

International Conference **on**

Science : Emerging Scenario & Future Challenges (SESFC-2018)



Organized By

Him Science Congress Association

Himachal Pradesh, India

08 - 09 September, 2018

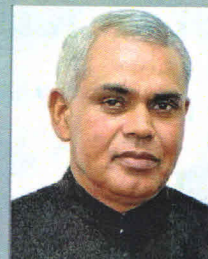
NIT Hamirpur, Himachal Pradesh India

SOUVENIR



Acharya Devvrat

Governor
Himachal Pradesh




आचार्य देवव्रत
राज्यपाल
हिमाचल प्रदेश

MESSAGE

I am glad to know that the Him Science Congress Association (HSCA) Himachal Pradesh is organizing an International Conference on *Science: Emerging Scenario and Future Strategies* on 8th and 9th September, 2018 at National Institute of Technology Hamirpur, HP.

I hope that this conference will go a long way in the exchange of some new and innovative ideas in the field of science stream to showcase the academic and research community with new dimensions and findings. I am sure that the Conference will also focus on and address the key challenges and find some workable solutions to boost the process of knowledge creation in the field of science.

I congratulate the organizers and hope that the conference shall be attended by professionals to discuss thread bare all aspects to come out with effective modes for the benefit of mankind. My best wishes for the resounding success of the Conference.


(Devvrat)



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Jai Ram Thakur



Message

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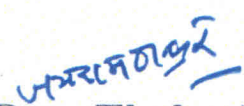
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I am happy to know that HIM Science Congress Association (HSCA) Himachal Pradesh is organizing International Conference on 'Science: Emerging Scenario and Future Challenges' on 8th and 9th September, 2018 at National Institute of Technology Hamirpur.

Science has changed the world* we live today with scientific experiments, researches, innovations, and inventions. Science has made human life much more convenient and easier by saving labor, time and much more with new technologies. Indeed, its series of discoveries has helped understand the nature of the world and has improved for the betterment of the society.

I hope this conference would provide an appropriate platform to experts to interact, share and improve their knowledge about the latest research and development in the field.

My good wishes for the grand success of the conference.


(Jai Ram Thakur)



Prof PK Khosla
Vice Chancellor



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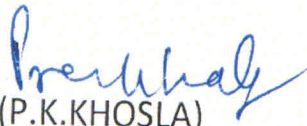
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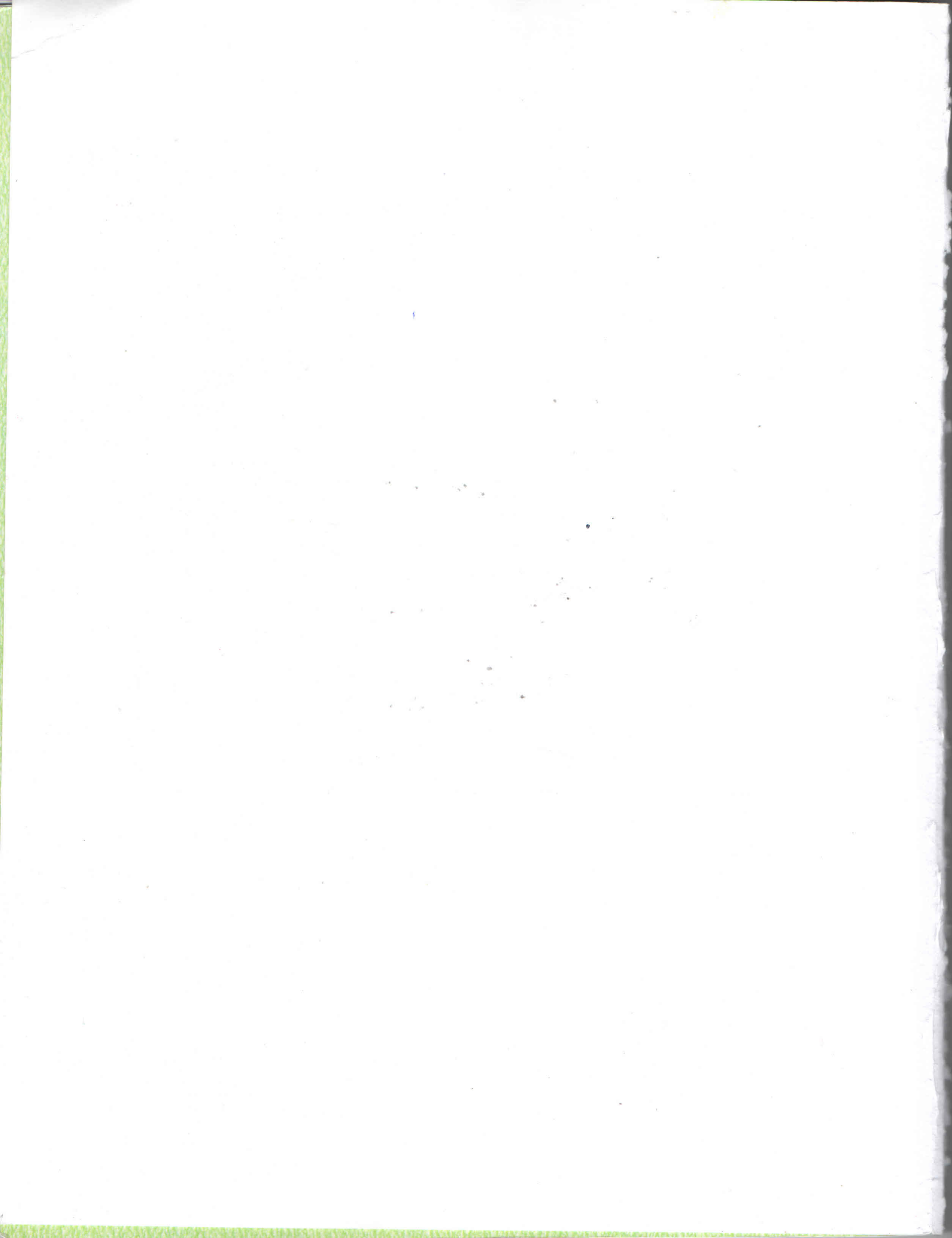
I am glad to know that the Him Science Congress Association (HSCA) is organizing Third International Conference on 8-9 September, 2018 at National Institute of Technology Hamipur, HP.

Shoolini University is fast emerging as a leader in imparting high quality education in Life Sciences and Business Management in the country and endeavours to provide elite human capital to the industry in coming years. Shoolini University is committed to its mission of attaining the status of being in the first 200 global universities by 2022.

Academic events such as the 3rd International Conference would definitely serve the purpose of our pursuit for attaining excellence in generating competent human capital. The Conference would provide a platform for meeting and sharing latest views in science and technology and fine-tuning our research and educational programmes.

I extend my best wishes for a grand success of this International conference being organized by the Him Science Congress Association.


(P.K.KHOSLA)





Welcome Message

Prof. (Dr.) Deepak Pathania
President, HSCA

On behalf of the International Conference organizing committee, I am truly honored and delighted to take this opportunity to welcome you all to this conference. It gives me great pleasure and privilege to serve as the Conference Chair for this event.

I am very much concerned about the connection between the science education and the needs of the society. The Conference is committed to make genuine and reliable contributions to the scientific community. Conferences make the perfect platform for global networking as it brings together renowned speakers and scientists across the globe. I commend you for having exciting and memorable events filled with enlightening interactive sessions.

