grown in Pb contaminated soils. The

effect of foliar application of 2.5 mM EDTA on two different crop varieties of *Brassica juncea* L., (Faisal as V1 and Rohi as V2), were studied with and without the treatment of 0.5 mM Lead acetate [Pb(C2H3O2)2]. Plants were grown in Sand-pot medium and were treated with Hoagland solution each week for two months. Statistical analysis revealed that Pb stress caused a considerable decrease in the overall biomass (56.2%), shoot and root length (21%), yield attributes (20.16%), chlorophyll content (35.3%), Total soluble proteins (12.9%) and Calcium (61.7%) and Potassium (40.9%) content of the plants as compared to the control plants. However, foliar application of EDTA ameliorated the adverse effects of lead in both varieties. EDTA improved the morphological attributes (67%), yield (29%), photosynthetic pigments (80%). Positive variations in the antioxidant's activity, ROS and contents of total free Amino acid, Anthocyanin, Flavonoids and Ascorbic acid even under Pb stress were very much prominent. It was deduced that application of EDTA had significantly redeemed the adverse effects of Pb. V1 exhibited much tolerance against Pb toxicity as compared to V2.
Keywords: Lead toxicity, Growth, *Brassica juncea* L., EDTA, Antioxidant activity, Biomass

Pseudocaryopteris foetida- A Potential Candidate Against Microbial Warfare

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Abstract—Medicinal plant species have significant contribution in pharmaceutical industries being producers of compounds utilized as precursors for drug development. The use of plant species in treatment of burns and infectious diseases is common in traditional medicine. The development of new antimicrobial agents against resistant pathogens is increasing interest. A plant species of Lamiaceae family; *P. foetida* had not been investigated for its anti-microbial potential. The preliminary phytochemical analysis of crude methanolic extracts and fractions of *P. foetida* leaves revealed that plant is rich in phenolic and flavonoid classes of secondary metabolites and tannins were detected in crude methanolic extract. Anti-bacterial and anti-fungal activity was tested using agar dilution technique and disc diffusion method respectively. The antibacterial potential of 5, 10 and 15 µg/ml Serial dilutions of plant extract and fractions of *P. foetida* was tested at four bacterial strains; *Escherichia coli*, *Staphylococcus aureus*, *S. epidermis* and *Klebsiella pneumonia*. Streptomycin sulphate (10 µg ml) used as positive control and methanol solvent (100 µg mlG) used as negative control. Similarly anti-fungal activity was tested against *Aspergillius flavus* and *Alternaria* alternate at same concentrations and plant samples. DMSO was taken as negative control while and fluconazole served as positive control. The maximum ZOI was of 34 and 33 mm was observed by crude extract at 15 µg/ ml against *S. aureus* and *E. coli* respectively. Dose-dependent inhibition of mycelial

growth was observed by all samples. While Crude extract showed 16 mm inhibition at 15 µg/ ml against *A. flavus* and 14 mm by n-hexane F. It is expected that significant anti-microbial activity of *P. feotida* can lead to the advanced research towards potent natural antibiotic discovery. Therefore, the isolation and characterization of antibacterial components will be highly advantageous.

Keywords: *Pseudocaryopteris foetida*, Antibacterial, Antifungal, Secondary metabolites, Fractions

Morphological and Physico-Chemical Changes Induced by Phytoplasma Infection in *Brassica napus* Plants

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Abstract—Phytoplasma has drastically affected economically important crops like *brassica napus*. Physiological changes and its related biochemical compounds produced upon phytoplasma infection in *brassica napus* plants remain unknown. The aim of this study was to find out the morphological and physico-chemical response of *brassica napus* plants against phytoplasma attack. In this study, phytoplasma was transmitted to brassica plants through grafting and insect vector, *Orosious orientalis.* In the present study change in morphology and physico-chemical attributes like chlorophyll a, chlorophyll b and total chlorophyll contents, the changes in total phenolic contents, total soluble proteins, H_2O_2 contents, peroxidase, (POD) and catalase (CAT) were analyzed in plants after phytoplasma attack. The data revealed that the phytoplasma attack results in small leaf size and stunted growth totally changed floral morphology and photosynthetic pigments like like chlorophyll a, b and total chlorophyll contents were reduced in brassica plants. The catalase, phenolics, amino acid, free protein and H_2O_2 contents were increased showing more susceptibility of brassica plants towards phytoplasma attack. More production of catalase and H_2O_2 contents and reduction of POD contents are important strategies to analyze severity of phytoplasma attack on brassica plants.

Keywords: *Brassica napus*, phytoplasma, *Orosious orientalis*, Floral morphology, Phenolics

Identification and Diversification of Mobile Genetic Elements in Various Plants Genomes

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Abstract—Mobile genetic elements (MGEs) or transposable elements (TEs) are the most abundant mobile elements actively proliferating in various genomes contributing to their genome size duplication, evolution, diversification, and plasticity. The current work focused on the identification, molecular characterization and diversification of MGEs in selected plant genomes using bioinformatics, molecular and cytogenetic techniques. Various MGEs belonging to different superfamilies were identified by using different softwares like LTR_Finder, LTR_STRUC, JDotter, MITE-Hunter and many others softwares. LTR retrotransposons like Copia, Gypsy, Non-LTR retrotransposons SINES and LINES predominated, while DNA transposons were represented by CACTA, hAT, Harbinger, Mariner, Mutator and MITEs superfamilies. The Helitron, Politron and Maverik elements were rarely observed in these plants. PCR amplification of reverse transcriptase (RT) of Retrotransposons and transposase (TNP) of DNA transposons revealed their distribution among various plants (Brassica, Banana) genomes, with some elements were found to be specie or genera specific, while others were mobilized by horizontal transfer. The fluorescent in situ hybridization (FISH) methodologies confirmed the random and variable distribution of these elements on chromosomes of various species. The evolutionary relationship of these elements resolved them into superfamily and family specific lineages, while others clustered together showing homology in their sequences. The results enabled the characterization, annotation, evolutionary dynamics and understanding of structural features of full length MGEs and their derivatives in *Brassica*, Banana, and Date palm genomes.

Key words: *Brassica*, Bioinformatics, Genome, Gypsy, DNA transposons, Evolution

Indigenous Utilization of Flora for Treating Cardiovascular Disorder by Local Community from Pattoki District Kasur

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Abstract—An ethnomedicinal study was carried out to document indigenous knowledge related to herbal remedies for the treatment of cardiovascular disorders by local inhabitants of Pattoki district Kasur. Data was collected from local inhabitants by conducting semi structured interviews. Different quantitative tools i.e Frequency Citation (FC), Relative Frequency of Citation (RFC), Use Value (UV), Relative Importance (RI), Family Importance Value (FIV), Family Use Value (FUV), Fidelity level (FL), Rank order priority (ROP), Relative popularity level (RPL) and Factor informant consensus (FIC) were applied on collected data. 71 informants were interviewed and overall, 86 plants belonging to 81 genera and 39 families were accounted as Poaceae was the predominant family with 10 species, leaves (44%) were the most commonly used parts of plant, indigenous plants were generally used as powder or decoction and were basically taken orally. The reported ailments were divided into 11 categories. RFC ranged from 3 to 65. Plant with highest UV was *Gossypium barbadense* (1.85714) while RI varied from 35 to 100. *Achyranthes aspera, Digera muricata, Eruca sativa, Azadirachta indica, Gallium aparine, Solanum nigrum, Fagonia indica*, *Conyza bonariensis, Chicorium intybus*, *Calotropis procera* with maximum FL (100%), were used against blood purification, heart attack and arteriosclerosis. The highest ROP reported (33.3) in *Digera muricata* L. and *Gallium aparine* L. for blood purification. These plants can be used to develop the drugs for cardiovascular disorders.

Keywords: Cardiovascular, Pakistan, Quantitative Ethnomedicine, Herbal remedies

Exploring Physical Characterization and Different Bio-Applications of *Elaeagnus angustifolia* Based Nickel Oxide Nanoparticles

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Abstract—*Elagnus angustiflora* (EA) mediated green chemistry route was used for the biofabrication of NiONPs without provision of additional surfactants and capping agents. The formation of NiONPs was confirmed using advanced different characterization techniques such as Scanning electron microscopy, UV,

Fourier transmission-infrared and RAMAN, energy dispersal spectroscopic and dynamic light scattering techniques. Further, different biological activities of EA-NiONPs were studied. Antibacterial activities were performed using five different bacterial strains using disc-diffusion assays and have shown significant results as compared to standard Oxytetracycline discs. Further, NiONPs exhibited excellent antifungal performance against different pathogenic fungal strains. The biocompatibility test was performed using human RBCs which further confirm that NiONPs are more biocompatible at the concentration of 7.51-31.25 µg/mL. The antioxidant activities of NiONPs were investigated using DPPH free radical scavenging assay. The NiONPs were demonstrated to have much better antioxidant potentials in terms of % DPPH scavenging (93.5%) and total antioxidant capacity (81%). Anticancer activity was also performed using HUH7 and HEP-G2 cancer cell lines and has shown significant potentials with IC_{50} values of 18.45 µg/ml and 14.84 µg/mL respectively. Further, the NiONPs were evaluated against *Lesihmania tropica* parasites and have shown strong antileishmanial potentials. The EA-NiONPs also showed excellent enzyme inhibition activities; protein kinase (19.4 mm) and alpha-amylase (51%). In conclusion, NiONPs have shown significant results against different biological assays. In future, we suggest various *in vivo* activities for EA-NiONPs using different animal models to further unveil the biological and biomedical potentials.
Keywords: *Elagnus angustiflora*, biofabrication, NiO nanoparticles, characterization techniques, biological activities

Fuelwood Consumption Pattern and its Impacts on Forest Structure in District Bagh, Azad Jammu and Kashmir

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Abstract—Fuelwood is the major source of energy for the rural Himalayan populations for the fulfillments of their fuel, fodder, livestock, cooking and heating requirements. Immense fuelwood extraction from the local forests has resulted in deterioration of forest structure as well as threatening the survival of important fuel wood species. The present study was carried out to estimate the demand, fuel wood consumption rates and to gain the information about preferred fuelwood species in upper and lower elevation villages of District Bagh Azad Jammu and Kashmir. The altitudinal range of the study area was 1250 m to 2630 m from subtropical to temperate type. Seven villages at the higher and lower elevation of District Bagh were surveyed to investigate summer and winter fuelwood consumption annually and per/capita/day consumption, family size, herd size, source of income and preferred fuelwood species. The weight survey method was used to estimate fuel wood quantity. Forest stands are surveyed by using standard phytosociological procedures to determine the impacts of fuel wood harvesting on natural forest structure and status of preferred fuel wood species. Deforestation intensity and regeneration status of the species were also

investigated. Population showed an average family size of about 7.57, herd size 3.28. Total average annual fuelwood consumption of District Bagh was 16.2 tons. Annual wood consumption at the higher and lower altitudinal villages was recorded as 18.355 and 10.78 tons annually. Per capita/day consumption was found to be 6.627 and 3.912 kg respectively with an average of 5.9 kg in the study area. The dominant species in the study area included *Pinus wallichiana*, Abies pindrow and *Quercus dilatata*. These three species had an average tree density value of 152.5 stems/ha, 118 stems/ha and 97.5 stems/ha. Average deforestation intensity recorded for these xiv species were recorded as 135.0 stumps/ha, 87 stumps/ha, and 67.5 stumps/ha. Similarly, the average regeneration density for these species was recorded as 27.1 seedlings/ha, zero number of seedling/ha and 17.5 seedlings/ha respectively. The average tree density for the whole forest stands was calculated to be 90.99 stems/ha. Due to over grazing and animal's trampling the regeneration rate was poor and maximum deforestation was recorded. Overall deforestation intensity for the forest stands had an average value of 72.018 stumps/ha whereas average seedling density was determined as 15.285 seedlings/ha. *Pinus wallichiana*, *Abies pindrow* and *Quercus dilatata* were highly exploited species which can leads to the loss of biodiversity and disturbance in the forest strata. In order to conserve the depleting forest strata, conservation policy should be applied at local and regional levels.

Keywords: Fuelwood, Forest, *Pinus wallichiana*, Forest Structure, Energy

Comparative Studies on Antibacterial and Antifungal Activities of Silver Nanoparticles Synthesized by Using Mint (*Mentha arvensis*) and Neem (*Azadirachta indica*) Leaves Extract

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Abstract—The present study was conducted to compare the anti-fungal and anti-bacterial activity of environmentally friendly biosynthetic silver nanoparticles from leaves extracts of *Azadirachta indica* and *Mentha arvensis*. Fine pieces of leaves of neem and mint were used to prepare aquatic decoction in 1L distilled water in separate flask. In each flask, 1mM $AgNO_3$ solution was mixed in each of the aqueous leaf extract of *A. Indica* and *M. arvensis* and stirred continuously at pH 7.0 at 25°C to 40°C until yellowish green color change into brown. Brown color is a strong indication of AgNPs biosynthesis. The Characteristics of AgNPs were studied, by five different techniques including UV-Vis spectrophotometer, an EDX, an XRD, FTIR, and a scanning electron microscope (SEM). The anti-fungal and anti-bacterial activities were determined by disc diffusion method. UV-Vis spectrophotometer confirm the synthesis AgNPs whereas EDX analysis

further confirm the purity of AgNPs. FTIR analysis provided the functional group of phytochemicals of plant extracts involved in reducing and stabilizing the AgNPs. By XRD analysis. The results of XRD analysis showed the crystalline nature of AgNPs, the size of nanoparticles was also estimated which was at the average of 24.21nm and 21.64nm of *Mentha arvensis* and *Azadirachta indica*, respectively, whereas the scanning electron microscopy (SEM) images represented the irregular shape and rectangular segments fused together from *Mentha arvensis* and *Azadirachta indica*, respectively. The comparison proved that *Azadirachta indica* mediated AgNPs have higher potential for anti-bacterial and anti-fungal activities than *Mentha arvensis* mediated AgNPs.
Keywords: Antibacterial, Antifungal activities, Nanoparticles, Mint, Neem, Leaf extract

Tissue Culture Optimization of *Fritillaria cirrhosa* D. Don Medicinal Plant from Azad Jammu and Kashmir

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Abstract—*Fritillaria cirrhosa* D. Don syn. *F. roylei* of Lillaceae family is primarily found in temperate regions of Northern hemisphere. In South Asia, it grows in Himalayan sub-alpine in range of 2800-4000m and is commonly known as 'parrhipayaz' or 'Ban payazi'. *F. cirrhosa* has anti-asthmatic, anti-microbial, anti-ulcer, anti-tussive, febrifuge, anti-viral, anti-hypertensive, haemostatic and skin soothing properties. *F. cirrhosa* is one of the eighteen species that are traded actively and demand is increasing while supply is rapidly declining. It is declared as critically endangered because of over-exploitation and unfavorable biotic and abiotic pressure, so its collection is banned in India, Nepal and China. Moreover, unfavorable biotic and abiotic conditions along with slow germination, low rate of viable bulbs growth and narrow growing season also reducing its natural populations. In Azad Jammu and Kashmir (AJK), its market value is 20,000–30,000 PKRs/kg. So, there is need to develop in vitro culturing protocol to help in future conservation trials in Pakistan. In the present work, among all the explants, bulb showed the highest callus response (80%) on MS media at 1.5mg/L BAP+0.4mg/L 2,4 D followed by leaf (50%) at 0.5mg/L BAP+0.5mg/L NAA and then stem (40%) at 1.5 mg/L BAP and 0.4 mg/L 2,4-D. MS media fortified with 2mg/L BAP and 0.5mg/L 2,4-D showed high regeneration from bulb and leaf explants. Bulb formation was observed to be enhanced at 1 mg/L BAP and 1 mg/L NAA. Plants shifted into potted soil under shady place showed same growth to field grown plant. This tissue culture developed system can be used for restoration of natural population from in vitro generated plantlets with improved or high regeneration rates.
Keywords: *F. cirrhosa* tissue culture, *in vitro* culture, Callogenesis, Regeneration, Bulb, Leaf, Stem explan

Digital Disease Mapping of Citrus Canker from Selected Citrus Orchards in Pothowar

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Abstract—Agriculture is one of the essential sectors for the survival of humankind. At the same time, digitalization touched across all the fields became easier to handle various difficult tasks. Adapting technology as well as digitalization is very crucial for the field of agriculture to benefit the farmer as well as the consumer. Due to adopting technology and regular monitoring, one can able to identify the diseases at the very initial stages and those can be eradicated to obtain a better yield of the crop. Crop growth and yield are essential aspects that influence the field of agriculture as well as farmer economically, socially, and in every possible way. So, it is necessary to have close monitoring at various stages of crop growth to identify the diseases at right time. But humans naked may not be sufficient and sometimes it would be misleading scenarios arise. In this aspect, automatic recognition and classification of various diseases of a specific crop are necessary for accurate identification. This thought gave inspiration for the present proposed framework. Pakistan confers with a broad range of agro-climatic positions, diverse from tropical to temperate, allowing 20 different types of fruits to grow. Citrus is an important fruit within the economically important family Rutaceae and is cultivated in Pakistan on 20.0461 thousand ha with an annual production of 2.29 million tons. The citrus production level in Pakistan is at the 16th level in the production of citrus around the world. Its production is decreasing after 2015 due to some serious Pre and Postharvest diseases. In 2016 CABI give a red alert to Pakistan on Citrus. One of the serious diseases that cause high losses in Citrus production is Citrus canker caused by gram-negative bacteria *Xanthomonas axonopodis*. Conventionally methods for plant disease diagnosis using hand lenses till to isolation lab techniques are laborious and not predictive for fungicidal application from time to time and make some treatment to control the diseases. By applying Artificial Intelligence and taking 4 to 5 thousand images of Citrus canker spots from different orchards from different plant parts fruit and leaves at a different location from pothowar. Then resize the images and retain images in a convolutional neural network (CNN) by using python as a computer language. A Model Citrus Fruits Detection (Multi Classification).ipynb (CFD) developed, detects the Citrus canker disease on Citrus Plant, and also detects and gives data about it that is it at the initial stage (Low Infection) or final stage (Severe Infection).

Keywords: Citrus, Citrus Canker, *Xanthomonas axonopodis*, Artificial Intelligence, CNN

Microbiome Engineering and Soil Amendments for Sustainable Crop Improvement under Climatic Change Scenario

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Abstract—Soil microbial diversity is a key indicator of soil health and fertility. The main drivers of soil ecosystems include plant and soil type, and environmental conditions govern all factors. There is a dire need to explore beneficial microbial responses for managing the risks to sustainable agriculture in an environment threatened by climate change. Soil is a limited resource, and environmental stresses decrease agricultural productivity day by day. To check the effect of environmental stresses like drought, salinity, and heavy metal on soil microbial biodiversity and testing the efficacy of tolerant Plant Growth Promoting Rhizobacteria alone and in combination with effective soil amendment techniques for improving plant growth under predicted abiotic stresses of climatic change. Experiments were conducted to isolate and characterize stress-tolerant Rhizobacteria and to check their stress mitigation potential. Modified plant biomasses like compost, biochar, and bio-organic fertilizer were used as soil amendments techniques. Various morphological, physiological, biochemical, growth and productivity parameters were studied. Microbial strains were isolated from the stressed region. The identification of isolated microbial strains was carried out by physiochemical and 16s rDNA sequencing and phylogenetic analysis. Stress tolerance and different plant growth-promoting traits of isolated strains were evaluated under normal and stress conditions. Inoculation of seeds with PGPR along with compost, biochar, and bio-organic fertilizer improved all growth and productivity parameters, increased nutrient status, and improved osmolyte production and hence helping the survival and growth under stress conditions. Microorganisms have a variety of evolutionary adaptations and physiological acclimation mechanisms that allow them to survive and remain active in the face of environmental stress. Building our understanding of the interdependence of microorganism communities, ecological pressures, and plant responses will be necessary for understanding climatic effects on soil health and plant growth. Our new understanding of microbial diversity in response to environmental stresses will allow us to cure and conserve our environment and grow more food.

Keywords: Soil microbes, Diversity, PGPR, Crop improvement

Antioxidant and Antibacterial Activity of Plants used for Making Herbal Teas in District Haveli, Azad Kashmir, Pakistan

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Abstract—Herbal tea has been consumed for centuries due to its health advantages and delicious flavor. Herbal tea is basically an herbal mixture prepared from leaves, seeds or roots of several plants. The objective of the study was to measure the antioxidant and antimicrobial activity of *Berginia ciliata, Calamus rotang, Mentha arvensis, Polygonum viviparum*, and *Thymus linearis*, commonly used herbal plants for making herbal tea in District Haveli, Azad Kashmir. Total phenolic content (TPC) and total flavonoid content (TFC) were calculated in phytochemical analysis. Antioxidant activity was measured using the 2, 2-diphenyl-1-picrylhydrazyl (DPPH) free radical scavenging assay, hydrogen peroxide (H2O2) assay, and reducing power assay. The disc diffusion method was used to determine antibacterial activity against gram-positive and gram-negative microorganisms. The phytochemical analysis showed highest TPC in extract of C. rotang (354.12±1.65 mg GAE/g) followed by *B. ciliata, M. arvensis, T. linearis* and *P. viviparum*, respectively. Highest TFC were found in M. arvensis (162.8±1.50 mg QE/g) extract obtained by decoction. The extract obtained by decoction method of P. viviparum showed highest antioxidant activity with the lowest IC 50 value (27.19 µg/ mL) against DPPH. Against H2O2, the extract obtained by maceration method of *Thymus linearis* showed highest antioxidant activity by the IC 50 value of 26.81 µg/mL. In reducing power assay, the extract obtained by maceration method of *Polygonum viviparum* showed highest activity with the IC 50 value of (62.70 µg/mL) as compared to decoction process. The maximum antibacterial activity (16.67±0.88 mm) was shown by extract of M. arvensis obtained through maceration process against Pseudomonas aeruginosa as compared to Staphylococcus aureus. The study established that the biological activity of herbal teas might be used for curing of various infectious diseases.
Keywords: Herbal teas; Antibacterial activity; Antioxidant activity

Current Trends in Ethnobotany and Antifungal Profile of Selected Ethnomedicinal Plants of Tanawal Area Pakistan

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Abstract—The disclosure of the ethnobotanical plants is a necessitous to appraise their beneficial prospective and it can point to the seclusion of new bio-operative compounds. This survey has been concerted on the valuation of ethno medicinal

attribute of 45 ethnomedicianal plants and antifungal effects of 8 most popular plants in practice by the people of Tanawal, Pakistan. As so far there is no data regarding this aspect about Tanawal area of Himalayas. Questionnaire was developed to interview of locals of different age belonging to different cultural groups regarding ethno botanical information through conversation. Photography of plants has been done for easy identification and to show real habitat and on the basis of highest U.V the Antifungal activity was conducted against *Fusarium* and *Helminthosporium*. The agar tube dilution method was used for antifungal activity of extracts as reported by Choudhary et al. Test samples (methanolic extract, Ethanolic and n-Hexane) for antifungal assay were prepared from stock solution (20mg/1ml DMSO). Media for fungus was prepared by dissolving SDA (MERCK) (6.5 g/100 ml) in distilled water. The people employed leaves, whole fresh herb and flowers in most of their recipes. Healers mostly treat gastrointestinal ailments using herbs. The extracts of *Olea ferruginea* L., *Schinus molle* L., Nerium oleander L. were vigorous against tested fungal strains (22.3, 20.5, 19.8 zone of fungal growth) while *Celtis australis* L. *Zizyphus nummularia* also shown the remarkable activity. Thus all species are of having great ethno medicinally significance and popular among the area and exhibit a great potency to show the antifungal activities (39--19.8 cm) in them.

