आज़ादी का अमृत महोत्सव

Abstract Book

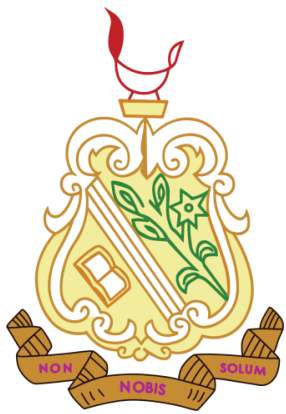
National Conference

on

Novel Progressions in

Science & Technology-2022

November 28-29, 2022



Organised by

St. Bede's College Shimla

Himachal Pradesh

National Advisory Committee

- **Prof. Ashish Arora**, Department of Mathematical Sciences, I. K. Gujral Punjab Technical University
- **Prof. Arvind Kumar Bhatt**, Department of Biotechnology, HPU Shimla
- **Prof. Shashikant Sharma** (Retd.), Department of Chemistry, HPU Shimla
- **Dr. Rakesh Kumar**, Department of Chemistry, NIT Jalandhar
- Dr. Sunil Thakur, Department of Zoology, CUHP Dharamshala
- **Dr. Pankaj Thakur,** Special Centre for Nano Science, Jawaharlal Nehru University, New Delhi.
- **Dr. Sunil Kumar**, Department of Chemistry, HPU Shimla

Patron: Prof. (Sr.) Molly Abraham
Convenor: Dr. Maheshwar Singh Thakur
Organising Secretary: Ms. Preeti Kaundal

Organizing Committee

Core Committee: Dr. Sapna Sharma, Dr. Shramja Munjal, Dr. Shweta Thakur, Dr. Shruti Gupta, Dr. Jyotika Brari, Dr. Kusum, Dr. Kanu Mehta and Mr. Susheel Gupta

Registration and Certificate: Dr. Kanu Mehta, Ms. Reena, Ms. Madhu Bala, Dr. Shweta Thakur

Designing Team: Dr. Sapna Sharma, Dr. Shramja Munjal, Mr. Nishant

Technical Team: Ms. Neha Walia, Mr. Nishant, Ms. Nivedita, Mr. Amit, Mr. Robin, Mr. Bhupinder

Abstracts: Dr. Navdeep Thakur, Ms. Madhu, Ms. Madhu Pahwa, Ms. Poonam

Auditorium and Seminar Room: Dr. Jyotika, Dr. Kusum, Ms. Shivani, Dr. Navdeep,

Stage Management: Dr. Shramja Munjal, Dr. Sapna Sharma, Dr. Shruti, Mr. Aakash

Report Writing and Media: Dr. Shruti, Ms. Shivani, Ms. Neha Katoch, Dr. Navdeep, Dr. Shweta, Dr. Kanu, Ms. Nivedita, Ms. Poonam, Ms. Madhu

Food And Catering: Mr. Sushil, Ms. Nishant, Ms. Reena, Dr. Kanu Mehta, Mr. B. L. Thakur, Mr. Aakash, Mr. Amit

Accommodation: Mr. Sushil, Mr. B. L. Thakur

Rajendra Vishwanath Arlekar
Governor
Himachal Pradesh

सत्यमेव जयते

राजेंद्र विश्वनाथ आर्लेकर
राज्यपाल
हिमाचल प्रदेश

Message

It gives me an immense pleasure to know that St. Bede's College, Shimla is organizing a National Conference on "Novel, 2022. I congratulate the Principal, organisers and faculty Progressions in Science and Technology 2022 on 28th and 29th November members of the college for this endeavor.

Such conferences provide an opportunity to bring together the subject experts, researchers and young minds to deliberate on the latest developments in various fields of Science and Technology. The paramount role and importance of this field in the world today is known to everyone. The breakthroughs in Science and Technology has enriched human life in various ways and has made it happier and healthier.

A new and modern India is the need of the hour today. We have already started moving in that direction in a big way with the help of Science and Technology. We have to make more sustained and intense efforts in this field and your valuable efforts in the form of organizing the National Conference are appreciable.

I once again congratulate St. Bede's College on this occasion and convey my good wishes for its success.

Rajendra Vishwanath Arlekar

Patron

"The science of today is the technology of tomorrow."- Edward Teller

Research has become a compelling priority for any higher educational institutions today. It allows one to pursue one's interests, to learn something new and to challenge oneself in new ways. I strongly believe that effective teaching and active research goes hand in hand, as they inform and complement each other. It is important to evolve research based dynamic learning-oriented assessment strategies that would, in turn, make the teaching-learning process meaningful.

As a part of the promotion of research, St. Bede's college hosts a National Conference on "Novel Progression in Science and Technology-2022" on 28-29th November, 2022. This conference is a significant platform for the experienced and the young minds to come together to present and deliberate on some of the key concerns and challenges in the field of science and technology. Such developments in science and technology are meant to enhance the quality of the human life and to solve the various issues which the society is facing today.

The proposed theme of this conference is most appropriate as science and technology contributes to the society in creation of new knowledge and ideas. I hope that the reflections of this conference will provide an excellent platform for transfer of knowledge based upon the research among scientist and young researchers. Taking these determiners into account, I believe the conference will certainly pave way for many future researches in the field of science and technology. With the blessings of almighty, I feel greatly privileged to welcome you all to the National Conference.

Prof. Sr. Molly Abraham
Principal
St. Bede's College Shimla

Convener

"Everything is theoretically impossible, until it is done."-Robert A. Heinlein

It is my privilege and honour to welcome you all to the National Conference on "Novel Progressions in Science Technology-2022" at St. Bede's College-Shimla, Himachal Pradesh India. This conference is sponsored by SJVNL Shimla, Himachal Pradesh Kaushal Vikas Nigam Shimla, Obexo Scientific Palampur, International Scientific & Surgicals Solan, Haryana Scientific Sheet metals works and Promark. Student researchers, Professors, and others gather at conferences to exchange ideas and research. Thus, the main objective of this conference is to exchange innovative ideas among the experts, scientists, and academicians. This conference shall provide an opportunity for those who have a thirst in knowing the present technological developments thus facilitating the participants to expose and share various novel ideas. Through oral/poster research presentations and invited talks on current technology developments, it seeks to bridge the gap between researchers working in academic and professional institutes. The conference is covered under eight subthemes and abstracts from various parts of the country have been received.

I want to thank in advance the conference committee for sparing their invaluable time in organizing the conference and all the authors, reviewers, and other contributors for their sparkling efforts and their belief in the excellence of "Novel Progressions in Science Technology-2022".

Dr. Maheshwar Singh Thakur
Assistant Professor Chemistry
St. Bede's College Shimla

About the College

St. Bede's College located at Navbahar, Shimla, Himachal Pradesh, is a historical and educational landmark of North India which aims primarily at providing quality higher education and training to women. Established in 1904, the institute was Re-Accredited with A^+ grade for the third time by NAAC in 2016. It has also been granted College with Potential for Excellence and Heritage Status by UGC.

About the Conference

The objective of the conference is to provide a common platform for the exchange of new ideas, applications, and research experiences, establish business or research relations, and find global partners for future collaborations.

Sub-Themes of the Conference

Advancement in Nanoscience

Nanoscience is an emerging zone of science which dealt with the study of structures and the unique applications of materials on an ultra-small scale. It has the potential to reshape the world around us. It could lead to revolutionary breakthroughs in fields ranging from manufacturing to health care. The term nanoscience is cross disciplinary, meaning scientists from a range of fields including chemistry, physics, biology, medicine, computing, materials science and engineering are studying it and using it to better understand our world. However, the similar term nanotechnology is the design, production and application of structures, devices and systems at the nanoscale and hence also called as molecular manufacturing. So specifically, one is dealing with the investigation of the range of nanoscale materials and their altering properties while the other is using those materials and properties to generate something new or different.

Advances in Mathematical & Physical Sciences

In today's era of science and technology, the role of an interdisciplinary area developed on the crossroad of many

science disciplines. There are many examples of implementing numerous models discovered by physics, chemistry and mathematics for the development of science and technology. This sub-theme deals with all the domains of pure and applied mathematics and physics which include Algebra, Number Theory, Graph Theory, Calculus, Matrices, Topology, Discrete Mathematics, Probability, Operational research, Fluid dynamics, Numerical analysis and computational analysis, Cryptography, Real Analysis, Materials and Photonics, Biomaterials and Biophysics, Condensed matter theory, Soft matter, Quantum Engineering and Computational condensed matter Physics, Mechanics and Mechanical engineering, Nuclear physics, Astrophysics, Plasma Physics, Optical Physics, Statistical Mechanics, Elementary Particle Theory, Gravitation and String Theory.

Environment Sustainability, Biodiversity & Agricultural Science

Biodiversity is the variety of plant and animal life in the world, including their genetic, species and ecosystems diversity. Biodiversity is the key indicator of the health of an ecosystem. It is essential for sustainable development and human well-being. It reinforces the facility of food, fibre and water and provides resilience to climate change. Biodiversity and agriculture are strongly interrelated because both contribute towards environmental sustainability. Despite these important roles in sustainable development and ecosystem services, biodiversity is lost due to over exploitation of resources, there is a risk that some thresholds will be passed; which may cause ecosystem imbalance. Hence conservation and sustainable use of biodiversity must require for mitigation and adaptation to climate change.

Biological Techniques in Life Sciences

Biological techniques are an essential part of life sciences study. Biological techniques refer to any physical or chemical technique that is used to study biological processes. From the single cell to the most complex organs a wide variety of tools and techniques enrich our understanding of the living world.

As the modern science progresses more and more new tools are being utilized for the same purpose. With these new advancements a plethora of information previously unknown to the scientific community is being unraveled at an astonishing pace. Immense new possibilities in the fields of medicine, agriculture and environment preservation have arisen.

Bioengineering, Bio-Therapeutics & Food Biotechnology

Bioengineering is a discipline that applies engineering principles of design and analysis to biological systems and biomedical technologies. It is a relatively new discipline that combines many aspects of traditional engineering fields such as chemical, electrical and mechanical engineering. Bioengineering research include bacteria engineered to produce chemicals, new medical imaging technology, portable disease diagnostic devices, and tissue engineered organs. Bio-therapeutics are "antibody-drug cell therapy products where the active substance is extracted or produced from a biological source." These products include recombinant proteins and hormones, monoclonal antibodies (mAbs), cytokines, growth factors, gene therapy products, vaccines, cell-based products, gene-silencing/editing therapies, tissue-engineered products, and stem cell therapies. Bio-therapeutics has become an integral part of modern medicine and is increasingly used to treat and prevent serious diseases, illnesses or infections. They have been highly effective in the treatment of a range of conditions- from cancer to diabetes to rheumatoid arthritis and more. Food biotechnology is the application of modern biotechnological techniques to the manufacture and processing of food products, food ingredients and food additives. The food industry has gone through major changes in response to consumers' demand like low calories food products enriched with natural ingredients and additives rather synthetic ones. This research area covers a wide range ofbiotechnological applications as well as food production, food processing, and food preservation.

Natural & Chemical Science

This theme covers all field chemistry that deals with the properties, composition, and structure of substances, the transformations they undergo, and the energy that is released or absorbed during these processes. Scientists are extensively involved to develop theories of matter that satisfactorily explain both permanence and change. To understand these complex behaviours, this field is divided into three parts physical, organic and inorganic chemistry. To understand deep inside the field, it is further explained through several disciplines. For example, analytical chemistry, theoretical chemistry, biochemistry, medicinal chemistry, neurochemistry, material chemistry, nuclear chemistry, electrochemistry, astrochemistry, quantum chemistry, computational chemistry, flavor chemistry, natural product chemistry, organometallic chemistry, petrochemistry, photochemistry, polymer chemistry, radiochemistry, supramolecular chemistry, synthetic chemistry, agrochemistry, atmospheric chemistry, chemical engineering, chemical biology, chemo-informatics, environmental chemistry, geochemistry, marine chemistry, pharmacology, phytochemistry, solid-state chemistry, thermochemistry, and many others.