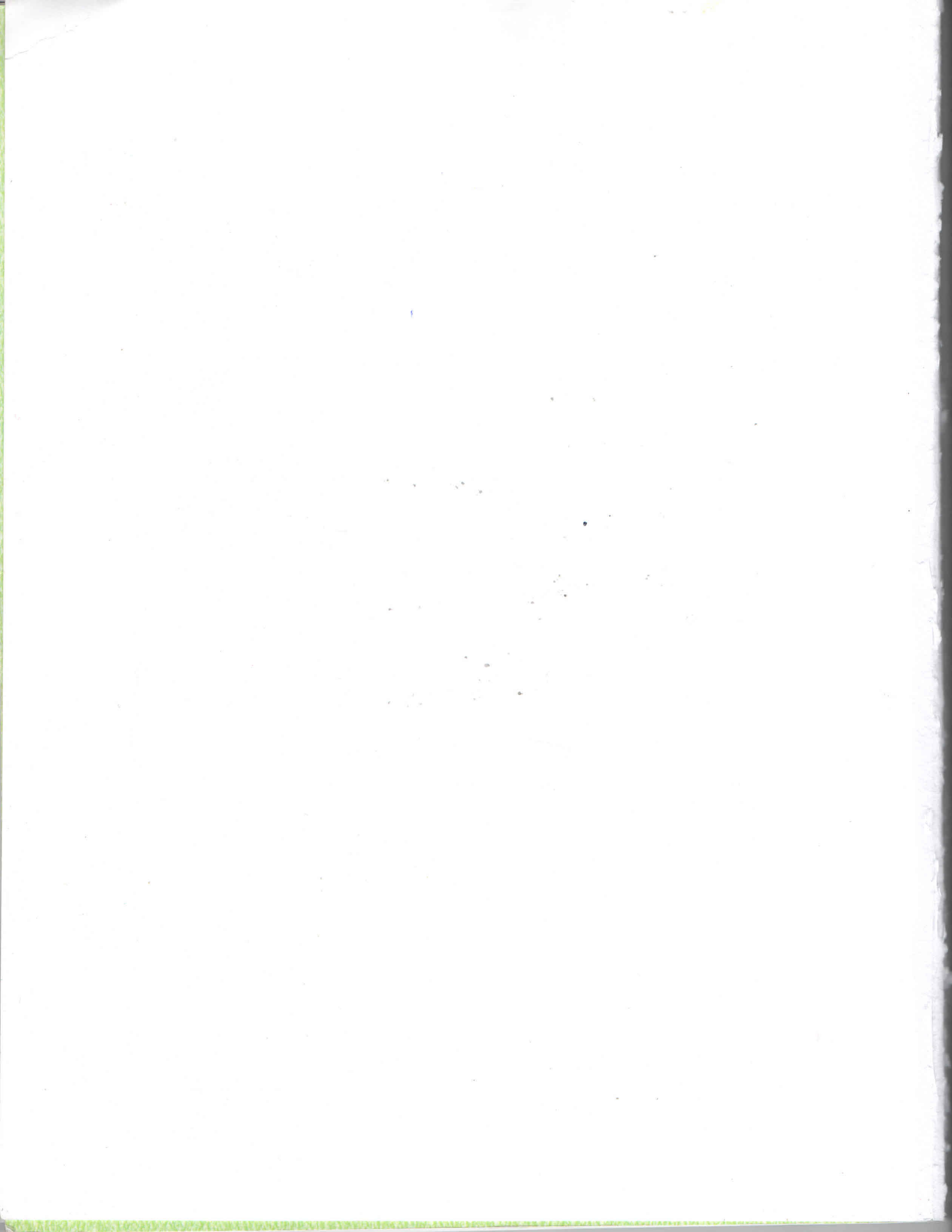
The two-day conference program focuses on a broad range of issues and challenges in the field of sciences which will be weaved through the Keynotes Speakers, Plenary Speakers and Lecturers. Around 200 papers will be divided between five oral sessions and poster sessions. The highlight of the conference will be the award giving ceremony; six awards namely the Best Oral and Poster Presenter, respectively in each discipline followed by four Young Scientist Awards given as recognition to the salient work of the selected researchers.

I believe that the success of the conference depends heavily on the people who have worked hard in planning and organizing the conference program. I hope that this conference will serve as an international platform for the exchange of knowledge and expertise in science researches and practices, at the same time explore the potential collaborations in future research.

I hope the deliberations from various distinguished speakers will benefit the participants to update their knowledge.

I congratulate you for your commitment and active participation and wish you all the success. Thank you for your attention.

(Prof. Deepak Pathania)





Prof. S.P. Bansal

Vice Chancellor

Former Vice Chancellor
Indira Gandhi State University, Rewari and
BPSMV State University, Sonapat, Haryana
Former Founder Vice Chancellor
Maharaja Agrasen University, Solan H.P.)



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Message

I am delighted to know that the Him Science Congress Association, Himachal Pradesh, is organizing a two day International Conference on **"Science: Emerging Scenario and Future Challenges"** during September 8-9, 2018 at National Institute of Technology, Hamirpur (H.P.). I am also glad to know that the Association has earlier organized many such events in almost every district of Himachal Pradesh to generate scientific sensation in the State.

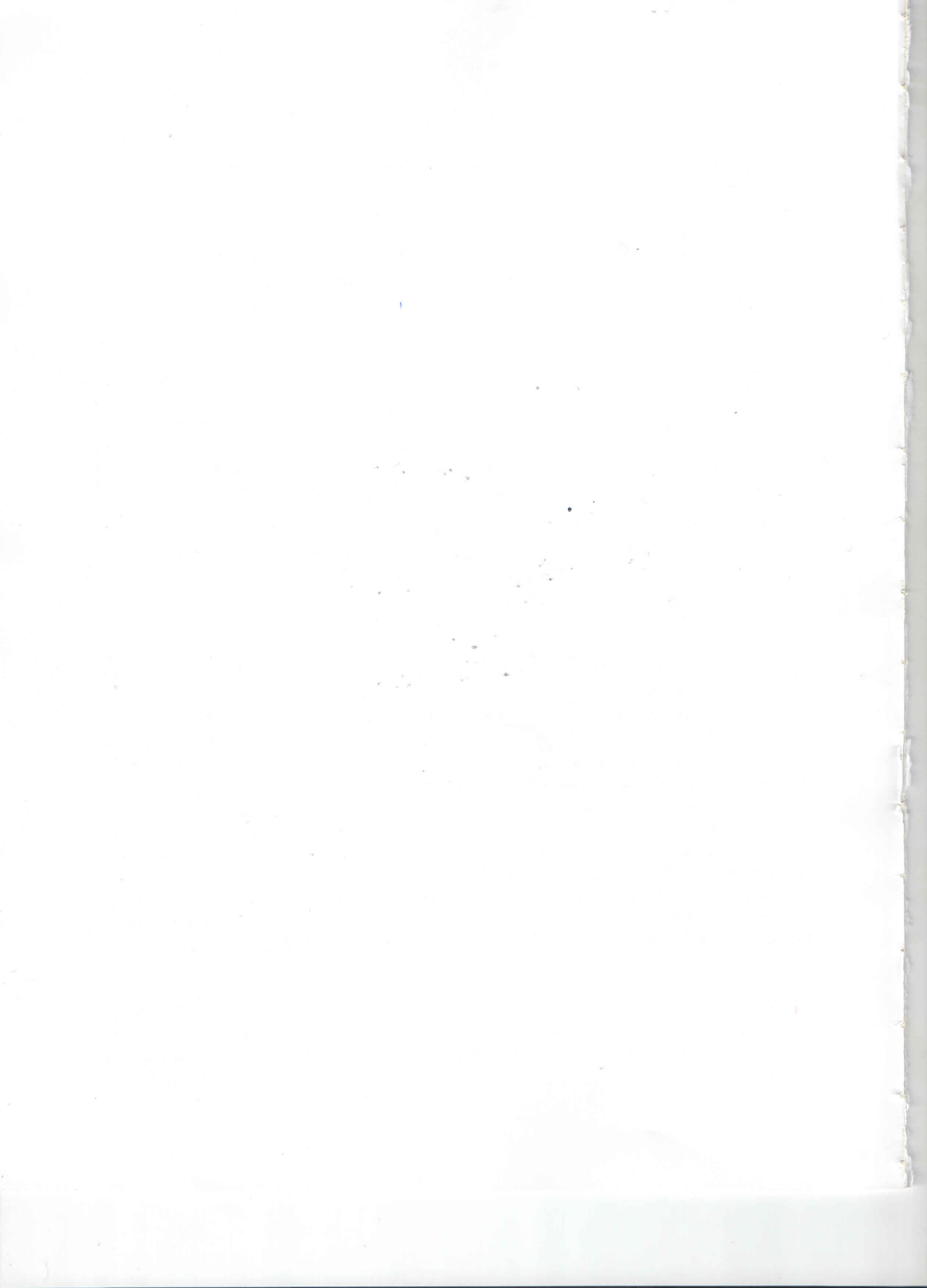
The theme chosen for the conference is of utmost important as the multidisciplinary technical ways could only help the healthy and sustainable life processes. This conference will not only provide scientific information, but also form a strong bound amongst the scientists to find out the solution.

This conference will provide a platform to bring together assorted academicians, researchers, industry experts and students who will address some of the pressing issues of the contemporary times that underline the nature of this field. Endeavours to organize such conferences are vital as these enable to demonstrate and show better path for a great future.

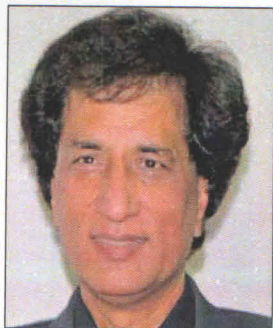
Keeping in view the diverse complexities of conference theme and the challenges thus posed to the academia for maintaining pace with the rapidly changing trends, I believe this event will prove to be a milestone in building of a powerhouse of knowledge which will, in turn, help in shaping the future course of Science. Here I expect that this conference will deliver its utility in best way through providing authentic and appropriate information by serious research.

I extend my best wishes to the organising team for the successful organization of the Conference and wish this International Conference a great success.

(Prof. S.P. Bansal)



Biopolymers as Nanogels for Human Healthcare



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Dr. Bhuvanesh Gupta is the Founding President of Asian Polymer Association- a Society dedicated to the development of polymer science at the International forum. He is the Professor of Polymers and Textiles at Indian Institute of Technology, New Delhi, India. Dr. Gupta did his PhD from IIT Delhi and spent eight years in France, Sweden and Switzerland under different capacities in several laboratories.

Dr. Gupta has about 200 publications in International journals and more than 350 conference presentations in India and abroad along with 26 patents to his credit. Dr. Gupta has authored eight books published by International publishers and has been invited by several laboratories across Europe for delivering talks. Several PhDs have been awarded from the group of Prof. Gupta in various domains of biomedical engineering.