Keywords: Medicinal plants, Tanawal, Ethnobotany, Antifungal profile

Curtaining Heavy Nitrogen use by Integrated Nutrients Management Approach

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Abstract—Nitrogen (N) is the most important plant nutrient and prerequisite for photosynthesis on planet Earth. Though 78 % of atmosphere is made up of N, plant production depends on the limit N exists in soil and ecosystem, being the latter N form as non-reactive. The Haber-Bosch process makes it possible to convert this non-reactive N into reactive form. Urea fertilizer (46% N) as the main N input by this process. Crop yields and fertilizer application typically show a strong positive relationship. However, having low use efficiency (27 %) couple with subsidy by Govt, heavy application of urea opens several ecological and environmental issues like GHG, NO3 contamination of ground water. With 112 Kg Pakistan ranks 4th heavy N using country in the world. Integrated Nutrients Management approached aims at neutralizing heavy N use by balance use of fertilizer so that environmental footprints can be minimized with concurrent increase in crop productivity

Keywords: Nitrogen, Balance, Integrated Nutrients Management, Contamination

Characterization of *Pythium* and *Phytophthora* Species Associated with Chili in the Pothwar Region of Pakistan

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Abstract—An overall incidence of 14.08% of *Pythium* damping off was recorded on chili in the Pothwar region of the Punjab province of Pakistan. Attock showed the maximum incidence of 19.86% followed by Rawalpindi and Chakwal districts having 16.22% and 10.22% disease incidences respectively. Jhelum had the minimum disease incidence of 10.05%. Disease severity was the maximum in district Attock (11.03%) followed by Rawalpindi (9.11%) and was the minimum in Chakwal (5.42%) followed by Jhelum (5.67%). In case of Phytophthora blight, the overall incidence on chili was found to be 14.46%. Incidence was found to be higher in Rawalpindi (18.44%) followed by Attock, Jhelum and Chakwal, where the incidences of the disease were 16.52%, 12.66% and 10.23% respectively. Disease severity was the maximum in Rawalpindi (6.63%) followed by Attock (6.12%) and was the minimum in Jhelum (3.69%) followed by Chakwal (3.54%). In total, 39 isolates of *Pythium* from chili were recovered in Pothwar. All the isolates showed variations in different morphological parameters and were confirmed to be *Pythium aphanidermatum* and *P. ultimum*. Out of 39 isolates of Pythium spp. from chili, 8% were highly virulent, 18% virulent, 36% moderately virulent and 38% were nonpathogenic. In case of Phytophthora, a total of 36 isolates from chili were recovered. All the isolates showed variations in various morphological characteristics and were recognized as *Phytophthora infestans* and P. capsici. All the isolates of *Pythium* and *Phytophthora spp*. produced bands of 800 bp with ITS1 and ITS universal primers respectively and were confirmed to be *Pythium* and *Phytophthora spp*. The phylogenetic analysis showed close relationship among all the isolates. The finding of these studies will be helpful for the farmers in designing control strategies for these two pathogens accordingly. The information will also be useful for the breeders to develop resistant varieties of chili against the most virulent isolates of the pathogen.
Keywords: *Pythium*, *Phytophthora*, Chili, Pothwar region

Impact Assessment of Overgrazing Practices on the Socio-Economic Wellbeing of Rural Communities in Southern Punjab, Pakistan

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Abstract—Ranges are very important natural resources for livestock production in developing countries including Pakistan. The majority of the rural herders in remote rural areas of the country rely upon livestock grazing on range vegetation in order to sustain their livelihood. However, overgrazing practices have put negative externalities on renewable resources. Keeping in view the importance of

range lands for the sustainable livelihood of rural inhabitants, this study, therefore, has been conducted to assess the impact of overgrazing practices on the socio-economic wellbeing of rural communities in Southern, Punjab Pakistan. District Jhang was selected purposively. Tehsil and subsequent union councils were selected randomly. A sample of 120 herders was interviewed using the snowball sampling technique. For data collection, a structured interview schedule was developed in accordance with the research objectives. The collected data were subject to analysis by using Statistical Package for Social Sciences (SPSS). The results indicated that the majority of the sampled population, 97% were linked with grazing practices as the primary source of their livelihood. 59.0%, 55.0%, and 62.0% were illiterate in large, medium, and small herder categories respectively. 45% of herders had their own land, whereas 30% were landless and about 25% were tenants. It has been observed that the source of feeding for livestock in range lands was natural vegetation in form of grasses, bushes, trees, and shrubs. The majority of the small herders were confronted with the problem of lack of credit facilities and the hostile attitude of farmers. It was suggested to the provision of credit facilities and land areas for small herders to overcome their issues.

Keywords: Range Lands, Degradation, Herders, Livelihood

Evaluation of Anatomical Diversity among Some Selected Species of Family Apocynaceae: An Experimental and in Silico Approach

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Abstract—The present research work was done to evaluate the anatomical differences and phylogenetic evolution among selected species of family Apocynaceae as less anatomical data is available with reference to this family in Pakistan. Apocynaceae is a remarkable family for its various medicinal properties. Anatomical characterization is the important feature for the identification and classification of plants. In the present work many anatomical structures such as type and shape of stomata, shape of leaf epidermis, size of epidermal cells and presence and absence of trichomes, epicuticular wax, crystals in the form of prism, raphides and druses were observed. Irregular, polygonal and hexagonal shapes of epidermal cells were also observed. Anomocytic, anisocytic, paracytic and tetracytic stomata were seen and studied. Glanduar/peltate, multicellular and non-glandular types of trichomes were observed. The *in-silico* activity were carried out by the phylogenetic analysis of the selected species of family Apocynaceae. For this purpose, we used the MEGA11 program to determine the phylogenetic tree. Moreover, the recombination detection program was carried out by using RDP-4 system in which we checked the recombination among these selected species of family Apocynaceae. This research work provides a comprehensive

review on anatomical characteristics, RDP-4 and phylogenetic analysis of selected plant species to identify plants accurately. Phylogenetic evaluation data provide the linkage among species of Apocynaceae family and by RDP-4 analysis, relationship among species become more prominent due to the formation of recombinant. This mechanism of analysis will play a significant role for the future studies.

Keywords: Apocynaceae, Identification, Anatomical Diversity, Phylogenetic analysis, Recombinant Detection

Control of Parthenium hysterophorus by Aqueous Extract of Anagallis arvensis

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Abstract—*Parthenium* is widely distributed, almost across the world and has become the most important invasive weed. The present study was designed to investigate the allelopathic effect of aqueous extracts of *Anagallis arvensis* L. against the *Parthenium hysterophorus* L. *A. arvensis* extracts demonstrated inhibitory effects on seed germination and seedling growth of *parthenium*. Aqueous extract of leaves and inflorescence of *A. arvensis* exhibited highest inhibition than the extracts of root and stem. Significant control was calculated in germination percentage (50%), fresh weight of seedling (-55% and -44%) and dry weight of seedling (-65% and -66%) by aqueous leaves and inflorescence extracts of scarlet pimpernel. In vitro foliar bioassay aqueous concentration (15 %) of *A. arvensis* surpasses the all treatments and reduce the fresh biomass of plant (-45%) and dry biomass of plant (-42%) in first week of spray and fresh biomass of plant (-75%) and dry biomass of plant (-82%) in second week of spray. Under In vivo conditions, significant reduction was calculated in fresh and dry biomass of root and shoot of *Parthenium hysterophorus* in response to allelopathic stress of dried whole plant of *Anagallis arvensis*. Parthenium fresh root biomass reduced from (-10% to -39%) and dried root biomass reduced from (-20 to -40) respectively as compare to control. *Parthenium* shoot fresh biomass reduced from (-25% and -26%) and dried biomass of shoot (-26% and -17%) respectively as compare to control.

Keywords: Biological control, Parthenium hysterophorus, Anagallis arvensis

Theme: Chemistry

Development of an Ultra-Sensitive Enzyme-based Electrochemical Sensor for Urea Detection

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Abstract—In this study, we have modified glassy carbon electrodes (GCE) with amine groups (−NH2) to produce aminated GCE that can effectively detect current changes during urea hydrolysis. The silk fibroin (SF) scaffolds are employed to place enzyme near the surface of the aminated GCE. The as-fabricated electrode is employed for electrochemical urea sensing that could be monitored via cyclic voltammetry and amperometric techniques. Our developed biosensor has displayed rapid detection response (~1 min) and sensitivity (112.3 μA mM-1 cm-2) with linear correlation (0.3–8.4 mM) between the current and urea concentrations. Moreover, the analogous sensing responses obtained via SF scaffold discs (generated and functionalized) in the urease/SF/aminated GCE assuring the suitable platform for the urea sensing application devices.
Keywords: Glassy carbon electrodes, Urea hydrolysis, Biosensor

Development of Pd/Ba Nanoparticles (Pd/Ba NPs@TiO_2) for Photocatalytic H_2 Generation from Water Splitting

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Abstract—Here we demonstrate an efficient approach to enhance the photocatalytic performance of titania via depositing Pd/Ba nanocomposite (Ag/Sr-NPs@P25) over the surfaces for H_2 generation. The Pd/Ba-NPs are in-situ deposited at the titania via optimized chemical reduction method. The catalytic impact of Pd and Ba nanoparticles in the photocatalytic reactions are further revealed. Ba in the form of barium oxide promotes electron transfer from the semiconductor surface to palladium nanoparticles by increasing the fermi level of the titania-support. The structural and morphological characterizations of as synthesized photocatalysts are carried out using UV−Vis/drs, XRD, PL, TEM, and XPS techniques, based upon which the mechanistic insights are justified and addressed.
Keywords: Photocatalysis, Nanoparticals, Water splitting

Chromium (VI) sorption by layered material

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Abstract—Degradation/removal of pollutant using layered double hydroxide (LDHs) are currently attractive research topic for the remediation of polluted environmental systems, because of its low price and have anion exchange capability. The Ca-Cr LDH nanoparticle was prepared by co-precipitation method. This nanocomposites material is found to be favorable for removal of Cr (VI) from aqueous solution with over 96% removal being achieved within 10 min. Studies of effect of hydrochemistry on the sorption process such as initial solution pH, and organic load contamination interference, indicated nominal effect on the amount of chromium (VI) removed by the LDH. Overall, the study indicated that ion-exchange are active contributory mechanisms to the sorption of Cr (VI) by Ca/Cr LDH from solution. The precursor LDH and their metal oxide were characterized by using technique Infrared spectroscopy (IR), X-ray diffraction (XRD) and Ultraviolet spectroscopy (UV) spectroscopy.
Keywords: Sorption, Flutents, Lyared materials, Hydrochemistry

Mechanically Robust and Highly Elastic Thermally Induced Shape Memory Polyurethane Based Composites for Smart and Sustainable Robotic Applications

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Abstract—In the present study, polyurethane (PU) was prepared using a pre-polymer method two-shot process with novel phloroglucinol chain extender. PU nanocomposite was prepared by incorporating acid-FMWCNTs in pristine-PU. Polystyrene (PS) was functionalized with the nitro group through our previously reported method. Nitro-functionalized polystyrene (PS-NO_2) was used to induce physical interaction (crosslinked physically interpenetrating networks) between polyurethane and PS-NO_2 between both polymer layers. The ternary blend composites (PU/PS-NO_2/FMWNTs) were also synthesized using acid functionalized multiwall carbon nanotubes (FMWCNTs). Nitro-functionalized polystyrene/polyurethane blend/composite properties were compared with neat polyurethane and its nanocomposite. Structure of the pre-designed PU polymer and its composites were confirmed by the FTIR and degree of crystallinity and amorphous structure was determined with XRD. The TGA was performed to study thermal behaviour and thermal stabilities of synthesized blends. Excellent thermal stabilities were confirmed through TGA thermogram with increase in

loading concentration of FMWCNTs. Excellent tensile strength 59.2 ± 2.6 MPa with 0.1g loading amount of FMWCNTs with enhanced flexibilities were observed, all the sample showed enhanced tensile strength with increase in loading amount and sufficient incorporation of FMWCNTs in polymer matrices. The significant change in surface morphologies and porosity suggested enhanced interaction (physical and chain entanglement) of FMWCNTs and nitrated-polystyrene with PU chain. The porous spongy cluster provides efficient shape recovery with excellent flexibility to the composite material with excellent thermal stabilities and mechanical properties with excellent repeatability. Almost 100 percent shape recovery was observed for all samples. Recovery time of polyurethane nanocomposite observed is shorter than neat polyurethane and PU/PS-NO_2 blends because of better conductive nature.

Keywords: Shape-memory, Composite, Polyuerthane, Robotics

Controlled synthesis of Co and Cu co-doped CdS@Phosphorous doped g-C_3N_4 Heterostructures

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Abstract—This work aimed to prepare Co and Cu co-doped CdS@PCN heterostructures for photocatalytic degradation of oTC. Co and Cu incorporated CdS@PCN heterostructures were synthesized by co-precipitation method. Cadmium sulphide is a visible light harvesting material and has been used for several applications. However, rapid recombination of electron-hole pairs (e-/h+), poor charge separation and low redox ability were the major drawbacks of CdS. These shortcomings were ameliorated by incorporating metal ions into the lattice of CdS to improve charge separation. The Co and Cu incorporated CdS@PCN heterostructures were prepared to tune band gap and reduce electron-hole pair recombination that could increase the photocatalytic efficiency. It was observed that the Co and Cu incorporated CdS@PCN heterostructures exhibited 96% degradation efficiency.

Keywords: Doping, Hetrostructure, Photocatalytic, Degradation

Synthesis of Metal Halide Perovskites for Tunable Optical Properties

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Abstract—Metal halide perovskites (MHPs) have attained significant attention due to their useful applications. The 3D MHPs show remarkable optical properties

due to their tunable color emission, however, the problem arises with their instability. The 2D MHPs have turned up as more stable materials due to their layered structure. Herein, quasi-2D MHPs (EDA)(MA)n−1PbnBr3n+1 with n=1-6 and 3D MAPbBr3 perovskites have been synthesized by co-precipitation technique and analyzed by different characterization techniques. These quasi2D MHPs can be used for wide applications due to their spectral range of emitted light and tunable band gap. The color emission of perovskites has been further altered by changing the halide anion. The as-prepared MHPs have shown tunable color emission with the change in number of layers and proved to be stable under ambient conditions.

Keywords: Pervoskites, Metal halides, Optical properties, Color emission

Turn-on fluorescent pyrene-based probe for highly selective detection of trace Cr(III) in aqueous media for live cell imaging

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Abstract—Designing and synthesis of suitable turn-on fluorescence sensors for monitoring intercellular Cr^{3+} is limited due to fluorescent quenching of paramagnetic Cr^{3+} and lack of Cr^{3+} selective multichelating ligand functionalities. To overcome the limitations related with the earlier developed methods, a fluorescent pyrene-based probe have been synthesized that selectively differentiate Cr^{3+} from alkali, alkaline earth metals and most of transition metals including Fe^{3+} ratiometrically in aqueous media. Interaction of Cr^{3+} with probe bring pyrene moieties close enough to have better aligned π–π stacking, which enhanced the excimer peak many fold. While the interaction of all other metals bring a insignificant difference in stacking, resulted a slight change in fluorescence intensity. Exceptional selectivity of probe with Cr^{3+} has been confirmed by density functional theory (DFT) studies in addition to experimental results. Confocal fluorescence microscopic imaging of HeLa cells revealed that probe can be used to monitor Cr^{3+} in live cells to map its subcellular monitoring.

Keywords: Fluorescence, Pyrene, Selective Detection, Sensors

Metal Halide Perovskites for Energy Conversion Applications

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Abstract—Metal halide perovskites have emerged as an efficient light harvesting material for solar cells and LEDs. We developed metal halide perovskite materials for sensing, photocatalysis, and photovoltaic applications. Owing to its efficient emitter, metal halide perovskite has shown good fluorescent sensing of lead ions,

water, and explosives. Apart from sensing applications, morphology-controlled thin films were deposited by aerosol-assisted chemical vapor deposition (AACVD). The planar solar device based on CsPbBr2I bulk perovskite shows a PCE of 4.8%. on the other hand, broadband emission and green emissions were also observed in metal halide perovskites. Interestingly, the compositional manipulations and the OHNH3PbX3 hybrid perovskites were successfully used for the degradation of commercial dye.

Keywords: Perovskites, Energy conversion, Metal halides, Degradation

Photoelectrochemical studies of PbO-ZnO composite thin films developed from {ZnPb(OAc)(TFA)3(THF)2}n complex by AACVD for water splitting

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Abstract—Excessive consumption of fossil fuels and non-renewable energy resources has not only created turmoil to the natural balance of such resources, but this unsustainable trend is also rendering a rapid decline in their reserves as well. With the view to focusing on alternate, renewable and clean energy, the current study aims to employ cost effective, thermally stable, and high photosensitive ZnO, by tuning its band gap favorable for solar water splitting.
ZnO–PbO composite thin films were deposited onto fluorine doped tin oxide (FTO) coated glass substrates from a newly synthesized polymeric Zn–Pb single source precursor {ZnPb(OAc)$(TFA)_3(THF)_2$}n *via* aerosol-assisted chemical vapor deposition. The precursor was synthesized using $Zn(CH_3CO_2)_2{\cdot}2H_2O$, and $Pb(CH_3CO_2)2{\cdot}3H_2O$ in the presence of triflouroacetic acid. The complex ({ZnPb(OAc)$(TFA)_3(THF)_2$}n) was characterized by NMR and single crystal X-ray analysis. The precursor had MP of 72 ^{O}C and decomposed at 450 ^{O}C with 36.6% residue as obtained *via* TGA. XRD analysis of thin films predicted a prominent growth of ZnO–PbO crystallites. FESEM analysis illustrated a homogenous and smooth surface with evenly distributed microspheres. Direct band gap of 2.40 eV was obtained that proved the narrowing of band gap in composite form of ZnO with PbO. Photoelectrochemical studies of ZnO–PbO photo electrode exhibited the photocurrent density of 705 μA cm^{-2} at an applied potential of +0.8 VSCE. EIS studies reveal efficient charge transfer mechanism. It is, thus, concluded that ZnO–PbO is a promising class of materials that has enormous potential to be employed as photo electrode for renewable energy applications.

Keywords: Photsensitivity, Water splitting, Renewable energy, Composite

Low Temperature, Solution Processed Spinel $NiCo_2O_4$ Nanoparticles as Efficient Hole Transporting Material for Mesoscopic n-i-p Perovskite Solar Cells

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Abstract—Spinel Nickel cobaltite oxide ($NiCo_2O_4$) have received great interest due to its usage in several industrial applications. The motivation of the present study is to explore the usefulness of spinel Nickel cobaltite oxide as inorganic charge transporting layer for standard perovskite solar cells (PSCs). This is the first demonstration of successful use of $NiCo_2O_4$ nanoparticles as hole transporting layer (HTL) in standard PSCs with the triple cation perovskite material. The synthesis of nanoparticles was done using a facile chemical precipitation method without the use of surfactant. The synthesized nanoparticles were characterized by the various techniques like X-ray diffraction (XRD), X-ray absorption spectroscopy (XAS), Field emission scanning electron microscopy (FE-SEM), and UV-vis spectroscopy (UV-vis). The co-ordination of Ni in Co_3O_4 matrix, as well as M^{+n}-O bond lengths, were confirmed by the XAS studies. The standard mesoporous PSCs were fabricated by spin-coating a thin layer of $NiCo_2O_4$ (120 nm), and fabricated PSCs show an esteemed power conversion efficiency (PCE) of > 14 % (under standard illumination conditions) and long-term stability (under ambient condition RH = 30 - 40 %) as compared to the spiro-based PSCs. To improve the device performance further we also fabricated the PSCs using the interfacial hole transporting layer, presenting a PCE of >16% with almost negligible hysteresis that is comparable to the normal standard PSCs based on spiro-OMeTAD as HTL. The performance of PSCs was further analyzed by Electrochemical Impedance Spectroscopy (EIS), Photoluminescence (PL), Time-resolved Photoluminescence (TrPL) studies. The results show the reduced recombination resistance in the PSCs using $NiCo_2O_4$ as well as interfacial layer. These outcomes indicate the effectiveness of $NiCo_2O_4$ interlayer for stable and highly efficient perovskite solar cells.

Keywords: Pervoskites, Solar cell, Transporting material, Nanoparticals

Cellulose based hydrogels for tissue engineering applications

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Abstract—Aminated cellulose (ACs) derivatives-based hydrogels are emerging as advanced health care functional materials in biomedicines, but limited data are available regarding its cytotoxicity studies for various biomedical application. In this study we synthesized 6-deoxy-amino-cellulose derivatives named as 6-deoxy-6-hydrazide Cellulose (Cell Hyd) 6-deoxy-6-diethylamide Cellulose (Cell DEA) and 6-deoxy-6-diethyltriamine Cellulose (Cell DETA) from Microcrystalline cellulose (MCC) via tosylation and explored their cytotoxic potential. AC derivatives were synthesized and then characterized by Fourier transform infrared spectroscopy-attenuated total reflectance (FTIR-ATR), nuclear magnetic resonance spectroscopy (NMR), X-RAY diffractogram (XRD), Scanning Electron microscopy (SEM), Elemental Analysis and Zeta potential measurements. Cytotoxicity was evaluated against normal fibroblasts (NIH3T3), mouse skin melanoma (B16F10), human epithelial adenocarcinoma (MDA-MB-231) and human breast adenocarcinoma (MCF-7) cell lines. IC_{50} values obtained from cytotoxicity assay and live/dead assay images analysis showed MCC was non cytotoxic while Cell Hyd, Cell DEA and Cell DETA exhibited noncytotoxic activity up to 200 µg/ml to normal fibroblast cells NIH3T3, suggesting its safe use in medical fields. The mouse skin melanoma (B16F10) are the most sensitive cells to the cytotoxic effects of Cell Hyd, Cell DEA, and Cell DETA, followed by human breast adenocarcinoma (MCF-7). MCC and AC derivatives were embedded in methacrylated gelatin (GelMA) for wound healing applications. GelMA and ACs were synthesized and characterized by spectroscopic techniques. Tensile strain of GelMA 61.30 % at break was increased to 64.3% in case of GelMA/Cell-HYD. In vitro cytocompatibility and cell proliferation using NIH-3T3 cell lines showed cell density trend on scaffold as GelMA/Cell-DETA>GelMA/Cell-Hyd> GelMA. Scratch assay for wound healing revealed that GelMA/Cell-DETA showed complete wound closure, while GelMA/Cell-Hyd and GelMA exhibited 85.7%, and 66.1% wound healing, respectively in 8 hours. In vivo tests on rats revealed that GelMA/Cell-DETA exhibited 98% wound closure on day 9, whereas GelMA/Cell-Hyd exhibited 97.7% and GelMA 66.1% wound healing on day 14. Based on our study, it is suggested that aminated cellulose derivatives could be promising candidates for tissue engineering applications and in cancer inhibiting studies in future, while GelMA embedded amine MCC derivatives hydrogels can be applied for achieving accelerated wound healing.