Advances in Mathematical & Physical Sciences

In today's era of science and technology, the role of an interdisciplinary area developed on the crossroad of many science disciplines. There are many examples of implementing numerous models discovered by physics, chemistry and mathematics for the development of science and technology. This sub-theme deals with all the domains of pure and applied mathematics and physics which include Algebra, Number Theory, Graph Theory, Calculus, Matrices, Topology, Discrete Mathematics, Probability, Operational research, Fluid dynamics, Numerical analysis and computational analysis, Cryptography, Real Analysis, Materials and Photonics, Biomaterials and Biophysics, Condensed matter theory, Soft matter, Quantum Engineering and Computational condensed

matter Physics, Mechanics and Mechanical engineering, Nuclear physics, Astrophysics, Plasma Physics, Optical Physics, Statistical Mechanics, Elementary Particle Theory, Gravitation and String Theory.

Artificial Intelligence & Computational Research

Artificial Intelligence and Computational Research are the theory, design, application, and development of biologically and linguistically motivated computational paradigms. Artificial intelligence is more like human intelligence, thinking strategically, abstractly, and creatively, with the ability to handle a wide range of complex tasks. Computational research is an evolving field which encompasses computing paradigms like ambient intelligence, artificial life, cultural learning, artificial endocrine networks, social reasoning, and artificial hormone networks. Computational research plays a major role in developing successful intelligent systems, including games and cognitive developmental systems. Over the last few years there has been an explosion of research on deep learning, machine learning and neural networks. Nowadays, deep learning and machine learning has become the core method for artificial intelligence.

Innovation, Technology & Start-Up

Nowadays, Start-ups are being widely recognised as important engines for growth and jobs generation. Through innovation and scalable technology, start-ups can generate impactful solutions, and thereby act as vehicles for socio-economic development and transformation. For innovative entrepreneurs, the process of solving the customer's problems begins with observing people and keeping abreast of technological changes. The idea is not to eliminate the superfluous functions of a product or service but to tap innovative entrepreneur's in-depth knowledge of a particular subject in order to define the essence of the problem. Start-ups not just solve customer's problems but give it an innovative approach and reach to their needs through an intelligent way

Invited Talk

Multifaceted Microbial Electrolysis Cells: A sustainable way of solving potential Fuel shortage

Lakhveer Singh
Department of Chemistry
Sardar Patel University, Mandi, Himachal Pradesh, India
lucki.chem09@gmail.com

The present work envisions on devising technologies for H_2 production from biomass/wastewater through dark fermentation with microbial electrolysis. Owing to higher investments and lower performance efficiency, scaling up and following up to a commercial level is far-fetched. In this context, we developed a novel MEC setup that is a) self-pressurised b) cost-effective with low-cost catalyst and c) with efficient bacteria with unique cloth electrode assembly (CEA) for suitable H_2 production (yield: 40 L H_2/L/day) that meets FCTO target **~ $2/gge**.

Invited Talk

Life and Work of S. Ramanujan

Ashish Arora
Department of Mathematical Sciences, I. K. Gujral Punjab Technical University
dr.ashish10@hotmail.com

The talk aims to highlight the life and work of S. Ramanujan. Infinite series expansion of the number, partition of a positive integer, and highly composite numbers shall be briefly discussed and the basics of the theoretical development by S. Ramanujan shall be highlighted. The magic squares and the mathematical algorithm for the formulation of Indian Yantras shall also be presented in brief. The main objective of the talk shall be to present interesting facts and the versatility of the applications of Mathematics.

Invited Talk

Plant Based Oral Vaccine against Anthrax: Recent Developments and Way Forward

Manoj K. Sharma
School of Biotechnology, Jawaharlal Nehru University, New Delhi
mksharma@jnu.ac.in

Anthrax is an infectious zoonotic disease (primarily of herbivorous animals like sheep, goats, cattle etc.), which is caused by a spore-forming gram-positive bacterium Bacillus anthracis. It is of particular importance due to frequent natural outbreaks in many parts of the world, especially in domestic/wild animals and could be transferred to humans too. It could be a potential bio-warfare agent as it is easy to weaponize and dissemination it as invisible aerosol. Therefore, development of effective anthrax vaccines for both veterinary or humans and therapeutic antibodies are important components of anthrax treatment. Further, the delivery of the vaccine through oral route offers a promising tool for delivery in domestic or wild animals.

Plants-expression systems could be a safe and promising to the currently available infectable vaccines, which are usually prepared from bacterial or other eukaryotic systems. Protective antigen (PA) is the key component of the anthrax vaccine for human and provide complete protection against anthrax spore challenge (Manish et al. 2020). Further immunization with domain IV of PA can generate protective response. Earlier, gene encoding for the PA was transferred to tobacco and plant-produced protein provided protective immunity in the mice against anthrax challenge (Gorantala et al. 2014). In order to make it domestic animal friendly, we are transferring the gene encoding for the complete protective antigen or domain IV only, to the fodder plant sorghum, through Agrobacterium-mediated plant transformation. Nontoxic cholera toxin B subunit is potent adjuvant that induces Th17-mediated responses critical for host defense for pathogens. We have introduced the gene encoding for the cholera toxin B subunit as a fusion product with Protective antigen or domain IV, which is expected to work as adjuvant for plant-based anthrax vaccine and would stabilize the antigenic determinants in the animal gut.

Invited Talk

Controlling the Morphology of Nanomaterials via Simple Methods

Pankaj Thakur
Special Centre for Nano Science, Jawaharlal Nehru University, New Delhi-110067
pankajthakur@mail.jnu.ac.in

The morphological control of nanoparticles (NP) is vital to adventure those for varied obstinacies. The nanostructure articulately stimuli the concert. The NPs license for quicker charging, augmented energy storage and a protracted existence, nonetheless the irrefutable endeavours are still happening as to which NPs shapes, sizes and crystallinities crop the peerless performance. This talk is reinvigorated by the same gap necessitating accurate control on the morphology of NPs through simplest routes so as to guide NPs usage in diverse outlook. Just, varying the kinetics and concentration etc. can coil prolonged morphological control for NPs for application in innumerable arenas.

Invited Talk

Silicon Photonics for Life Sciences and Medicine

Tarun Sharma

Department of Electronics and Communication Engineering, University Institute of Technology, Himachal Pradesh University, Summerhill, Shimla

sharma.tarun23@gmail.com

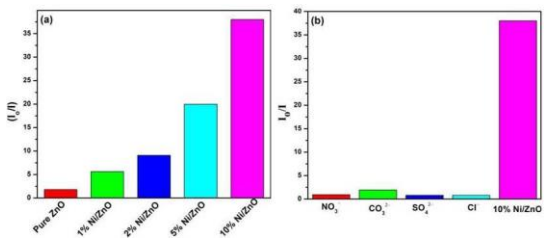
Silicon photonics have used for many practical applications ranging from sensing, communication, and information processing in the last decades. The Silicon photonics, specifically not used only for the communication devices, but I it also used for the various life science and medical applications. Photonic technology leads to the development in the public health care with the development of rapid, cost-effective, personalized interventions. The high-speed movement of optical photons and the ability of light waves to penetrate various biological barriers without causing unwanted interactions have many advantages in human healthcare. The silicon photonics based biosensors have made a remarkable development in the area of food quality monitoring, drug discovery, environmental monitoring, soil quality monitoring, the healthcare industry, and medical point of care diagnosis. These Integrated photonic biosensors based on silicon technology could act as early diagnostic tools with better sensitivity, specificity, and reliability, which could improve the effectiveness of in-vivo and in-vitro diagnostics. Further, artificial intelligence and silicon photonic combine and used for the early stage detection of the cancer.

Keywords: Silicon photonics, biosensors, artificial intelligence.

Chemical Synthesis, Characterization and Environmental Remediation Applications of Ni doped ZnO Nanoparticles Synthesized via Facile Solution Approach

Ramesh Kumar
Government Degree College Solan, District Solan-173212, Himachal Pradesh, India
romeshkumar.hpu@gmail.com

A facile solution phase synthetic approach has been employed for the large scale synthesis of pure ZnO and Ni doped ZnO nanoparticles. After successful characterization of these nanomaterials, their environmental remediation applications were reported. The synthesized ZnO nanomaterial (0.05 g) shows 50% degradation of Rhodamine B (RhB) dye in 60 minutes whereas complete degradation is achieved within 60 minutes while using 10% Ni doped ZnO sample. The as synthesized nanomaterial was also utilized as luminescence sensor for the detection of cyanide ions with low detection limit of 9.7 μM in the presence of various interfering anions viz. Cl-, SO_4^{2-}, CO_3^{2-} and NO_3^-. The photoluminescence results clearly indicate the improvement in the detection limit with increasing dopant ion concentration as well as selectivity of the as fabricated sensor. These results demonstrate that the Ni doped ZnO nanoparticles can provide a new robust platform for cyanide ions luminescence sensor design and water purification applications.



Key words: Ni doped ZnO nanoparticles, Rhodamine B, Cyanide ion, luminescence sensor

Synthesis, characterization and gas sensing applications of rGO-PEG composites

Rajesh Kumar
Department of Chemistry, Jagdish Chandra DAV College, Dasuya, Punjab 144205 India
rk.ash2k7@gmail.com

By reducing GO with sodium borohydride, rGO was synthesized. To produce rGO-PEG composites, rGO was dispersed and sonicated in DI water containing polyethylene glycol (PEG). Various characterization techniques were used to confirm the features of the composites. A prominent and distinctive diffraction peak matching to lattice planes (0 0 2) for rGO was seen at Bragg's diffraction angle of 24.33 °. Characteristic PEG diffraction peaks were seen at 19.18° and 23.31° corresponding to the (1 2 0) and (1 1 2) diffraction planes. Raman spectra revealed higher ID/IG value for rGO as compared to PEG-rGO composites. The gas-dependent electrical characteristics of the composites were examined at room temperature. According to the findings, sensors made of rGO-PEG composites outperformed pure components towards H_2 gas sensing. Due to their high sensitivity and selectivity, rGO-PEG composites may be a great choice for creating ultrahigh-performance gas sensors for a range of applications.

Keywords: rGO-PEG composites; Hydrogen; High selectivity.

Inhibitory effect of magnetic CLEA with immobilized cocktail of enzymes on *E. coli* and *S. aureus* biofilm

Mohammad Perwez and Pankaj Thakur*

Special Centre for Nanoscience, Jawaharlal Nehru University, New Delhi-67

pankajthakur@mail.jnu.ac.in

Cross-linked enzyme aggregate (CLEA) is a method of enzyme immobilization for its various applications in chemical industries. Magnetic CLEA has been synthesised by immobilizing commercial enzyme pectinase (containing pectinases, xylanases and cellulases) on modified magnetic nanoparticles. Different parameters were optimized, and it was observed that 0.4 mg/ml of protein (containing 25 U/mg cellulase activity), 0.5 mg/ml BSA and 10 mM glutaraldehyde when incubated for 3 hrs gives 100% enzyme activity using ethanol as the precipitant. The structural characterization of magnetic CLEA was studied by Scanning Electron Microscopy. Thermal stability was performed at 70°C for pectinase and 80°C for xylanase and cellulase respectively. Half-life (t1/2) of the xylanase, cellulase and pectinase in free form remarkably enhance from 84.51, 29.36, and 25.29 minutes respectively to 533.07, 187.29 and 147.44 minutes in magnetic CLEA respectively. Magnetic CLEA can be efficiently reused till 12th cycle. m-CLEA was utilized for bacterial biofilm inhibition. m-CLEA of Pectinase shows 75-78% biofilm inhibition of *E. coli* and *S. aureus*. Furthermore, m-CLEA can be reused till 4 cycles with same efficiency. The carbohydrate contents of *E. coli* biofilm decreased from 64.629 µg to 6.23 µg and for *S. aureus* biofilm, it decreased from 58.46 µg to 5.52 µg when treated with m- CLEA in comparison to untreated biofilms. FTIR, darkfield illumination Fluorescence Microscopy and SEM was further used for characterization.