The Textile materials have generated considerable interest as biomaterials in human healthcare where biomaterials represent the most innovative domain of medical science & technology. It is not only the structural aspect of the materials but also the innovations in the biomaterials that have created enormous interest of the scientific community in bringing in new generation products. The major requirement of the textile materials is the bioreceptivity and biocompatibility at the application site in human being. Our bioengineering group has been working in four domains: sutures, wound dressings, tissue engineering and nanobiotechnology.

The world of healthcare is unlimited and possibilities are enormous. The accelerated healing may be achieved by using wound dressings with innovative features of exudate absorption, biocompatibility and infection control. We have been working on wound dressings based on biopolymers such as chitosan, dextran, chitosan and polyvinyl alcohol hydrogels so that a faster healing along with minimum scarring may be achieved. The efforts against infection have been the global initiative. This becomes particularly interesting when polymers are used as implants and a very precise biomaterial fabrication is needed to control the infection at the site. A proper combination of the material with the proper choice of a bioactive agent would remain as the focus of biomaterial development.

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Luminescence Materials for OLEDs Application

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Dr Kiran K. Surati did his Ph.D. Chemistry from V. N. S. G. University, Surat, Gujarat, India and is presently working in Department of Chemistry, S. P. University, Anand, Gujarat. He is having vast experience of teaching, research and administration. His main research focus is to design organic semiconductors, novel photochromic pyrazolone based compounds and their applications in advance devices such as OLEDs, LEC etc.

Organic light emitting diodes (OLEDs) have gained great interest in the last years due to their potential for future flat panel display and solid-state lighting applications. The OLED technology is now being commercialized as a multi-billion-dollar market. OLEDs are already used in small displays in cellular phones, car stereos, digital cameras, etc. The rapidly growing market for OLED displays and lighting is driving research in both develops low cost advanced materials and improved manufacturing processes for large scale fabrication. Many type of metal complexes, polymers, organic and small molecules are used as emissive materials for OLEDs fabrication. There are still many problems concerning the efficiency, stability, color saturation and manufacturing cost of such materials. To reach high luminescence, metal complexes and especially transition metal complexes have been widely investigated [1].

In view of this here the present talk is mainly focused on various luminescence materials and its fundamental mechanism of radiative and non-radiative emission. Here our special emphasis on ancillary and cyclometalated ligands to facilitate the color tuning, efficient band gap engineering with other electron transporting and hole transporting materials. Beside this thermally activated delayed fluorescence (TADF) materials are also disused.

Acknowledgment

Author express sincere thanks to Department of Science and Technology (DST), New Delhi, for financial support under Technology System Group (TSG) programme (Ref. No. DST/TSG/PT/2011/194-G) and Gujarat Council of Science and Technology (GUJCOST), Gandhinagar (Ref. No. GJCOST/MRP/14-15/27). Author also thank to research scholars A. C. Vamja and MehaPrajapati.

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Geological Proxies and Resilience in the Himalayan Ecosystem

Rajesh Sharma, D.P. Dobhal and Vikram Gupta

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Dr Rajesh Sharma is one amongst high end researchers of his field. He has more than 30 years of research experience on Himalayan Minerals, Geo-fluids, Magmatism and Metamorphism. Also contributed to the understanding of Proterozoic crustal evolution of Schirmacher region, Antarctica, tungsten-lithium mineralization in Rajasthan and on ore gold forming fluids. He has published many research papers in reputed journals and guided many students for their masters and doctoral research. Currently working as Scientist 'G' and Group Head of "Petrology and Geochemistry" Division of Wadia Institute of Himalayan Geology, an autonomous research Institute of Department of Science and Technology, Government of India, at Dehra Dun, Uttarakhand.

There is now abundant evidence that many ecosystems at regional and global levels, such as the Himalayan ecosystem, have become highly stressed. The Himalayan mountain range represents a highly fragile and vulnerable Mountain Ecosystems. Geologically, Himalaya is young and tectonically active, and evolved since about 55 million years ago as a result of the continent-continent collision between Eurasia and the northward-drifting Indian plate. Himalaya is a unique orogen, known for hydrological, biological, aesthetic and cultural heritage. Many mighty rivers, thousands of glaciers, lakes, millions of springs and the vast natural resources which are life-line for the one fifth of the global population are part of the Himalayan ecosystem. The monsoon originated from the Indian Ocean is blocked by the Himalaya and channelled back through the Himalayan Rivers like Ganga and Brahmaputra. The water flows back into the Indian Ocean and these rivers carry with them sediments, which are deposited to form extensive and highly productive alluvial plains. The Himalayan eco-system is vulnerable and sensitive to the consequences of natural causes such as climate change and also by the anthropogenic emissions. Among the geological indicators that may reflect effect of climate or anthropogenic interventions on the Himalayan ecosystem are glaciers, springs, landslides, speleothems, mines, rivers/streams and landforms. In the recent years systematic efforts have been made to study some of the main geological proxies for understanding change in the Himalayan ecosystem. The three factors viz. water, air and land can be evaluated for environmental assessment. Mining activity, although limited in Himalaya, has potential to effects the streams, agricultural land and destabilize the slopes. It is observed that overburden and mine waste dumps at some sites need to be managed carefully to restrict any mutilation to the water bodies and adjacent agricultural land. Air pollution in mine area is found to be restricted to the operation site, and effect on health of mine worker is not observed. Himalaya house one of the largest resources of snow and ice and its glaciers control long-term consistent of the rivers and temperature balance. Several studies carried out on Himalayan Glaciers indicate that majority of glaciers are retreating with variable rates ranging between 5 to 20 m per year. Another important issue observed in the recent years is diminishing and drying of the Himalayan springs, and with decreasing water discharge. These may be due to coupling of the natural as well as anthropogenic factors. With reasons like deforestation, grazing, erosion of top fertile soils, forest fires and development and mining activities the water holding capacity of the soils have been adversely affected which intern imbalance the hydrogeological regime in watersheds. Further, the initial results suggest that rainfall pattern has changed towards having more extreme rainfalls at selected locations causing more vulnerability of landslides, particularly during monsoon seasons. Overall, the degradation of the ecosystem is both because of the climate change effects and human interference such as increased demands of the geological resources.



Search for new mechanism of d^0 magnetism: A case study of MoO_2 , TiO_2 and SnO_2 thin films using x-ray absorption spectroscopy

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Prof Ravi Kumar is presently working as Prof. & Head, Centre for Materials Science and Engg., NITHamirpur (HP) and his **research area** is High Temperature Superconductors & the study of flux dynamics, Colossal Magneto resistance materials, Spintronics, Nano Ferrites, Multi-ferroic Materials, Polymer nano- Composite. He has vast experience of teaching, research and administration.

In the recent time many transition metal oxides which are non-magnetic in the bulk form are showing ferromagnetism in the form of nanometer size particles. Various researcher explained this anomalous behavior due to oxygen vacancies, defects etc. To understand this behavior we have grown the thin films of MoO_2 , TiO_2 and SnO_2 and study their structural and magnetic properties and observed that they are showing ferromagnetism in different structural forms at room temperature. To understand this phenomenon we have employed the x-ray absorption spectroscopy, which is an elemental specific technique. Further, we employed the special modes such x-ray magnetic circular dichroism (XMCD) and x-ray linear dichroism (XLD). From our results we have observed that the magnetism is occurring at oxygen anion not at transition metal cations. From XLD study we have found that there exist a strong orbital anisotropy, which will create the charge polarization at Fermi level to give ferromagnetism. Our experimental results support the phenomenon of new mechanism and latter a theoretical calculations were also performed by some groups to strengthen our experimental evidence.



Glory of Ancient Indian Science

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Dr. Adarsh Pal Vig is currently working as

Professor Department of Botanical & Environmental Sciences Guru Nanak Dev University, Amritsar.

His **research area includes** Vermitechnology, Solid Waste Management, Bioactivities of Glucosinolates.

Science derived from the latin word 'Scientia' or 'Scire' which means knowledge. It is a systematic method of describing and controlling the material world. It can be differentiated into: Western Science and Indian ancient Science. The outlook of Indian science is mentioned in the world's first written book RIGVED as "Let noble thoughts come to us from all and every direction in the universe" India invented the Number system. Zero was invented by Aryabhatta. The world's first university was established in Takshila in 700BC. More than 10500 students from all over the world studied more than 60 subjects. India that is BHARAT was leader in all fields of science like Mathematics, Architecture, Metallurgy, Chemistry, Ayurveda, Biology, Navigation etc. Ayurveda was the earliest school of medicine known to humans. Charaka, the father of medicine consolidated Ayurveda 2500 years ago. Famous western scientist Albert Einstein quoted "We owe a lot to the Indians, who taught us how to count, without which no worthwhile scientific discovery could have been made".

BUT, if we don't see even a glimpse of that great Bharat in the India that we see today, it clearly means that we are not working up to our potential and that if we do and also feel proud of our scientific heritage, we could once again be an ever shining and inspiring country setting a right path for rest of the world to follow by interlinking traditional & modern science.