Keywords: Cellulose, Hydrogels, Tissue engineering, Biomedicins

In vitro evaluation of phthalimideoxadiazole – benzenesulfonamide conjugates as inhibitors of dengue virus protease

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Abstract—Viral infections have become biggest threat to the humanity. Synthesis of effective drugs to treat viral infections has become the need of the time. Direct Acting Anti HIV and HCV drugs have been efficaciously established by targeting the viral proteases. Likewise, dengue virus (DENV) protease, which is comprised of NS2B and NS3pro proteins, can also be exploited for finding new anti-dengue drugs. Here, we have established two alternate series of novel hybrids, namely S-alkylphthalimideoxadiazole-benzenesulfonamides (8a-j & 14a-f) and S-benzyloxadiazolebenzenesulfonamides (9a-c & 15a-e). To obtain first series of hybrids, the reaction of paminobenzoic acid (1) with 4-methyl and 4-trifluoromethylbenzene-sulfonyl chloride (2a-b) provided 4-{[(4-methylphenyl)sulfonyl]-amino}benzoic acid (3a) and 4-{[(4-trifluoromethylphenyl)sulfonyl]amino}benzoic acid (3b), respectively. The sequential esterification, hydrozinolysis and cyclizaation of carboxylic acid group of (3a-b) resulted 4-{[(4- methylphenyl)sulfonyl]amino}phenyl 1,3,4-oxadiazole-2-thiol (6a) and 4-{[(4-trifluoromethylphenyl)sulfonyl]amino}phenyl 1,3,4-oxadiazole-2-thiol (6b). The intermediate (6a-b) reacted with N-bromoalkyl substituted phthalimides (7`a-f) and trifluoromethylated benzyl chlorides (7ac) to afford 8a-j & 9a-c in good yields. To access second series of hybrids, probenecid (10) was converted into 4-[(dipropylamino)sulfonyl]benzene 1,3,4-oxadiazole-2-thiol (13) and d similarly elaborated to sulfonamido-1,3,4-oxadiazole-2-thiols (13) which is then bifurcated to Salkylphthalimide and S-benzyl 4-[(dipropylamino)sulfonyl]benzene 1,3,4-oxadiazole-2-thiol hybrids (14a-f) and (15a-e), respectively. Bioactivity screenings revealed that 8g and 8h are found to be the most potent inhibitors of DENV NS2B/NS3 protease among the synthesized analogs, possessing the IC50 values of 13.9 μM and 15.1 μM, respectively. Molecular docking studies anticipated the binding of the inhibitors at an allosteric site generated in the open conformation of DENV2 NS2B/NS3pro. All these inhibition findings establish that the synthesized novel S-benzyl- and S-alkylphthalimideoxadiazole-benzenesulfonamide hybrids possess a great potential for further antiviral drug development.

Keywords: Antiviral drug, Dengue virus, Protease, Hybrids

Synthesis, characterization, *in vitro* tissue-nonspecific and intestinal alkaline phosphatase inhibition assay as well as docking evaluation of 1,3-thiazoles

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Abstract—Alkaline phosphatases (APs) are a class of homodimeric enzymes which physiologically possess the dephosphorylation ability. APs catalyzes the hydrolysis of monoesters into phosphoric acid which in turn catalyze a transphosphorylation reaction. Thiazoles are Nitrogen and sulfur containing aromatic heterocycles considered as effective APs inhibitors. Consequently, the current research presents the successful synthesis, spectroscopic characterization and in vitro alkaline phosphatase inhibitory potential of new thiazoles. Compound 5e was found to be the potent inhibitor of h-TNAP with IC50 value of 0.17 ± 0.01 µM. Additionally, compounds 5a and 5i were found to be highly selective toward h-TNAP with IC50 values of 0.25±0.01 µM and 0.21±0.02 µM respectively. Similarly in case of h-IAP, compound 5p served as the most potent inhibitor with IC50 value of 0.71 ± 0.02 µM. Structure activity relationship and molecular docking studies were performed to find out the binding modes of the screened compounds with the target site of tissue non-specific alkaline phosphatase (h-TNAP) and intestinal alkaline phosphatase (h-IAP). Accordingly, the most active inhibitors showed important interactions within the binding pockets of h-IAP and hTNAP, may be responsible for the inhibitory activity of the compound towards the enzymes. Therefore, the screened thiazole derivatives provided an outstanding platform for further development of alkaline phosphatase inhibitors.
Keywords: Alkaline phosphatase, Inhibitor, Docking, 1,3-Thiazaoles

Synthesis, characterization, and mechanical properties of nacre inspired flame retardant multilayered coatings

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Abstract—Inspired by the hierarchical structure of nacre, we propose an environmentally friendly method for fabricating durable and flame-retardant films using chitin, a readily available biopolymer. Chitin was phosphorylated to make it water-soluble. To construct mechanically strong, colorful, and flame-resistant

multilayered films inspired by nacre, layer-by-layer (LbL) and vacuum-assisted filtration (VAF) self-assembly were used. Multilayered thin films containing graphene oxide (GO), laponite (LAP), poly (vinyl alcohol) (PVA), and phosphorylated chitin (p.Chitin) were dip-coated on pre-activated silicon wafers and quartz slides. The selected components were assembled into thin films with architecture (PVA/p.Chitin/LAP/GO)n, with a total number of layer pairings (n) of 50, based on their functionality and intrinsic reactivity. A UV-Vis spectrophotometer and an ellipsometer were used to measure the film growth after each layer pair was deposited. Photographic images showed a sheen comparable to that of the mother of pearl, while SEM micrographs of films revealed a nacre-like layered structure. Nanoindentation study showed a reduced modulus of 25.53 GPa and a hardness of up to 1.45 GPa, demonstrating mechanical properties that are similar to the nacre. In addition, multilayered films exhibited iridescence and attractive flame retardancy. We propose that embedding chitin in materials for food packaging, barrier, and electronic materials offers cost-effective and environmentally friendly coatings.

Keywords: Flame retardant, Coating and films, Graphene oxide, Nacre

One-pot Multicomponent Synthesis of Symmetrical bis-imidazole derivatives and their Biological Applications

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Abstract—α-Glucosidase is a catabolic enzyme that regulates the body's plasma glucose levels by providing energy sources to maintain healthy functioning. 2-Amino-thiadiazole (1–13) and 2-amino-thiadiazole based Schiff bases (14–22) were synthesized, characterized by 1 H NMR and HREI-MS and screened for a α-glucosidase inhibitory activity. All twenty-two (22) analogs exhibit varied degree of a-glucosidase inhibitory potential with IC50 values ranging between 2.30 ± 0.1 to 38.30 ± 0.7 µM, when compare with standard drug acarbose having IC50 value of 39.60 ± 0.70 µM. Among the series eight derivatives 1, 2, 6, 7, 14, 17, 19 and 20 showed outstanding a-glucosidase inhibitory potential with IC50 values of 3.30 ± 0.1, 5.80 ± 0.2, 2.30 ± 0.1, 2.70 ± 0.1, 2.30 ± 0.1, 5.50 ± 0.1, 4.70 ± 0.2, and 5.50 ± 0.2 µM respectively, which is many folds better than the standard drug acarbose. The remaining analogs showed good to excellent α-glucosidase inhibition. Structure activity relationship has been established for all compounds. The binding interactions of these compounds were confirmed through molecular docking.

Keywords: One-pot synthesis, Bisimidazole, Biological application, Molecular docking

Albumin Binding and Anticancer Studies of trimethyl-, tributyl- and triphenylstannyl derivatives of Sodium deoxycholate

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Abstract—Serum albumin is crucial in Drug-Pharmacokinetics and pharmacodynamic. So, coordination compounds with therapeutic index needs to be attested by exploring their binding affinity with coordination compounds to qualify for understanding their mechanism of action. Herein drug protein interaction modes will be presented taking into consideration the synthesis, anticancer activity and interaction of trimethyl and triphenyltin(IV) derivatives (labeled as 1 and 2 respectively) of sodium deoxycholate (sodium (4R)-4-((3R,5R,10S,12S,13R,17R)-3,12-dihydroxy-10,13-dimethylhexadecahydro-1H-cyclopenta[a]phenanthren-17-yl)pentanoate) with bovine ser and human serum albumin at two different temperatures (298 and 310K) by means of fluorescence quenching experiments. Compounds were well characterized by IR, 1H-, 13C- and 119Sn-NMR. Both the compounds showed good anticancer activity. Fluorescence quenching constants was determined from Stern-Volmer equation. Both the compounds bind with BSA and HSA through dynamic quenching pathway. Compound 1 bind with BSA and HSA at two temperatures with an association constant of 3.9 x 104 and 8.0 x 104 at 298K and 9.9 x 104 and 1.02 x 104 at 310K respectively. Similarly compound 2 binds with BSA and HSA with quenching constants of 3.9 x 104 and 1.8 x 104 at 298K and 1.4 x 104 and 4.5 x 104 respectively. Synchronous fluorescence spectrum of compounds suggested that the tryptophan residues contribute greatly to the quenching of intrinsic fluorescence.

Keywords: Anticancer, Coordination compounds, Serum Albumin, Fluorescence

Fabrication of Molecular Imprinted Polymer based Sensors for the Early Detection of Lung Cancer Biomarkers

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Abstract—Lung cancer is the most common cause of cancer-related deaths in humans. Early diagnosis of lung cancer with suitable treatment significantly improves the five-year survival rate. Lung cancer dysregulations imparts oxidative stress which results in important metabolic products in the form of volatile organic compounds. The non-invasive, cost-effective and simple in use

analytical techniques for the detection of exhaled volatile organic compounds (VOCs), cancer biomarkers are of substantial interest for early diagnosis of lung cancer. Molecular Imprinted Polymer Based Artificial Sensors were designed for the generation of highly selective receptors for Butane and P-Xylene. Two polymer systems i.e. acrylate and polystyrene were screened out to achieve optimal sensitivity and selectivity. Artificially designed receptors were coated onto the transducer (IDEs) and change in conductance was measured by LCR meter. IDE coated by thin layer of receptors were exposed to various concentrations of templates (Butane & P-Xylene) ranging from 0-10 ppm, by using these concentrations change in signal response was recorded. In Butane At 0 ppm, conductance (Cs) measured was 0 and as for 1ppm, 2ppm, 4ppm, 6ppm, 8ppm and 10 ppm, conductance was 368nF, 512nF, 580nF, 634nF, 696nF, and 800nF. While in P-Xylene At 0 ppm, conductance (Cs) measured was 0 and as for 1ppm, 2ppm, 4ppm, 6ppm, 8ppm and 10 ppm, conductance was 154nF, 230nF, 324nF, 437nF, 596nF and 656nF respectively. Sensors showed concentration dependent linear response towards their respective template molecules. When response of polystyrene system against Butane and P-Xylene was compared with response of Acrylate system it was revealed that response of Acrylate system was greater than polystyrene system. Acrylate system-based composites were synthesized to check the response of the sensor by the addition of graphene oxide, it enhanced the surface area that leads to increase the sensitivity of sensor. The sensor was characterized by using Fourier-transform infrared spectroscopy (FTIR). Furthermore, sensor response of these Butane MIPs based sensors were investigated in the presence of competing agents/interfering analytes i.e., Butanol, Hexane and Styrene. While in the case of P-Xylene selectivity behavior was checked against Toluene, Styrene and Hexane of fabricated sensors. Each sensor responded to its template molecules only in the presence of other interfering molecules with same geometrical shape which indicate that sensors are highly selective, selective and specific.

Keywords: Lung cancer, Biomarkers, Polymers, Sensors

Theme: Mathematics

Multi Objective Convex Separable Programming and its Application to Portfolio Optimization Problem in Capital Market Structure

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Abstract- This research envisages addressing the case when the convex separable programming problem has multiple objective functions to be optimized. Thus a novel convex multi-objective convex separable programming technique is developed for multi-objective convex separable programming problems. The convexity requirements ensure an approximate global optimal solution for the problem only if it is minimizing a convex function or maximizing a concave function subject to a convex set. Moreover, the accuracy is compromised only by the stiffness of the piecewise linear approximations adopted in the solution process. The main advantage of the convex separable approach is that the problem is solved using linear programming methods without enforcing the adjacency restrictions of the simplex restricted basis method. The proposed technique is then implemented for the selection of optimal portfolios in the capital market structure. The convex separable programming technique is adopted for the minimum variance portfolio optimization problem. After that the risk aversion model is studied using the convex separable programming technique. The results of both are then combined into a multi-objective convex separable programming problem and solved with the help of the Python machine learning software. The results obtained identified portfolios that can return more financial benefits to the investors while investing in the capital market structure. Furthermore, the results of the proposed convex separable programming approach were 22.5% greater than the risk aversion model and 17% greater than the minimum risk model. All the three models were solving by using the Python machine learning software. The successful implementation of the technique and the promising results depicts the importance, credibility and usefulness of the technique for identifying optimal portfolio investments to the investors in the capital market structure.

Keywords: Multi-objective Convex Separable Programming, Portfolio Optimization, Capital Market, Convex Optimization, Separable Programming.

Transmission and Reflection of SV Waves at Micropolar Solid–Liquid Interface with Dual-Phase Lag Theory

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Abstract-As micropolar theory explains the material's inner structure and behavior; therefore, it is more appropriate for various geological materials including soils and rocks. Micropolar materials are characterized as a substance with properties such as molecules of the dumbbell form and atoms of dipole nature, which are present on body couples and surface. The target of this study is to see the influence of the magnetic field, angular velocity, initial stress, and rotation on the incident SV wave. The SV waves are reflected as well transmitted at the interface of micropolar solid and liquid half-space. The dual-phase lag theory is used for energy equation; the basic equations have been discussed to drive results for transmitted thermal and P waves and reflected thermal, micro-rotation, SV and P waves. The transmission and reflection of SV waves are examined after applying the boundary conditions, and amplitude ratios are figured by the matrix inversion method. Graphs are sketched and discussed for various values pertinent parameters on amplitude ratios. We observe the outcome of a magnetic field, angular velocity, and initial stress on the refraction and reflection of SV wave in the context of DPL theory at micropolar solid and liquid layers. The amplitude ratios of reflected SV wave start from its minimum value and moves towards unity. The amplitude ratio of the reflected P wave is more prevalent. The transmitted P and T wave show a small change in amplitude ratio.
Keywords: Reflection, Initial Stress, Micropolar Solid, Magnetic Field, Refraction

One Dimensional Optimal System of Lie Sub-Algebra and Analytic Solutions for a Liquid Film Fluid Flow

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Abstract- Lie symmetry procedure enables reduction of the dependent and/or independent variables of the differential equations through similarity transformations, if they admit a Lie point symmetry algebra. A 7-dimensional Lie

point symmetry algebra for the fluid flow and heat transfer in a thin liquid film due to an unsteady stretching sheet has been obtained earlier. Here we construct the 1-dimensional optimal system of Lie sub-algebras, corresponding invariants and similarity transformations. We use these transformations in reduction of the independent variables of the considered flow model. We achieve double reductions of the model that convert the governing partial differential equations into ordinary differential equations. We present all classes of ordinary differential equations that are obtainable through the invariants associated with each member of the deduced optimal system. In some cases, we construct analytic solutions for these reduced systems of differential equations using Homotopy analysis method. The selection of these cases is based on the form of stretching sheet velocity, temperature and film thickness, i.e., both the former remain functions of space and time variables while the latter is a function of time only.

Keywords: Lie Point Symmetry Algebra, Differential Equations, Fluid Flow and Heat Transfer, Invariants, Thin Liquid Film, Homotopy Analysis Method

Subdomain Method for Solving Non-integer Order Differential and Integrodifferential Equations

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Abstract-The main focus of this article is to check the applicability of Subdomain method to solve differential, and integrodifferential, equations of fractional order. Differential operators of non-integer orders are considered a generalization of ordinary operators and they are a hot topic of research nowadays. In this work, we have used Caputo's fractional differential operator to form fractional differential and integrodifferential equations. Subdomain method is a domain decomposition method which works in the essence of method of weighted residuals. We have successfully solved a number of numerical examples to demonstrate the applicability of the subdomain method to equations of fractional nature. The accuracy of the solutions has been checked either by comparing with the exact solutions (for benchmark examples) or by illustrating the residue curves.

Keywords: Subdomain Method, Integrodifferential Equations, Fractional Order Derivatives, Caputo's Differential Operator

Thermo-fluidic Impact in Power Law Rheology with Mass Diffusion and Thermal Rates Including Hybrid Nanoparticles Simulated by Finite Element Approach

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Abstract-Ethylene glycol with nanoparticles behaves as a non-Newtonian fluid and its rheology can be best predicted by the power-law rheological approach. Further, MoS_2 and SiO_2 nanoparticles are responsible for anti-oxidation, anti-evaporation, and anti-aging. Therefore, their dispersion in ethylene glycol is considered as these properties make the nanofluid stable. This article examines the impact of MoS_2 and SiO_2 on the thermal enhancement of ethylene glycol as it is a worldwide used coolant. Moreover, simultaneous effects of temperature and concentration gradients, Joule heating, viscous dissipation, thermal radiations, and Bouncy forces are modeled and developed investigations are computed by FEM. An increase in temperature due to composition gradient and an increase in concentration due to temperature gradient are observed. A significant increase in the Ohmic phenomenon with an increase in the intensity of the magnetic field is observed. Numerical experiments are performed by considering single-type nanoparticles (MoS_2) and hybrid-type nanoparticles (simultaneous dispersion of SiO_2 and MoS_2 is considered). During the visualization of simulations, it is observed that the effective thermal conductivity of MoS_2- SiO_2-ethylene glycol.
Keywords: Finite Element Method, Single-Type Nanoparticles, Hybrid-Type Nanoparticles, Non-Newtonian Fluid

Multiple Solutions with Cattaneo-Christov Double Diffusion Model of Carreau Fluid Flow

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Abstract-Inspired by the varying applications of non-Newtonian fluids, we completed our numerical computation for multiple solutions near by the stagnation point flow of Carreau viscosity model past a shrinking sheet with infinite shear rate viscosity. Heat transfer is inspected allowing for non-Fourier heat flux and thermal stratification. Energy and concentration equations are developed with the help of theory of Cattaneo-Christov double diffusion. Such diffusions are established as a part of expressing the solutal and thermal relaxation times framework. The emerging leading non-linear equations have been solved numerically by means of Runge-Kutta Fhelberg method. The obtained numerical

results have been displayed graphically and some exciting features like multiple solutions are established. The critical values are computed for the suction and shrinking parameters. Moreover the critical values have been attained by using the plots of reduced skin friction. This study discloses that the multiple solutions occur for the different essential physical parameters for example suction parameter s, shrinking parameter λ, magnetic parameter M, Prandtl number Pr, velocity slip parameter δ, viscosity ratio parameter β*, Schmidt number Sc, non-dimensional thermal relaxation time δe and non-dimensional solutal relaxation time δc.

Keywords: Runge-Kutta Fhelberg Method, Cattaneo-Christov Double Diffusion, Carreau Fluid, Shrinking Sheet

Cross Fluid Model Impact on Peristaltic Motion in the Presence of MHD and Viscous Dissipation Effects

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Abstract-This research object is focused to discuss the peristaltic motion in a horizontal channel. Non-Newtonian cross fluid model is considered in the analysis. Wall properties, viscous dissipation and MHD effects are also taken into account. Governed mathematical equations are solved by numerical method after using lubrication approximation. To see the theoretical consequence of peristaltic wave along channel, graphical results are plotted for different innovative parameters which are discussed in detail. Stream lines are strategized to see the circulation pattern in presence of considered effects. From a theoretical point of view, it is noted that peristaltic waves accelerate the fluid circulations more significantly near the walls. Moreover, the ambient temperature is shown to rise when the Brinkman number increases. Basically, higher values of Br correspond to stronger viscous dissipation, i.e., stronger heat generation due to friction is used by shear in the flow which raises the fluid temperature.

Keywords: Cross fluid model, Numerical Solution, Wall Properties, Viscous Dissipation, MHD

Mixed Convective Flow of Jeffrey Nanofluid over an Inclined Stretching Sheet

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Abstract-The main purpose of this article is to study the 2-dimensional flow of Jeffrey nanofluid by the stretching of a sheet on which fluid is placed. The boundary condition are presume to be convective. By using suitable similarity

transformations the partial differential equations which are modelled corresponding to the present problem are converted into the differential equations with ordinary derivatives. The converted differential equations involving ordinary derivatives are resolved by an analytical method called Homotopy Analysis Method (HAM). The effect of involved parameters e.g., Biot number, Brownian motion parameter, thermophoresis parameter and Lewis number are studied over velocity, temperature and concentration profiles. Furthermore, the local skin fraction coefficient and local Nusselt number are discussed through graphs.
Keywords: Jeffrey Nanofluid, Homotopy Analysis Method, Convective Boundary Conditions, Brownian motion

Analysis of Sensitivity of Thermal Conductivity and Variable Viscosity on Wall Heat Flux in Flow of Casson Fluid over a Wedge

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Abstract-The author aims to discuss sensitivity of pertained parameter for a two dimensional convective wedge flow of non-Newtonian casson fluid having varying viscosity and conductivity over a semipermeable wedge surface using Response Surface Methodology (RSM). The transformed boundary layer equations forms partial differential equations which in turn are becomes a set of non-linear ordinary differential equations by use of regular perturbation method. These systems are solved numerically by the use of Matlab built in routine bvp4c respectively. The obtained results found quite comparable with those already presented in literature by other methodologies. We have made a statistical experimental design based on parametric ranges of governing parameters of the problem. We have then calculated the local wall shear stress and local wall heat flux numbers as responses for all combination of parameters in experimental design. Then we use RSM by using Central Composite Design (CCD) in order to develop a correlation between responses either or and governing parameters of the problem. After developing a best fitted response surfaces for each of the response variables we have performed a detailed sensitivity analysis for each of the response surface.
Keywords: Response Surface Method (RSM), Sensitivity Analysis, Perturbation Method, Porous Wedge, Variable Properties

Slip Flow of Couple Stress Casson Fluid with Cattaneo-Christov Heat Flux Model

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Abstract- Fluid mechanics have been one of the most important branches of mathematical physics since 19th century. It mainly describes fluid flow through different channels with different physical parameters. There are many applications of fluid mechanics in engineering sector and industries. Chemical reactions involve h-h (homogeneous and heterogeneous) reactions in many chemically reacting processes. In homogeneous reactions, reactants and products are in the same phase, whereas the reactants involve two or more phases in heterogeneous reactions. Riga plate is an assortment of electrodes in alternating pattern and permanent magnets fixed on a plane surface. This pattern yields electric & magnetic fields which spawns Lorentz forces parallel to surface. Increasingly interested study of velocity and thermal slip conditions is due to its interested applications like artificial cavities polishing and heart valves etc. Main objective of present research is to examine attributes of Cattaneo-Christov Double-Diffusion for heat transmission and diffusion for couple stress Casson fluid over stretching sheet. Fluid model is renovated in presence of homogenous-heterogeneous reactions. Stagnation point flow of Casson fluid is examined with the impact of Lorentz force (exerted by riga plate) and slip boundary conditions. Flow is studied for different values of appropriate physical quantities. Eq's of continuity, momentum, energy and chemical reactions with associated boundary conditions will be transformed by using suitable similarity transformation. Convergence of solution is approached by using built-in Shooting scheme. Computation is performed with help of mathematical software to approach numerical solution. Results for physical parameters effecting velocity function, thermal distribution and mass distribution will be discussed graphically.