Keywords: m-CLEA, pectinase, *E. coli*, *S. aureus*, FTIR, SEM, biofilm

Flower mediated green synthesis and characterization of bare and doped ZnO nanoparticles

Palak Ahir and Sunil Kumar
Department of Chemistry, Himachal Pradesh University, Shimla
sunil.667788@gmail.com

Development of plants based nanoparticles has many advantages over conventional methods. This approach aims to both minimize the use of toxic chemicals in nanoparticle fabrication in accordance with green chemistry principles and enhance the antimicrobial activity and biomedical applications. In the present work, Flower mediated Zinc Oxide nanoparticles and Rare Earth Metal Doped Zinc Oxide Nanoparticles were prepared from aqueous flower extract of Rhodedendron Arboretum, the state flower of Himachal Pradesh. The structural and optical properties of NPs were investigated by X-ray diffraction (XRD), Fourier transform infrared (FTIR) spectroscopy, ultraviolet-visible spectrophotometer (UV-Vis).

Keywords: Nanoparticles, Rare earth metal, XRD, Flower extract

Synthesis of Zirconium-Cobalt hybrid nanomaterial for environmental remediation

Neha Singh,[1] Divya Thakur,[1] Manish Kumar*,[1] and Maheshwar S. Thakur*,[2]

[1]*Department of Chemistry, Central University of Himachal Pradesh Dharamshala, India*

[2]*St. Bede's College Shimla H.P.*

drmsthakur9@gmail.com, manishssu26@gmail.com

Development of hybrids of transition metal oxides achieves great attraction among the researchers because of their enhanced and wide applications. Here, specifically the synthesis of hybrids of 1st and 2nd transition series metal is focused. In the first synthesis, hybrid of Zirconium and cobalt were synthesized via green protocol. This green route is followed by combustion method where ethanol is used fuel and water is used as solvent. The method demands annealing at 800°C four 4 hours and provide insoluble material. This developed material is used for the discoloration of water which is colored by industrial dye Novacron blue. The developed material, 100% decolor the 100ppm solution of dye in 90 minutes. This developed material is also utilized for the discoloration of methyl orange solution and it is observed that 60% solution of methyl orange is decolored in 2 hours. The optimization of method is under progress and will be shared. Further, the developed material will be analyzed for the removal of biological in addition to industrial pollutants.

Keywords: Annealing, Cobalt, Combustion method, Ethanol, Zirconium.

Rhotrices & Its Vector Spaces

Satish Kumar
Department of Mathematics,
Government College Solan, Distt. Solan, India.
satishkumar31982@gmail.com

Cryptography is a science of hidden writing. Matrices play important role in cryptography and cryptology. It is also used in exchanging secret information. It can be used in Quantum Mechanics for time domain state space. It has some applications in control theory and stresses in materials using tensor. MATLAB software is a default data type matrix. It is widely used in engineering. Vector spaces and matrix used extensively in electrical engineering field. Rhotrix is a further extension of the matrix and it is new paradigm in enrichment of mathematics. It has some applications in design of experiments, coding theory and cryptography. In this context we study the basic properties of rhotrices and investigate vector spaces.

Numerical investigation of Soret and Dufour effect on unsteady free convective chemically reacting Nanofluid past a vertically moving porous plate in the presence of viscous dissipation and heat source/sink

Aastha and Khem Chand
Department of Mathematics & Statistics, Himachal Pradesh University, Shimla
aastha2101@gmail.com

The article divulges a numerical investigation of the Soret and Dufour effects on the unsteady free convective chemically reacting Nanofluid past a vertically moving porous plate in the presence of viscous dissipation and heat source/sink. The water based nanofluid constituting nanoparticles of copper is taken into consideration. The equations directing the flow are non-dimensionalized and modified to ordinary differential equations. The emerging equations are resolved computationally by making use of bvp4c function in Matlab software. The impact of physical quantities on core components are elaborated with the help of graphs and tables for various governing parameters involved to anatomize the fluid motion and heat transfer.

Effect of magnetic field in Thermohaline instability of Veronis type in porous medium

Kanu Mehta and Jyoti Prakash

Department of Mathematics & Statistics, Himachal Pradesh University, Shimla
dr.kanumehta@gmail.com

The paper prescribes the upper bounds of neutral or growing amplitude for oscillatory motions in thermohaline configuration of Veronis type in porous medium. The study was carried out in the presence of magnetic field (Darcy-Brinkman model) in such a way that it results in sufficient conditions of stability for an initially top-heavy as well as initially bottom-heavy configuration.

Keywords: Top-heavy, Veronis, Oscillatory motions

Love wave at the interface between porous layer and elastic half-space with triangular irregularity

Rajbir Kaur
Guru Nanak Dev Engg. College, Ludhiana, Punjab
rajbiramar@yahoo.com

Propagation of the love wave is studied along the irregular interface between the porous layer and the elastic half-space. The porous layer is assumed to be saturated by two immiscible fluids. The irregularity at the interface is considered in the form of a triangular pit embedded in the half-space. The elastic half-space is considered to be initially stressed under the effect of gravity. A complex transcendental and implicit relation between the frequency and the phase speed of the Love wave is derived in the form of a dispersion relation. A numerical study is conducted to observe the effect of material parameters and irregularity on the behavior of the Love wave. A significant impact of the triangular pit, porosity, and frequency is observed on the phase speed of the propagating Love wave and depicted graphically.

Keywords: Love wave, Triangular pit

A Mathematical Theorem in Triply Diffusive Convection in a Densely Packed Porous Medium with Viscosity Variations

Chitresh Kumari, Harjinder Singh and Jyoti Prakash
Department of Mathematics and Statistics, Himachal Pradesh University, Shimla
chitreshsharma9098@gmail.com

A mathematical theorem is derived which provides a classification of the neutral and unstable triply diffusive convection in a densely packed porous medium into two classes namely the bottom heavy class and the top heavy class and strikes a distinction between them by means of mathematical theorem which disallow the existence of oscillatory motions in the former class.

Artificial Intelligence: A scientific intervention in seed science and research

Neha Thakur and Priyanka Thakur
College of Horticulture and Forestry, Thunag, Dr. Y S Parmar, UHF Nauni, Solan
drneha.thakur0708@gmail.com

Seeds are the most needed and inevitable input in agriculture. Seeds or rather true seeds may increase crop production by 40 percent. Hence good quality seeds when placed in good quality land will yield abundant produce. The quality parameters of seeds viz., genetic, physical and physiological quality, as well as seed health, is assessed manually which creates a lot of data per the sample analyzed. But after the scientific intervention of artificial intelligence (AI) this tedious task may be sorted very effectively. AI deals with algorithms that are designed to solve the problems associated with complex data. Such as using the AI in dormancy breaking and germination induction as well as checking the field emergence. The bottleneck in studying the interaction of various factors associated with these seed quality parameters can be emitted by using AI software and networks. This is a very unique and new technology that was out of touch in seed science and technology. This novel technique can tell us about the factors which can interfere with the germination and other physiological processes and their interactive effect on the same.

In-silico comparative structural and residue interaction network analysis of MATE efflux proteins in *P. aeruginosa* and *S. aureus*

Vandna Kumari and Shamsher S. Kanwar*
Department of Biotechnology, Himachal Pradesh University,
Summer Hill, Shimla-171005.
kanwarss2000@yahoo.com

Bacterial multidrug resistance against front-line antibiotics has been widely observed by scientists and epidemiologists. Multidrug and toxic extrusion proteins are active transporters and play a vital role in the efflux system. Their main generalized function is the exclusion of various antibiotics and xenobiotics out of their host cells. Despite their wide presence in all living kingdoms, the structure-function relationship is not well understood. Protein characterization and structural analysis may help to figure out the important aspects of structure-function relationships. In the present study, multidrug and toxic extrusion protein sequences of *P. aeruginosa* and *S. aureus* were characterized and comprehensive analysis of their structural levels was done. Residue interaction network algorithm further insight into amino acid residues has been designed. These proteins were also analyzed for hydrophilic and hydrophobic amino acid residues which indicated the predominance of hydrophobic amino acids in bacterial multidrug and toxic extrusion proteins primarily existing in the transmembrane region of the host cell. The residues involved in tertiary structure formation and the analysis of the network that emerges due to the interacting residues may reveal additional information about the structure-function relationship in a protein. The residue interaction networks were generated for these bacterial homologs of multidrug and toxic extrusion proteins has revealed the scale-free degree distribution and hydrophobic amino acids to be the major actors among these networks.

Phloretin induces G2/M arrest and apoptosis by suppressing the β-catenin signaling pathway in colorectal carcinoma cells

Smita Kapoor[1,2] and Yogendra Padwad[1,2]
[1]Pharmacology and Toxicology Lab, Dietetics & Nutrition Technology Division, CSIR-IHBT Palampur, H.P., India
[2]Academy of Scientific and Innovative Research (AcSIR), Ghaziabad, 201002, India
smitakapoor47@gmail.com , yogendra@ihbt.res.in

Phloretin, a well-known dihydrochalcone is present in apple, pear and strawberry. It has been proven to induce apoptosis in cancer cells and also exhibited anti-inflammatory and other biological activities thus can be explored as potential anticancer nutraceutical agent. Colorectal cancer (CRC) is third most prevalent and causes significant mortality worldwide. The available therapies are associated with different unwarranted effects therefore nutritional intervention using natural polyphenols is a best alternate to prevent CRC. In this study we have explored potential of phloretin in exhibiting *in vitro* anticancer activity against CRC. Phloretin reduced cell proliferation, colony forming ability and cellular migration in HCT-116 and SW-480 cells. Results also revealed generation of reactive oxygen species (ROS) which provoked depolarization of mitochondrial membrane potential (MMP) further causing cytotoxicity to colon cancer cells. Phloretin also modulated the cell cycle regulators including cyclins and cyclin-dependent kinases (CDKs) and halted cell cycle at G2/M phase. Moreover, it also induced apoptosis by regulating the expression of Bax and BCl-2. In conclusion, our results strongly suggested that phloretin can be used as a nutraceutical anticancer agent for combating CRC.

Keywords: Colorectal cancer, Phloretin, Apoptosis, ROS, MMP, β-catenin.

Impact of temperature fluctuations on α- amylase activity, seed germination, and seedling growth of common Buckwheat (*Fagopyrum esculentum sp*.)

Marry Albright Johnson* and Sveta Thakur
Department of Biosciences, Himachal Pradesh University Shimla-171005
marrylenthra@gmail.com

During seed germination endogenous gibberellic acid triggers the production of α-amylase (1,4-D-glucan maltohydrolase), a starch-degrading calcium metalloenzyme that hydrolyzes the starch side chains. The biosynthesis of α-amylase and the rate of seed germination is limited by several genetic and climatic variables including temperature fluctuation. Hence, our study assessed the effect of temperature change on the activity of enzyme α-amylase in *F. esculentum* seeds, and additionally, alteration in the seed germination and seedling growth rate was also examined under different temperatures. *F. esculentum* seeds were subjected to 8ºC, 16 ºC, and 25 ºC temperatures under 16/8h light durations and it was observed that low-temperature exposure enhanced the α-amylase production, seed germination and seedling growth rate, suggesting that low temperature might be suitable for *F. esculentum* growth and development. The average α-amylase activity obtained at 8 ºC, 16 ºC, and 25 ºC were 3.31±0.98, 4.18 ± 0.67, and 2.59± 0.71 mg/ml, respectively. The rate of seed germination was also influenced at given temperatures, maximum germination was obtained at 25 ºC followed by 16 ºC and 8 ºC. A delay in seedling emergence was observed in seeds exposed to 8 ºC and the growth was better in the seedlings exposed to 16 ºC as compared to 25 ºC. All experiments were carried out in triplicates and repeated once. The data are presented as arithmetic means ± S.E.

Keywords: *F. esculentum*, α-amylase, temperature, seed germination, seedling growth.

Studies on antioxidant activity and phytochemical constituents of *Meconopsis aculeata* Royle

Jagriti Rana,* Jyoti Rana and Anand Sagar
Department of Biosciences, Himachal Pradesh University, Shimla, 171005, (H.P.), India
jagritiranag@gmail.com

Throughout the human history, plants and their products are being used as food and medicine. *Meconopsis aculeate* Royle is one of the medicinal plants used by inhabitants of Lahaul and Spiti District of Himachal Pradesh. By applying DPPH free radical scavenging assay and reducing power method antioxidant activity of different extracts of this plant was investigated, also phytochemical constituents of this medicinal plant were initially screened qualitatively and later by GCMS analysis. Plant exhibited almost same antioxidant activity in both the extracts and displayed the presence of alkaloids, flavonoids, tannins, terpenoids, carbohydrates and proteins in methanol extract and except alkaloids same constituents were present in acetone extract also GCMS analysis showed 24 and 38 peaks in acetone and methanol extracts, respectively.