A Reversibly Sealed Microfluidic Platform for Fluorescence and Scanning Electron Imaging of 3D Tumor Microtissue

Gabriele Pitingolo¹, Philippe Nizard¹, Antoine Riaud¹ and Valerie Taly¹

¹INSERM UMR-S1147, CNRS SNC5014; Paris Descartes University, Paris, France.

Dr Gabriele Pitingolo is a Researcher at Université Paris Descartes- Paris and his area of research is Microfluidics, PDMS, Mesenchymal Stem Cell, Microfabrication, Micromachining, Microfluidic Engineering, Microengineering, Cleanroom Processing, Soft Lithography.

To date, tumor spheroids represent the major 3D *in vitro* models that have been described over the past four decades for *in vitro* cancer research¹. Over the years, several methods were developed for the formation of spheroids: in suspension culture, with non-adherent surface, hanging drop and microfluidic methods. Compared to these existing methods, the microfluidic platforms offer many advantages for spheroids formation and analysis, such as high-throughput and low-cost for drug screening or physiological flow conditions for high fidelity micro-tissue models. Although microfluidics offers various advantages, such as the reduction of sample volumes and minute control over the microenvironment, the irreversible bonding of the microchannels prevents the spheroid retrieval for off-chip analysis². Several research groups have developed specific channel geometries to recover the spheroids by reversing and increasing the flow rate. This technique lacks the ability to retrieve the spheroids without cells damaging caused by high shear stress. Herein, we developed a novel microfluidic platform for tumor microtissue culture, drug response analysis and versatile microscopic characterization. By reversibly bonding the chip, we go beyond the on/off chip tradeoff, which allows us to perform both fluorescence and SEM characterization of tumor microtissues on a simple platform³. The proposed microfluidic platform thus enables to grow a 3D tumor microtissue in a controlled dynamic microenvironment, and subsequently to retrieve the 3D tumor microtissues after chemotherapeutic treatment for in-depth analysis.

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3. Pitingolo G, Nizard P, Riaud A, Taly V. Beyond the on/off Chip Trade-off: a Reversibly Sealed Microfluidic Platform for 3D Tumor Microtissue Analysis. *Sensors & Actuators: B. Chemical*. 2018 (In press)



MULTIFUNCTIONAL SMART MATERIALS FOR AGRICULTURAL APPLICATIONS: DEVELOPMENT METHODS AND STRATEGIES

Balbir Singh Kaith

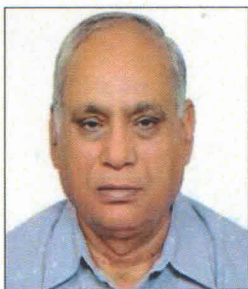
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Prof BS Kaith is a noted researcher working in Super-absorbents, Smart Materials, Biodegradable Green Composites and Nano-Science & Technology. Currently he is working in Chemistry Department of NIT Jalandhar as a Professor. He has published many papers in journals of repute and has guided many students during their doctoral research.

Globally, the increase in population has become a serious problem due to the limited resources of food production. Uncertainties in frequency and pattern of rainfall in arid areas result in crop losses every year due to the deficiency of water and desertification of soils. Multifunctional smart materials based controlled release devices have limited the problem of desertification. These materials can be used for the sustained and controlled release of fertilizers and pesticides. Such technologies can provide alternative to traditional chemical fertilizer treatment due to their ability to release the fertilizer, pesticides and water content to the soil in a slow and sustained way. In addition to maximum crop yield production, controlled release technique also limit air and underground water pollution and reduces the fertilizer content needed to provide maximum crop yield production. The overdoses of fertilizers and pesticides can be controlled with this technique to facilitate the farmers with the problem of increasing fertilizer and pesticide cost. Thus, the multifunctional smart materials provide a better way to solve problems related with agricultural issues. In the present research work, the author has highlighted the preparation of multifunctional smart polymeric materials of natural origin and their applications in agricultural and horticultural sector for the controlled release of fertilizers and pesticides.

Keywords: Multifunctional, crosslinked, smart material



Benchtop/Compact/Desktop/Personal Scanning Electron Microscopes

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***Prof M L Sharma** worked as Scientist In-charge EM Facility CIL, Panjab University, Chandigarh and superannuated in November 2006 after putting 39 years service. Technical (electron microscopy) consultant to Dr. Reddy Laboratory, Hyderabad Technical (electron microscopy) consultant to (Hitachi, Japan) M/S Forvision Pvt Ltd, Hyderabad. Technical member on panel of many national institutions like FRI Dehradun, IMTECH, Chandigarh, CSIO, Chandigarh, IHBT Palampur Developed EM sample handling material for novice in electron microscopy Technical training in cryo SEM, JEOL Datum, Tokyo Training in Cryo-Ultra-Microtomy for TEM conducted by Leica, Netherland Technical Training Cryo UM Tucson AZ, (US). He has won many national and international awards related to the field.*

Basic Characterization tools, techniques and instruments in nanoscience/nanotechnology are the hardware, software and supplies used to measure and manipulate structures on the nanoscale. They include microscopes, probes, lithography systems, manipulation and fabrication systems, software and other accessories. Chemistry, physics, biology and materials science have had a significant impact on future industries, and it is in this interdisciplinary that nanotechnology is unique. The next few years, however, will witness a new industry emerge, as industries begin to see the cost benefits of nanotechnology to the bottom line? The earliest beneficiaries will be the life sciences, material science and semiconductor industries.

Why Compact/Benchtop/Desktop SEM?

The prospective beginner buyer of a Scanning Electron Microscope is faced with many decisions regarding microscope capabilities as they relate to the eventual cost of the system. Beyond the initial acquisition cost depending on the type of microscope, there may also be significant on-going costs for maintenance, service costs for the tool, the cost of facilities and even specially trained operation personnel.

Compact/ Benchtop/Desktop or Tabletop SEM's as they have come to be known, are now widely considered a highly useful, microscopic analytical tool. Many research and quality assurance laboratories are using these instruments. The beginner never thought to acquire a full-sized SEM due to the cost, infrastructure and specially trained personnel required to operate them. The highly useful SEM systems are available which are cost effective, capable of providing the imaging, morphological and elemental analysis capabilities. User requires easy to use by multiple members of their technical staff. Today, current SEM offerings have closed with higher beam energies and resolutions approaching those of full-size tungsten filament systems. The gap between capabilities of these compact, personal Tabletop SEM's and full-size systems has grown much smaller. For example, these with its 5nm resolution, variable apertures, 5-axis stage, 30kV beam energy and full-featured EDS has practically equivalent capabilities to several full-size mid-range SEM's. The 80-90% imaging work is done at magnification less than 10,000X with SEM. This is easily within the range of these SEM on the market today.



Roots of Science in India

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Prof Bhag Chand Chauhan is currently Dean, School of Physical & Material Sciences (SoPMS) in Central University of Himachal Pradesh (CUHP), Kangra. He is also Head of the Department of Physics & Astronomical Science, CUHP. He has diverse research interests in areas including High Energy Physics, Neutrino Astrophysics and Dark Matter in the Universe, Geothermal Energy and Earthquakes, and History and Philosophy of Science, mainly Indian contributions to Science and its foundation in Indian Culture and Religion. As a researcher, he has published 100+ well cited and quality Research Papers, Preprints, and Articles in reputed Journals, Magazines and Newspapers. In the light of his excellent academic career and active participation in social activities, he has been conferred with several Honors/ Awards/ Distinctions by a number of organizations.

There must be no doubt about the fact that the Europe is the prime source of evolution of modern science. It was in the 15th and 16th Century that the people started questioning the authority of Church about the established false paradigm of natural laws. As such, several scholars and philosophers dared, and pave the way to the scientific revolution in Europe. Definitely during that period most of the Indian part was repressed and struggling with the invaders and looters. Over the passage of time India drown into the severe poverty and deep ignorance. The slavery of about thousand years led Indian mind and knowledge system into oblivion. As such, in the modern days it is nearly impossible to believe that India could be the cradle of science, technology and unimaginable human knowledge system during ancient times. It is corroborated by several noted scholars that India is the root source of a large number of scientific inventions and discoveries that have credited by the Europeans. These concepts have been the foundation stones for the modern scientific edifice, but unfortunately the Indian contribution has been put under the rug of Eurocentric bias. Historian and scholar corroborate that India has been a phenomenal source of fascination and a great material wealth on this planet, which allured the looters and invaders to. Contribution of the ancient Indians in spirituality and science, which could broaden the horizon of human consciousness, is remarkable and we all must know about it. The work has been supported by the facts, findings and quotes of the historians and scholars.