Keywords: MHD, Riga plate, Slip boundary, h-h reaction, Cattaneo-Christov model, Double diffusion, Maple

Theme: Zoology

Distribution and Diversity Analysis of Finfish Species of Platycephalidae (Flatheads) from Sonmiani Lagoon Waters Balochistan, Pakistan

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Abstract—Platycephalidae derived from a Greek word, platys meaning flat and kephale means head therefore, the finfish belong to this family are flat headed species. Family Platycephalidae comprises of about 70 species, 18 genera that are widely distributed in Indo-Pacific Ocean. It has moderate to strongly depressed head and Pelvic fins are behind the pectoral base. First dorsal fin has 6-9 spines with the first spine short and second dorsal fin has 11-15 soft rays. Most species buried in bottom of the sea. These species mainly feed on crustaceans and small fishes and have the maximum length is about 1.1 m. The present study described the abundance, diversity and distribution of family Platycephalidae in the Miani Bay waters during the year of 2020 to 2021. The most abundant species was *Platycephalus indicus* that has been found in all four seasons while *Cociella* punctate and *Grammoplitesscaber* were the only species that were found in only one season. However, *Platycephalus indicus* also showed the highest number of individuals and *Grammoplitesscaber* showed the least number in the present study. Furthermore, the descriptive statistic calculation explained the size and mass distribution of various species of the family through estimation of mean and maximum weight and length. During the morphometric analyses, *Platycephalus indicus* showed a positive correlation between the length and weight as length increases with the increase of weight accordingly.

Keywords: Platycephalus, Morphometric, Length, Pelvic fins, Diversity, Distribution

Shell Morphometry of Barnacles Species *Chirona (Striatobalanus) Amaryllis* (Darwin, 1854) Collected from Sonmiani Beach Balochistan, Pakistan

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Abstract—Morphometrical relationship in the barnacle's species *Striatobalanusamarylis* has been studied in relation to variation in shapes, sizes, colours and ornamentations. The present study was designed to identify morphometric relationship of species *Striatobalanusamarylis* and to quantify

traits of evolutionary significance by detecting changes in shape and function. Specimens were collected from Sonmiani beach during the months of November 2021 to February 2022. Shell of the specimens tubulo-conical in shape; orifice moderately large, pentagonal and toothed; surface smooth, pinkish purple with yellowish tint; lower half very lighter in colour, usually white. Parities solid, non-porous, articular ridge blunt and slightly prominent. Tergum long, with apex forming a slight beak. The following measurements of the shell were taken on each individual: the length of the basis along the carinorostral axis (LBA), the width of the basis (WBA), the length of the orifice along the carinorostral axis (LOR), the width of the orifice (WOR), the height of the carina (HTC), and the average thickness of the shell wall (TKC). These parameters have continued to be used as an estimate of size and in this study, the height of the carina ranged 11 mm - 27 mm, the height of the rostrum ranged 4 mm - 9 mm and the basal diameter of shell ranged from 6 mm - 11 mm. The derived morphometric measurements revealed the significant differentiation and accurate measurements between species by using allometric and statistical data.

Keywords: Morphometry, Barnacles, Sonmiani, Pakistan

Seasonal Variations in Microplastic Distribution in Sediments of Sandspit Backwaters Mangroves Area Karachi

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Abstract—Microplastic pollution in near shore marine environment has become increasingly prominent and has received widespread attention due to expected adverse effect. In addition to offering a setting for microplastics to enter the water, bathing beaches serve as a major location for leisure and entertainment in coastal communities. In the present study, the distribution, composition and seasonal variation of microplastics in mangrove sediment of Sandspit backwater were analyzed. Sediments were collected at three different selected stations in backwaters area from three (low tide, mid tide, high tide) tidal levels. In laboratory, at initial step sediments were dried in oven for 48 hours at 90°C and after drying 50 grams of each sediment sample were taken in beaker and then processed through adopted procedure from literature and after 24 hours, each sample was filtered and tagged with each station after drying filter papers, samples were observed under stereomicroscope for the analyses. The abundance of microplastic in backwaters zone of bathing beach was significantly higher as compared to other two stations indicated the relationship between the prevalence of microplastics and human leisure activities or anthropogenic impact. The majority of the microplastic variety includes fragments, films, different colors of fibers and beads and foams.

Keywords: Microplastics, Sediments, Distribution

A Study on the Distribution and Shapes of Ossicles in the Muscles of *Thymiosycia arenicola* (Holothuria: Echinodermata) found along the Coast of Pakistan

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Abstract—Echinoderms especially Holothurians are exclusively marine organisms with a variety of environmental and financial significance viable as now accounted in food. These species are useful in ecological monitoring to achieve biological and investigational aims since member of this phylum are sensitive to ecological changes and rich in the coastal benthic ecosystems of marine environments. *Thymiosyciaarenicola* is a pale-coloured holothurians having thin but rough body wall with a double row of large dark spots on the dorsal surface. This species is usually found in shallow water connected with sand and under slabs of rocks or rubbles. The current study is the part of ongoing study about an integrative taxonomy of the *T. arenicola*is also described with the help of calcareous parts (ossicles) present in the muscles. Sampling was done bimonthly during low tide from Buleji station. Samples were randomly collected for their spatial and temporal variability investigation. For ossicles study, muscular parts of body (N=10) were digested in KOH solution, through stirrer and incubation method. Later the samples were bleached and filtered through filter paper and procured ossicles were counted and their shapes were observed under the stereomicroscope and images were taken through camera mounted (Olympus) with microscope. The number of ossicles varied according to the size of individual. The different shapes (square, rectangular, W shape and longitudinal needle like) of ossicles were observed. This study provides the importance of the species in the benthic ecosystem, suitability of habitat and ossicles study that is potentially relevant information for future systematic, biological and phylogenetic studies.

Keywords: Ossicles, Holothurians, Taxonomic study, Thymiosycia arenicola.

Genetic Structure and Population Frequency Distribution in the Genus *Metapenaeus Sp.* (Penaeidae; Crustacea) Based on Isozyme Analysis

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Abstract—Integrative taxonomy and population study methods are being used widely in species and their population determination and delimitation; it is quite comprehensive approach to find out their intra and interspecific relationships. Along with morphometric analyses, amylase, creatinine kinase isozymes and

native Coomassie marker were used to investigate the genetic diversity and discrimination among population structure of genus *Metapenaeus sp*. A total of 117 individual shrimps were collected from four locations. The mean size was significantly varied among the four populations. From 1st segment, muscles were taken for analysis and native PAGE were used for protein dissolution and a total of 25 loci were observed. 48% loci were found polymorphic such as in CA-1 allele were resolved at four loci (A=0.444, B=0.111, C= 0.278 and D= 0.167) while CAT-1 and CK-2 represented A and B equally. AMY-5and CK -5 showed frequency of allele A and C as 0.972 and 0.028. These were found to be significantly different CA-2, CA-3, AMY-1, AMY-2, CAT-2, CK-1 and CK-4. N_a, N_e, and I were found to be 1.680 ± 0.852, 1.376 ± 0.588 and 0.295 ± 0.395 respectively, observed and expected heterozygosity was 0.264±0.374 and 0.184 ± 0.245 which indicated that the four populations of *Metapenaeus sp.* possessed a rich genetic diversity. The deviation from Hardy–Weinberg equilibrium ($P<0.05$) was observed as F_{st} and N_m were 0.249 and 0.752 respectively. The results were based on the number of alleles as the main indication of genetic differentiation. The species of Korangi, Ketibander and Karachi fish harbor were found to be falling in the same cluster while Sonmiani population was mostly acquiring different cluster.

Keywords: Metapenaeus, Genetic diversity, Amylase, Creatinine kinase, Isozymes, Native Coomassie

A Novel Metabarcoded 18S Ribosomal DNA Sequencing Tool for the Detection of *Plasmodium*Species in Malaria Positive Patients

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Abstract—Malaria elimination strategies demand constant monitoring of the parasite population for genetic variations that necessitate a public health response, such as a new form of drug resistance. Malaria control relies mainly on rapid and precise diagnosis, followed by successful treatment. Malaria diagnosis must be made as soon as possible to provide optimal disease management and surveillance. In every situation, the accuracy of malaria diagnosis is essential, as misdiagnosis can result in severe morbidity and mortality. Here, we describe a novel, high through put method using an Illumina Mi-Seq platform to demonstrate the proportions of *Plasmodium* species in meta barcoded DNA samples derived from human malaria patients. We reported a unique, high throughput approach for determining the ratio of *Plasmodium* species in meta barcoding DNA samples generated from human malaria patients using an Illumina Mi-Seq. Positive control gDNA from *P. falciparum* and *P. vivax* was used to mock DNA pols of parasites to test the assay direction threshold for each species. Several mock pools indicated the accuracy of detection abilities and the proportion of each species. The

technique was subsequently used on malaria-positive patient samples to determine the species composition of *Plasmodium* populations in Punjab region from Pakistan and the tribal territories of the Auragzai Agency Border (Shanawari Zargari), Ali Masjid, Landi-Kotal Khyber Agency on Pak-Afghan border. The deep amplicon sequencing approach contrasts with an immunochromatographic test, commonly utilized for diagnosis in the region. According to deep amplicon sequencing, *P. vivax* was present in 69.8 percent of the patients, *P. falciparum* in 29.5 percent and mixed infection in 0.7 percent of the cases. *Plasmodium vivax* was found in 65.6 percent of patients, *P. falciparum* in 27.4 percent, mixed infection in 0.7 percent of patients and 6.32 percent of positive malaria cases were negative in immunochromatographic diagnosis but positive in deep amplicon sequencing. Overall, metabarcoding DNA sequencing improves diagnosis accuracy, resulting in a significant increase in *Plasmodium* infection prevalence estimates. The use of metabarcoding DNA in next-generation sequencing could help in *Plasmodium* infection diagnosis, surveillance, treatment, and control and can also contribute to research in parasite biology.

Keywords: Diagnosis, surveillance, Illumina, Plasmodium, P. falciparum, Immune-chromatographic, Amplicon sequencing, Surveillance,

Genomic Characterization of ABC Transporter Gene Family in Tilapia Fish

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Abstract—ATP-Binding cassette (ABC) proteins are a kind of transporter found in eukaryotes and prokaryotes that regulates the transit of chemicals between the internal and external environments as well as between body organs. These proteins are present in cell membrane and function as ATP-dependent biochemical pumps that enable a variety of metals and organic molecules to leave the cell. The present study was aimed to characterize ABC superfamily so as to identify its members, their physiochemical properties and mutations in Tilapia fish. To identify the ABC genes, genomic sequences of zebra fish were used as a query to retrieve related sequences from NCBI. These sequences were then blasted for identification and validation of ABC genes in Tilapia. Phylogenetic analysis, gene structure and mutation analysis were performed using bioinformatics tools. Phylogenetic analysis revealed 42 ABC transporter genes in the tilapia genome that are classified and grouped as follows: 7 ABCAs, 7 ABCBs, 11 ABCCs, 4 ABCDs, 1 ABCEs, 3 ABCFs, 8 ABCGs and 1 ABCH. Overall, phylogenetic relationship revealed that tilapia ABC gene family is more closely related to zebrafish and common carp. Gene structure analysis revealed that the ABC transporters consist of two conserved regions: a highly conserved ATP binding cassette (ABC) and a less conserved trans membrane domain (TMD). Ten different motifs of ABC gene family were observed in Tilapia including motif 1 and 3 (consisting of 41 and 28 amino acids) which were

annotated as the ABC trans domain, while 8 motifs were annotated as ABC membrane in Pfam search. In conclusion, the findings of the present study help to better understand the evolution of ABC gene family in Tilapia fish. Furthermore, identified mutations can help in selection of fish for efficient energy utilization and growth.

Keywords: BLAST, Pfam, Transmembrane domain.

Role of Big Data in Health Care Industry: An Empirical Evidence from Pakistan

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Abstract—Diversified technological and innovative techniques are being adopted in healthcare 4.0, including the Internet of Things (IoT), Big Data Analytics (BDA), block chain, artificial intelligence and cloud computing etc. to complete transformation to cyber systems and automated digital environments. Therefore, it seems that, in resource constrained developing countries like Pakistan, Big Data may open new doors in the industries such as healthcare dueto its high-volume, high-speed, high-variety information for better and informed decisions. As evidence from literature review, we observed a scarce literature on the level of Big Data awareness, its utilization in healthcare and role in firm performance, therefore the aim of current study was to empirically test this proposed literature gap. A cross-sectional study was conducted, for which a survey questionnaire was considered as a study tool. The study population comprised of Health Care Establishment (HCE's) in Pakistan. Accurately filled 235 self-administered and/or e-questionnaire with a response rate of 52.2% were analyzed further to establish the relationship by using SPSS version 21. Results supported the proposed model and showed positive relationship between the level of awareness of Big Data and firm performance that is mediated by Big Data usage. Moreover, we found resistance to change as moderator between level of awareness of Big Data and firm performance. We concluded that the level of awareness of Big Data has a significantly positive relationship with firm's improved performance. Where Big Data usage positively mediates this relationship whereas resistance to change moderates this relationship. So, were commend on the basis of these findings that healthcare firms should educate and train their managers and professionals on the importance of Big Data and its usage in health-related activities for their improved productivity.

Keywords: Level of awareness of Big Data, Health care establishment's (HCE's), Firm Performance, Resistance to change

3D Structure Prediction of TANK Binding Kinase 1-Binding Protein 1 by Using Different Online Tools (I-TASSER, Alpha Fold and Robetta)

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Abstract—TANK binding kinase 1-binding protein 1 is protein which has numbers of protein-binding sites, to which TBK1 and IKBKE bind and perform different functions mainly immuno-modulatory functions, anti-proliferative and antiviral innate-immunity in which the interferons Type-1(IFN) such as IFN-β and IFN-α are released, due to which this protein is called adapter protein. It is observed to localize in lungs, small intestine, leukocytes, heart, placenta, muscles, kidneys and relatively low level in thymus and brain. It is a protein which is encoded by gene TBK1 present in *Homo sapiens*. Present study was conducted to predict3D structure of protein through different online servers that would be helpful for further studies in future. The 3D structure of protein predicted through online Software tools such as I-TASSER, Robetta and Alpha-Fold. These tools provide approximately 5structures each of which was then evaluated and validated by another tool SAVES (VERSION6.0). The resulting structures from different tools were validated and evaluated by SAVES (VERSION 6.0). After validation the best predicted structure found through Robetta that had ERRAT value of 84.0604 and PROCHECK (Ramachandran plot) had found residues in most favorable regions were 90.8 %, residues in additional allowed regions were 8.0%, residues in generously allowed regions were 0.6% and residues in disallowed regions were 0.6%. The predicted model was then visualized through Swiss PDB Viewer in different format such as ribbon and ball and stick. After unveiling 3D structure of novel protein, we concluded that this structure will help us to find out its role other than in antiviral innate immunity and by producing torsion in its 3Dstructure, researchers will be able to detect either this protein is involved in any disease or not because according to previous studies it is not associated with any disease.

Keywords: 3D structure prediction, TANK binding kinase 1, I-TASSER server, Innate-Immunity

Protective Effect of N-Acetyl Cysteine against Sodium Arsenite Induced Toxicity in Laboratory Mice

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Abstract—Arsenic is one of those heavy metals that is found in contaminated water and soils in the form of organic and inorganic components. Inorganic form is more toxic, causes nervous dysfunction, neurological disturbances, cardiovascular problems, nephrotoxicity and hepatotoxicity. NAC (n-acetyl-L-cysteine) is a powerful antioxidant which has been used to cure various diseases and toxicity. The current study was conducted to examine the protective effect of nacetyl-L-cysteine against sodium arsenite ($NaAsO_2$) induced tissue toxicity in albino mice. The experiment was conducted for 28 days and the mice were divided into eight groups. The first group was control received saline, second group received arsenic only, 3rd, 4th and 5th received NAC only while 6th, 7th and 8thwere the treatment groups. Arsenic treated groups showed significant increase in AST, ALP, ALT, creatinine, cholesterol, triglyceride, stress markers (ROS and TBARS) and Total protein while significant decrease occurred in the antioxidant enzyme such CAT, SOD, POD and GSH in kidney, liver and brain tissue as compared to control group. Arsenic treated groups also showed alterations in normal morphological architecture of kidney, liver and brain and non-significant decrease in the organ mass index was also observed in arsenic treated group. The result was found that high dose of NAC-150 significantly reduced alterations in oxidative stress and serum toxicity markers and restored the morphological alterations. It is concluded that NAC at a dose of 150 mg/kg is beneficial to treat arsenic induced toxicity in albino mice.

Keywords: Sodium arsenite, N- acetyl cysteine, Toxicity, Antioxidants, Mice

Protective Effects of *Tephrosialu Pinifolia* Dc. Against Cadmium Induced Renal Toxicity in Sprague Dawley Rats

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Abstract—Cadmium is a common environmental pollutant which is linked with a variety of adverse health effects such as renal impairment, carcinogenesis, hepatotoxicity as well as disruption of normal endocrine and reproductive functions. *Tephrosialu Pinifolia Dc* belongs to the family "Fabaceae" and is traditionally used in the treatment of urinary disorders, stomach ache, diarrhea, rheumatism and asthma. Effects of *Tephrosialu Pinifolia Dc* pre-treatment were

investigated in cadmium induced changes on renal function tests including creatinine, urea, uric acid and blood urea nitrogen. In this study, male rats were administrated (orally) with TLM (25, 50 mg/kg) for seven days and then injected (intravenously) with cadmium ($CdCl_2$, 4 mg/kg) to induce acute renal toxicity. Creatinine, urea and blood urea nitrogen levels were decreased while uric acid increases due to cadmium administration when compared to control rats. Treatment of *Tephrosialu Pinifolia Dc.* to rats improved cadmium induced toxicity and restored these values towards normal. The present study suggested the preventive potentials of *Tephrosialu Pinifolia Dc* against the cadmium induced renal toxicity that justifies its uses for the cure of various diseases particularly urinary and gastrointestinal disorders.
Keywords: Cadmium, Renal toxicity, *Tephrosia lupinifolia*

Identification of A Novel Homozygous Missense (c.443A>T:p.N148I) Mutation inBBS2 in a Kashmiri Family with Bardet-Biedl Syndrome

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Abstract—Bardet-Biedl syndrome (BBS) is a rare autosomal recessively inherited disorder with major clinical symptoms such as: obesity, retinal degeneration, polydactyly and renal abnormalities. The aim of the study was to find out the disease causing variant/s in patients exhibiting clinical features of (BBS). The identification of pathogenic variant was performed by using whole exome sequencing on Illumina HiSeq 4000 platform involving the SeqCap EZ Exome v3 kit (Roche Nimblegen). The identified variant was further validated by Sanger sequencing. WES revealed a novel homozygous missense mutation (NM_031885:c.443A>T:p.N148I) in exon 3 of BBS2 gene. Sanger sequencing confirmed this mutation as homozygous in both affected individuals and heterozygous in both parents, demonstrating autosomal recessive mode of inheritance. To the best of our knowledge this variant was not present in literature and in publically available databases. The candidate variant is predicted to be disease causing by in silico analysis. Clinical and genetic spectrum of BBS and BBS-like phenotypes is not fully defined in Pakistani as well as in Kashmiri population. Therefore, more genetic studies are needed to gain insights into genotype-phenotype correlations to facilitate carrier screening and genetic counseling of families with such disorders.
Keywords: Bardet-Biedl syndrome, BBS2 gene, In-silico analysis, Ciliopathy, Exome sequencing, Kashmiri family

Investigation of Mitochondrial Calcium Exchange in Ionomycin-Induced Neutrophil Degeneration

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Abstract—Neutrophil Extracellular Traps (NETs) are web-like filaments containing decondensed chromatin decorated with antimicrobial proteins that are released in response to inflammatory stimuli. Ionomycin and thapsigargin are potent inducers of NETosis (formation of NETs) which work via increase in intracellular calcium and ROS formation. The current study explored the role of mitochondrial calcium efflux in ionomycin and thapsigargin-induced neutrophil degeneration that may be linked to cellular NETosis. Initially, Polymorphonuclear neutrophils (PMNs) in both whole blood (WB)and a platelet-lacking whole blood preparation (WBP) were pre-treated with CGP-37157, a pharmacological blocker of NCLX, followed by stimulation with ionomycin and thapsigargin. Smears were Field's-stained and brightfield microscopy was performed for quantifying the morphological changes in neutrophils. Also, isolated PMNs treated with ionomycin and thapsigargin were used to check the release of MPO after stimulation. Moreover, mitochondrial membrane potential (MMP) was also assessed in ionomycin and thapsigargin treated PMNs. Our results showed increased neutrophil degeneration upon ionomycin and thapsigargin stimulation. The presence of platelets in whole blood negatively affected the ionomycin stimulation of neutrophils. Interestingly, CGP-37157 increased the damage in PMNs stimulated with ionomycin or thapsigargin. Inhibition of NCLX depolarized MMP in ionomycin stimulated neutrophils while thapsigargin stimulated neutrophils also induced depolarization of MMP. Our data also showed increased MPO activity in ionomycin and thapsigargin treated PMNs.
Keywords: Neutrophil Degeneration, Ionomycin, Thapsigargin, NETs, NCLX, Mitochondrial Membrane potential, MPO Activity.

Iron Nano Particles Inhibit Growth in High Altitude Endemic Murree Hills Frog (*Nanorana vicina*)

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Abstract—Amphibians constitute highest number (41%) of threatened vertebrates. The group is facing threats such as habitat destruction, climate change, epidemics, invasive species and pollution due to pesticides and heavy metals. Nanoparticles are small sized elements (P <; 100nm) manufactured on a large scale for different products and also occur in nature. We conducted the

present study to see if growth (body weight, tail length, body length, total length and body width) and development differed among tadpoles of Murree Hills frogs *Nanorana vicina* treated with a gradient (0, 10, 25 and 40 mg/L) of Iron Oxide (FeO) nanoparticles (NP)concentrations under laboratory conditions. The frog is endemic to forested montane high-altitude freshwater wetlands of Himalayan region. We carried out synthesis and characterization of the NPs using standard protocols. We then subjected a total of 48 tadpoles to the selected concentration gradients (three replicates for each concentration, 4 tadpoles/replicate, 12 tadpoles /concentration) for eight weeks. We weighed and measured tadpoles and observed development using developmental stages described by Gosner (1960) on weekly basis. Our results showed that the mean of all studied variables (body weight, tail length, body length, total length and body width) in tadpoles subjected to 10, 25 and 40 mg/L of FeO nanoparticles concentrations were significantly lower ($P < 0.05$) when compared with the control (0 mg/L). However, advanced developmental stages (38 and above) were attained in the control and all three treatments. We present first empirical data on how nano particles of a heavy metal could affect a high-altitude endemic frog species.

Keywords: Forested wetlands, Himalayan endemics, Heavy metals, Aquatic pollution, Nanotechnology

First Record of *Ampulex compressa* (Fabricius, 1781) (Hymenoptera: Ampulicidae) from Pothwar region of Pakistan

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Abstract—The wasps of genus Ampulex Jurine (Hymenoptera: Ampulicidae) are commonly known as cockroach wasps. They are distributed in Australia, Ethiopian, Nearctic, Neotropical, Oriental and Palearctic region. Some species of this genus have been confirmed asparasitoids of cockroaches specially genus Periplaneta. Around 130 species of this genus are recorded in the world and 20 have been described in neighboring country,India. Keeping this in view, multisite surveys were carried in various localities of Pothwar region during 2021-2022. Wasps belonging to Family Ampulicidae were collected from different habitats randomly. They were identified using available literature. Micrographs of the species were prepared with the help of using an Amscope18 megapixel camera attached to a LEICA MS5 microscope. As a result of these studies, *Ampulexcompressa* (Fabricius, 1781) commonly known as emerald cockroach wasp or jewel wasp is recorded for the first time from Potohwar region of

Pakistan. Main identification characters of this species supported with measurements and illustrations are provided here with notes on distributional range. Both male and female have been illustrated using micrographs of morphological characters. Remarks on ecology of the species have been given. Our results have added a new record in the fauna of Pakistan. This wasp may be applied as a bio-control agent after mass rearing in the urban as well forest areas surrounding different cities.