Studies on Antioxidant activity and Phytochemical Analysis of *Jatropha curcas* L. Leaves

Dimple Guleria,* Anand Sagar and Amit Kumar Sehgal

Department of Biosciences, Himachal Pradesh University, Shimla, 171005, (H.P.), India
dimpleguleria1424@gmail.com

Leaf extracts (methanol and acetone) of *Jatropha curcas* L. were examined for their antioxidant activity using DPPH (2, 2-diphenyl-1- picrylhydrazyl) free radical scavenging assay and Reducing power assay. Also, leaves of *Jatropha curcas* were investigated for the presence of different phytochemicals by preliminary and GC-MS methods. Among methanol and acetone extracts, methanol extracts showed the best antioxidant activity with low IC_{50} and EC_{50} values for free radical scavenging assay and reducing power assay, respectively. Preliminary analysis revealed the presence of alkaloids, flavonoids, terpenoids, carbohydrates, and protein. GC-MS results of leaf methanol extracts showed 28 peaks, which determined the presence of 28 different phytochemicals.

Effect of temperature on the conductance behavior of drug Levofloxacin Hemihydrate in aqueous solutions of Sorbitol at different temperatures

Madhu Bala and Shashi Kant Lomesh
Department of Chemistry, Himachal Pradesh University, Shimla-171005, India.
madhubala861994@gmail.com

The interactions of drug Levofloxacin Hemihydrate (LFH) with water and aqueous sorbitol as a function of temperature have been investigated by conductance studies. Densities and speed of sound of LFH in water and aqueous solutions of sorbitol (0.002, 0.004, 0.006) $mol.kg^{-1}$ have been measured at temperature (T)= (305.15K, 310.15K and 315.15K) and atmospheric pressure. Conductance data was used to calculate molar conductance, limiting molar conductance and Walden product. The positive temperature coefficient of Walden product suggests that LFH acts as structure maker in water and aqueous sorbitol systems.

Keywords: Molecular interactions; Temperature coefficient.

Viscometric studies of anti-diabetic drug Metformin Hydrochloride (MH) in water and aqueous dulcitol as a function of temperature

Shashi Kant Lomesh and Inesh Kumar*
Department of Chemistry, Himachal Pradesh University, Shimla, India-171005
ineshsharma930@gmail.com, drsklomesh@gmail.com

The viscosity studies were used to investigate the interactions of drug MH in water and aqueous dulcitol system at different temperatures (305.15K, 310.15K and 315.15K). The measured data has been analysed with the help of Jones-Dole equation ($\eta/\eta_o = 1 + A\sqrt{c} + Bc$). Constants A and B were determined from intercept and slope of the linear plots of $\left(\frac{\eta}{\eta_o}\text{-}1\right)/\sqrt{c}$ versus $\sqrt{c}$. A corresponds to ion-ion interaction and B signifies ion-solvent interactions. The structure making and structure breaking behaviour of electrolytes was obtained by sign of dB/dT. The positive value of dB/dT indicated the structure breaking and negative value of dB/dT will indicate structure making behaviour of electrolytes in solutions. The data of viscosity was also analysed on the basis of transition state theory of relative viscosity of electrolytic solution. The dB/dT values are negative for Metformin hydrochloride (MH) drug in water and in 2%, 4% and 6% aqueous arrangements of dulcitol system. Also, the results obtained from transition state theory also shows that MH acts as a structure maker in water and in 2%, 4% and 6% aqueous solutions of dulcitol system.

Keywords: Falkenhagen Coefficient**;** Jone Dole Coefficient; dB/dT; Gibbs free energy; enthalpy and entropy.

Synthesis, Characterization and Biological Study of copper(II) Indole-3-acetohydroxamate

Vineet Kumar Choudhary
Department of Chemistry, IEC University Baddi, Solan, Himachal Pradesh, India
vineetchoudhary171@gmail.com

The copper(II) Indole-3-acetohydroxamate has been synthesized by the reactions of copper sulphate with potassium Indole-3-acetohydroxamate and characterized by IR, 1H, 13C NMR and mass spectrometry. The copper bind to ligand through C=O and N-O oxygen atoms (O, O coordination) and distorted-square planar geometry has been proposed. The in vitro antibacterial study against bacteria viz. *Salmonella typhi*, *Escherichia coli, Bacillus cereus* and *Staphylococcus aureus* by MIC method has shown complex has significant antimicrobial potential.

Keywords: Copper (II) Indole-3-acetohydroxamate, Spectral Study, Antimicrobial studies

Biologically active zirconium (IV) nicotinohydroxamate complex: Synthesis, characterization and biological evaluation

Kanika Mandhana and Vineet Kumar Choudhary
Department of Chemistry, IEC University Baddi, Solan, Himachal Pradesh, India
vineetchoudhary171@gmail.com

The zirconium (IV) nicotinohydroxamate complex has been synthesized by using potassium nicotine hydroxamate and ZrOCl2.8H2O and characterized by various spectral techniques FT-IR, 1H NMR, 13C NMR and mass spectrometry. The zirconium metal bind to ligand via carbonyl and hydroxamicoxygens and distorted-octahedral geometry has tentatively been proposed from spectral studies. The antimicrobial activity has been evaluated against *Salmonella typhi, E.coli, Bacillus cereus* and *Staphylococcus aureus* using MIC method which has revealed complex has significant antibacterial potential.

Keywords: Zirconium (IV) nicotinohydroxamate complex, Spectral Study, biological evaluation

Inhibition of Fibril Growth of Human γD-crystallin by Rhodamine B

VandnaSharma[1] and Kalyan Sundar Ghosh[2]
[1]*Department of Chemistry, IEC University Baddi, Solan, Himachal Pradesh, India,*
[2]*Department of Chemistry, National Institute of Technology Hamirpur, Himachal Pradesh 177005, India*
vsharmahmr77@gmail.com

The aggregation of eye lens proteins known as crystallins is a leading cause of blindness. In aged and cataractous lens, these crystallin proteins form amorphous as well as fibrillar aggregates. Among crystallin proteins, human γD-crystallin (HGD) had formed *in vitro* mature fibrils after incubation for 48 hours at 37°C at pH 3.0. The inhibition of amyloid fibrils formed by human gammaD-crystallin (HGD) was targeted by using small molecule rhodamine B (RH). Various fluorescence based assays (thioflavin T, ANS binding and intrinsic tryptophan fluorescence determination), circular dichroism and microscopic imaging techniques were used to study inhibition. From the above studies, it is certainly confirmed that RH prevents HGD most efficiently from acquiring predominant fibrillar structure. The microscopic images acquired from fluorescence microscopy and transmission electron microscopy had also authenticated our spectroscopic inspections. The hydrophobic and aromatic interactions among partially unfolded HGD and RH are probably accountable for demonstrating inhibition of HGD fibrillation.

Keywords: Human gammaD-crystallin (HGD), rhodamine B (RH), Thioflavin T (ThT)

A Sorption study of Cu^{2+} ions on Graft copolymers of Cellulose extracted from Pine needles.

Lalit Kumar Guleria
Govt. College Solan Distt. Solan (HP)
drlalitguleria@gmail.com

In present Study, the attempt has been made to develop and investigate the potential of graft Copolymers of Cellulose extracted from pine needles as new polymeric backbone material. For this Cellulose was Graft Copolymerized with Styrene (Sty) and Acrylonitrile (AN) by radiation induced method and optimum conditions for grafting was established. The Cu^{+2} ions sorption from its aqueous solution was studied on to Cellulose, Cellulose graft copolymer with Styrene (Cell-g-Sty) and Cellulose graft copolymer with Acrylonitrile (Cell-g-An) at different grafting percentage. The gamma radiation initiation shows three times more ions sorption as compared to identical graft levels copolymers synthesized by chemical initiation methods in presence persulphate as redox system. Evidences from structural characterization of grafted chains were provided by elemental analysis, Thermal analysis and Fourier transform Infrared Spectroscopy.

Keywords: Pine Needles, Grafted chain, Percent Grafting, Retention Capacity, Percent sorption**.**

Cobalt phenylphenoxide nanoparticles: Effective photocatalyst for degradation of methyl orange dye

Shalima Kumari and Maridula Thakur*
Department of Chemistry, Himachal Pradesh University, Summer Hill, Shimla-5
mriduthakur82@gmail.com

Humans utilize dyes to add colour to a variety of materials, such as paper, leather, fur, hair, pharmaceuticals, etc. Methyl orange is a synthetic anionic dye that is water soluble and widely used as a dyeing agent. The majority of dyes are carcinogenic and their release into the environment has raised serious health concerns. To remove synthetic dyes from wastewater, a variety of processes have been employed including electrolysis, adsorption, oxidation, coagulation, and membrane filtering. However, these processes have several limitations, including the potential for sludge development, incomplete breakdown or the production of hazardous byproducts. Due to the high surface to volume ratio, nanoparticles have been employed in the catalytic degradation of different dyes. Degradation of methyl orange by newly synthesized cobalt complexes of 4-phenylphenol, produced in organic (THF) and mixed solvent (H_2O+THF) media have been carried out. The degradation of the dye have been indicated by the absence of dye-specific peaks in the solution's FTIR analysis. Powder X-Ray Diffraction experiments (PXRD) and Scherrer's formula [$D=0.9/\beta\cos\theta$] indicated the nanoparticle size of compounds (14.4 nm). The degrading process follows first order kinetics. The rate of degradation increases as complex concentration increases while it decreases as dye concentration increases. For complexes synthesized in organic solvent, the dye degradation efficiency was up to 80.62 % and 90.4 % in the absence and presence of an initiator, respectively, while for complexes synthesized in mixed solvent, the efficiency was 87 % and 88 %, respectively, at a catalytic load of 5 mg/15 ml of complex in a time interval of 50 minutes.

Functionalized biowaste as an adsorbent for harmful dyes uptake from wastewater

Kavita devi and Kiran Kumar
Department of chemistry, Himachal Pradesh University Shimla
kavitathakur292@gmail.com, drkiran1980@gmail.com

The world is experiencing rapid industrial development in a variety of fields, particularly the textile industry. Although the industrial revolution has made enormous contributions to growth and employment, textile businesses are also leaking dangerous, mutagenic, and carcinogenic dyes into the environment. Many different water treatment techniques have been employed to deal with this condition. In the present study crosslinked polymer poly(VSA)-*cl*-C^h(IV) was synthesized using biowaste coconut husk (C^h), initiator-crosslinker system, and monomer VSA (sodium vinyl sulphonate). It was exploited for the uptake of dyes from wastewater. It was found that it adsorbs all cationic dyes but preferentially crystal violet (CV). The polymer was characterized by different characterization techniques such as FTIR, FESEM, XRD, and EDS. Further CV uptake was optimized with respect to the contact time, temperature, pH, and initial concentration of CV. Poly(VSA)-*cl*-C^h(IV) showed q=45.75mg/g within 15 min with initial CV concentration of 50 ppm. Adsorption data best fitted in the pseudo-second-order kinetics model and followed the Langmuir adsorption isotherm. Thus, the synthesized polymer was found to be a cost-effective and quite efficient adsorbent for CV uptake.

Keywords: crosslinked polymer, adsorption, wastewater dyes.