List of Abstracts

1. Chemical Sciences

Abstract Number	Authors	Affiliations	Title of Paper
CH01 (Oral)	Virender Singh	Department of Chemistry, Dr. B R Ambedkar National Institute of Technology, Jalandhar 144011, India	Exploration of Versatility of 1-Formyl 9H- b-Carboline for the Synthesis of Biologically Potential b-Carboline Based Molecular Architectures
CH02 (Oral)	Renu Verma and Hardeep Anand	Department of Chemistry, Kurukshetra University, Kurukshetra, 136119, India	A comparative Study of corrosion inhibition of mild steel by corrosion inhibitors
CH03 (Oral)	Anupama Saini and Kovuru Gopalaiah	Organic Synthesis and Catalysis laboratory, Department of Chemistry, University of Delhi, Delhi-110007	Synthesis of Quinoxalines by Copper-Catalyzed Oxidative Annulation of o-Phenylenediamines with 2-Phenylethylamines
CH04 (Poster)	Sanjay Kumar ¹ and SK Mehta ²	¹ Department of Chemistry, Vallabh Government College Mandi, H.P. -175015, India ² Department of Chemistry and Centre for Advanced Studies in Chemistry, Panjab University, Chandigarh-160014, India	Aqueous surfactant solution: an ideal medium for restricting the nanoparticle's growth
CH05 (Poster)	Sapna Sharma ¹ , Kuldeep Kumar ^{1*} , S Chauhan ² , MS Chauhan ²	¹ Department of Chemistry, Career Point University Hamirpur (H.P.) India-176041 ² Department of Chemistry, Himachal Pradesh University, Shimla, India-171005	Behavior of Antihistaminic Drug in Aqueous Solutions of Various Inorganic Halides: Volumetric and Viscometric Studies
CH06 (Poster)	Aashima Beri, Parampaul K. Banipal, Tarlok S Banipal	Guru Nanak Dev University	Calcium Chloride influencing the Solvation Behavior of Caffeine, Theophylline and Theobromine: Volumetric, Acoustic, Viscometric and Calorimetry Approach
CH07 (Oral)	Roby Soni	Physical and Materials chemistry, Division National Chemical Laboratory, Pune	Induction of Superhydrophilicity in Polyaniline through Electrochemical Functionalization of Carbon Fiber Core in a Polyaniline-Carbon Fiber Composite for High Rate Electrochemical Capacitor

CH08 (Poster)	Pallavi Sohal, Paramapaul K. Banipal*, Sonika Arti, Tarlok S Banipal	Department of Chemistry, Guru Nanak Dev University, Amritsar 143005, India	Conductance and volumetric study to analyze the effect of vitamin C on the mixed micellization behavior of catanionic {sodium dodecylsulfate + cetyltrimethylammonium bromide} surfactants at variable temperatures
CH09 (Oral)	Lalita Pathania and S Chauhan	Department of Chemistry, Himachal Pradesh University, Shimla, India-171005	Intermolecular Interactions and Micellar properties of CTAB and DTAB in aqueous solutions of Antibiotic drug Cefepime at different temperatures: Volumetric and Compressibility Studies
CH10 (Oral)	Maninder Kaur and S Chauhan	Department of Chemistry, Himachal Pradesh University, Shimla, India-171005	Behaviour of Cationic Surfactant in the Presence of Quaternary Ammonium Based Ionic Liquids (ILs): Micellar and Microbial Activity
CH11 (Poster)	Swati Rani, Mamta kumari and Subho Mozumdar	Department of Chemistry, University of Delhi, Delhi- 110007	Spectroscopic Analysis of Binding of Curcumin with Surfactant like Imidazolium based Ionic Liquid
CH12 (Poster)	Parveen Gahlyan, Rakesh Kumar	Bioorganic Laboratory, Department of Chemistry, University of Delhi, Delhi- 110007, India	Triazole-tethered rhodamine based dual sensor for recognition of Cu^{2+} and Fe^{3+}
CH13 (Poster)	Vikas Nathan and Shashi Kant Lomesh	Department of Chemistry, Himachal Pradesh University, Shimla, India-171005	Investigating molecular interactions of Doxycycline Hyclate with aqueous LiCl Solutions at different temperatures: volumetric and acoustic approach
CH14 (Poster)	RD Pawar ¹ , SR Patil ² , GP Waghulde ³	¹ A.C.S College, Yawal (Maharashtra State, India) ² A.S.C. college, Chopada (Maharashtra State, India) ³ D.D.N.Bhole Collge ,Bhusawal (Maharashtra State, India)	Investigation of Molecular Interactions Studies of Binary Liquid Mixture by Ultrasonic Velocity, Density and Viscosity at 303.15 K and 308.15 K
CH15 (Poster)	Deepika Yadav and Satish K Awasthi	Department of Chemistry, University of Delhi, India- 110007	Palladium nanoparticles supported on triazine functionalised mesoporous covalent organic polymer as an efficient catalyst for Sonogashira coupling reaction
CH16 (Poster)	Subodh and DT Masram	Department of Chemistry, University of Delhi, India- 110007	Three-Dimensional TiO_2 - AAPTMS@GO Nanocomposite: An Excellent Heterogeneous Catalyst for the Synthesis of 2,4,5-Triaryl-

			imidazoles
CH17 (Poster)	Karan Chaudhary and DT Masram	Department of Chemistry, University of Delhi, Delhi-110007	Ligand free C-N coupling by using biomass derived carbon supported copper nanoparticles
CH18 (Oral)	Sachin Sharma	M Pharmacy (Medicinal Chemistry), Dept of Pharmaceutical Sciences and natural products, Central University of Punjab, Bathinda 143001	Targeting neuronal Nitric Oxide Synthase (nNOS) enzyme: A key therapeutic target for treating neurodegeneration
CH19 (Poster)	Tanu Sharma ^a , Arvesh Sharma ^a , Inderpreet Kaur ^{b*} , RK Mahajan ^b , SK Sahoo ^c , BS Bajwa ^a	^a Department of Physics, Guru Nanak Dev University, Amritsar, Punjab. ^b Department of Chemistry, Centre of Advanced Studies, Guru Nanak Dev University, Amritsar, Punjab. ^c Bhabha Atomic Research Centre, Mumbai.	Uranium Distribution and its Risk Assessment in the Groundwater of Tarn-Taran district, Punjab
CH20 (Poster)	Shashi Kant Lomesh, Abhishek Thakur, Dinesh Kumar	Department of Chemistry, Himachal Pradesh University, Shimla, India-171005	Volumetric, Viscometric and Acoustic behaviour of glycine and glycyglycine in aqueous organic acid at different temperatures
CH21 (Poster)	Arush Sharma ^a , Maria Panayotova ^b , Zia-Mahmood Siddiqi ^c , Deepak Pathania ^d	^a Shoolini Institute of Life Sciences and Business Management, Solan 173212, Himachal Pradesh, India ^b Department of Chemistry, University of Mining & Geology, Sofia, Bulgaria ^c Jubail University College, P.O. Box10074, Jubail Industrial City 31961, Kingdom of Saudi Arabia ^{d*} Department of Environmental Sciences, Central University of Jammu, Rahya-Suchani, Bagla Distt., Samba 181143, Jammu and Kashmir, India	Adsorption behavior and photocatalytic mechanism of magnetic carbon supported nanohybrid for persistent aromatic pollutants from water system
CH22 (Poster)	Rupinder Kaur, Parampaul K Banipal, Tarlok S Banipal	Department of Chemistry, Guru Nanak Dev University, Amritsar 143005, Punjab, India	Interactions of sodium valporate with Cationic surfactants: Calorimetric and Spectroscopic Approach

CH23 (Poster)	Bhanu Priya, Abhishek Kumar, Neeraj Sharma	Department of Chemistry, Himachal Pradesh University, Shimla, India-171005	Oxidovanadium (IV) Complexes of Acetylsalicylhydroxamic Acid as Potential Antimicrobials: Synthesis, Characterization and Biological Activity
CH24 (Poster)	O Kotresh, Veerabhadrayya S Negalurmath	Department of Chemistry, Karnatak University's Karnatak Science College, Dharwad-580001, Karnataka, India	Synthesis of benzofuran linked pyrrole derivatives as anti-cancer agents
CH25 (Poster)	Madhu Bala, Dinesh Kumar & Shashi Kant Lomesh	Department of Chemistry, Himachal Pradesh University, Shimla, India-171005	Volumetric and acoustic studies of Diclofenac Sodium Salt in Aqueous solutions of Sorbitol at Different Temperatures
CH26 (Poster)	Rashmi Dhawan ¹ , Meenakshi Goyal ² and KK Bhasin ³	¹ Department of Chemistry, S.A. Jain (PG) College, Ambala City ² Dr. S.S. Bhatnagar University Institute of Chemical Engineering & Technology, Panjab University ³ Department of Chemistry, Panjab University, Chandigarh	Adsorption-Desorption studies of methanol vapors on activated carbons
CH27 (Oral)	Kuldeep Singh and S Chauhan	Department of Chemistry, Himachal Pradesh University, Shimla, India-171005	Study on Micellar Behaviour of Bile Salts in aqueous medium of Ceftriaxone Sodium: Conductometric and Spectrometric Approach
CH28 (Poster)	Shashi Kant Lomesh, Poonam Thakur	Department of Chemistry, Himachal Pradesh University, Shimla, India-171005	Study of Drug – Amino Acid Interactions at different temperatures: Volumetric and Ultrasonic Approach.
CH29 (Poster)	Shivayogi S Narasagoudr ¹ , Saraswati P Masti ¹ , Ravindra B Chougale ² , Deepak Kasai ³	¹ Department of Chemistry, Karnatak Science College, Dharwad-580 001, Karnataka, India. ² Department of Chemistry, Karnatak University, Dharwad- 580 003, Karnataka, India. ³ Department of Materials Science, Mangalore University, Mangalangothri – 574 199, Karnataka, India.	Study of Kinetic Parameters of Poly (vinyl alcohol)/Boswellic acid Composite Films