Keywords: Ampulex compressa, Hymenoptera, Ampulicidae, First record, Pakistan

Spatial Distribution of Malaria and its Vectors in Five Selected Districts of Khyber Pakhtunkhwa, Pakistan

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Abstract—Pakistan is considered as a moderate malaria-endemic country but still, 177 million individuals are at risk of malaria that make up roughly 60% of Pakistan's population. The current study was conducted from ex FATA; which included districts of Khyber, Orakzai, subdivision Peshawar, subdivision Kohat and subdivision Lakki Marwat. This research work was carried out from October 2017-December 2020 to find out the spatial distribution of malaria, to identify possible hotspots for the disease and its vector mosquitoes in the selected regions based on available data. Spatial distribution was determined using ArcMap 10.8 by making maps. Malaria prevalence data analyzed; *Plasmodium vivax* cases were more common than *Plasmodium falciparum*. A total of 50,89,970 samples were observed during these years, 62,148 came out positive, 53,930 cases turned out to be *P. vivax*, 6474 *P. falciparum* and 1684 were mixed cases. Although the cases of malaria were reported throughout the year, infection rates were found to be highest during the months of July-October. From the data obtained, only the data for selected districts were retrieved. Out of total, 52% were males and 48% were females. The current study indicates that malaria prevalence is regulated by intricate collaborations among the hosts and vectors and has a direct relationship with the prevailing conditions of environment and climate. The findings of this study also imply that if *Anopheles* vector is not controlled efficiently, it might result in repeated incidence in areas which are not endemic.

Keywords: Malaria, Ex FATA, Spatial distribution

Theme: Botany

Evolutionary Descent of Different Bacteria from a Common Ancestor Based on Bioinformatics Tools

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Abstract−Bioinformatics tools aid in the comparison of genetic and genomic data and understanding of evolutionary aspects. Salmonella and E. coli are both bacteria and they are fundamentally similar. The primary aim of this study was to describe that how different bacteria are inter-related with each other and at how much extent. A bioinformatics analysis of both bacteria was prepared by inputting file (FASTA format), performing multiple alignment, exporting alignment into Mega format, constructing phylogenetic tree. Both bacteria can cause food poisoning. If certain strains of either bacterium enter body, a person can become physically ill and may experience vomiting and diarrhea with both. E. coli is 95.1–99.1% identical with Salmonella. Similar method was done on 20 different bacteria to distinguish between them based on bioinformatics tool. Salmonella and E. coli have diverged from common ancestor about 100 million ago. This study confirm that many bacteria are inter-connected with each other and there is evidence for one clear ancestor for each domain—the last bacterial common ancestor (LBCA).

Keywords: Phylogenetic tree, Bioinformatics, Microbes, Bacteria

Eco-friendly Approach to Utilize Nanoparticle along with Ascomycetes Fungal Strains to Enhance Lignin Degradation Process

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Abstract−Amongst naturally available biopolymers lignin came at second position, comprised of asymmetrically assorted phenyl polymers. Lignin degradation significantly important for photosynthetically fixed carbon recycling. In present research, potential fungal strains were isolated from paper mill effluent (black liquor) in order to investigate its probability for the biodegradation of lignin. The four fungus strains (M1, M2, M3, M4) were screened on the basis qualitative and quantitative assays using black liquor and Kraft lignin. The nanozyme approach has been used to mimic the enzyme activity by nanoparticles

to enhance lignin degradation ability of the strains. The results of initial screening indicated that the selected strains showed ligninolytic zone on MSN agar plates supplemented with black liquor (BL). The molecular identification suggest that the selected strains are *Aspergillus terreus*, *Dipodasceus australiansis*, *Geotrichum candidum* and *Aspergillus fumigatus* and belongs to ascomycetes. For insoluble lignin residues all the four selected strains observed a clear growth. Under optimized conditions *Aspergillus terreus* (M1) shows 73%, *Dipodasceus australiansis* (M2), *Geotrichum candidum* (M3) shows 84% and *Aspergillus fumigatus* (M4) 80% lignin degradation respectively. The biodegradation efficiency was consolidated with the help of secretome and FTIR analysis which indicated transformation of complex structure of lignin. Our results suggested that the eco-friendly approach of nanoparticles with selected ascomycetes strains possess excellent lignin degradation capability and can be used effectively in commercial waste treatment system for pulp and paper mill effluent.
Keywords: Black liquor, Lignin degradation, process optimization, nanoparticles

Ethno-Pharmacological Approach of Stinging Nettle (*Urtica dioica* L.) among the Local Inhabitants of District Rawalpindi, Province of Punjab, Pakistan

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Abstract−*Urtica Dioica* L. belongs to the family Urticaceae, commonly known as `Stinging Nettle`. It is used by traditional naturopaths to treat different diseases such as hematuria, nephritis, jaundice, arthritis, menorrhagia, rheumatism and skin itches. Phytochemical study revealed the presence of many valuable compounds such as saponins, phytosterols, flavonoids, proteins, tannins and amino acids. Present investigation aimed to explore the use of the *Urtica Dioica* L among the local inhabitants of District Rawalpindi. A survey was conducted among the people who were native to the area and possessing some ethno-pharmacological knowledge. Survey results reported that among the plant parts used, leaves (72.9%) are most common to cure diseases as compared to roots (12.5%), stem (6.3%) and flower (8.3%). Mostly people used to make tea of leaves (70.2%), whereas 29.8% local inhabitants used mixed tea for the medication of different diseases. Native people used it for allergy infections (61%), inflammation (6%), arthritis (6%), stomach-ache (12%), anemic condition (7%), whereas 8% used for eczema. The results of the present investigation revealed that the occupants of the Rawalpindi district have sound information about the ethno-pharmacological consumption of *Urtica Dioica* L. to treat diseases.
Keywords: *Urtica Dioica*, Stinging nettle, Ethno-pharmacology

Optimization of In-situ Biogas Up-gradation by CO_2-to-CH_4 Bioconversion in Two Stage Attached Growth Reactor

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Abstract−Biogas is customarily utilized for cooking and heating due to its low energy output, to be exploited as vehicle fuel and power generation up-grading is impulses. The biological in-situ biogas up-gradation with gasses recirculation and H_2 from external source, the hydrogenotrophic methanogens transforms CO_2 and H_2 into CH_4 preserving surge in CH_4 formed during anaerobic digestion process. The efficiency of up-gradation depends upon the proportion of hydrogenotrophic methanogens which tends to form biofilm. The biofilm in methanogenic reactor will increase the hydrogenotrophic methanogens in reactor resulting high rate up-gradation. The present study looked into the impact of biofilm in methanogenic reactor during in-situ biogas up-gradation. For biogas up-gradation, the gasses were recirculated along with hydrogen supply form the external source in attached growth and suspended growth methanogenic reactor. The flow rate and recirculation time were optimized to boost the efficacy of in-situ up-gradation process. Without up-gradation the methane yield was recorded 0.223 and 0.241 NL g-1VSaddedin case of suspended and attached growth methanogenic reactor. While during up-gradation the methane yield was increased to 0.663 and 0.733 NL g-1VS added in suspended growth and attached growth methanogenic reactor at optimum flow rate and recirculation time. The methane contents of biogas were increased from 71 to 99% in optimized conditions without compromising the process stability. During in-situ biogas up-gradation the biofilm in methanogenic reactor increased the methane production by 11% as compared to control. The study concludes that the inclusion of biofilm in methanogenic reactor showed significant impact on the efficiency of the reactor during in-situ biogas up-gradation.

Keywords: Methane, Biofilm, Biogas up-gradation, Methanogenic reactor

Assessment of Antidepressant Potential of *Zizyphus Nummularia* in Sprague Dawley Rats Using Forced Swim Test

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Abstract−Depression is a mental illness which causes high suicide rate and physical impairment as well. Currently, it is acknowledged as a major health issue. Therefore, it is very essential to search for novel therapeutic products for the cure of this ailment. *Zizyphus nummularia* belongs to the family Rhamnaceae. It is used for the cure of diabetes, as anti-inflammatory, antioxidant, anti-bacterial and fungal agent. Objectives: In the present investigation, anti-depressant potentials of methanolic extract of *Zizyphus nummularia* were determined in Sprague Dawley rats using forced swim test. The rats were divided into three different groups (n=3). One group was kept as negative control while the other two groups were administered with flouxetin (10mg/10ml) and *Zizyphus nummularia* (400 mg/kg). Results: The results of this study have shown that methonolic extract of *Zizyphus nummularia* significantly reduced theimmobility time by 90.33 ± 32.86 seconds (P<0.05) in comparison to the immobility time of control i.e., 137.67 ± 6.11 sec. The decrease in the immobility time of standard was 37.00 ± 18.61 sec. Conclusion: The findings of this study are indicating the anti-depressant potential of *Zizyphus nummularia* which can be due to the presence of phytochemical compounds in it. This should be further investigated by isolating and identifying these compounds to use for drug formulation.

Keywords: *Zizyphus nummularia*, Anti-depressant, Forced Swim Test, Flouxetine

Study of Cytotoxic Activities of Different Fractions of *Periploca aphylla* Decne

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Abstract−*Periploca aphylla* Decne. belongs to the family Asclepiadoideae. In folk medicine, the milky juice of *P. aphylla* is externally applied to swellings and tumors. Brine shrimp lethality assay mostly associate well with anti-tumor and cytotoxic properties. In this study, the cytotoxic potentials of various fractions of crude methanolic extract of *P. aphylla* were investigated. The cytotoxic activities of different fractions of *P. aphylla* were determined by using brine shrimp assay. Results: The n-hexane fraction showed low cytotoxicity (53.33%) at 1000 mg/ml, while 33.33 and 20% was observed at 100 and 10 mg/ml, respectively. The LD 50 value calculated was 736.396 mg/ml for hexane fraction. The chloroform fraction marked good activity at all concentrations (63.33, 56.66 and 33.33 at 1000, 100 and 10 mg/ml, respectively). The LD 50 was 84.91 mg/ml. The ethyl acetate fraction exhibited good brine shrimp lethality at respective test concentrations that was 76.66, 70 and 30% at 1000 mg/ml, 100 mg/ml and 10 mg/ml, respectively. The LD 50 value calculated was 41.599 mg/ml. The butanol fraction of the plant exhibited good cytotoxic activity (83.33, 60 and 30%) at respective test concentrations. The LD 50 value calculated was 51.10 mg/ml. The aqueous fraction showed good cytotoxic activity (90, 70 and 30%) at respective concentrations and the LD 50 was 35.93 mg/ml. Conclusion: Hence, it can be concluded from these results that *P. aphylla* possess strong cytotoxic potential which justifies its traditional use against tumors

Keywords: *Periploca aphylla*, Cytotoxic, Brine shrimp assay

Physiological and Biochemical Response of Mutated M3 Cotton (*Gossypium hirsutum* L.) to different Level of Salt Stress

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Abstract−Genetic variation in cotton for salinity tolerance is a prerequisite for developing genetically improved cultivars. The objective of the study was to assess the genetic variation for salt tolerance in mutated M 3 population of cotton developed by gamma irradiation and EMS. A screening experiment was conducted for 12 mutated and one normal/untreated genotype in a hydroponics

system under controlled conditions. The three salinity levels used were control, 150 mM and 300 mM. Three leaf seedlings were transplanted to hydroponics having half-strength Hoagland solution at control, 150 mM, and 300 mM NaCl salinity levels. Salinity induced significant variation in root and shoot lengths, fresh root and shoot weight, dry root and shoot weight, root shoot ratio, survival rate, protein contents, and α-amylase activity were observed. Genotypes 9Ac, 47Ab, 1Aa, 45Aa, and PB-899 were observed highest tolerant genotypes with a better performance at 150 mM salinity level. However, at 300 mM salinity level best genotypes included were 57ab, 47Ab, 1Aa, and 54Aa. On the other hand, genotypes 7Bb, 51Aa, and 57ab showed poor performance or susceptible response across the 150 mM saline environment. Genotypes 9Ba, 45Aa, 9Ac and PB-899 were susceptible at 300 mM salinity. Thus, the genotypes 57ab, 47Ab and 1Aa were found tolerant to adoption of salt stress and can be used as a source in crop improvement program.

Keywords: Mutagenesis, Cotton, Salinity tolerance, Hydroponics technique, biochemical response, TILLING population

Electro-Chemical Activity and Diversity Profiling of Enriched Electricigens from Sewer Contaminated Soil Sediments in Dual Chamber Microbial Fuel Cell

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Abstract−Depleting energy resources worldwide has created a huge concern towards finding alternative, innovative solutions. Microbial fuel cells (MFCs) has been viewed as another innovative solution to this ongoing dilemma. Enrichment of electricigens and their associated power generation was carried out in Microbial Fuel Cells (MFC1 and MFC2) from sewer contaminated soil sediments (S1 and S2). Microtiter plate assay indicated 90% (n=101) biofilm forming culturable bacteria and most common of them were Pseudomonas, Bacillus sp., Proteus sp., and E. coli. In MFC1, Pmax = 26728mWm-2 whereas in MFC2 Pmax = 12008mWm-2(57Ω). Molecular phylogeny of biofilms in MFC1 and MFC2 indicated abundance of phylum Proteobacteria. Its density in MFC1 was comparatively higher [(99.1%) (Class: β-Proteobacteria > γ-Proteobacteria > α-Proteobacteria) than in MFC2 [(94.5%) (Class: γ-Proteobacteria > β-Proteobacteria > Opitutae)]. Presence of few exotic species like proteobacterium_cloneBAS3181, uncultured α-proteobacterium cloneMS129A1-D01 and uncultured pseudomonas sp._clone _G13-S-2-F05 with unknown functionality specifically demanded physiological role in MFCs. The present study revealed the successful enrichment and power generation capabilities of electrogenic bacterial communities enriched from sewer contaminated soil sediments (S1, S2). Bacterial density, diversity and associated power output varied with different soil sediments.

Keywords: Microbial fuel cells; Electricigens; Proteobacteria; Power density; Enrichment

Comparison of Different Mobile Applications for the Identification of FJWU Flora

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Abstract—Plant identification is essential for the conservation of biodiversity and satisfaction of the curiosity among people to know about the species in their surroundings. Various mobile applications (apps) have been developed for plant identification. These artificial intelligence-based apps are used by researchers as well as by the general public. Some apps have their database while others store the data of users. This study aimed to compare widely used mobile apps for the identification of Fatima Jinnah Women University (FJWU) diverse flora. Five different apps were compared with Google lens which was used as a standard. Android system and iOS system were the study instruments. A total of 100 different plants including fruits, vegetables, ferns, herbs and trees from different parts of the university were studied using mobile apps. One-way ANOVA was applied to analyze the data for this comparative study. Only one app showed the highest accuracy (90%) of plant identification, and it is the most recommended plant identification app but still, it should be used cautiously and after consultation with the experts. Non-significant results of statistical analysis showed that all the apps were equally effective in plant identification. Hence, all other apps can also be used for plant identification.

Keywords: Plant identification, Mobile applications, ANOVA, Google lens, Artificial intelligence, Flora

Novel Report of *Fusarium oxysporum* causing dry rot of carrot in Pakistan

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Abstract—*Fusarium* rot or dry rot is an emerging threat to the carrot field, which is responsible for significant economic losses worldwide. The study aimed to identify *Fusarium* species associated with dry rot of carrot. For this purpose, a survey was conducted at Vegetable Research Station Sahiwal (VRSS) to the

collection of symptomatic carrot roots. Diseased samples based on the symptoms appeared as yellowing and wilting of leaves, dry rot lesions on root surface, expressing light brown cankers with defined rounded or irregular shapes later on whitish mycelium developed on the lesions were surface sterilized with 1% sodium hypochlorite, rinsed thrice with sterile distilled water and dried by placing them on filter paper for 45 sec. Sterilized tissues (approximately 4 mm3) were excised and incubated on potato dextrose agar (PDA) medium at 25 ± 4°C. A total of ten isolates were recovered from the diseased samples. After incubation for 7 days, the morphological studies of the fungal colonies revealed the colonies as cottony with abundant aerial mycelium. In microscopic observation, Macroconidia was falciform and measured 12.1 to 30.7 (L) × 3.6 to 5.8 (W) µm with 2 to 3 septation, while elliptic Microconidia of 5.8 to 8.6 × 2.9 to 3.6 µm with none or one septate. Based on the characters, the fungus was tentatively identified as *Fusarium oxysporum*. For molecular characterization, DNA of the 03 isolates (ON955520, ON955053 & ON955054) were amplified with internal transcribed spacer (ITS) gene regions were sequenced. Sequence comparison revealed 99-100% genetic homology with previously reported isolates of *F. oxysporum*. A phylogenetic tree was constructed and analysis highlighted three diverse subtrees. After confirmation through pathogenicity test, to our knowledge, this is the first-ever detailed study of its kind to know the status of the disease along with its characterization from Pakistan. *Fusarium oxysporum* causing dry rot of carrot could pose a serious risk to the carrot growers of Pakistan and may require devising of appropriate management strategies.

Keynote: *Fusarium oxysporum*, Dry rot, Carrot, Pakistan

Elucidating the role of antioxidant enzymes in stripe rust resistant and susceptible genotypes

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Abstract—The objective of the current study was to determine the activity of antioxidant enzymes: superoxide dismutase (SOD), ascorbate peroxidase (APX), glutathione peroxidase GPX and catalase (CAT) in 10 wheat near isogenic lines (NILs) showing compatible and incompatible interactions. The enzyme activity was determined at 24 hours after inoculation (24hai), 48 hours after inoculation (48hai) and 72 hours after inoculation (72hai). To fulfill this objective, 12-day-old wheat seedlings were inoculated with stripe rust race. The results of the study showed that enzyme activity and their gene expression was significantly high in incompatible interaction as compared to compatible interaction. All enzyme exhibited increased activity at 72hai. High enzyme activities of CAT (55.95 U/mg protein), APX (55.85 U/mg protein), SOD (97.64 U/mg protein) and GPX (84.75 U/mg protein) were recorded in Yr 5/6* Avocet S at 72hai. The results indicate a

unique pattern of activity of the antioxidant enzymes in the compatible and incompatible interaction.

Keywords: Stripe rust, Antioxidant Anzyme, Gene Expression, compatible and Incompatible interaction.

Screening of chilli germplasm for resistance to bacterial foliar pathogens

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Abstract—Chilli is a major cash crop of Pakistan and is prone to various bacterial diseases. Therefore, the current study was planned to elucidate the resistant chilli germplasms against local chilli putative bacterial isolates. For isolation of bacteria, chilli disease samples were collected from Taxila, Mianwali, Islamabad, Chakwal, and Rawalpindi during 2021-22. In addition, seed borne bacterial infection percentage and isolation from different chilli varieties was also performed. In total, 9 isolates were obtained out of which 5 were obtained from infected leaf samples while the rest were isolated by seeds. Seed infection varied from 10 to 20 % in different chilli varieties. Biochemical assays were performed for the characterization of pathogens. The two well characterized isolates GP (plate poison technique) and APO (*Pseudomonas syringae*) were used in chilli gerplasm screening. Leaf detach and seedling inoculations methods were used for pathogenicity assays. Hot pepper and Gaula (sweet pepper) were found resistance against GP and APO respectively in leaf detach assay. Out of three varieties (TAX, Sky Star and Golden Hot), TAX resistance against Xanthomonas vesicatoria while Sky star found resistance against Pseudomonas syringae in seedling inoculation assay. GP and APO antibiotic sensitivity (erythromycin penicillin, streptomycin, and tetracycline) assays were also performed by disc diffusion method. It was found that tetracycline and streptomycin were effective against GP and APO respectively. Our data showed that *Xanthomonas vesicatoria* and *Pseudomonas syringae* were quite common in chilli field plantations and chilli germplasm must be screened against these bacteria before sowing to avoid future disease spread.

Keywords: Chilli, *Xanthomonas vesicatoria*, Leaf Detach

New insights on distribution and molecular characterization of sugarcane bacterial diseases in Pakistan

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Abstract—Phytobacteria are emerging as a threat to sustainable production of sugarcane (*Saccharum officinarum* L.) which considered as the second most important cash crop in Pakistan. During this study, major sugarcane growing areas of KPK, Punjab and Sindh provinces were surveyed in year 2020-21. Based on field symptomology, three bacterial diseases viz., red stripe, leaf scald and Stewart bacterial wilt were found in Punjab while in Sindh only leaf scald and red stripe were observed. The putative bacterial isolates initially confirmed as *Xanthomonas albilineans* (Xa), *Pantoea stewartii subsp. stewartii* (Pss) *Acidovorax avenae subsp. avenae* (Aaa) through morpho-biological assays. Bacteria showed maximum sensitivity against tetracycline in disc diffusion method. However, bacteria found insensitive against copper sulphate and grow at temperature range between 10 to 40oC. PCR test was used for the molecular confirmation of these bacteria. *Xanthomonas albilineans* was confirmed by specific primers XaF/XaR on which it showed band at 600 bp while *Pantoea stewartii* subsp. stewartii and *Acidovorax avenae subsp. avenae* gave clear bands at 1500bp with universal primers B16SF/B16SR and P0f/P6r respectively. Both Pss and Aaa were sequenced through sanger sequencing method by Macrogen company Korea. After blasting, our sequenced result of *Pantoea stewartii subsp. stewartii* and *Acidovorax avenae subsp. avenae* showed similarity with Chinese, Malaysian and USA isolates (MW015765, MF351732 for Pss and KU948662, CP028300 for Aaa respectively). Furthermore, these sequences were submitted to GenBank (NCBI) with the accession number SUB11720155 (ON965180, ON965181) for Pss and SUB11952181 (OP267574, OP267575) for Aaa. This pilot study provided insights regarding prevalence of phytobacteria in sugarcane areas which can be used in future sugarcane germplasm disease screening program.

Keywords: Sugarcane, Xanthomonas albilineans, Pantoea stewartii subsp. stewartii, Acidovorax avenae subsp. avenae

Vigna radiata Chromium Stress-Induced Oxidative burst & its management by indigenous Plant Extracts

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Abstract—Mung bean (*Vigna radiata* L. Wilczek) also known as green gram is an important edible pulse crop that are rich in protein and have a potential to fix atmospheric nitrogen. After chickpea it is an important cash crop that is cultivated on arid region of Pakistan. Unfortunately, due to various abiotic and biotic factors production of that crop is very low in Pakistan as compared to other countries. Amongst abiotic constraints accumulation of heavy metal Chromium Cr (VI) is threating food safety issue that impact on mung bean production in Pakistan. The contemporary study was conducted to ascertain the impact of Cr (VI) on the physiology, germination and growth of mung bean. In the present study the petri plate experiment was conducted in the lab. The surface sterilized seeds of mung bean were sown in different concentrations of Cr (VI) and left for 10 days. After 10 days of seeds germination different physiological attributes like total chlorophyll content (TCC) and soluble sugar (SUG) were studied. Biochemical traits i.e, Total protein content (TPC) and Catalase activity (CAT) were studied after 10 to 15 days of seed germination. Moreover, the growth parameters like germination % root and shoot length, biomass and metal accumulation were studied after 15 days of mung bean plant. Furthermore, the increasing dose of Cr (VI) exhibited deleterious effect on the root and shoot growth of mung bean while, it showed no effect on germination rate. At highest dose of Cr (VI) germination index (GI) and relative injury rate (RIR) was significantly reduced up to 57% and 0.2% respectively, over negative control. Over and above, at 1.0 to 2.0 mg kg-1 of Cr (VI) exhibited deleterious effect on both root and shoot (height and biomass). The root length and biomass was drastically reduced by 94% to 49% as compared to negative control whereas, the shoot growth (length and biomass) were gradually reduced by 87 to 61% with respect to negative control. Cr (VI) accumulation by different plant parts (root and stem) was increased with increased in heavy metal concentration (0.5-2.0 mg kg-1) in order of: root > shoot. Cr (VI) accumulation by different plant parts of mung bean plant was gradually increased in a concentration dependent manner with increased Cr (VI) concentration. Moreover, the mung bean plant is also accumulating the Cr (VI) from the soil that would be an alarming situation for the future that it could enter into our food stuff (grains, plants used as fodder crop) that pose risks and hazards to humans and animals. So far, there should be the environment friendly way to mitigate the distressing heavy metal pollution from soil and water (streams, rivers and ground water).