Green synthesis of quaternized pine needles as a rapid and efficient adsorbent for anionic dye removal

Babita Kumari and Sandeep Chauhan

Department of Chemistry, Himachal Pradesh University, Shimla-171005, India

sandeepchauhanin2020@gmail.com

Aquatic environment pollution brought on by different toxic substances including dyes, metal ions, and other pollutants discharged from various textile companies has become an increasingly critical issue in current years. Aquatic vegetation, fauna, and people are all put in peril by this issue, either directly or indirectly. This issue can be solved by treating wastewater with readily available organic wastes derived from biomass, either in their natural form or after chemical modification. In the current research, pine needles (PNs), which are widely available, were employed as a renewable feedstock to create an inexpensive adsorbent for the quick and efficient removal of anionic dye. Whole PNs were first modified and characterized using Fourier transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), Field emission scanning electron microscopy (FESEM), and Energy dispersive X-ray spectroscopy (EDS), after which they were used as an adsorbent to remove the anionic dye, congo red. Numerous adsorption experiments were conducted as a function of time, temperature, pH, and dye concentration. The maximum adsorption capacity of 47.38 mg/g from 50 ppm of the aqueous solution of CR was observed in 120 min. It was observed that the adsorption followed pseudo-second-order kinetics, indicating that the adsorption mechanism involves chemisorption. In addition, it was also found that for CR, the adsorption followed the Langmuir isotherm more closely than the Freundlich isotherm. According to the results of this study, modified PNs have a great deal of promise for removing CR from industrial and wastewater effluents.

Keywords: Modified pine needles, Adsorbent, Congo red, Wastewater treatment.

Synthesis and characterization of vanadium (III) hydroxamate complex

Sonika Sharma
Department of Chemistry, MLSM College Sundernagar
sonikasharmahpu@gmail.com

The chemical synthesis of vanadium hydroxamates has long fascinated the inorganic chemists. Hereby, a new vanadium(III) hydroxamate complex of composition $V(4\text{-}NO_2C_6H_4CH{=}CHCONHO)_3$ has been synthesized by reaction of VCl_3 with potassium salt of 4-nitrocinnamohydroxamate ($4\text{-}NO_2C_6H_4CH{=}CHCONHO$) in 1:3 molar ratio in dry methanol Solvent. The newly synthesized complex is characterized by elemental analyses, molar Conductivity, molecular weight determination, magnetic moment measurements and IR, UV-Vis Spectral studies and mass spectrometry. The magnetic moment measurements and electronic Spectra of complex inferred +3 oxidation state of vanadium. A distorted-octahedral geometry around vanadium center has been suggested for complex based upon vibrational spectra, involving Bonding through hydroxylamine and carbonyl oxygens. The electrochemical Behavior of complex has been studied by cyclic voltammetry. The biological activity profile of Complex has been tested by MIC method.

Keywords: Vanadium (III) hydroxamate, magnetic study, spectroscopic study, antimicrobial

Synthesis and Characterization of Polypyrrole-Tungsten disulphide Nanocomposite

Yuvika Sood[1], Harish Mudila[1] and Anil Kumar[1]
[1]*Department of Chemistry, Lovely Professional University, Phagwara, 144411, India*
rsanil.nit@gmail.com

Conducting Polypyrrole (PPy) was synthesized using In-situ chemical oxidative polymerization route with ammonium persulfate and ferric chloride as an oxidizing agent. For the preparation of nanocomposites, different wt% (1.0, 5.0, 10, 20 and 30) of chalcogenides tungsten disulphide (WS_2) have been utilized as filler in the matrix of conjugated polypyrrole. Structural and morphological analysis of the prepared nanocomposite were done via Fourier transform infrared spectroscopy (FTIR), X-ray diffractometry (XRD), and field emission scanning electron microscopy (FE-SEM), respectively. According to XRD data, loading a high weight percentage of filler consistently raised the intensity of the most noticeable peak at 14.3^{o}. FE-SEM analysis shows the granular morphology of PPy along with hexagonal sheets of chalcogenides WS_2. Further, current-voltage measurement of PPy and nanocomposites shows the electrical conductivity about $4.9x10^{-2}$ S/cm for PPy with APS, 9×10^{-3} S/cm for PPy with $FeCl_3$. The prepared nanocomposites can be further use for gas sensing.

Keywords*:* Polypyrrole, Nanocomposite, Chemical oxidative polymerization, Tungsten disulphide

Thermal, Antifungal and molecular docking studies of copper (II) 3-nitrobenzohydroxamate

Parul Chauhan and Vineet Kumar Choudhary
Department of Chemistry, IEC University Baddi, Solan, Himachal Pradesh, India
vineetchoudhary171@gmail.com

The copper(II) 3-nitrobenzohydroxamate of composition [Cu(3-$NO_2C_6H_4CH_2CONHO)_2$] has been synthesized and characterized by spectral techniques. The thermal behaviour of complex has been studied by thermo gravimetric techniques (TGA, DTG, DTA). The *in-vitro* antifungal activity assay against fungi *Fusarium sambucinum* and *Rhizoctonas solani* by MIC method has revealed their significant antifungal potential. The interactions of the *Fusarium sambucinum* fungal receptor with complex, their binding energy value and inhibition constant have been computed.

Keywords: Copper (II) 3-nitrobenzohydroxamate, Thermal Study, Antifungal study, Molecular Docking

Synthesis, Characterization and Biological Evaluation of Some Potent Pyrazole Based Urea Derivatives

Renu Bala[1], Karan Singh[2] and Lakhveer Singh[1]

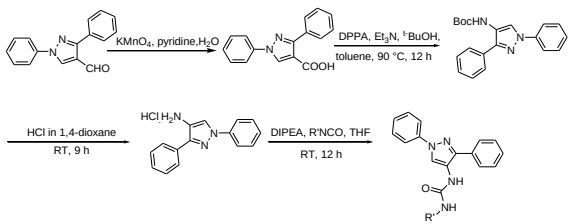
[1]*Department of Chemistry, Sardar Patel University, Mandi-175001, H.P. India*

[2]*Department of Chemistry, Indira Gandhi University Meerpur, Rewari-122502, Haryana. India*

thakur.tanu1989@gmail.com

The synthesis of series of urea derivatives were commenced with the synthesis of pyrazole aldehyde which on oxidation with $KMnO_4$ to form pyrazole carboxylic acid. The Boc-protected amine formed from pyrazole carboxylic acid using Curtius Reaction in the presence of DPPA, triethylamine and ^{t}BuOH. The Boc-protected amine on treatment with 4M HCl in dioxane underwent Bocdeprotection to afford the key precursor 4-aminopyrazole HCl salt.

The reaction between hydrochloride salt of 4-aminopyrazole nd different isocyanates in presence of DIPEA in THF afforded the various urea derivatives in good to excellent yields All the synthesized compounds have been characterized from the rigorous analysis of their IR, ^{1}H NMR, MS and physical analysis. The synthesized derivatives were evaluated for their in vitro antimicrobial by test tube dilution methods (MIC).



Keywords: 4-Substituted 4-formyl pyrazole, 4-Aminopyrazole hydrochloride and its urea derivatives.

Nano-catalysts: Green and Sustainable Catalysts in Organic Synthesis

Shaifali

Arni University, Kathgarh, Distt. Kangra, Himachal Pradesh-176401

shaifalikang21@gmail.com

From last few decades, heterogeneous nano-catalysis has materialized as a promising methodology for sustainable synthesis attributed to its high recyclability, reactivity, productivity, and selectivity. Green nanotechnology (GNT) generally focus on the development of clean chemical transformations without affecting the environment adversely. Metal organic frameworks, graphene oxide, metal oxides, polymeric materials, carbon nano-rods, fullerenes etc. have been exploited as solid support for heterogeneous nano-catalysts to synthesize industrially and pharmaceutically important molecules. Till date, nano-catalysts have been successfully explored in wide range of organic transformations such as reduction, oxidation, condensation, multicomponent reactions, dehydration, alkylation, cross-coupling reactions, carbonylative couplings, dehydrogenation, and heterocycles synthesis. Their characteristics features involve tunable particle size or morphology and large surface to volume ratio which enhance their catalytic reactivity towards various organic transformations. Their properties like high porosity and tunable structural morphology have been successfully applied for fixation of gases (CO_2& CO) and their conversion to value added chemicals/biofuels. Moreover, with the advancement in nanotechnology and material science various nano-photocatalysts which work efficiently in organic transformations under UV/Vis irradiation. Nowadays, nano-catalysts have been efficaciously utilized for the synthesis of various biologically active/potent heterocycles following green and sustainable approaches.

Therapeutic evaluation of Benzosulfones as a browning agent in the treatment of obesity

Abhishek Goel,[1,3] Ashish Kumar,[2,3] Pralay Das[2,3] and Yogendra Padwad[1,3]

[1]*Pharmacology and Toxicology Laboratory, Dietetics and Nutrition Technology Division, CSIR- IHBT Palampur, (H.P), India.*

[2]*Chemical Technology Division, CSIR- IHBT, (H.P), India.*

[3]*Academy of Scientific& Innovative Research (AcSIR), Ghaziabad, (U.P), India*

abhibiotech1993@gmail.com

Obesity with diabetes as a co-morbidity is associated with impaired adipogenesis. Sedentary lifestyle and aging are the major cause of their occurrence. Available drugs like TZD's are widely used to cure diabetes but their side effects like obesity make them less effective. It offers challenge to pharmaceutical industries since no drug is available to elicit the targeted response. Our objective was to screen the molecule, Benzosulfones semisynthesized from himachalenes extracted from essential oil of *Cedrus deodara*. We used differentiated 3T3-L1 and C3H10T1/2 cell model to ascertain the role of Benzosulfones. Molecule was tested under differentiation and post differentiation that included tests for lipid accumulation, insulin sensitivity and energy expenditure. Our findings suggested that Benzosulfones had a considerable effects in an inhibition in lipid accumulation, phase dependent decrease in adipogenesis and G1 cell cycle arrest. Also, it restricted the cell proliferation by inhibiting mTOR, up regulates AMPK and consumes white fat. Moreover, it improved the insulin sensitivity and promoted energy expenditure by inducing UCP1 expression. All of these findings suggested that Benzosulfones have the ability to combat both obesity and diabetes byinducing browning signatures in white fat.

Keywords: Benzosulfones, Adipogenesis, Browning in white, Obesity and Insulin sensitivity

Identification and characterization of 18S rRNA gene of *Demodexcanis* from the dog population of Mizoram, India

Moneesh Thakur and Hridayesh Prasad
Department of Veterinary Medicine, College of Veterinary Sciences and Animal Husbandry, Central Agricultural University, Selesih, Aizawl, Mizoram – 796015, India
vetdrmoneesh@gmail.com

Canine demodicosis is a common parasitic condition which involves dog skin. Demodicosis in dogs is due the prominent growth of *Demodex*. Out of various canine *Demodex* spp., *Demodexcanis*is the most often involved species. Canine demodicosis can occur as either a localized or generalized form of demodicosis severely affect the dogs and in non-treated dogs may cause death. This study was planned with the aim to screen and characterize the 18S rRNA gene of isolated *Demodexcanis*. A total of 1200 dogs were screened during this study period. The skin scrapings of all the suspected dogs were examined under a microscope at 100X magnification for the presence of *Demodexcanis*. The skin scrapings positive for *Demodexcanis* were examined using PCR for confirmation. A total of 35 dogs were confirmed a positive result for *D. canis*based on 18S rRNA gene amplification by PCR. Further, the 18S rRNA gene of isolated *Demodexcanis* was cloned and sequenced for genome analysis. On the sequence analysis, it was found that isolated sequence (GenBank Accession No. MK177513) had close similarity (99.7%) to that of *D. canis* genotype of China (Accession No. MG372254).

Keywords: Canine demodicosis, *Demodexcanis*, 18S rRNA gene, Genome analysis, Phylogenetic analysis.

Effect of Climate Change on Agriculture in Himalayan Region

Ranbir Choudhary and Manju Bala*[1],
Department of Economics
Himachal Pradesh University Shimla, Himachal Pradesh -171005 (India)
manjuvardhan350@gmail.com

Climate is the primary important factor for agricultural production. The increasing rate of deforestation in Himalayan region is the major factor behind the climate change in Himalayan region. The temperature increase is widespread over the globe, with higher than average trends in many of the worlds highlands. The unplanned construction, various projects of hydroelectricity, expansion of roads leads to excessive deforestation day by day which ultimately causes heavy rainfall, cloud burst and ultimately the soil erosion in Himachal Pradesh. Changes in temperature as well as changes in rainfall patterns and the increase in CO_2 levels projected to accompany climate change will have important effects on global agriculture, especially in the hilly regions. It is expected that crop productivity will alter due to these changes in climate and due to weather events and changes in patterns of pests and diseases.