CH30 (Poster)	Bhanu Priya ^a , Deepak Pathania ^b , Amar Singh Singha ^c	^a Shoolini Institute of Life Sciences and Business Management, Solan 173212, Himachal Pradesh, India ^b Department of Environmental Sciences, Central University of Jammu, Rahya-Suchani, Bagla Distt., Samba 181143, Jammu and Kashmir, India ^c Department of Chemistry, NIT Hamirpur 177005, Himachal Pradesh, India	Starch/PVA Biocomposite Blend Films: Mechanical Properties and Antibacterial Activity
CH31 (Poster)	Maheshwar Singh Thakur, Onkar Singh Nayal, Neeraj Kumar and Bikram Singh	¹ Natural Products Chemistry and process development department, CSIR-Institute of Himalayan Bioresource Technology, Palampur, H.P.- 176 061, INDIA ² Academy of Scientific and Innovative Research, Anusandhan Bhawan, 2 Rafi Marg, New Delhi-110001, INDIA	2-Aminoquinazolin-4(3H)-one: A Bioinspired Organocatalyst for Selective Organic Transformation
CH32 (Poster)	Javaid Shabir, Charu Garkoti , Surabhi , Digvijay Sah and Subho Mozumdar	Department of Chemistry, University of Delhi-110007	Development of Amine Functionalized Wrinkled Silica Nanospheres as Efficient and Recyclable Solid Base Catalyst and Their Application in Knoevenagel Condensation
CH33 (Poster)	Abhishek Verma, Parveen Gahlyan, Rakesh Kumar	Bioorganic Laboratory, Department of Chemistry, University of Delhi, Delhi- 110007, India	Design and synthesis of fluorescent symmetric bis-triazolylated-1,4- dihydropyridines as potent anti- breast cancer agents
CH34 (Poster)	Navin P Chikhaliya	Department of Chemistry, Sardar Patel University, Vallabh Vidyanagar-388120, INDIA	A Study on Environment Friendly Biolubricants Based on Branched Terpolymers
CH35 (Poster)	Anchal Sharma, Kalyan S Ghosh	Department of Chemistry, NIT Hamirpur	Inhibition of amyloid fibrillation of bovine serum albumin by using zinc oxide and copper nanoparticles
CH36 (Poster)	Manpreet Singh and Virender Singh	Department of Chemistry, Dr BR Ambedkar National Institute of Technology, Jalandhar 144011	I ² -Mediated Expeditious Synthesis of b-Carboline C-1 Tethered annulated Thiazole Derivatives
CH37 (Poster)	Shubham Sharma, and	Department of Chemistry, Dr BR Ambedkar National	An Expeditious Approach Towards One-Pot Synthesis of Pyrazole

	Virender Singh	Institute of Technology, Jalandhar 144011	Tethered Imidazo[1,2-a]pyridine Derivatives
CH38 (Poster)	Raj Kaushal, Mandeep Kaur	Department of Chemistry, National Institute of Technology, Hamirpur, Himachal Pradesh-177005, India	An efficient synthesis of novel metal chalcone complex and its characterization
CH39 (Poster)	Raj Kaushal, Archana Thakur	Department of Chemistry, National Institute of Technology, Hamirpur, Himachal Pradesh-177005, India	Molecular docking studies of indoles as topoisomerase inhibitors for discovery of new anticancer drugs.
CH40 (Poster)	Anchal Sharma, Kalyan S Ghosh	Department of Chemistry, National Institute of Technology, Hamirpur, Himachal Pradesh-177005, India	Inhibition of amyloid fibrillation of bovine serum albumin by using zinc oxide and copper nanoparticles
CH41 (Poster)	Shiwani Rana, Kalyan Sundar Ghosh	Department of Chemistry, National Institute of Technology, Hamirpur, Himachal Pradesh-177005, India	Inhibition of copper-mediated aggregation of Human γ D-crystallin by diimine compound
CH42 (Poster)	Manikant Singh and Virender Singh	Department of Chemistry, Dr. B. R. Ambedkar National Institute of Technology, Jalandhar 144011	Application of A3-Coupling for the Synthesis of b-Carboline Tethered Quinoline Derivatives
CH43 (Poster)	Stuti, Sunil Kumar	Department of Chemistry, Mata Gujri Khalsa College, Kartarpur, Pb., India Department of Chemistry, GC Khundian, H.P., India	Applications of Nano Materials: A Review
CH44 (Poster)	M Anand	Department of Chemistry, Dr. B.R. Ambedkar University, Khandari Campus, Agra- 282002, India	DDT in Placenta and its Association with Birth Weight
CH45 (Poster)	Shashi Kant Sharma & Inesh Kumar	Department of Chemistry, Himachal Pradesh University, Shimla, India-171005	Ultrasonic and conductance studies of Metformin hydrochloride in water and in aqueous sorbitol solution at different temperatures
CH46 (Poster)	Pooja Kaundal and S Chauhan	Department of Chemistry, Himachal Pradesh University, Shimla, India-171005	Effect of Ethambutol Dihydrochloride (EMB) on Micellization Behaviour of Cationic Surfactant DTAB at Variable Temperatures

CH47 (Poster)	Kamal Kishor Thakur and Shashi Kant Sharma	Department of Chemistry, Himachal Pradesh University, Shimla, India-171005	Density and viscosity study of BaCl ₂ .2H ₂ O in 2, 4 and 6 wt. % aqueous Mannitol, sorbitol and dulcitol solutions at 293.15, 303.15 and 313.15K.
CH48 (Poster)	M Sharma ¹ , VK Vtas ¹ and DS Rana ²	¹ Department of Chemistry, Maharaja Agrasen University, Baddi, Solan, India ² Department of Environment Science, Central University of Himachal Pradesh, Dharamshala, India	Metformin hydrochloride - sodium dodecyl sulphate Interactions in Aqueous Solutions: Physico-Chemical Studies
CH49 (Poster)	Nisha Kumari & Shashi Kant Lomesh	Department of Chemistry, Himachal Pradesh University, Shimla-171005, India.	Investigation of molecular interactions of the drug Streptomycin sulphate in different aqueous Mannitol solutions at different temperatures.
CH50 (Poster)	Manish Kumar, Deepika Kaushal and Nidhi Sharotri	Department of Chemistry, Sri Sai University, Palampur	Synthesis, Characterization and Mechanistic aspect of photocatalytic degradation of Visible light responsive Mn-S-co-doped TiO ₂ photocatalyst
CH 51 (Poster)	Neha Bhatt	Gurukula Kangri Vishwavidyalaya, Haridwar	A Kinetic Spectrophotometric Study for Finding a Cost Effective Method for Removal of Aminophenols in Water Samples

2. Biological and Medical Sciences

Abstract Number	Authors	Affiliations	Title of Paper
BMS01 (Oral)	Moneesh Thakur ¹ and Radhika Thakur ²	¹ Division of Veterinary Medicine, Faculty of Veterinary Sciences and Animal Husbandry, R. S. Pura, SKUAST-Jammu (Jammu and Kashmir) ² Department of Basic Sciences, College of Forestry, Dr. Y. S. Parmar University of Horticulture and Forestry, Nauni, Solan (Himachal Pradesh)	Electrocardiographic studies on extra-cardiac affections in dogs

BMS02 (Poster)	Jasvinder Singh Bhatti ^{1*} , Sumanpreet Kaur ² , Navneet Kaur Saini ^{1, 2} , Gurjit Kaur Bhatti ³ , Sanjay Kumar Bhadada ⁴ , Rajesh Vijayvergiya ⁵	¹ Department of Biotechnology, Sri Guru Gobind Singh College, Chandigarh, India ² Department of Microbial Biotechnology, Panjab University Chandigarh India ³ UGC Centre of Excellence in Nano Applications, Panjab University, Chandigarh, India ⁴ Department of Endocrinology, PGIMER, Chandigarh, India ⁵ Department of Cardiology, PGIMER, Chandigarh, India	Glutathione-S-Transferase Gene Variants and Their Susceptibility to Type 2 Diabetes and Related Cardiovascular Complications in Asian Indians
BM03 (Oral)	R Sharma, G Mal, B Singh, US Pati and D Gopinath	ICAR – Indian Veterinary Research Institute, Regional Station, Palampur, Kangra (Himachal Pradesh)	A study on the wildlife mortality in Kangra valley of Himachal Pradesh
BMS04 (Poster)	Moneesh Thakur ¹ and Radhika Thakur ²	¹ Department of Veterinary Medicine, College of Veterinary Sciences and Animal Husbandry, Central Agricultural University, Selesih, Aizawl (Mizoram) ² Department of Basic Sciences, College of Forestry, Dr. Y. S. Parmar University of Horticulture and Forestry, Nauni, Solan (Himachal Pradesh)	Haematological alterations' in a Demodicosis affected Doberman Pinscher Dog – A Case Report
BMS05 (Poster)	Meenakshi Sharma and Sunita Kapila	Department of Botany, Panjab University, Chandigarh-160014, India	Cytological Studies in Some Eastern Himalayan Members of Family Pottiaceae
BMS06 (Poster)	Monika Thakur and Hem Chander	Division Botany, Department of Biosciences, Career Point University, Hamirpur (Himachal Pradesh)	An Enumeration of Lichenized Fungi from Sikandra Dhar Region of District Mandi, Himachal Pradesh
BMS07 (Poster)	Jyoti Pathania and Hem Chander	Division Botany, Department of Biosciences, Career Point University, Hamirpur (Himachal Pradesh)	An Analysis of Nutritional Qualities and Host Specificity of Most Common Edible Macrofungi of Hamirpur Region of Himachal Pradesh
BMS08 (Oral)	Reena V Saini, Indu Hira, Amit Kumar, Reena Kumari and Adesh	Animal Biotechnology Lab., School of Biotechnology, Faculty of Applied Sciences and Biotechnology, Shoolini University, Solan (Himachal Pradesh)	Immunomodulatory and anticancer potential of Pectin-Guar gum-Zinc oxide nanocomposite.