Keywords: Stress, Growth, Physiological alterations, Chromium, Vigna radiata

Development and evaluation of dry powder sachet formulation from *Grewia asiatica* (Phalsa)

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Abstract—Urinary tract infections (UTI) are among the most commonly occurring infections, affecting 150 million people annually, and a mortality rate of 20-40% per year. Traditionally, *Grewia asiatica* (Phalsa) is used as a summer fruit for its stimulant and coolant effect. This study is carried out to investigate the anti-uropathogenic activity of *G. asiatica* and formulation of its fruit powder sachets as alternative to treat UTI. The antiuropathogenic activity of the G. asiatica aqueous and organic extractswere evaluated against uropathogenic bacterial strains by the disc diffusion method. The extracts were evaluated for its antioxidant activity through DPPH free radical scavenging assay. In addition, the extracts were further evaluated for its cytotoxic potential on normal Human Corneal Epithelial cells (HCEC). *G. asiatica* fruit extracts exhibited antiuropathogenic activity against uropathogenic strains including, *Escherichia coli*, *Acinetobacter baumanii*, *Staphylococcus aureus*, *Proteus* mirabilis, and *Pseudomonas aeruginosa*. In addition, the fruit extract exhibited strong radical scavenging activity at a concentration of 500 µg/ml. Furthermore the *G. asiatica* fruit extracts showed low cytotoxicity against HCEC cell line. The *G. asiatica* fruit extracts revealed the presence of secondary metabolites and showed the anti-uropathogenic activity with low cytotoxicity to normal cells, therefore this study can provide the basis for the formulation of dry powder sachet from Phalsa as an alternative therapy to treat UTI.

Keywords: Urinary tract infections, *Grewia asiatica* (Phalsa), Anti-uropathogenic activity

Treatment of Abbotair's Wastewater by Using Integrated Approach

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Abstract—The meat processing sector is proliferating with the increasing demand for meat. Facilities use a large volume of water for animal slaughtering, meat processing and cleaning. In the last three decades, meat production has doubled, which projected a sharp increase in meat production by 2050. Abattoir wastewater has a complex composition that includes nutrients, fibres, proteins, and fats from animal slaughtering. These nutrients cause eutrophication in water bodies when discharged without treatment. Therefore, it is very important to treat Abbotair's wastewater due to high BOD, COD, TDS, TSS, Nitrate and Phosphate concentrations. The study aims to treat Abbotair's wastewater by using an

integrated approach and meet the National Environmental Quality Standards (NEQS) discharge standards and use it as irrigation water. The use of sludge produced as Blood Meal in vegetable growth which acts as slow-release fertilizer in the soil is also an objective of this study. In the study, Integrated approaches like preliminary, settling, aeration, chemical precipitation, coagulation, flocculation and Biochar were used for treatment. Biochar is also considered a medium for removing nutrients from wastewater due to its excellent binding structural properties. By using these approaches BOD and COD were removed from the wastewater by 98 percent. Nutrients were removed by 99 percent from Abbotair's wastewater. The TSS value of wastewater was reduced by 97 percent. Due to the treatment methods, wastewater becomes colorless and odorless which indicates the reduction of pollution load. Use of different treatment techniques, high organic loaded wastewater become reusable and meet the NEQS standards.
Keywords: Treatment, Abbotair's Wastewater, Integrated, Approach

Documentation of Traditionally used Medicinal Plants by Local Communities of District Okara

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Abstract—The Okara district is rich in floral diversity and traditional knowledge of extremely significant plants. A study was conducted to evaluate the utilization of medicinal plants by locals in District Okara. Semi structured questionnaire was designed to record survey data. 100 plants belonging to 88 genera and 40 families were reported during present research work. Results exhibited Asteraceae as most popular family with 11 species and 11 genera. Herbs were most frequent form of life i.e. 60%, whereas most prevalent habitat of plants was wild i.e. 76%. It was observed that whole plant (29%) and leaves (19%) were most commonly practiced. Highest utilization out of 13 categories was observed for digestive problems (25%). Decoction was the most authentic way of preparing herbal recipes for oral use. Highest values of RFC (Curcuma domestica 0.78), UV (Albizia procera 3.36), (RI; Stellaria media 93.75), (FUV; Malvaceae and Papaveraceae 2 for each), (FIV; Asteraceae 230.68) and (FL, digestive disorders, skin disorders, sexual disorder and liver and spleen problems, 100%) were observed from the collected data. Highest ROP (60) was recorded for digestive and urinary disorders while Highest FIC was reported for digestive problems i.e., 0.95. This study can be helpful in future for development of natural harmless drugs.
Keywords: Medicinal Plants, Pakistan, Quantitative Ethnomedicine, Herbal remedies

Screening of Maize Hybrids and Lines against Stalk rot (*Fusarium verticillioides*)

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Abstract—Maize (*Zea mays* L.), also known as corn, is a monocot plant belonging to the Poaceae grass family. It is used as staple food in many countries of the world. In Pakistan, corn is 3rd important crop among cereals after wheat and rice in production. It is sensitive to numerous pathogens including fungi, bacteria, nematodes and viruses. Corn production is affected by number of *Fusarium* species e.g., *Fusarium graminearum*, *Fusarium verticillioides* and *Fusarium proliferatum* attack maize crop globally. *Fusarium verticillioides* is the most destructive pathogen of maize among *Fusarium* species infecting maize stalks, causing yield losses and ultimately leads to economic loss. In current study, maize hybrids and lines were screened out against stalk rot by artificial inoculation of *Fusarium verticillioides* to find the hybrids and lines that are moderately resistant, resistant, susceptible, moderately susceptible or highly susceptible to the stalk rot fungus. Effect of stalk rot on maize hybrids and lines were monitored by observing some plant physiological parameters. Moreover, different fungicides were applied in the field infected with *Fusarium verticillioides* to examine the efficacy of the particular fungicide against stalk rot infection in a separate experiment.

Keywords: Maize, Storage Losses, Pathogen, Harmful, *Fusarium*

Plant Disease Survey of Burewala, District Vehari

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Abstract—Burewala, district Vehari is an agriculturally rich region with extensive cultivation of food and fiber crops in southern Punjab, Pakistan. It is located at 30°10‘0N, 72°39’0E, and has an altitude of 133 meters (439 feet). Wheat, cotton, sugarcane, and maize are the main crops, while the cultivation of vegetable and fruit crops is also significant. Most of the farmers owe a small land (2-5 acres) for agriculture, so a continuous cycle of crops remains in practice without land fallowing. Such intensive cultivation leads to the successful harboring of several plant pathogens in the crop cycle. The occurrence of frequent diseases in plants provides a fruitful business for pesticide companies. Farming community, being unaware of the proper disease diagnosis and control, bears huge economic losses. Keeping in view the above-mentioned scenario, a study based on the prevalence of plant diseases in Burewala region was designed. Recently, surveys were conducted in the selected villages to find the incidence and severity

of the prevalent diseases. To date, data from eight villages have been collected, and a few more villages will be visited. The prevalent diseases noted are cotton wilt (*Fusarium oxysporum*), Cotton leaf curl virus in cotton; Alternaria leaf spot of cucurbits (*Alternaria cucumerina*) in seasonal vegetables; citrus canker, and mango anthracnose. Further, diseased plant samples are also collected which are processed in-vitro for diagnosis of the plant pathogens. The objective of the study is to devise better and integrated control measures against prevalent plant diseases and to suggest a general advisory to the farmers of the region. The diagnosis information along with the suitable control measures is communicated to the concerned farmer based on his interest and follow-up.

Keywords: Plant disease, Diagnosis, Cotton, Cucurbits, Citrus, Disease management

Assessment of Genetic Diversity among different populations of Taxus baccate from Neelum Azad Kashmir, Pakistan

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Abstract— Taxus baccata L. is an evergreen tree of order Coniferales. It is small to medium sized tree which has value wood and forage for cattle. It is also native to Himalaya's regions and mixed with fir and pines. In Azad Jammu and Kashmir (AJK), T. baccata has low diversity due to deforestation, over exploitation and other human's impacts. Owing to the endangered status of T. baccata, a study has been designed to access its genetic diversity based on simple sequence repeats (SSR) markers. SSR were designed and amplified using Polymerase chain reaction (PCR). The data was scored from amplified bands and it was shown that T. baccata from district Neelum AJK has no polymorphism. Most of the bands were mono-morphic and only two were dimorphic. This low level of genetic diversity can be attributed to human impact on T. baccata populations. From the results and conclusion, it is suggested that T. baccata in AJK needs restoration as early as possible. A comprehensive study is needed to estimate its genetic diversity from whole country and restoration approaches.

Theme: Chemistry

A Facile Solution Based Chemical Method to Fabricate Template- Controlled Titania (B-TIO_2)

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Abstract—Nanoparticles have more ability to self-assemble due to smaller size and higher surface energy. Directed self-assembly is a method to get the regularity and anisotropic in agglomerated structures by using different shape-directing agents. Due to direct self-assembly process, nanoparticles with various applications are being observed such as catalysis, biosensing, luminescence, drug delivery etc. From last few decades, much of work have been done for nanoparticles. Due to more potential of self-assembly in Nano scale there is great demand to control the self-assembly at nano regime for efficient control of size and shape formed by directed self-assembly of such smaller particles for significant application. Titanium oxide, a significant semiconductor nanomaterial have been seen considerable use as a photocatalyst for diverse applications involving environmental remediation, as a photocatalyst for production of H 2 in water splitting, in dye-sensitized solar cells, for synthesis of organic chemicals etc. The properties of TiO 2 its chemical and thermal stability, low toxicity and high resistant to corrosion. TiO2 has wide direct band-gap and fast excitons recombination rate, therefore it has a limited absorption range in electromagnetic spectrum that decreases its efficiency as a photocatalyst and hinders its application for light absorption. In this work, template controlled titania is prepared by wet chemical approach by using different templates like decyltrimethylammonium bromide, tetraoctylphosphonium bromide and Tannic acid to tune the band gap of titania for efficient absorption. Then as-prepared material has been characterized by using wide range of different characterization techniques. The structural and phase characterization of as prepared material has been checked by powdered X-rays diffraction (p-XRD). The photo-generated electrons and holes and their behavior has been analyzed by using photoluminescence (PL) emission spectra. The optical and absorption properties has been studied by using ultra-violet-visible spectroscopy (UV-VIS). For analysis of functional groups Fourier transforms infrared spectroscopy (FTIR) has been used. The morphological determination of as-made titania (TiO2) would be carried out by field-emission scanning electron microscopy (FESEM). The results are helpful in designing multi-phased titania based Nanocomposites for water splitting applications.
Keywords: Nanoparticals, Titania, Self-assembly, Nanoscale

Niobium and Titanium doped Nickel rich $LiNi_{0.8-x}Co_{0.1}Mn_{0.1}O_2$ (x = 0.01, 0.1and 0.2) as efficient cathode materials for energy storage applications

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Abstract—The pristine $LiNi_{0.8}Mn_{0.1}Co_{0.1}O_2$ and the doped (Ti, Nb) $LiNi_{0.8-x}Co_{0.1}Mn_{0.1}O_2$ (x = 0.01, 0.1and 0.2), as efficient and stable cathode materials for batteries, have been synthesized for the very first-time through CHFS. This work reports a strategy (doping) to stabilize the structure of $LiNi_{0.8}Co_{0.1}Mn_{0.1}O_2$ materials. XRD analysis exhibited that heat treatment at 850 ºC for 12 h using 3X (1.6 g / 2 g NMC powder) lithium content is the optimized conditions to get the most stable structure. Furthermore, the introduction of dopants into the host structure has notably enhanced the structural and cycling stability of the cathode material. The dopant's effect on the structural and electrochemical properties of the material was studied *via* a number of techniques, including XRD, EDX, SEM, CV and charge/discharge studies. The pristine NMC material showed very low discharge capacity (~130 mAh g^{-1}), which decreased rapidly on cycling owing to structural deterioration, unexpected side reactions and cation mixing. However, increasing the dopant's fraction in the cathode material delivered higher discharge capacities along with enhanced cycling stabilities. The dopants exhibited the discharge capacities in the order: 2 % Nb^{5+} (180 mAh g^{-1}) > 0.1 % Ti^{4+} (130 mAh g^{-1}). Importantly, Nb^{5+} was electrochemically active and improved the electrochemical performance by mitigating the electrode polarization and increasing the lithium ion diffusion pathways. Contrary to this, Ti^{4+} doped NMC materials delivered less discharge capacities. Here, the opposing effect is attributed to the electrochemically inert nature of Ti^{4+}, improving only the stability of the material. In general, dopants played their role in enhancing the performance of cathode material depending upon their structural effects. It is highly expected that this work will provide a general approach to improve the electrochemical properties of cathode materials for Li-ion batteries.
Keywords: Doping, Cathode Material, Energy storage, Battery

Synthesis of Cd^{2+}/ Ti^{3+} doped copper oxide nanostructured materials

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Abstract—Copper oxide nanomaterial have diversity in technological application due to its optical and Photoluminesence character. The distinctive behavior of nanomaterial depends upon the variation in the chemical and physical

properties. These properties mainly depend upon the size, morphology and chemical composition of the nanomaterials. Copper oxide has limited absorption window in electromagnetic spectrum. In monoclinic crystal lattice copper is surrounded by four oxygen atom and having square planer geometry with narrow band gap~1.2eV and behave like *p*-type semiconductor .Metallic doped copper oxide nanoparticle were synthesized by the wet chemical method. For aim to create mid states, doping of metal ion was done in crystal lattice which reduced the direct band gap. The as- prepared sample characterized, by different characterization techniques. Optical properties checked by using UV-Visible spectroscopy (UV-VIS) and Photoluminescence (PL) spectroscopy. For information of chemical bonding, fourier transform infrared spectroscopy (FTIR) was used. Morphological features were analyzed by scanning electron microscopy (SEM) performed. The analysis of structural composition was confirmed by powdered X-Ray Diffraction (p-XRD). Extended absorption window was achieved by incorporating Cd^{+2} and Ti^{+3} ions. The as-synthesized nanomaterials have reduced band-gap then the bulk material.

Keywords: Doping, Copper oxide, Nanomaterials, Synthesis

Development of a novel electrochemical sensor for the sensitive detection of Metanil Yellow using Square Wave Voltammetry

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Abstract—Metanil Yellow is a non-permitted food dye and is used as an additive in various foods such as turmeric and Indian Spices. It is also present in wastewater as an organic pollutant. It is very toxic in nature and can affect brain and nervous system badly. Therefore, it is very necessary to detect its presence in water as well as in various foods. For this purpose, different analytical techniques are being employed for the conformation of its presence. In this work, a novel electrochemical sensor based on Multi walled Nano carbon tubes and Silver MWNCTs/Ag/GCE is designed for the sensitive detection of Metanil Yellow by using a very sensitive electrochemical technique i.e., Square Wave Voltammetry (SWV). Developed sensor is given preference over others due to the reason that synergic effect of MWNCTs and Ag greatly enhanced the electrocatalytic activity of Metanil Yellow. A linear graph is drawn between concentration of analyte and the current, between concentration range of 0.1 μM and 0.007 μM, under optimal condition (0.1 M HCl, +0.2V deposition Potential and 75 sec Deposition time). Using the standard deviation of blank solution and slope of linear curve, Limit of detection and limit of Quantification is found accurately which shows the sensitivity and selectivity of the designed electrochemical sensor.

Keywords: Synthesis, Sensor, Metanil yellow, Voltametry

Niobium and Titanium doped Nickel rich $LiNi_{0.8-x}Co_{0.1}Mn_{0.1}O_2$ (x = 0.01, 0.1and 0.2) as efficient cathode materials for energy storage applications.

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Abstract—The pristine $LiNi_{0.8}Mn_{0.1}Co_{0.1}O_2$ and the doped (Ti, Nb) $LiNi_{0.8-x}Co_{0.1}Mn_{0.1}O_2$ (x = 0.01, 0.1and 0.2), as efficient and stable cathode materials for batteries, have been synthesized for the very first-time through CHFS. This work reports a strategy (doping) to stabilize the structure of $LiNi_{0.8}Co_{0.1}Mn_{0.1}O_2$ materials. XRD analysis exhibited that heat treatment at 850 ºC for 12 h using 3X (1.6 g / 2 g NMC powder) lithium content is the optimized conditions to get the most stable structure. Furthermore, the introduction of dopants into the host structure has notably enhanced the structural and cycling stability of the cathode material. The dopant's effect on the structural and electrochemical properties of the material was studied *via* a number of techniques, including XRD, EDX, SEM, CV and charge/discharge studies. The pristine NMC material showed very low discharge capacity (~130 mAh g^{-1}), which decreased rapidly on cycling owing to structural deterioration, unexpected side reactions and cation mixing. However, increasing the dopant's fraction in the cathode material delivered higher discharge capacities along with enhanced cycling stabilities. The dopants exhibited the discharge capacities in the order: 2 % Nb^{5+} (180 mAh g^{-1}) > 0.1 % Ti^{4+} (130 mAh g^{-1}). Importantly, Nb^{5+} was electrochemically active and improved the electrochemical performance by mitigating the electrode polarization and increasing the lithium ion diffusion pathways. Contrary to this, Ti^{4+} doped NMC materials delivered less discharge capacities. Here, the opposing effect is attributed to the electrochemically inert nature of Ti^{4+}, improving only the stability of the material. In general, dopants played their role in enhancing the performance of cathode material depending upon their structural effects. It is highly expected that this work will provide a general approach to improve the electrochemical properties of cathode materials for Li-ion batteries.

Treatment of Rubber and Textile Processing wastewater with advance oxidation processes.

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Abstract—Wastewater treatment is essential to avoid water pollution of the receiving bodies. Conventional methods have failed to meet the standards. Humans are searching for better technologies i.e. Advance Oxidation Processes and the verification of these methods is an ongoing practice. In the current study five treatment methods, namely ozone (O_3), ultra violet (UV), UV + $FeSO_4$, UV+ O_3, and O_3+ UV were applied. Water quality before and after treatment was determined by testing color, odor, temperature, turbidity, electric conductivity, total dissolved solids (TDS), pH and chemical oxygen demand etc. After the treatment, sludge weight per liter of wastewater was also calculated on adding polymer. The best treatment method was UV+$FeSO_4$ with COD removal efficiency of 82.14%, 87.50% and 98.03% in rubber industry, textile bleaching and textile dye-bath wastewater samples respectively. Whereas O_3 treatment was the best for maximum turbidity removal (69.53%) in rubber industry. However, O_3+ UV was the best for turbidity removal (31.40%) in textile dye bath samples. The maximum TDS removal (50-400 mg/l) was achieved by UV+$FeSO_4$ for bleaching waste. The turbidity removal was improved up to 32.20% whereas polymer addition removes it upto 17.82% only. Finally 98.03% and 90.16% COD removal through UV+$FeSO_4$ and by UV+O_3 technique were attained respectively. AOPs are very effective, sustainable and environment friendly treatment methods for the industrial wastewater.

Keywords: Waste water treatment, Advanced oxidation processes, Industrial waste treatment, Water pollution

Saccharum munja biochar loaded with hematite nanomaterial for remediation of cadmium from aqueous media

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Abstract—Saccharum munja biochar prepared by slow pyrolysis method was loaded with hematite nanomaterial and utilized for uptake of cadmium from aqueous environment. Characterization of raw Saccharum munja, Saccharum munja biochar and hematite loaded Saccharum munja biochar were carried out through SEM and FTIR. SEM revealed porous structure, rough irregular sites

more prevalent on nanosorbents surface compared to raw and biochar form of sorbents. FTIR exposed surface functional groups for cadmium removal. Adsorption experiments were performed by applying different parameters, like concentration, time and temperature, with percentage removal efficiency as 72 ppm, 67.73 ppm, 48.7 ppm for Hematite loaded Saccharum munja biochar, Saccharum munja biochar and raw Saccharum munja respectively. Which revealed efficient adsorption results of nanosorbents with more exposed sites. These experimental data were used for evaluation of isotherms for which linear and non-linear form of Freundlich isotherm exposed best fit values with high value of $R^2 \geq 0.9$, error analysis, kinetic studies and thermodynamics. Thermodynamic studies showed appropriate, spontaneous and endothermic adsorption method. While, change in enthalpy values less than 80 kJ/mole showed physical sorption and positive entropy change values described enhanced sorption. Adsorption kinetic models were investigated to discover rate constants and feasible order of reaction. Data fitted best into type I of pseudo second order kinetics as indicated by values of correlation constants $R^2 \geq 0.98$ and rate constants K_2 (0-1).

Keywords: Cadmiun, FTIR, Adsorption studies, Enthalpy change

Electrochemical Performance of Carbon Modified $LiNiPO_4$ as Li-Ion Battery Cathode: A Combined Experimental and Theoretical Study

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Abstract—Saccharum munja biochar prepared by slow pyrolysis method was loaded with hematite nanomaterial and utilized for uptake of cadmium from aqueous environment. Characterization of raw Saccharum munja, Saccharum munja biochar and hematite loaded Saccharum munja biochar were carried out through SEM and FTIR. SEM revealed porous structure, rough irregular sites more prevalent on nanosorbents surface compared to raw and biochar form of sorbents. FTIR exposed surface functional groups for cadmium removal. Adsorption experiments were performed by applying different parameters, like concentration, time and temperature, with percentage removal efficiency as 72 ppm, 67.73 ppm, 48.7 ppm for Hematite loaded Saccharum munja biochar, Saccharum munja biochar and raw Saccharum munja respectively. Which revealed efficient adsorption results of nanosorbents with more exposed sites. These experimental data were used for evaluation of isotherms for which linear and non-linear form of Freundlich isotherm exposed best fit values with high value of $R^2 \geq 0.9$, error analysis, kinetic studies and thermodynamics.

Thermodynamic studies showed appropriate, spontaneous and endothermic adsorption method. While, change in enthalpy values less than 80 kJ/mole showed physical sorption and positive entropy change values described enhanced sorption. Adsorption kinetic models were investigated to discover rate constants and feasible order of reaction. Data fitted best into type I of pseudo second order kinetics as indicated by values of correlation constants $R^2 \geq 0.98$ and rate constants K_2 (0-1).