Keywords: Cloud burst, Deforestation, Global agriculture.

Current aspects of heavy metals interaction with gut microbiota, its notorious impact, mitigation strategies and future perspectives

Pushpak Dahiya, Manya Behl, and Ravi Kant Bhatia*
Department of Biotechnology, Himachal Pradesh University Summer Hill, Shimla-India
ravibiotech07@gmail.com

The gut microbiota, when viewed as a separate organ, contains up to 100 trillion microorganisms. Their species diversity varies from person to person. The gut microbiota is referred to as a "super organ" because it plays an important role in immunity, metabolism, and homeostasis maintenance. As heavy metals become an inseparable part of our daily lives, they are wreaking havoc on human health via food, water, and air. Heavy metals such as As, Cd, Pb, and Hg are considered chemicals of public health concern by the World Health Organization, and their exposure to humans is increasing day by day, potentially affecting human gut microbes. Because the gut microbiome is so important for metabolism, any changes in its population can lead to serious health problems. The current manuscript discusses the importance of microbiota in human health, the impact of heavy metals on the microbiome, their interaction, and approaches to reduce heavy metal side effects on gut microbiota for improved health.

Keywords: Heavy metals, gut microbes, interaction, implications, health issues

Efficacy of plant essential oil of *R. rugosa* and its two major constituents as insecticides against Cabbage butterfly, *Pieris brassicae*Linn. (Lepidoptera: Pieridae)

Jyotika Brari

Department of Zoology, St. Bede's College Shimla, H.P. India

Jyotika58brari@gmail.com

Laboratory bioassay of the essential oil extracted from *Rabdosiarugosa* Wall. exBenth. by hydro distillation was carried out against the major crop pest *Pieries brassicae* Linn. to evaluate their, larvicidal activity, antifeedant activity and ovicidal action. Essential oil of *R. rugosa* oil produced 64.33±2.1% mortality for 3rd instar larvae at 100 µl/ml after 120 hrs followed by 58.16±4.4 (50 µl/ml), 55.35±2.5 (30 µl/ml) and 52.09±1.1 (10 µl/ml). Whereas for eugenol and linalool at a highest concentration of 100µl/ml68.17±3.2 and 71.04±1.8%mortality was observed against3rd instar larvae of *P. brassicae*and48.09±1.9and54.22±4.2%mortality against 5th instar larvae at similar concentrations respectively. Feeding deterrence indices (FDI) showed that the tested plant essential oil and monoterpenes had antifeedant action against *P. brassicae* at different concentrations. Eugenol was found to be most effective antifeedant followed by linalool and essential oil of *R. rugosa*. There was a significant difference in the number of eggs laid on treated and control and among the different treatments The results in data showed that eugenol and linalool were most potent in reducing the egg hatchability at a highest dose of 100 µl/ml to 20.20±1.2 and28.32±4.1% and 75.14±2.2 and 65.15±1.2% egg mortality was observed respectively.

Keywords: Essential oil, monoterpenes, antifeedant, ovicidal, larvicidal.

On The Occurrence Of An Endangered Therapeutic Orchid (*Satyrium nepalense* D. Don) In Himachal Pradesh

Kusum and Jagdeep Verma[1]
Department of Botany, St. Bede's College, Shimla – 171002, Himachal Pradesh, INDIA
[1]Department of Botany, Sardar Patel University, Mandi – 175001 (Himachal Pradesh) INDIA
kusumstar85@gmail.com

Himachal Pradesh is an Indian state located in Northwest part of the Himalayan range between 30°22'-33°12'N latitude and 75°47'-79°04'E longitude. Huge geographical area and remarkable altitudinal variation (350-7000 m) make this Himalayan state rich in biodiversity. Among plants, the family Orchidaceae is represented by more than 85 species, majority of which are ground growing and therapeutic. *Satyrium nepalense* D. Don is one of such terrestrial therapeutic orchids. It is distributed at 1350-3300 m altitudes mainly in Solan, Sirmaur and Shimla districts, occupying open grassy slopes and exposed forest floors. *Satyrium nepalense* populations in the state were observed to exhibit pronounced variations both in floral and vegetative characteristics. Local inhabitants use dried and powdered tubers of this species for preparation of an energizing tonic. It is also used to cure different types of fever in traditional health care system. However, unscientific and unscrupulous tuber collections along with poor natural regeneration in natural habitats have pushed this species to the endangered category. This is a worrying issue and needs to be addressed on priority along with many other orchid species occurring in the Himalayan zone. Present paper deals with morphology, distribution pattern, habitat characteristics and conservation of this taxon in Himachal Pradesh.

Keywords: Conservation, Orchid, Endangered, Therapeutic, Regeneration.

Synthesis and analysis of Novel Deep eutectic solvents systems for electrochemical applications.

Akshay Sharma, Renuka Sharma and Ramesh Chand Thakur*

Department of Chemistry, Himachal Pradesh University, Summer Hill Shimla, H.P. India.

aks94592@gmail.com

Electrochemical energy storage being a cleaner approach towards environmental protection has attracted significant attention from researchers. Electrolytes are the key ingredient in these electrochemical energy storage devices. Deep eutectic solvents have the potential to serve as an alternative for currently used organic electrolytes in commercial batteries as the flammability of organic electrolytes presents serious safety risks. In this study, different combinations of novel DESs were synthesized and their physicochemical properties like measurements of density, viscosity, conductivity, thermophysical and acoustic parameters of system selected for energy storage applications were determined. The electrochemical parameters like electrochemical window, thermal stability, and capacity of electrolytic systems taken were calculated. Molecular level interpretation of such systems was also studied using spectroscopic techniques to infer the observation in terms of their molecular interaction behavior. TGA studies were also performed to determine their temperature range of applicability and the safety conditions for their use, which include the identification and the toxicity study on the degradation compounds. Water as an additive was also investigated in these solvents as it can increase the conductivity and decrease the high viscosity of these solvents, thereby making them more efficient, cost-effective, and environment-friendly electrolytes. Therefore, it is important to continue researching optimization techniques such as altering the electrolyte's ingredients, metal salts, solvents, and additives, as well as their respective ratios, in order to improve the qualities of existing electrolytes for use in rechargeable metal batteries.

Investigation on volumetric, viscometric and conductance studies of triethylmethylammoniumtetrafluoroborate and tetraethylammoniumtetrafluoroborate in pure propylene carbonate (PC) and binary aqueous mixtures of propylene carbonate (PC) at four equidistant different temperatures.

Renuka Sharma, Akshay Sharma and Ramesh Chand Thakur
Department of Chemistry, Himachal Pradesh University, Summer Hill Shimla, 171005, Himachal Pradesh, India.
aks94592@gmail.com

Electrolytes are essential parts of electrochemical energy storage devices, and organic electrolytes are preferred over aqueous electrolytes in practice because of their wide electrochemical window, high energy density, and efficiency. Thermodynamic parameters like density, viscosity and conductance of TriethylmethylammoniumTetrafluoroborate ($TEMABF_4$) and TetraethylammoniumTetrafluoroborate ($TEABF_4$) in pure propylene carbonate (PC) and binary aqueous mixtures of PC (0.01 &0.02 m) have been measured at different temperatures and concentrations. From this data various thermophysical parameters like apparent molar volume, limiting apparent molar volume, Masson's coefficient, partial molar expansibilities and Hepler's constant ($\partial^2\Phi_V^o/\partial T^2$), Falkenhagen Coefficient, Jones-Dole coefficient, specific conductance (κ), molar conductance (Λ_m), limiting molar conductance (Λ_m^o) and Walden product ($\Lambda_m^o\eta_o$) have been calculated and the results obtained are analysed and compared in terms of solute-solute and solute-solvent interactions. To validate the results obtained from thermophysical parameters, FT-IR spectroscopy has also been carried out. Hepler's criterion, B coefficient and temperature coefficient of Walden product for both the electrolytes suggest that both the salts act as structure breaker in PC and maker in binary aqueous mixtures of PC (0.01 & 0.02m). These studies suggested that a binary aqueous organic electrolytic system can also be a potential electrolytic system as its electrochemical window is comparable to that of pure electrolytic organic solvents.

Insights from the genome sequence of *Bacillus tropicus* EMB20, an efficient β-lactamase-producing bacterium

Huma Fatima[1], Sumit Kumar[1,2] and Sunil Kumar Khare[1]

[1]*Enzyme and Microbial Biochemistry Laboratory, Department of Chemistry, Indian Institute of Technology Delhi, HauzKhas, New Delhi 110016, India*

[2]*Amity Institute of Biotechnology, Amity University, Noida, Uttar Pradesh, India*

fatima.huma1993@gmail.com

We report here the whole-genome sequence of β-lactamase-producing bacteria *Bacillus tropicus* EMB20. The genome sequence of *Bacillus tropicus* EMB20 has a size of 5.8 Mb (G+C content of 35.52%) with 5593 coding DNA sequences (CDSs), 108 tRNA, and 14 rRNA operons. The bacterium has the unique ability to produce a β-lactamase enzyme with high activity. β-Lactamases are one of the most common causes of antimicrobial resistance as these enzymes inactivate almost all β-lactam antibiotics. The antibiotic susceptibility test showed that the *B. tropicus* EMB20 is producing β-lactamase and can degrade the β-lactam antibiotics. Further, the antibiotic degradation potential of this bacteria was confirmed by growing the bacteria in the presence of varying concentrations of β-lactam antibiotic, amoxicillin. The bacteria were able to hydrolyze amoxicillin up to 50 mg/L in 4 h. Furthermore, the analyses of the genome revealed the presence of multiple β-lactamase genes, possibly involved in antibiotic degradation. The availability of the genome sequence will provide further insights into the mechanism of antimicrobial resistance by β-lactamase-producing bacteria.

Keywords: Genome sequence, β-Lactamase, *Bacillus tropicus*, Antimicrobial resistance

Exploration of Himalayan medicinal plants for the development of anti-cancerous therapeutics

Sangeeta Kumari, Ravi Kant Bhatia and Neelam Kaushik*

[1] *Department of Biotechnology, Himachal Pradesh University, Summer Hill Shimla-171005*

aneelamkaushik@gmail.com

Cancer is a most prevalent health problem that continues to be leading cause of deaths all over the world. Several pharmaceutical drugs are available in the medical practice to treat various cancers in the initial stages. Currently, surgical removal and chemotherapy methods are used to treat cancerous cells. Due to disadvantages of chemotherapy such as reoccurrence of disease, drug resistance and toxic effects on normal tissues, the use of anticancer drugs is restrained which impair patient's quality of life. The renewed interest in applications of medicinal/herbal plants for treatment of various diseases may be utilized for search of new anticancer drugs with least side effects and optimum response. Medicinal plants have been used to treat different diseases since ancient time. Medicinal plants are rich in various phytochemicals such as flavonoids, alkaloids, tannin, saponins, triterpenoids etc. that are responsible for anticancerous activity. These phytochemicals inhibit proliferation of cancerous cell without affecting normal cell and inactivate carcinogen**.** As there is no specific cure for cancer, the search for effective anticancerous drugs with lesser side effect is major concerns for scientists worldwide. This manuscript is an effort to explore active anti-cancer phyto constituents from various medicinal plants of Himalayan region for the development of novel anticancerous therapeutics.

Keywords*:* Cancer, medicinal plants, Himalayan region, phytochemicals, anticancerous, therapeutics

Studies on the floral biodiversity of the Shimla: its uses, threats and conservation.

Prem Prakash and Aarti Negi
Department of Botany, Govt. College Solan
peepeenegi5@gmail.com

Biodiversity forms the bases of healthy environment and the source of economic and food security for future generations. Shimla is a rich biodiversity spot in the western Himalayan region with varied plant species. It is located in the South Western ranges of Himalayas at 31.61" N and 77.10" E with average altitude of 2206 m above the mean sea level. Shimla City stretches nearly 9.2 Km East to West. The main objective was to study the wild flora with respect to their systematics, common names, citations, Habit, economic and ethnobotanical or local uses, threats and conservation. In present study 92 plant species belonging to 73 genera and 40 families have been reported. The Highest number was reported in Compositae Family with 15 Species followed by Rosaceae family with 6 Species and Primulaceae family with 3 species. Out of 92 Species 52 are herbs, 25 are Shrubs, 5 are Climbers, 10 species were reported.