	Kumar Saini	Pradesh)	
BMS09 (Poster)	Indu Kumari & Rajesh Kumar	Department of Life Sciences, School of Basic Sciences, Arni University, Kangra (Himachal Pradesh)	Beekeeping vis-à-vis Hybrid Cropping System
BMS10 (Poster)	Sahar Bano, Anju Rao and Navneet Agnihotri	Department of Botany, Panjab University, Chandigarh – 160014, India	Effect of heavy metals copper and nickel on some biochemical contents of the moss <i>Mnium cuspidatum</i>
BMS11 (Oral)	G Mal, Vinesh Sharma, B Singh, R. Sharma and J B Dhar	ICAR-Indian Veterinary Research Institute, Regional Station, Palampur-176 061, H.P.	Effect of thermal processing on antimicrobial activity of indigenous cattle milk
BMS12 (Poster)	Sweta & Arti Jamwal	Division of Botany, Department of Biosciences, Career Point University, Hamirpur (Himachal Pradesh)	An impact of drought stress on enzymatic antioxidants of medicinal plants
BMS13 (Poster)	Prakriti Nidhi, Garima Bisht, Vikas Kumar, Kamal Dev and Anuradha Sourirajan	Faculty of Applied Sciences and Biotechnology, Shoolini University, Bajhol, Solan (Himachal Pradesh)	Therapeutic Potential of Essential Oils from two Citrus spp. of North western Himalayan for Treating <i>Candida albicans</i> Infections in Humans
BMS14 (Poster)	Ishita Guleria, Amita Kumari	School of Biological and Environmental Sciences, Faculty of Basic Sciences, Shoolini University, Solan (Himachal Pradesh)	Genetic Diversity of wild <i>Viola</i> species from Mid Hills of Himachal Pradesh using ISSR Markers
BMS15 (Poster)	Shilpi Sharma and Jyoti Vakhlu	Metagenomics lab School of Biotechnology University of Jammu	Evolution and Biology of CRISPR System: A new era tool for genome editing
BMS16 (Poster)	Satvir kaur ¹ , Sunita Kapila ¹ , Anjna Sharma ² and Indresh K. Maurya ³	¹ Department of Botany, Panjab University, Chandigarh-160014 ² Center for Nanoscience and Nanotechnology, Panjab University, Chandigarh-160014 ³ Department of Microbial Biotechnology, Panjab University, Chandigarh-160014	Antimicrobial activity and phytochemical analysis of <i>Plagiasma appendiculatum</i> Lehm. & Lindenb.

BMS17 (Poster)	Keshav Kumar, Humakhan and Azhar Khan	Molecular and Immune-Parasitology Research Laboratory, Faculty of Applied Sciences and Biotechnology, Shoolini University of Biotechnology and Management Sciences, Bajhol, Solan – 173212 (Himachal Pradesh)	In vitro Antidiabetic Properties of Traditional Antidiabetic Plants (Ficus benghalensis and Psidium guajava)
BMS18 (Oral)	Nitesh Kumar ¹ & Bhagwati Prashad Sharma ²	¹ Department of Botany, Gautam College, Hamirpur (Himachal Pradesh) ² Department of Botany, Govt. College, Barsar, District Hamirpur (Himachal Pradesh)	Ethnomedicinal uses of some plants of district Hamirpur of Himachal Pradesh for the treatment of malaria
BMS19 (Oral)	Anu Sharma	Department of Botany, University of Jammu, Jammu – 180006 (Jammu and Kashmir)	Studies on two species of Asterella P. Beauv. showing mycorrhizal associations
BMS20 (Poster)	Ruhi Pathania, Tanu Devi, Prince Chawla, Ravindar Kaushik and Azhar Khan	Faculty of Applied Sciences and Biotechnology, Shoolini University, Bajhol, Solan – 173229 (Himachal Pradesh)	Formulation of gum arabic stabilized nanoemulsion of Eucalyptus globulus oil and its antimicrobial activity
BMS21 (Poster)	Huma Khan, Varun Jaiswal and Azhar Khan	Faculty of Applied Sciences and Biotechnology, Shoolini University of Biotechnology and Management Sciences, Solan – 173229 (Himachal Pradesh)	In silico study of Sesame indicum bioactive compounds with angiotensin converting enzyme
BMS22 (Poster)	Mukul Kumar and Ravinder Kaushik	School of Bioengineering and Food Technology, Shoolini University, Solan – 173212 (Himachal Pradesh)	In vitro anti-obesity study of Himalayan herbs formulation
BMS23 (Poster)	Samriti Guleria and Dinesh Kumar	School of Bioengineering and Food Technology, Shoolini University, Solan – 173229 (Himachal Pradesh)	Monascus purpureus used for the production of pigment and their application in model food products
BMS24 (Poster)	Isar Sharma, Sakshi Sharma, Indu Priya and Nisha Kapoor	School of Biotechnology, University of Jammu (Jammu and Kashmir)	Association Studies of TLR2 Gene Polymorphism with Schizo-Phrenia in J&K Population
BMS25 (Poster)	Indu Priya and Nisha Kapoor	School of Biotechnology, University of Jammu (Jammu and Kashmir)	Association Studies of BDNF Gene Polymorphism with Schizophrenia in J&K Population

BMS26 (Poster)	Garima Bisht, Prakriti Nidhi, Vikas Kumar, Anuradha Sourirajan and Kamal Dev	Faculty of Applied Sciences and Biotechnology, Shoolini University, Bajhol, Solan (Himachal Pradesh)	Antimicrobial and antioxidant properties of red pigment extracted from psychro -halophilic bacterium Rhodonellumpseudophilum strain G L8
BMS27 (Poster)	Nancy Bhagat	University of Jammu	CRISPR/cas9: Platforms for genome editing in crop plants
BMS28 (Poster)	Prince Chawla ¹ , Huma Khan ¹ , Naveen Kumar ² , Azhar Khan ¹ and Ravinder Kaushik ¹	¹ Shoolini University, Solan – 173229 (Himachal Pradesh) ² Amity University, Jaipur – 303002 (Rajasthan)	Antimicrobial and sensing properties of dextrose stabilized silver nanoparticles
BMS29 (Poster)	Chhering bodh ¹ , Samriti Sharma ^{1,2} , Rajinder Kaur ¹ , Krishan Kumar ³	¹ Department of Biotechnology, Dr. Y. S. Parmar University of Horticulture and Forestry, Nauni, Solan (Himachal Pradesh) ² Department of Biotechnology, Chandigarh Group of Colleges, Landran, Mohali (Punjab) ³ Department of Fruit Science, Dr. Y. S. Parmar University of Horticulture and Forestry, Nauni, Solan (Himachal Pradesh)	Studies on genetic fidelity of micropropagated plants of strawberry (<i>Fragaria</i> × <i>anannasa</i> Duch.) using molecular markers
BMS30 (Poster)	Nitika Thakur	Shoolini University of Biotechnology and Management Sciences, Solan (Himachal Pradesh)	Food quality and safety: An alarming concern from farm to fork
BMS31 (Poster)	Radha and Sunil Puri	Faculty of Basic Sciences, Shoolini University, Solan (Himachal Pradesh)	Survey of Ethnoveterinary Medicines used by Shepherds during Seasonal Migration in Tribal areas of Himachal Pradesh
BMS32 (Poster)	Manjula Gautam, Prakriti Nidhi, Vikas Kumar, Anuradha Sourirajan and DR Sharma	School of Biotechnology, Shoolini University, Bajhol, Solan, (Himachal Pradesh)	Comparison of Antifungal potential of Essential oil and Methanolic extracts of leaves of the medicinal plant <i>Zanthoxylum armatum</i> DC