Keywords: $LiNiPO_4$, sol-gel process, LNP/C-composites, High-temperature electrochemical impedance, electrode materials, lithium-ion batteries (LIBs)

Deposition of ZnO Doped Thin Films by AACVD Method for Water splitting Applications

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Abstract—High quality doped zinc oxide (ZnO) thin films deposited onto glass substrates as well as on FTO substrate by aerosol assisted chemical vapors (AACVD) method. The deposition was performed using zinc acetate solution in methanol as zinc precursor with predetermined concentration of acetate of Co, Cr, Fe, Sb, Ni as dopant source. In order to obtained good quality crystalline thin films, the deposition was carried out at 450 °C. Uniform well adhesive thin films were grown and exhibited good photochemical response. The as- synthesized doped ZnO thin films were characterized by powdered x-rays diffraction (p-XRD), scanning electron microscopy (SEM), and ultra violet-visible spectroscopy (UV-Vis). These doped thin films have potential use for water splitting applications including linear sweep voltammetry, Cyclic voltammetry, chronoamperometric measurements, Chemical double layer capacitance (cdl).

Keywords: Zinc oxide, water splitting, Dopants, Thin film deposition

Enhanced Photo catalytic Removal of Eosin Y and Methylene Blue by using TiO2 / GO/ PA as photo catalyst

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Abstract—Environmental problems are becoming more prevalent day by day, and it becomes one of the most serious global challenges. Textile industries are discharging a high amount of dyes into bodies of water without any treatment. Photocatalytic degradation is by far the most suitable method of removing dyes

due to its high degradation percentage and low quantity of by-products. One of the best known and broadly used photo catalysts in this regard is TiO2, as it is non-toxic, cheap and highly stable chemically. To enhance its efficiency and to make it more effective, it is doped with Graphene oxide (GO). Immobilization of TiO2 with different types of poly amides is another useful technique as it increases the photo catalytic efficiency of catalyst and avoids the formation of secondary pollutants. The effects of this catalyst on photo degradation of Eosin Y (EY) and Methylene blue (MB) are investigated in this work. The band gap of TiO2 is larger (3.2 eV), but it decreases when doped with GO and PA. The photo degradation efficiency of TiO2 / GO/ PA catalyst is increased much as compared to TiO2 and TiO2 / GO catalysts. Degradation efficiency is also influenced by catalyst's dosage and change in pH. The absorbance spectra will be obtained by UV-Vis spectrophotometer. Maximum degradation is obtained at pH 5 and at pH 9 for EY and MB respectively. By linear regression model, both dyes follow the pseudo-first order kinetics. The R2 values for Eosin Y and MB are 0.9559 and 0.9685 respectively and degraded up to 95 % and 75 % approximately. Both dyes have different structures, functional groups, chemical properties and extent of ionization in aqueous solutions. It is supposed that both dyes behave in dissimilar manner in the process of photo degradation.

Keywords: Photocatalyst, Methylene Blue, Eosine, Photodegradation dyes

Study of physicochemical properties of Soft drinks and Energy drinks available in local market of Lahore, Pakistan

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Abstract—Energy drinks are the beverages which include variable combination of different energy enhancing ingredients similarly soft drinks are the combination of different flavouring agents, sugar, carbon dioxide and water. This research did to determine the pH, TDS, Electrical conductivity, Caffeine and Sodium concentration in ten soft drinks and six energy drinks available in local market of Lahore, Pakistan. pH, TDS and electrical conductivity were measured by pH meter (pH 7110) and TDS/Conductivity meter (3145 conductivity meter) respectively. Caffeine was extracted from samples by solvent extraction method using CCl_4 as extracting solvent, caffeine's quantitative estimation was performed by UV-Visible spectrometer (CECIL 7200) at 270 nm. Sodium content in samples were determined by flame photometer. The pH of the soft drink and energy drinks was found in the range of 2.42-3.35 and 2.89-3.31respectively. The TDS of soft drinks and energy drinks was found in the range of 139.5-486 mg/l and 237-817 mg/l respectively. The conductivity of soft drinks sample and energy drinks sample was in the range of 229-808 µS and 394-1362 µS respectively. The caffeine content in soft drinks and energy drinks was found in the range of 10.5-34 mg/serving and 15-79.5 mg/serving respectively. The concentration of sodium in soft drinks and energy drinks was found in the range of 10 to 50 mg/serving

and 30 to 105 mg/serving respectively. Soft drinks and Energy drinks are acidic in nature, values for TDS, Conductivity and Concentrations of caffeine and sodium were higher for Energy drink samples than Soft drink samples.
Keywords: Soft drinks, Energy drinks, pH, TDS, Conductivity, Caffeine, Sodium, Solvent extraction

Estimation of vitamin c in tropical and stone fruits by comparative analysis of titration, UV-Visible spectrophotometer, and FTIR

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Abstract—Ascorbic acid, commonly called vitamin C, is water soluble and an important antioxidant for the body. Due to the COVID-19 pandemic, a reliable source of antioxidants has been increased. Consumers and quality control agencies now need reliable information about the levels of vitamin C in various local fruits. . This study aims to find out if Vitamin C is readily available in tropical fruits (Mango, Banana, Guava, and Papaya) and stone fruits (cherry, plum, and peach). The study was carried out by collecting these fruits in their fresh state by using the traditional titration method and modern analytical techniques, UV-Visible spectrophotometer, and FTIR. Ascorbic acid content was calculated in titration, iodine reacts with ascorbic acid, which then reacts with starch solution and the endpoint is deep blue coloration. In the UV-visible technique, bromine water reacts with ascorbic acid, and then it is then treated with 2, 4-DNPH at room temperature for three hours. The solution was treated with 95% H2SO4 and the absorbance was noted at 521nm. The same solutions prepared for the UV-Visible spectrophotometer were used in FTIR. The samples prepared were stored for one week and examined under a UV-Visible spectrophotometer and FTIR. The samples were again prepared and examined after three days. By comparing both results it was found that the Vitamin C concentration decreases during storage. The outcome of the study suggests that these methods of examination are cheap and reliable for routine analysis. However, the traditional titrimetric method is more time-consuming and less precise in comparison to analytical methods UV-Visible and FTIR which are more precise and less time-consuming.
Keywords: Ascorbic acid, Anti-oxidant, Titration, UV-Visible

Estimation of daily intake of heavy metals Pb, Cd, Cr, Cu through food in Ravi Road and Manawan, Lahore, Pakistan

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Abstract—The importance of food safety is a major area of interest worldwide as contaminants particularly heavy metals are destroying its quality. The objective of the present study is to determine the total intake of heavy metals concentration including lead(Pb), cadmium(Cd), copper(Cu), and chromium(Cr) in 28 samples that were collected from different stores in Manawan and Ravi Road, Lahore, Pakistan. The samples were dried, digested, and then analyzed by AAS. The highest mean concentrations of heavy metals in liquid foods were in the order Pb (0.0094 to 0.04) mg/kg >Cr (0.257 to 0.842) mg/kg> Cu (0.21 to 1.756) mg/kg> Cd 0. 001 mg/kg which were all below the detection limit (BDL) except Pb while for semi-solid or solid food, the order of concentrations was Pb (0.26) mg/kg>Cu (0.73 to 21.02) mg/kg> Cr (0.05 to 1.71) mg/kg> Cu (0.11 to 8) mg/kg which were all below the detection limit. The results obtained were compared with permissible limits set by Pak NSDWQ, USEPA, and WHO/ FAO. The estimated daily intake (EDI) of Pb, Cd, Cr, and Cu lies in the range of 45 to 670 µg/person, 14.5 to 70 µg/person, 1.12 to 3.44 mg/person, and 13.5-60 mg/person. The noncarcinogenic risk was evaluated from the values of the target hazard quotient (THQ) which is < 1 for individual metals and the hazard index (HI) for multiple combined heavy metals >1 indicating that the consumption of these food items together can pose health risks. It was concluded that the people residing in the study area are at potential health risks and food authorities should keep a check on the contamination of food.

Keywords: Heavy metals, Atomic Absorption Spectroscopy, Below Detection Limit, Target Hazard Quotient, Hazard Index

Comparative study of different adulterants in tetra-pack and fresh milk samples collected from West Lahore

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Abstract—Milk is a complete diet for young and old people due to its high nutritional value. To compensate for the milk demand and supply gap, milk adulteration is increased day by day, which not only decrease its nutritional value but also cause severe health problems. This research enlist the various milk adulterants, their hazardous effects on health, qualitative tests, and quantitative technique (FTIR) to check for adulteration by comparative analysis of raw milk with tetra pack and fresh milk. 120 milk samples were collected. By qualitative parameters, it was estimated that water, table sugar, and starch were present in

100%, 75% and 80% of the milk samples, respectively. Acid, soap and detergents were present in 25%, 40% and 44% of the samples. Skimmed milk powder and glucose were in 26% and 80% of the samples respectively. Using FTIR, characteristic peaks were obtained for raw milk; and for tetra pack milk and fresh milk in the region of 6000-600 cm^{-1}. These characteristic peaks of fresh and tetra-pack milk were compared with those of raw milk peaks. The difference between their spectra implied that milk samples contained adulterants. The increased absorbance in the region of 1710-2850cm^{-1} showed the presence of carboxyl group and ethylene group, whereas decreased absorbance in the region of 1510-1560cm^{-1} and 1030-1080cm^{-1} showed the presence of amide group and carbohydrates respectively. This research suggests that milk sold in West Lahore is very much adulterated, so milk marketing should be governed through laws and regulations to protect consumer health.

Keywords: Milk, Adultrants, Tetra-packs, Absorbtion

A comparative analysis of Physico-chemical parameters and heavy metals in Government filter water plants and tap water to evaluate the quality of drinking water in three residential areas Jallo More, Bhagbanpura, and Islampura in Lahore, Pakistan

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Abstract—The quality of water is getting decreased due to overexploitation. The present study was conducted to evaluate the drinking water quality of three different residential areas namely; Jallo More, Bhagbanpura, and Islampura in Lahore, Pakistan. Total ninety samples were collected, 45 from government filter plants (F) and 45 from their nearest tap water supply (T), and compared their various Physico-chemical parameters and heavy metals using standard methods. These parameters include temperature by using a mercury glass thermometer, pH, Electrical Conductivity (EC), Turbidity, total dissolved solids (TDS) by using specialized multimeters, total suspended solids (TSS) by filter paper method, Total Hardness by Complexometric titration, Total Acidity and Total Alkalinity by Acid-Base titration, Chloride Contents by Argentometric titration, sodium, potassium, calcium, and magnesium by flame photometer, and heavy metals such as iron, lead, copper by Atomic Absorption Spectrophotometer. The results were obtained in the following range; temperature (F=31-34°C, T=30-33°C), pH (F=7.03-7.82, T=7.12-7.73), EC (F=332-1584µS/cm, T=382-2850µS/cm), Turbidity (F=0.25-0.4NTU, T=0.35-0.48NTU), TDS (F=199.6-960ppm, T=397-998ppm) TSS (F=320-880ppm, T=300-970ppm), Total Acidity (F=80.06-205ppm, T=300-970ppm), Total Alkalinity (F=90.07-240.19ppm, T=140.1-370.26ppm), Total Hardness (F=75.06-410.32ppm, T=115.09-395.31ppm), Chloride content (F=177.3-999.97ppm, T=312.04-1241ppm), Na (F=156.73-

190.04ppm, T=184.38-201.17ppm), K (F=0-7.92ppm, T=0-8.25ppm), Ca (F=74.31–139.2ppm, T=100-201ppm), Mg (F=11.56-25.33ppm, T=20.08-31.66ppm), Fe (F=0.20-0.85ppm, T=0.5-1.95ppm), Cu (F=1.26-1.97ppm, T=1.38-2.32ppm), Zn (F=0.04-0.15ppm,T=0.03–0.08ppm), Ni (F=0.01-0.078ppm,T=0.05-0.074ppm), Pb (F=14-19ppb, T=19-27ppb), Cd (F=0-25, T=11-29ppb). The results obtained fell within the maximum allowable limit set by WHO and PAK-EPA for drinking water except for chloride content and Pb metal.

Keywords: Heavy metals, Tape water, Physicochemical parameters, Residential areas

Physiochemical Properties of Fluoride Toothpaste, Herbal Toothpaste in Comparative to Non-Herbal Toothpaste and Analysis of Heavy Metal In Fluoride Toothpaste, Herbal And Non-Herbal Toothpaste

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Abstract—The physicochemical characteristics of herbal and fluoride toothpaste and heavy metals in both herbal, non-herbal and fluoride toothpaste have been studied in vitro. This study focuses on people's knowledge of, attitudes to, and behavior regarding the used toothpaste when brushing. The physicochemical analysis such as pH, conductivity, moisture, and formability is performed. The relative gravity of both herbal non-herbal and fluoride toothpaste has been analyzed by Specific Gravity Bottle. The foamability of both types of toothpaste was checked. 11 different brands of toothpaste were selected which contained 3 herbal toothpaste 3 non-herbal toothpaste and 8 fluoride toothpaste. To determine the level of toxic metals like Pb and Cd in herbal, non-herbal and fluoride toothpaste was checked by using Atomic Absorption Spectrophotometer. Using BIS 6356:2001 method, it is found to be difficult to analyze toothpaste containing <100ppm Pb based on the PbS color formed by the addition of sodium sulfide. In the present investigation an alternative, highly sensitive, and specific AAS technique has been developed and used. The result of physicochemical properties showed that both herbal and fluoride toothpaste are effective for dental health but fluoride concentration affects the activity. More fluoride concentration can cause fluoride toxicity but herbal toothpaste is safe to use for every age. The minimum detection limits are found to be 0.227-0.255 μg/mL Pb and 0.08-0.020 μg/mL Cd.The aim of the research was to evaluate the comparison of herbal and non-herbal toothpaste and the benefits of using Fluoride toothpaste. Herbal toothpaste containing herbal ingredients is more ore acceptable in public than non-herbal toothpaste. Herbal toothpaste is more efficient than non-herbal toothpaste. On the other hand, fluoride toothpaste is also more efficient than simple toothpaste

Keywords: Toothpaste, Fluoride, Physio-chemical properties, Toxic Metals

Determination of alpha tocopherol in grains and nuts by UV-VISIBLE spectroscopy and FTIR spectroscopy

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Abstract—Alpha-tocopherol is the most active form of vitamin E that exists in human plasma. Alpha tocopherol is a lipid-soluble antioxidant that is generally prepared only by photosynthetic organisms. It acts as the inhibitor of oxidative stress, defence of cell membrane, regulates platelet aggregation and maintains human health. The purpose was to investigate methods for the measurement of vitamin E in nuts and grains. This study was helpful to determine different concentrations of alpha-tocopherol. Vitamin E is a necessary fat-soluble nutrient that is mostly found in plant-based oils, nuts, cereals, seeds, fruits and vegetables. By using UV-VISIBLE spectroscopy and fourier transform infrared (FTIR) spectrometer, alpha-tocopherol levels in various edible grains and nuts from different areas of Lahore, Pakistan. The oils were extracted from samples by the Soxhlet method using n-hexane as a solvent. The concentrations of alphatocopherol in almond, walnut, cashew, pistachios, peanut, wheat, rice, barely, corn and canola seeds were 36.9, 0.5, 0.10, 0.3, 9.0, 212.2, 3.5, 1.04, 2.1 and 1.4mg/100g. The results reveal that the maximum concentration of alpha-tocopherol is present in wheat and the minimum concentration in cashew. The findings highlight the need of including edible nuts and grains in daily diet to address vitamin E insufficiency in humans by demonstrating that these foods provide adequate level of alpha-tocopherol.

Keywords: Alpha-tocopherol, UV-Visible, FT-IR, Antioxidant

Surface modification of composite polyamide nanofiltration (NF) membrane by immobilizing Ag-doped TiO_2 nanoparticles for water purification

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Abstract—With the dawn of nanotechnology, surface modification by incorporating nanomaterials is considered as an auspicious way to improve the membrane performance. The objective of current study was to immobilize silver doped TiO_2 (Ag-TiO_2) nanoparticles on the surface of commercial nanofiltration (NF) membrane for effective photodegradation and antibacterial activity. For this purpose, an energy saving commercial polyamide NF membrane was modified through successive surface treatment with glutaraldehyde solution followed by

polyvinyl alcohol (PVA), TiO_2 nanoparticles and silver doped titania (Ag-TiO_2) nanoparticles. Modified membranes were characterized by ATR-FTIR spectroscopy, SEM, AFM, XPS and contact angle analyzer. Static leaching experiments were conducted to examine the stability of TiO_2 and Ag-TiO_2 on the surface of modified membranes. After modification, surface hydrophilicity as well as NaCl rejection improved significantly. However, the decline in water flux was the upshot of inevitable accumulation of nanoparticles in the pores of modified membrane. Additionally, the antifouling property was also evaluated by colony counting method. The bacterial count was reduced by 93% and 91% for *E.coli* and *B.subtilis*, respectively, for 0.5% Ag-TiO_2 loading. We believe that the current work offers new insights in the modification of low cost, large scale multifunctional nanofiltration membranes for application in textile wastewater treatment.

Keywords: Polyamide, Nano-filtration membrane, Nano-particles, Water purification.

Noble metal doped rGo-ZnS nanocomposites for adsorption and photocatalytic degradation of environmental pollutants

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Abstract—Our present paper aims to design environment friendly, highly effective, reusable and low cast photocatalysts to destroy harmful pollutants like phenolic compounds and various types of dyes such as methyl green which are liberated from many industries and produce water pollution at large scale along with biological pollutants like fungi and bacteria. Graphene oxide based some stable nanocomposites with metal sulphides will be prepared by simple coprecipitation method using DMF as a solvent as well as a reducing agent for metal sulphide nanoparticles. Sodium sulphide will be employed as sulphur source in zinc sulphide nanoparticles. In the next step, doping of zinc sulphide will be carried out with different weight % of cost-effective noble metal i.e., silver by in-situ synthesis of silver nanoparticles.

Prepared nanomaterials are characterized in detail to study their composition, morphology and stability. Photocatalytic properties are investigated by employing the prepared materials as photocatalysts for the reduction of some phenolic compounds like resorcinol and 3-chlorophenol. Photocatalytic reactions were monitored by UV-Visible spectroscopic technique. Effects of various parameters like pH of medium, concentration effect and loading of silver nanoparticles with different ratio was also studied to tune the photocatalytic response under UV light source. Additionally prepared materials were also utilized to study adsorption of different dyes from waste water along with anti-bacterial applications against various bacterial strains.

Keywords: Photocatalysis, Metal sulphides, Graphene oxide, zinc sulphide

Evaluation of toxic (Pd, Cd) and essential (Cu, Cr) heavy metals in foodstuff by AAS and their health risk assessment in Manawan and Ravi Road, Lahore, Pakistan

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Abstract—Food is a basic necessity in human life but as global pollution is increasing gradually, contaminants in food are also exceeding their permissible international standards. So, to study the heavy metals content in foodstuff, two specific areas of Lahore, Pakistan, i.e., Manawan and Ravi Road were selected. Two toxic heavy metals such as lead (Pb) and cadmium (Cd), while two essential heavy metals given as copper (Cu) and chromium (Cr) were analyzed in 28 food samples by (AAS) after drying and performing Di/Tri-acidic digestions. The mean concentration of heavy metals in liquid food is in the range of 0.0094 to 0.042 mg/kg for Pb, below detection limit (BDL) to 0. 001 for Cd, 0.21 to 1.756 mg/kg for Cu, and 0.257 to 0.842 mg/kg for chromium and for solid/ semi-solid foods it was BDL to 0.26 mg/kg for Pb, 0.11 to 8 mg/kg for Cd, 0.73 to 21.02 mg/kg for Cu, and 0.05 to 1.71 mg/kg for Cr, respectively. The result of this study was compared with national or international standards of WHO, FAO, Pak NSDWQ, and USEPA. Daily intake (DIM) of Pd, Cd, Cu, and Cr was in the range of 45 to 670 µg/person, 14.5 to 70 µg/person, 1.12 to 3.44 mg/person, and 13.5-60 mg/person. Almost all the metals were within the safe limit of the total food intake of a person per day except for lead intake while in individual foods, some HMs concentrations were at higher levels than the permissible standards. So, the food authorities should keep a check and balance on foodstuff where quality is compromised as this can pose serious implications to its consumer.

Keywords: Heavy metals, Food stuffs, Toxicity, HMS

Theme: Zoology

Prevalence and Associated Risk Factors of Premenstrual Syndrome among Female Population of Peshawar City

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Abstract—Premenstrual syndrome (PMS) is a cyclic disease that badly affects adult females. Its symptoms appear only through the secretory phase of the menstruation. Objectives of the study were to predict the prevalence and associated risk factors of premenstrual syndrome among female population of Peshawar city. The data was collected from SBBWU students, home to home survey from local female population of Gulbahar colony, Peshawar. A survey study was conducted to gather the required data from October 2021 to December 2021. A questionnaire was designed for the collection of required information. At least one symptom was reported by each female in this study. The prevalence of PMS and premenstrual dysphoric disorder (PMDD) were detected to be 31.67% and 8.72%, respectively. The most frequent symptoms were abdominal pain (75%), back pain (74%) and fatigue (64%). Family history of PMS was mostly found to be associated with the severity of symptoms of PMS. In conclusion, 31.67% of female population of Peshawar city is affected by PMS with abdominal pain as a most frequent symptom.
Keywords: Premenstrual dysphoric disorder, Premenstrual syndrome

Monthly Distribution of *Planilizasubviridis* (Perciformes, Mugilidae), Collected from Sonmiani Bay, Balochistan-Pakistan

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Abstract—Fishes of the family Mugilidae are commonly known as Mullets and are distributed in all tropical and temperate seas. These species are accountable as a good seafood source among the other Chondrichthyes seafood fishes. They live in the form of schools and mainly feed on algae and diatoms. In this study, the monthly distribution and seasonal size variation of a Mullet species, *Planiliza subviridis* was investigated. The samples of *P. subviridis* were collected from Sonmiani Bay, Balochistan during March 2005 to May 2007. The Beach seine

and gill net were used to capture the fish. The highest numbers of specimens were observed during December 2005 while the lowest numbers of specimens were seen during the SW monsoon period. Present work provides information regarding the seasonal distribution and habitat suitability including abundance of *P. subviridis* from Sonmiani Bay, Balochistan which will be helpful to assess fish distribution in a particular time or area.

Keywords: Distribution, Diversity, Abundance, Baluchistan.

Analysis of SNP of Kisspeptin Gene in Diabetes Mellitus Type 2 Patients in District Gujrat, Punjab

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Abstract—Type 2 diabetes mellitus is a major metabolic disorder in which the glucose level of an individual increases from the normal level due to low level of insulin production. Kisspeptin gene forming a peptide hormone which play a key reproductive, metabolic role and any abnormality in KISS1 gene can leads to reproductive (PCOS, CPP) and metabolic disorders (diabetes, obesity). The objective of the current study was to identify and examine the association of KISS1 nsSNP (rs1303540530) with T2DM in District Gujrat, Pakistan. Initially different bioinformatics tools were used for the identification of deleterious nsSNPs of kisspeptin. A single KISS1 nsSNP (rs1303540530) was selected out of 301 nsSNPs and against this nsSNP primer was designed. After that for the experimental work 70 (35 T2DM and 35 control group) blood samples were taken. The DNA was extracted from the whole blood through phenol chloroform method and the ARMS-PCR was used for the amplification of DNA and detection of KISS1 nsSNP (rs1303540530) through designed primers. In our study no double band were seen in all T2DM and control group. Thus, the nsSNP (rs1303540530) were not identified and showed no association with T2DM. The demographic study revealed that age, body mass index (BMI) and blood group show significant association while gender show no association with T2DM. Further studies in larger population or people from different regions are needed to verify and explore our findings.