Keywords: Biodiversity, Flora, Systematics, Ethnobotany, Climbers.

Nanopesticides-A mega Step in Modern Agriculture

Vandna and Sveta Thakur
Department of Biosciences, Himachal Pradesh University Shimla
kapilvandna47@gmail.com

Agriculture has always been the foundation of our country. The world's expanding population is currently the agriculture sector's main challenge. India had over 1.27 billion inhabitants according to the 2014-2015 censuses, whereas, the world will have nearly 9.8 billion people by 2050. Due to this growing food demand, increasing the global agricultural output by at least 60% is of utmost importance. But it seems difficult with challenges that confront the agricultural sector - climate change, anthropogenic pollution, and decreasing arable land. Pathogen invasion is also one of the key factors causing a drop in agricultural production. The common pesticides we use frequently are chemical pesticides (carbamates, organochlorine, etc.). But these have various flaws, like; the use of chemicals for pest control which is dangerous to organisms that are not their intended targets, the issue of persistent usage in fields making pests resistant towards them, a decrease in fertility of the soil, bio-magnification in the food chain. But despite having so many negative impacts farmers still use chemical pesticides to increase the yield as they increase yield by 35-40%. Nano pesticides are a relatively novel, environmentally friendly, and economical solution to combat the detrimental effects of these toxic pesticides. These nano pesticides and fertilizers are applied in minuscule amounts. To date research on nano-pesticides has been going on but these are associated with a type of metal that may cause heavy metal stress to the plants. This review focus on the benefits, risks, challenges, and future perspectives of nano-pesticides.

Keywords: Phyto bioremediation, Pest removal, Nanoparticles, Green synthesis, Nanopesticides

The macro problem of micro plastic: Are PGPRs the answer?

Riya Chandel and Sveta Thakur

Department of Biosciences, Himachal Pradesh University Shimla

chandelriya21@gmail.com

In recent years, concern has grown over a new type of pollutant called microplastics (<5 mm). Due to their widespread use, resistance, and extended presence in the ecosystem, microplastics (MPs) pose a danger to the environment on a global scale. To date, most of the microplastic research has predominantly engaged with aquatic ecosystems with limited emphasis given to terrestrial ecosystems. However, Microplastic levels in the terrestrial ecosystem are 4-23% higher than those in the aquatic ecosystem and act as the major source of its omnipresence. Microplastic has entered the farm soil and cycle in our food chain. The pace at which microplastic degrades in nature is incredibly slow and inadequate. Different physical and chemical methods have been utilized to remove microplastic from the terrestrial ecosystem. But, with the continuous increase in microplastic use these methods are less convenient; feebler; cost expensive, and non-sustainable to use. For dealing with such technical challenges, we can use the bio-inspired microbial degradation method for the natural decamping of microplastics. This review deals with plant growth-promoting rhizobacteria as a tool for microplastic degradation. This is an eco-friendly and natural method of microplastic decamping. Microbes can adopt and use microplastic as their carbon source. PGPRs possess different enzymatic properties which can degrade the polymer of microplastic to useable and non-toxic by-products which can increase the fertility of soil and plants. Hence, this method provides us with a new approach to dealing with this pollutant.

Keywords: Bioremediation, microplastic removal, PGPRs, Bioconversion; Microbial enzyme, Biocatalyst, Terrestrial ecosystem

Noctuid Moths as Ecological Indicators in Cold Deserts of Himachal Pradesh

Shweta Thakur
Department of Zoology, St. Bede's College Shimla, H.P. India
stbedescollegeicbc@gmail.com

The Lepidoptera are arguably one of the most appropriate groups to use, especially given their species richness and abundance for most of quantitative comparisons. Due to their relatively great diversity and the quantity of knowledge, Lepidoptera have historically held a prominent place in entomological studies. The main objective of the study was to evaluate the health of the conifer forests biodiversity by utilising moths as indicator species. However, no research has been done so far to determine how the forest cover affects the species richness of the moth families in the Indian Himalayan region. They are a significant pest in agriculture, damaging a variety of crops like winter cereals, cotton, clover, beets, potatoes, and onions. Crop output and agricultural pests are significantly impacted by climate change and extreme weather, and noctuids as insect pests react differently to different causes of climate change. The species diversity, evenness, and richness in various sites were quantified. Environmental variables (temperature, humidity, rainfall, altitude), as well as the prevalence of pests in the field, was evaluated. The present research work is an attempt to examine taxonomically significant wing venation and genitalia for characterizing species of noctuid moths. The genitalia were dissected under Nikon SZM 1500 Trinoculor Zoom stereomicroscope. The photography of external male and female genitalia was completed with the Digital Shot DS- Fi2 Frame Grabber and Digital Sight DS-L3 stand alone and analytical unit. The terminology by Klots (1970) has been followed in the present study for naming different structures of genitalia. Intensive collections were made for two consecutive years to identify and characterize the noctuid moths (Lepidoptera) in cold deserts of Himachal Pradesh.

Development of polysaccharide gum-itaconic Acid based nanocomposite adsorbent for wastewater treatment

Pooja Kumari and Manish Kumar*

Department of Chemistry and Chemical Science, Central University of Himachal Pradesh, Shahpur, District Kangra , Himachal Pradesh-176206, India.

manishssu26@gmail.com

Water contamination has become a widespread problem for many countries as a result of release of untreated or poorly treated industrial wastewater into the environment and water bodies. The fast industrialization and population growth are both contributing to the rapid depletion of freshwater resources. The discharged waste contains heavy metal ions, organic dyes, colorless organics, pesticides, paints, cosmetics and pharmaceuticals and all these have an impact on water quality. Polysaccharide gums are common natural polysaccharide that has been widely utilized in both research and industry for a variety of purposes. These are inexpensive polysaccharides with useful properties. These are mostly biodegradable, widely accessible, safe, environmental friendly, pH stable, and water soluble and has high adsorption and antibacterial effects. Polysaccharide gum-based nano-composites and hydrogels have a wide range of uses, including the purification of water. Being a major class of water pollutants, toxic metal ions and dye pollutants must be removed before water can be used to ensure the safety of living beings. We have synthesized polysaccharide gum co itaconic acid-based hydrogels by incorporating monomers on to the raw gum by free radical crosslinked polymerization method. The synthesis is confirmed by FTIR, SEM, and XRD analysis. The thermal stabilities will be confirmed by TGA and DSC studies. The metal and dye removal activities of the synthesized hydrogels will be analyzed using swelling and adsorption studies. Further modifications will be done to get better results as required.

Assessment of Germination and Growth in seven commonly grown cultivars of *Triticumaestivum* L. under cadmium stress: A comparative study

Sanjay Kajal* and Sveta Thakur
Department of Biosciences, Himachal Pradesh University, Shimla-171005
sanjaykajal354@gmail.com

Wheat *(Triticum aestivum* L.*)* is the oldest and most widespread staple food in the world highly affected by biotic and abiotic factors. Among abiotic factors heavy metal contamination is a prominent issue, gravely affecting plant life and food safety. Previous studies have suggested cadmium uptake by wheat possess a serious threat to human health. This study aimed to assess how locally grown north Indian wheat varieties respond in aspects of germination and other growth parameters when exposed to varying concentrations of Cd. To assess the Phytotoxicity of Cd to wheat, fresh wheat seeds procured from IARI, Shimla were exposed to different Cd concentrations (50, 100, 200, 500, 800, and 1000 µM) for seven consecutive days. Compared to the control, all results show that heavy metal adversely affects all growth parameters by reducing seed germination and decreasing root and shoot length. The selected wheat varieties can be arranged to the degree of tolerance (HS-490>365>240>542>375>HS-562>507) according to their response to Cd. The information provided here will likely benefit wheat growers and consequently cost-effectively optimize wheat production on stressed soils.

Keywords: *Triticum aestivum* L., Cadmium, Germination and Growth parameters, Phytotoxicity

Environmental Planning: Inclusive Approach Towards Sustainability

Shilpa Sharma*, R K Gupta, Ashu Chandel and Umesh Sharma

Department of Basic Sciences, College of Forestry, Dr YS Parmar University of Horticulture and Forestry Solan H.P.

shilpasharma24396@gmail.com

Environmental planning entails preserving the environment while fostering biodiversity preservation, sustainable resource use, and environmental service provision. It is a collaborative strategy in which the government, communities, landowners, important stakeholders, and indigenous people are all involved. Planning is frequently used in conjunction with evaluation tools like the Kyoto (CDM) project cycle, Strategic Environmental Assessment (SEA), and Environmental Impact Assessment (EIA). The phrase & quot; green development & quot; refers to more than just reducing pollution or conserving energy; it also refers to the energy and resources that are concealed in waste materials and require recycling. This phenomenon is also used to restore ecological services, resources, and biodiversity. Though the technology has developed still our planning efforts mostly stick to the local resources alone. During environmental planning, effects of significant global environmental issues are given a higher importance than local biodiversity issues. The effects of invasive and exotic species, over-exploitation of living resources, habitat degradation, effects of global warming and climate change, conflicts with humans resulting from development activities, growth in human population, and pollution must all be minimized with active environmental protection measures, and wild animals must be protected. Because once we lose a species or a valuable gene we can never get it back, the proficiency in biodiversity is a must in the environmental review process when planning the project. According to evidence, biodiversity is essential for ecosystem services and function on which humans rely as well as being directly related to the environmental, social, and economic aspects of sustainability.

Ethnobotanical Study in Changar Area of District Kangra, Himachal Pradesh

Bhagwati Prashad Sharma
Department of Bio Sciences, Career Point University, Hamirpur, Himachal Pradesh
bp76sharma@gmail.com

Man has been using plants to cure various ailments since time immemorial. This traditional knowledge of use of medicinal plants has been described in traditional system of medicines such as Ayurveda, Unani and Sowa Rigpa etc. Besides, traditional knowledge of use of wild plants as ethnomedicine has been passed orally from generation to generation by indigenous people. Himachal Pradesh, a hill state located in western Himalaya in India is rich in traditional knowledge of ethnomedicinal plants. Here traditional healers have been preparing ethnomedicines for various ailments since ancient times. The present study was conducted in Changar area of district Kangra, Himachal Pradesh for exploring traditional ethnomedicinal knowledge of natives of the area. Local people of the region including Gujjar tribe have rich knowledge of ethnomedicines and ethnomedicinal plants. An ethnobotanical study was conducted in the area during 2021-22. Twenty three ethnomedicinal plants belonging to 19 families were studied which are used to cure ailments like skin problems, cough, asthma and leukoderma etc. Out of 23 plant species reported, 10 were herbs, 05 shrubs, 04 climbers and 04 trees. The most frequently used plant part was leaf followed by seed, whole plant, bark, fruit, latex and root. Elders of the area have rich ethnomedicinal knowledge. The present study provides a data base of traditional ethnomedicinal knowledge of people of Changar area of district Kangra in Himachal Pradesh. This ethnomedicinal plant data base can be used for further studies and drug development.

Keywords: Ailments, Ethnomedicinal plant, Indigenous people, Traditional knowledge, Western Himalaya.

Nutraceutical and Medicinal Values of Some Wild Edible Plants Consumed by Rural communities in Shivalik Hills of Himachal Pradesh.

Ruchika Devi and Nitesh Kumar*

Department of Biosciences, Himachal Pradesh University Shimla.

niteshchauhan7@gmail.com

Nutraceutical are naturally derived bioactive compounds that provide medicines and health benefits to humans and animals. They show advantages over medicine as they avoid side effects, are economically affordable, and are rich in the composition of natural dietary supplements. Research has proved that food with phytochemicals may help to provide protection from some diseases such as cancer, diabetes, etc. In this review, we summarised the progress related to nutraceutical value as well as potential benefits for the human health of some plants. Plants like *Artemisia maritima*, *Cassia fistula*, and *Moringa oleifera* show numerous active ingredients with a wide range of bioactivity that has different modes of action for the treatment of malaria, hepatitis, cancer, etc. The nutraceutical properties of many of the wild edible plants of Himachal Pradesh have yet not been evaluated to a large extent and thus need to be studied. Studying these properties may help provide new replacements for traditional staple food crops. These studies may also provide new medicinally active ingredients used in different medicines.