Keywords: Kisspeptin, SNPs, *Diabetes Mellitus*

Removal of Antibiotic Resistant Bacteria and Associated Resistant Genes from Hospital Wastewater by Employing Strategic Optimization of 2-Phase Anaerobic Digestion Process

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Abstract—Hospital wastewater are the hotspot for the antibiotic resistance dissemination into the environment as it leads to ARB proliferation and horizontal genes transfer among microorganisms. The current study focuses on the antibiotic resistant gene isolation and identification from the environmental sample of hospital wastewater and their knockout by two stage anaerobic digestion process. Strategic optimization via controlling parameter that is the effect of different temperature (22°C, 37°C, 46°C, 55°C) on fate of ARGs. The current study was conducted to isolate and identify the antibiotic resistant genes from hospitals wastewater and assessing the anaerobic digestion process impact on antibiotic resistant genes by performing double stage anaerobic digestion process. Additionally, the study was done to collect samples from 3 different hospitals for identification of biological and technical replicates and to obtain the pure/isolated colonies via biochemical identification. To evaluate phenotypical confirmation by performing susceptibility testing before and after wastewater treatment. To employ PCR testing for genotypic confirmation before and after wastewater treatment. To perform anaerobic digestion process in double stage anaerobic digesters. Wastewater sample collection according to SMPs from three different hospitals. After serial dilution, total bacterial count was performed to determine total culture able bacterial number and diversity among samples. Biochemical identification was done. Isolation of ARBs occurred via antibiotic sensitivity testing ARGs identification via PCR. Wastewater was treated in double stage anaerobic digesters for about 90 days. After WWT, susceptibility testing for phenotypical confirmation; PCR for genotypic confirmation. At the end, sequencing was performed for checking mutation. Significant ARGs removal has been observed from hospital wastewater via optimized conditions in anaerobic digestion process. Higher thermophilic temperature-55°C have more promising effects on fate of ARGs removal instead of mesophilic temperature. High density and diversity of microorganism sustained by nutrient rich environments of HWW creates favorable conditions for proliferation 6f ARBs and ARGs transfer. Significant removal of ARGs proves that anaerobic bioreactors are far better than conventional WWTP.

Keywords: Wastewater treatment, ARB proliferation, SMPs, ARG, HWW, WWTPs

Comparative Study of Liver and Kidney Functions in Broiler and Domestic Chicken (*Gallus Gallus domesticus*)

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Abstract—From the beginning, poultry industry has been facing several challenges such as diseases and price fluctuations. It has important role in the country's economy. The aim of current study was to evaluate and compare the liver and kidney functions of broiler and domestic chicken. One day old domestic and broiler chicken were collected from a hatchery. Six chicks of each group were selected and raised under controlled conditions. The food provided was *ad libitium* and similar care for both groups was given. The weight of the broiler and domestic chicken were recorded on day 1, 15 days, 4 weeks, 6 weeks and 8 weeks. Blood was collected at 15 days, 4 weeks, 6 weeks and 8 weeks for the evaluation of liver and kidney functions. Broilers gained weight rapidly i.e., 290g after 4 weeks and 1.5kg after 6 weeks. In domestic chicken weight gain was low compared to boilers i.e., 220 g after 4 week and 280-330g after 6 weeks. At 8 weeks, weight of broiler chicken was significantly higher than the domestic chicken ($p< 0.033$). On 6 weeks, bilirubin and ALP levels in domestic chicken were significantly high compared to broiler chicken ($p<0.035$ and $P<0.0001$ respectively). In 8-week-old chicken, there was no significant difference in the liver and kidney functions of broiler and domestic chicken groups. Results showed that the weight gained by broiler was more compared to the domestic chicken. However, no difference was observed in the liver and kidney functions of the animals of the two groups.

Keywords: Broiler chicken, Domestic chicken, Liver functions, Kidney functions

Autosomal Recessive Transmission of a Rare HOXC13 Variant Causes Pure Hair and Nail Ectodermal Dysplasia

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Abstract—Fully mature hair and nails differ greatly in physical appearance but share common signaling events at the embryonic level during development and morphogenesis. Abnormalities in any crucial component of these signaling cascades can lead to either isolated hair and nail disorders or associated phenotypes such as pure hair and nail ectodermal dysplasia (PHNED). The current

study was conducted to find out the genetic factors behind severe form of Ectodermal Dysplasia in Pakistani family. For the current study, we recruited large kindred with multiply affected individuals from a remote area of Pakistan. Approval for the study was obtained from the institutional review board of Quaid-i-Azam University, Islamabad, Pakistan, and written informed consent was obtained from all the available family participants. Haplotypes were constructed by typing microsatellite markers which revealed linkage to chromosome 12q13. Sequence analysis of HOXC13 revealed that all affected individuals were homozygous for a novel nonsense variant (c.265C/T, p.Gln89*). To date, only five sequence variants in the HOXC13gene causing PHNED have been reported. The presence of the mutated genes and the polymorphic nature of the variant (c.265C/T, p.Gln89*), detected in our family were excluded from a panel of 150 unrelated ethnically matched control individuals. In conclusion, we report a novel nonsense variant (c.265C/T, p.Gln89*) in the HOXC13 gene, which resulted in a premature termination codon and is predicted either to produce a truncated protein without an essential DNA binding homeodomain or more likely to undergo nonsense-mediated RNA decay ultimately producing the PHNED phenotype. These findings expand the spectrum of mutations related to the HOXC13 gene, which results in the PHNED phenotype.

Keywords: Rare variant, HOXC13, Pure hair and nail ectodermal dysplasia, Autosomal recessive disorder

Impact of Pro-Inflammatory Mediators on Agonist-Induced Platelet Aggregation

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Abstract—Platelets are multi-functional cells which besides playing their role in homeostasis also contribute to immunity when activated via their immune receptors. The immunological responses are associated with platelet activation which can be further enhanced by various proinflammatory mediators. In this study we investigated the role of different pro-inflammatory molecules on the priming of agonist-induced platelet aggregation responses. For this purpose, we employed several Pathogen/Damage Associated Molecular Patterns (PAMP/DAMPS) like FMLP, glucose, FMLP treated blood cell supernatant, mitochondrial DNA (mtDNA) and mitochondrial proteins (mt proteins). We isolated platelets, manually counted them and after treatment with a priming agent stimulated with adenosine- diphosphate (ADP) and adrenaline (AD). Extent of aggregation was noted by using a time- lapse spectrophotometric assay. A notable aggregation of platelets in response to ADP and AD was found. Interestingly, we observed a significant difference of AD-evoked aggregation in mtDNA primed group as compared to control. We surprisingly found no significant alteration in platelet aggregation profiles after pre-treatment with other priming agents such as FMLP, Glucose, FMLP-treated blood cell lysate, mt protein). In summary, we

found a so far unreported accelerated AD-dependent platelet aggregation upon priming with mtDNA. However, these findings require further experimentation to determine the exact molecular mechanism involved in this phenomenon.
Keywords: Platelets, Hemostasis, Proinflammatory mediators, PAMPs, DAMPs, Immunity

Prevalence of Myopia in Young Females

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Abstract—Myopia or nearsightedness is an eye condition in which the parallel light rays converge on the focal point before the retina. Myopic individuals can clearly see the objects placed near to them, but the objects farther away get blurred. There are billions of individuals suffering from vision impairment all over the world because of uncorrected refractive errors of the eye. Myopia is caused by both environmental and genetic factors. Many studies have been conducted to find the prevalence of myopia; however, few population-based surveys have been conducted on young females. According to past pieces of evidence, there is a continuous increase in the prevalence of myopia. The current study aimed at finding the prevalence of myopia in 19-23 years old young females. A cross-sectional analytical study was conducted and data were collected from 300 myopic females of Fatima Jinnah Women University out of 918 interviewed graduates. Participants were asked to fill a questionnaire; their current myopic condition was determined and the underlying risk factors of myopia were identified. Our results revealed that the prevalence of myopia was 32.7%. Moreover, apart from heredity, the major associated risk factor of myopia was found to be the excessive use of electronic gadgets. Most of the respondents were at the stage of mild myopia. Only 40% of females showed a willingness to get eye surgery done as a permanent cure.
Keywords: Myopia, Nearsightedness, Vision impairment, Refractive errors, Electronic gadgets, Eye surgery

Time Spent on Social Media by University Graduates

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Abstract—Social media are virtual platforms that improve global communication, socialization and sharing of information among users. This study aimed to find out the type of social media usage, the average amount of time spent on popular social media apps and their impact on the mental and physical health of university students. A survey-based questionnaire was designed and the study

encompassed 300 university students. The data were collected from students aged 18 to 24 years with a 100% response rate. The collected data were analyzed and presented in the form of graphs, tables and figures. According to the study and findings, students preferred to spend most of their time on social media for entertainment and communication. On average, every student had 2-5 social media accounts and they spent about 3-7 hours daily on social media. Half of the respondents claimed that they were addicted to social media. It was noticed that the excessive use of social media led to anxiety and depression among students. It was also observed that the balanced use of social media helped in improving the students' academic performance. Furthermore, many students were restricting their use of social media by taking breaks from one or more apps while a few of them also wanted to quit these platforms. In conclusion, completely restricting social media in this modern era is not possible as they have been incorporated into many aspects of our lives, however, they must be utilized in an appropriate, regulated and healthy way.
Keywords: Social media, WhatsApp, Facebook, Twitter, Instagram, TikTok

Prevalence and Risk Factors of Gestation Diabetes Mellitus in Twin Cities

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Abstract—Gestational Diabetes Mellitus (GDM) is a pregnancy complication that is becoming a serious concern because of its consequences on fetus and mother. Timely diagnosis of GDM is important to prevent future T2DM. The purpose of the present study was to investigate the prevalence of GDM in twin cities of Pakistan and further identification of GDM specific risk factors among pregnant women between 24-28 weeks of gestational age. A cohort study was conducted in which a total of 250 pregnant women with the gestation age 24-28 week attending five different hospitals of Rawalpindi and Islamabad were screened for GDM. A research questionnaire was designed for data collection and correlation analysis was used for the determination of association of various risk factors with GDM. The prevalence of GDM was found to be 18.4%. A steady rise of 0.6% GDM cases have been observed. Moreover, Age (p=0.012), diet (p=0.008), obesity (p=0.050), gestational hypertension (p=0.045), stress (p=0.041), and previous GDM diagnosis (p=0.001) had a positive association with GDM and were found to be the significant risk factors. Whereas, lack of physical activity (p=0.548), PCOS (p= 0.665) and family history of diabetes mellitus (p=0.092) were found to have a positive yet an insignificant relationship with GDM. The study highlights the need of an early investigation of GDM for timely management of the disease to avoid during and post pregnancy complications.
Keywords: Prevalence, GDM, Obesity, Gestation hypertension, Rawalpindi, Islamabad

Habits of Junk vs. Healthy Food in University Graduates

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Abstract—Healthy foods are rich in nutrition and have a beneficial effect on the overall health while unhealthy foods have less nutritional value and are high in fat, sugar and calories. University education is considered to be the transition period from adolescence to adulthood which plays a vital role in influencing the eating habits of students. The current study aimed at exploring eating habits as well as discovering the reasons for such eating habits among university graduates. For this purpose, a self-administered questionnaire comprising close-ended questions was distributed among the students belonging to different departments of Fatima Jinnah Women University, Rawalpindi. Data analysis revealed that students had diverse opinions regarding their behavior towards the food. Choice of their food selection depended on various factors such as peer influence, financial status and parental feeding. In special circumstances like during examinations, study, travel and menstruation, the majority of the students preferably consumed junk food. The study findings demonstrated that fun and enjoyment was the main reason for the preference of junk over healthy food. Students considered junk food a status symbol and most of them admitted that they have a junk food addiction. However, some of the students preferred a healthy breakfast over unhealthy junk products in the morning and a few students also skipped breakfast as part of their daily routine. The study demonstrated an overall increasing yet alarming trend of junk food among university graduates despite knowing and acknowledging the harmful impacts of junk consumption on health.

Keywords: Eating habits, University graduates, Junk addiction, Healthy food, Junk food, Food selection

Effect of COVID-19 Vaccination on Female Health

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Abstract—Enormously rising COVID-19 cases necessitated precautionary measures. Under such circumstances vaccine proved to be the most effective form of prevention against the virus. Attributing to the lack of long-term trials and unknown side effects, people are hesitant to receive vaccines. This compels monitoring the effects of COVID-19 vaccination on health through different means. Specifically considering female health, vaccination may affect their sexual and reproductive health. In this study, we attempted to determine the effects of vaccines on female health and checked their prevalence by conducting survey-

based research. Opinions of female participants were also recorded to know their reviews about COVID-19 vaccination. Using a cross-sectional design, we gathered data from 300 females using an anonymous questionnaire that was distributed by hand and afterwards the data were statistically analyzed. The majority of the participants received vaccine doses of Sinopharm (40%) and Pfizer (21%). The study findings revealed that 46% of the vaccine recipients faced common side effects like fever, fatigue and headache after vaccination while 7.6% suffered from severe side effects like allergic reactions. Study respondents (12.7%) also experienced changes in menstruation while no changes were reported during pregnancy due to the lack of pregnant vaccine recipients. Only one breastfeeding female observed a post-vaccination change in the amount of milk production. Hence, the vaccine cannot be solely held responsible for such changes, other factors like genetics, stress and mental health should also be considered. So, a large-scale study is recommended for the validation of our results.

Keywords: COVID-19 vaccination, Female health, Vaccine recipients, Menstruation, Pregnancy, Breastfeeding

Morphological Appraisal of Acanthocephalan parasite *Polymorphus minutus* infecting *Anas platyrhynchos*

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Abstract—The phylum Acanthocephala is a small, discrete and very distinct group of obligate endoparasites also known as thorny headed worms which are distributed worldwide with almost 1300 reported species. In this study, we investigated host specific strain of *Polymorphus minutus. F*or this purpose, we characterized the morphological features of Palaeacanthocephalan specie (*Polymorphus minutus*), the first representative of the genus Polymorphida, from its main host Mallard (*Anas platyrhynchos*). Previously reported data of *P. minutus* is not enough to develop a better understanding due to scarcity of detailed description. Samples were collected and further processed for light microscopy, histology and Scanning electron microscopy. Parasite oval, elongate, with a prominent constriction observed at half body length, dividing it in two parts. Anterior body part, before the constriction, partially covered with numerous small spines. Maximum body width usually achieved at the middle level of posterior body. Proboscis receptacle much elongated and saclike. Proboscis is oval in shape and armed with 15 to 17 longitudinal rows of hooks, with 8–10 hooks in each. The lengths of hooks are smaller at the base of proboscis. The present specie has identical features with regard to appearance as reported for *P. minutus* in prior studies and majority of main features (Body size, anterior trunk spines, shape of

proboscis, and number of hooks in a row) are identical but there is a contradiction in proboscis and body ratio, size of proboscis and length of hooks. The results obtained are used to clarify possible structure of the surface of the parasite which would facilitate the absorption of nutrient substances through the body wall.
Keywords: Acanthocephala, Polymorphus minutus, Morphological features

Molecular and Genetic Analysis of Hotspot Exon (10) *GBA* Gene in Pakistani Families Affected with Gaucher's Disease

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Abstract—Gaucher Disease (GD), is one of the most pervasive lysosomal storage diseases transmitted in autosomal recessive pattern. It results from a lack of the enzyme glucocerebrosidase. The chemical substrate glucocerebroside gather in the patient's spleen, liver and bone marrow. The resultant collection in few tissues and organs prompts various signs like anemia, hepatosplenomegaly, thrombocytopenia, development hindrance and skeletal illness There are three detailed clinical kinds of GD where type 1 is non-neurological yet type 2 and 3 are neurological handicap. The gene responsible for glucocerebrosidase is GBA, situated on chromosome lq21 having 11 exon and 10 introns. The exon 9 and 10 is the hot spot exon of GD in Asia and worldwide. In the current study, we investigated the exon 10 of GBA gene transformations in families with Gaucher disease. Numerous families were involved for sequencing and genetic investigation. Genomic DNA extraction was finished by the phenol-chloroform method and PCR response were finished for Sangar sequencing. Sequencing uncovered 4 distinct variations including 1 novel heterozygous and non-synonymous polymorphism and other 3 variations were predicted to be disease causing mutation by mutation taster. Three novel mutations were found, 2 of them is non-synonymous heterozygous and other one is synonymous heterozygous mutation. This shows extensive image of molecular properties of GBA gene and related phenotypic varieties in the patients. We want further assessment of residual exons to decide the carrier proportion of Gaucher disease in our population or whether we ought to evaluate our neonates for such lysosomal disease.
Keywords: Lysosomal storage disease, Gaucher disease, Glucocerebrosidase, Polymorphism, Mutation

De-sizing of Cotton Fabric with Amylase Produced by Indigenously Isolated *Bacillus Cereus*AS2

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Abstract—Textile processing is an ever-growing industry that has traditionally used a lot of chemicals, energy and water but due to the environment hazards and high costs of these chemicals, investigation is under way throughout the world to replace chemical de-sizing with economically attractive and eco-friendly bioprocesses. Present study describes the comparison of traditional de-sizing to bio-based de-sizing method and optimization of conditions for fabric de-sizing through crude amylase. In the present study, fermentative de-sizing potential was found maximum at 72 hrs with no surface destruction of fabric. Optimum fabric de-sizing to TEGEWA scale 9 was observed in 5N HCl within 1 hr. Optimization of de-sizing conditions for amylase showed maximum activity at 60°C within 15 hrs, 1000 IU/ml of amylase and 0.5% Triton-X. After process optimization, de-sizing efficacy was checked through weight loss and water absorbance and both parameters were found similar for enzyme and commercially de-sized fabric. Through SEM micrographs enzyme de-sized fabric was found free from any starch particle similar to industrially de-sized fabric which ensure the efficacy of bioprocess.

Keywords: Textile, Fermentative desizing, Bacillus, Optimization, Scanning electron micrograph, Eco-friendly bioprocess

Mitochondrial Transplantation Attenuates Ischemia-Reperfusion Injury

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Abstract—Peripheral arterial disease (PAD) is an atherosclerotic obstructive disorder of the arteries supplying nutrient-rich blood to the lower extremities. Globally, it has become the third leading cause of atherosclerotic morbidity. Among many others, ischemia-reperfusion injury (IRI) is the central manifestation of PAD where their habilitation of blood flow to a hypoxic organ proves detrimental instead of alleviating it. IRI mainly affect mitochondrial functions and initiates cell death. Though the transfer of intact healthy mitochondria into damaged organs has shown some promising results in clinical trials. However, it has left researchers with some open questions regarding the viability of mitochondria in an exogenous Ca 2+ -rich environment before being taken by the recipient cells. Our present study aimed to explore the effect of

allogenic mitochondrial transplantation in a model of acute hind limb IRI, mimicking PAD. Two different mitochondrial populations (based on size) were obtained from mice liver and proceeded for their viability by performing MTT assay, mitochondrial content through protein quantification and functional integrity by MPTP opening. Acute hind limb IRI was induced by using grommets and orthodontic rubber bands (ORB) in male BALB/c albino mice and the model was then confirmed by quantifying infarct size, histological staining and the level of muscle damage characteristics enzymes; Lactate dehydrogenase (LDH) and Creatine kinase (CK). The model development was followed by in vivo mitochondrial transfer and its characterization. The data showed that relatively bigger mitochondria were more viable as compared to the smaller ones with an insignificant impact on the mitochondrial content and sensitivity to mitochondrial permeability transition pore (MPTP) opening. The in vivo experiments revealed that both grommet and ORB successfully induce IRI, by increasing infarct size in the gastrocnemius muscle with no significant difference between grommet and ORB induced IRI. Furthermore, there was a significant increase in blood LDH and CK levels. Likewise, the results from hematoxylin and eosin staining exposed raised myocyte degeneration and fatty acid accumulation in the IRI muscle. The in vivo transplantation experiments revealed successful mitigation of IRI by reducing infarct size besides reducing LDH and CK levels. Finally, the data confirms a therapeutic benefit of mitochondrial transplantation in acute hind limb IRI.

Keywords: Peripheral artery disease (PAD), Ischemia-reperfusion Injury (IRI), Mitochondrial transplantation, Gastrocnemius (GS) muscle

Expressional Alteration of MicroRNAs in Papillary Thyroid Carcinoma

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Abstract—Papillary Thyroid Cancer (PTC) is a most prevalent type of thyroid cancer accounts for over 80% of all thyroid cancer cases. In last two decades, prevalence of PTC has increased worldwide as well as in Pakistan. Innovative molecular diagnostic and therapeutic options are suggested for diagnostic and treatments of thyroid cancer. microRNAs or miRNAs are endogenous, single-stranded non-coding RNAs that are around 20–22nucleotides long. microRNAs greatly influence the control of several vital functions, including hematopoiesis, immunological responses, proliferation of cells, and programmed cell death. miRNAs have a significant role in the initiation, development, and progression of a variety of human cancers. MicroRNAs and cancer have a strong correlation, and papillary thyroid carcinoma has been linked to deregulation of numerous microRNAs. Aim of this study was to evaluate the miRNA expression pattern in PTC using Real time PCR. Two microRNAs mir-21 and mir-31were selected for

present study. Confirmed PTC patients (n=50) from hospitals of Rawalpindi and Islamabad were recruited in the present study. Tissue samples and adjacent healthy samples were collected in RNA later followed by RNA extraction by TRIzol method and amplification with specific primers by Real time PCR. Fold change method was used to find out expression level of miRNAs in PTC. Student's t-test was used to evaluate the difference in expression of respective miRNAs in disease and healthy samples. $P < 0.05$ was taken as significant and statistical analyses were carried out by using SPSS software. This study showed that level of mir-21 was up regulated (fold change 1 to 12) in PTC tissues and was positively correlated with older age and high TSH level. While mir-31expression was observed to be significantly down regulated (3.7 to -85.2) in PTC tissues as3compare to normal adjacent healthy sample ($P<0.05$). Expression analysis of studied miRNAs has increased the possibility for using miRNAs as cancer biomarkers and therapeutic targets. Regression analyses of miRNAs expression and various hormones suggested that high TSH level might play an important functional role in PTC tumorigenesis. Both of the studied micro RNAs were observed in strong association with thyroid cancer. It is predicted through this study that these miRNAs can be used as diagnostic and prognostic markers in the early detection of thyroid cancer in Pakistani population.

Keywords: microRNA, Thyroid cancer, Papillary Thyroid cancer, Expressional analysis

First Record of *Trirogma caerulea* Westwood, 1841 (Hymenoptera: Ampulicidae) from Pothwar region of Pakistan

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Abstract—The genus Trirogma Westwood, 1841 (Hymenoptera: Ampulicidae) are commonly known as cockroach wasps. They are found on dead woods, leaf litter, or on tree trunks. Only seven species of this genus have been described only from Oriental and Palaearctic regions. No species of this genus is recorded from Pakistan, although some species are reported from India. Keeping in view this situation, multisite surveys were carried in various localities of Pothwar region during2021-2022. Wasps belonging to Family Ampulicidae were collected from different habitats randomly. They were identified using available literature. As a result of these studies, Trirogmacaerulea Westwood, 1841 is recorded for the first time from Pothwar region of Pakistan. Main identification characters of this species supported with measurements and illustrations are provided here with notes on distributional range. Remarks on ecology of the species have been given. Our results have added a new record in the fauna of Pakistan. This wasp may be applied as a bio-control agent after mass rearing in IPM programs against cockroach.

Keywords: *Trirogma caerulea*, Hymenoptera, Ampulicidae, First record, Pakistan