Keywords: Nutraceutical, Composition, Antioxidant, Phytochemicals, Medicinal

Some Ethnomedicinal Plants of Khajjiar region of Himachal Pradesh

Arun Kumar* and Hem Chander
Department of Biosciences, Career Point University, Hamirpur, Himachal Pradesh
arun.jatropha@gmail.com

Ethnobotany has become increasingly valuable in the development of health care and conservation programs in different parts of the world. The Chamba district of Himachal Pradesh is considered as one of the richest areas of traditional and potential medicinal wealth. On interacting and interviewing the local people of different ages of Khajjiar and its adjoining villages reveals more than 20 species of flowering plants used traditionally for medicinal purposes to treat various diseases like hemorrhoids, leprosy, asthma, fever, wounds, vomiting, menstrual disorder, anti-helminthic, aphrodisiac, gonorrheal discharges inflammation and many other diseases. Most of the tribal people of this area use different parts of the plants to treat different diseases and it is found that they do not make any use of synthetic chemicals for preparation of traditional medicines. Study of this area reveals that people of this area uses plants for traditional medicines having no side effects on the body. The information collected from the area help in documentation of floristic diversity used by the local people of Khajjiar region of western Himalaya which become important source of information for developing conservation strategies as well as developing potential medicines in future.

Keywords: Traditional, Indigenous, Floristic diversity, Conservation.

Prospectives of Tannins in Sustainable Cosmetics- a Protective, Damage-repairing Ingredient

Archana Mullick
Department of Biotechnology, St Bede's College, Shimla
archana.mullick13@gmail.com

Consumers are showing an enhanced interest in skin health and beauty owing to higher importance being given to holistic wellbeing, self-confidence and aesthetic features. This is accompanied by a prominent trend in using natural, organic botanicals as opposed to synthetic chemical based cosmetics. This review describes tannins, water- soluble polyphenolic secondary metabolites produced by terrestrial plants and marine algae, as a potential active ingredient in cosmetics. Their anti-microbial, anti-fungal, astringent, de-pigmenting, antioxidant, anti-inflammatory, UV- protecting, wound healing properties make them suitable for various cosmetological applications. Moreover, the ease of extraction and sourcing from seaweeds makes the use of tannins highly sustainable. This short review summarizes properties of tannins and their potential in the sustainable cosmetic industry.

Traditional knowledge of tannins and dyes yielding plants of Kathua district of J&K, India

Rupinder Kaur* and Rekha Dhanai
Department of Agriculture, Tula's Institute, Dehradun, India
roopnarang@gmail.com

Dyes are the natural or synthetic chemicals which are used to colour various materials. They are obtained from the different plant parts such as Leaf, stem, bark, rhizome, flower, buds, berries, etc. Tannins were originally recognized and used for tanning the hides into leather (hence their name) due to their ability to bind with and cross-link proteins in the hides. The present study deals with the diversity of tannin and dyes yielding plants at Kathua district of J&K. Field investigation was carried out in study site and ethno botanical information was collected by personal interviews and group discussion among the major ethnic communities of Kathua district. Present study sheds light on 35 species of tannin and dye yielding plants belonging to 31 genera and 20 families documented along with their common name, families, parts used and their applications. The trees were identified with the help of available literature and local people. The families such as Fabaceae & Combretaceae were represented by higher number of species. Natural dye yielding plants have tremendous significance in the socio-economic and socio-cultural life of ethnic people and if we promote these products in a managed way then efforts towards preservation of traditional knowledge and local biodiversity will be more fruitfully achieved. However it is a matter of concern that the indigenous knowledge of extraction, processing and practice of utilizing of natural dyes has now diminished because of synthetic dyes which are cheaply available. The information gathered from present survey will through more light on plant wealth particularly on tannin and dye yielding plants.

Key words: Tannin, Dye, Traditional knowledge, Kathua district and Ethnic communities

The Green Composites by Green Viables

Shivani Chauhan
Founder: Green Viables
shivanic84@gmail.com

Being sustainable is not a choice anymore, it's the need of hour. Green Viables, a Shimla based startup aims at bringing revolution in packaging industry by providing sustainable packaging solutions. India generating 3.7 million tonnes of plastic waste every year can help eliminate it by choosing sustainable packaging solutions. Green Composites part of Bio composites, are sustainable and ecofriendly in nature. The plastic boxes, punnets will be replaced by green composites formed thus providing biodegradable packaging solutions. After its usage, the boxes can also be used for growing plants. The Green Composites created are based on the concept of waste to wealth creation. The Green composites are formed with Dry Pine Needles Biomass and Natural binder created through process of polymerisation. Dry Pine Needles were collected from nearby forest areas, shredded and grinded into fine powder form. The natural binder was created with organic compounds through process of polymerisation. Later the binder was mixed with dry pine needles powder and steam was provided. The paste formed was hot pressed at 110-120 degree Celsius for 10-15 minutes with a pressure of 10-50 MPa. The product formed was disinfected with UV radiations. The composite was from cellulose based binder and natural dry pine needles biomass. The tensile strength of composite formed greatly depends on fibre content. However, Dry Pines being rich in lignin is strong enough and thus the composite formed is also strong for packaging up to five kilograms withholding capacity initially. The Green Composites formed have a practical utility in markets including Gifting, Cosmetics, Agriculture, Bakery, Groceries, Pharmaceuticals, Food and Beverages.

Meat Based Plant

Vaishnavi Kashyap
Department of Biotechnology, St. Bede's College, Shimla
vaishnavikashyap89@gmail.com

Lab grown meat is meat produced by culturing animal cells in vitro but the matter of concern with this is the texture of the lab grown meat, so by the process of decellularization, we can overcome this problem. Decellularization is a technique in which the cells are removed from a tissue by treating it with different solutions leaving behind a structure called a scaffold. Scientists have been exploring this technique for many years because these empty scaffolds are extremely useful for cell culture. These scaffolds can be recellularized with any dividing cells. By injecting the plant scaffolds with meat cells, meat based plants can be obtained. This technique cannot only resolve the texture issue but can help with food security, animal welfare, human health and also has environmental impact of meat production.

Assessment Of Fluoride Excretion From The Body Through Urine In School Children Of Satnali Block, Mahendergarh District (India)

Neerja Dhiman*,[1] and Rajesh Kumar[2]

Department of Chemistry, Government College, Ateli (Mahendergarh)

Department of Chemistry, Himachal Pradesh University Shimla

Haryana is a relatively larger state of the Indian Union. Fluorine is the 13th most abundant element in earth's crust. Human body is exposed to fluoride mainly through consumption of water. Fluoride enters the human body through gastrointestinal tract and remains there as hydrofluoric acid. The maximum acceptable concentration of fluoride in drinking water may be extended to 1.5 mg/l. In this study, Urine samples were collected from 110 male school children in age group of 11-16 years and analyzed on the spot for fluoride concentration. The urine samples of female children were not made available by the residents of block due to social customs. The fluoride concentration in urine is determined by ion selective electrode methods. Also it was observed that water consumption is approx. 2.5 litres per children per day during the months of April to August. If we take average fluoride concentration in the different water sources into consideration, then the fluoride intake by children from ingested water could be higher fluoride/person/day at Satnali Block. These values are higher than the recommended fluoride intake from the diet by a person. It has been observed that absorption of fluoride from water ranges from 86 to 97%. The dietary fluoride allowances are in the range of 0.1 to 1.0 mg/person/day for children under the age of one year; 0.5 to 1.5 mg person-1 day-1 for children between one and three; up to 2.5 mg/person/day for children under 12 and 1.5 to 4.0 mg/person/day for adults . It is evident from the results that the people in study area are chronically exposed to higher levels of fluoride from drinking water. Urinary fluoride concentrations in the urine of the children of Satnali block. The mean urinary fluoride concentration at Satnali block was in the range of 1.00 to 3.10 mg/l. The mean urinary fluoride concentration of children from Satnali in habitations was significantly higher. The results showed that majority of the children had abnormally higher levels of fluoride in urine. For 90% of the children, the urinary fluoride concentration was in the range of 1.0-2.5 mg/l. Urinary fluoride concentration is well established indicator of fluoride intake by individuals and should regularly be estimated to detect the danger of fluoride toxicity in a population.

Contamination Of Fluoride And Seasonal Variation In Ground Water Quality Parameters, Kanina Area, Mahendergarh (Haryana)

Neelam Bharti*

Department of Chemistry, Government College for Women College Ateli, Mahendergarh (Haryana)

msbhandoria@gmail.com

Fluoride is one of the most important Geo- Environmental issues in 25 developed as well as developing nations. Excessive ingestion of fluoride results into a disease called fluorosis. The fluoride content is ground water and it's imparted on human health imparting human living.In addition, the water sample contain Fluoride content in ground water in some locations are also evaluated, further which put effect on human health on the population of Mahendergarh areas.Ground water samples of Kanina area of Mahendergarh district have been collected from the bore wells. The results indicate that fluoride concentration is varying from 0 .9- 5.9 mg/L.This Paper briefly presents the high content of fluoride in ground water.Also in present paper water quality parameters like pH, electric conductivity, sodium, potassium, calcium, magnesium, bicarbonate, chloride, Sulphate, dissolve oxygen, biochemical oxygen demand, chemical oxygen demand, nitrate, phosphate, and iron has been studied in the period of August 2020 to April 2021.The study shows that seasonal variation in the physico-chemical parameters. In addition, all the parameters are compared with different water quality standards in the research work.

Key words: Physico–chemical parameters, Fluoride, Seasonal variation, Mahendergarh

Different Methods of Synthesis of TiO2 Nanoparticles and its Photocatalytic Application

Monika

Department of Chemistry, Government College, Ateli (Mahendergarh)

Metal oxide exhibited astonishing properties in the Nano level due to their high surface to volume ratio. Out of these TiO_2 metal oxide nanoparticles shows special properties like hydrophobic nature, no wettability and high energy gap, hence showed different types of applications such Generally various synthesis techniques are available to prepare TiO_2 nanoparticles. In this synthesis of TiO_2 nanoparticles were focused using different methods. The obtained TiO_2 nanoparticles had been characterized by different techniques. Thin layers of TiO_2 with a high photocatalytic activity for use as a self-cleaning transparent coatings for windows in outdoors.

Keywords: TiO_2 nanoparticles, Synthesis, Photo catalytic degradation, Waste Water treatment

Effect of abiotic factors on the development of Wet Bubble Disease (WBD) caused by *Mycogone perniciosa*

Kanika Mahajan
Department of Environmental Sciences, Central University of Himachal Pradesh,
TAB, Shahpur, Himachal Pradesh

The examinations were led under *in-vivo* conditions to see the impact of climate conditions (temperature and relative humidity) and various composition of casing materials on wet bubble disease of white button mushroom. The outcomes showed AUDPC and rate of disease increase (r) as 2258% and 0.110 individually. Simple correlation showed positive correlation between disease incidence with mean temperature (0.383) and also positive with RH (0.189) while, multiple correlation coefficient between disease incidences with mean temperature and mean relative humidity were not huge. Regression equation $Y = 315.66 + 13.84X_1 - 7.38\ X_2$ showed that predominant mean temperature had positive consequence while relative humidity almost negatively affected the development of disease. The viability and proliferation of mushrooms is associated with variety of things, which can act separately or have collective effects with them. As to materials coco peat gave least disease rate of 2% and greatest yield was acquired in formalin treated coco peat + FYM (22 kg), while sand brought about least yield (8 kg) of sporophore under *in-vivo* conditions. The standardization of the moisture level within the casing layer is essential side of the scientific cultivation of button mushrooms. Reduced moisture content of casing soil favours *M. perniciosa* survival. *Mycogone* was unable to live in casing soil with moisture contents of 60% or higher.

Key words: Wet bubble, weather parameters, casing materials, disease incidence, yield.

Sponsor

HARSAW ®
Haryana Scientific
SHEET METAL WORKS

OBEXO
SCIENTIFIC

promark ™
MARK OF PROFICIENCY

INTERNATIONAL
SCIENTIFIC & SURGICALS