BMS33 (Poster)	Mukul Kumar, Samriti Guleria, Azhar Khan and Ravinder Kaushik	School of Bioengineering and Food Technology, Shoolini University, Solan – 173212 (Himachal Pradesh)	In vitro anti-obesity study of Himalayan herbs formulation
BMS34 (Poster)	Indu Kumari & Rajesh Kumar	Department of Life Science, School of Basic Sciences, Arni University, Kangra (Himachal Pradesh)	Comparison of Honey Yield among Artificially Fed & Unfed Honeybee Colonies
BMS35 (Poster)	Anu and Suman Sharma	Department of Zoology and Environmental Sciences, Punjabi University, Patiala 147002 (Punjab)	Protective efficacy of curcumin on antioxidant status and histopathological alterations in pancreas of cadmium exposed albino mice
BMS36 (Poster)	Sushma Sharma and Arti Rana	Department of Biosciences, Himachal Pradesh University, Summer Hill, Shimla – 171005 (Himachal Pradesh)	Histopathological changes on alloxan induced diabetic mice kidney after administration of Carissa spinarum methanolic leaf extract
BMS37 (Poster)	Shivani Shukla ¹ , Anjali Kashyap ¹ , Rajan Rolta ¹ , Vikas Kumar ¹ , Anuradha Sourirajan ¹ , David J. Baumler ^{2,3,4} , Kamal Dev ^{1,2}	¹ Faculty of Applied Sciences and Biotechnology, Shoolini University, Solan (Himachal Pradesh) India ² Department of Food Science and Nutrition, ³ Microbial and Plant Genomic Institute, ⁴ Biotechnology Institute, University of Minnesota-Twin Cities St. Paul (Minnesota) USA	Methanolic Extract of Bistorta macrophylla is rich in Antioxidants and Potent Bioenhancer of Antifungal Antibiotics.
BMS38 (Oral)	Rajan Rolta ¹ , Akash Sharma ¹ , Vikas Kumar ¹ , Anuradha Sourirajan ¹ , David J. Baumler ^{2,3,4} , Kamal Dev ^{1,2}	¹ Faculty of Applied Sciences and Biotechnology, Shoolini University, Solan (Himachal Pradesh) India ² Department of Food Science and Nutrition, ³ Microbial and Plant Genomic Institute, ⁴ Biotechnology Institute, University of Minnesota-Twin Cities St. Paul (Minnesota) USA	Rheum emodi: Broad spectrum Bioenhancer of antibiotics against bacterial and fungal pathogens.
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BMS40 (Poster)	Divyanshi Sharma, Kamal Dev and Anuradha Sourirajan	Faculty of Applied Sciences and Biotechnology, Shoolini University, Bajhol, Solan (Himachal Pradesh)	Characterization of cellulase from thermophilic <i>Bacillus</i> sp. of hot springs of Himachal Pradesh
BMS41 (Oral)	Javsir Singh Dalio	Department of Biology, G.G.S.S.S. Budhlada – 151502 (Punjab)	Insect visitors of <i>Bauhinia variegata</i> L. with special reference to honeybees
BMS42 (Poster)	Javsir Singh Dalio	Department of Biology, G.G.S.S.S. Budhlada – 151502 (Punjab)	<i>Papaver rhoeas</i> , an excellent pollen plant for honeybees
BMS43 (Poster)	Sushma Sharma and Seepika Thapar	Department of Biosciences, H. P. University, Summer Hill, Shimla (Himachal Pradesh)	Effects of organophosphate Dichlorvos on gills and heart of <i>Cirrhinus mrigala</i>
BMS44 (Poster)	Sarita Kumari and Javed Ahmed Khan	Department of Zoology, Saifia Post Graduate College of Science (Barkatullah University), Bhopal (Madhya Pradesh)	Analysis of Physical, Chemical and Biological Quality of Motia Lake, Bhopal
BMS45 (Poster)	Komal Arora	Department of Botany, DAV College, Jalandhar 144008 (Punjab)	Bioherbicidal Potential of Essential Oils: A Review
BMS46 (Poster)	Arti ¹ , Anuradha Sourirajan ¹ , Madhu Choudhary ²	¹ School of Biotechnology, Faculty of Applied Sciences and Biotechnology, Shoolini University of Biotechnology and Management Sciences, Solan (Himachal Pradesh) ² ICAR – Central Soil Salinity Research Institute, Karnal (Haryana)	Plant growth promoting activities of bacteria isolated from salt affected soils
BMS47 (Poster)	Nitin Sharma	Department of Biotechnology, Chandigarh Group of Colleges, Landran, Mohali, Punjab, India	<i>Cordyceps sinensis</i> : Potential drug target for plethora of diseases
BMS48 (Poster)	Bhanu Sharma, Huma Khan and Azhar Khan	Faculty of Applied Sciences and Biotechnology, Shoolini University, Bajhol, Solan, 173229, Himachal Pradesh, India	In Silico analysis of natural plant compounds of <i>Hibiscus sabdariffa</i> against angiotensin type 2 receptor
BMS49 (Oral)	Jagdeep Verma	Department of Botany, Government College, Rajgarh – 173101, Himachal Pradesh, India	Variety of Orchid Habits and Habitats in Himachal Himalaya

BMS50 (Poster)	Sonia Rathour ¹ and Rakesh Kumar Negi ²	Department of Zoology, Govt College Bilaspur, H.P., Pin- 174001. Assistant Professor-Zoology. R.K.M.V. Shimla-1	Nematodes Associated with Okra (Abelmoschus esculentus (Linn) Moench) in Ghuwarwin area of District Bilaspur, Himachal Pradesh
BMS51 (Poster)	Sanjay Kumar Narang ¹ and Kiran Chauhan ²	¹ Department of Zoology Govt. College Bilaspur, H.P., 174001 ² Department of Biosciences MLSM College Sundernagar. Mandi. H.P.	Cardiomyocyte Remodeling In Chronic Fenoterol Dose Administered Murine Model.
BMS52 (Poster)	Om Parkash ¹ , Samer Singh ¹ , Kashmir Singh ³ , Sanjeev Kumar Soni ² , Rupinder Tewari ¹	¹ Department of Microbial Biotechnology, Panjab University, Chandigarh-160014, India ² Department of Microbiology, Panjab University, Chandigarh- 160014, India ³ Department of Biotechnology, Panjab University, Chandigarh- 160014, India	Cloning and expression of cellulases from Aspergillus niger RSO-1
BMS53 (Poster)	Navneet Kaur Saini ¹ , Sumanpreet Kaur ³ , Sanjay Kumar Bhadada ² , Samer Singh ³ , Jasvinder Singh Bhatti ^{1,4}	¹ Department of Biotechnology, SGGS College, Chandigarh India ² Department of Endocrinology, Post Graduate Institute of Medical Education and Research, Chandigarh India ³ Department of Microbial Biotechnology, Panjab University, Chandigarh India ⁴ Texas Tech University Health Sciences Center, Lubbock 79430 TX United States	Transcription factor 7 like-2 (TCF7L2) gene polymorphisms rs12255372, rs7903146 and the association with type 2 diabetes in North Indian population
BMS54 (Poster)	Vandana Kumari, V K Mattu and Neelam Mattu	Department of Biosciences, Himachal Pradesh University, Shimla (HP)	Pollen analysis of some honey samples from Shimla hills of the Northwest Himalayas

3. Physical Sciences

Abstract Number	Authors	Affiliations	Title of Paper
PS01 (Poster)	Reetika Bhadwal and	Department of Physics, Career Point University,	Uranium detection in drinking water samples of Galore area of

	Naveen Thakur	Hamirpur (HP) 176041, INDIA	district Hamirpur Himachal Pradesh, India
PS02 (Poster)	Akariti Sharma ¹ , Kulveer Kaur ¹ , Vinayak Garg ^{1, a)} and R. K. Moudgil ²	¹ Department of Physics, Punjabi University, Patiala-147 002, India ² Department of Physics, Kurukshetra University, Kurukshetra-136 119, India	Static Correlation Functions of Coupled Electron-Hole Quantum Wire System at Finite Temperature
PS03 (Poster)	Richa ¹ , Munish Aggarwal ² , Harish Kumar ¹ , Navdeep Singh Arora ³ , Deepshikha ⁴ , Tarsem Singh Gill ⁵	¹ Punjab Technical University, Kapurthala, Punjab-144601, India ² Department of Applied Science, Lyallpur Khalsa College of Engineering, Jalandhar - 144001, Punjab, India ³ Department of Applied Science, Amritsar College of Engineering and Technology, Manawala-143115, Punjab, India ⁴ School of Physics and Material Science, Thapar Institute of Engineering and Technology, Patiala, 147004, Punjab, India ⁵ Department of Physics, Guru Nanak Dev University, Amritsar-143005, India	Effect of magnetic field on Self-focusing of Q-Gaussian Laser Beam in Relativistic plasma
PS04 (Oral)	Ankush, Rishu Verma, Gazal Sharma and BC Chauhan	Department of Physics & Astronomical Science, School of Physical & Material Sciences, Central University of Himachal Pradesh (CUHP), Dharamshala, Kangra (HP), India-176215	Chi-Square Analysis and bounds on Sterile Neutrino Flux in the Solar Neutrino Data
PS05 (Oral)	Kumar Anshuman ^a , BC Chauhan ^b	^a VISVA-BHARATI UNIVERSITY, West Bengal. ^b Department of Physics & Astronomical Science, School of Physical and Astronomical Sciences, CUHP, Dharamshala, H.P.	A Model for Estimating the Unexplained Matter

PS06 (Poster)	Arvind Kumar*, KK Sharma, Subhash Chand and Ashwani Kumar ¹	*Department of Physics, National Institute of Technology, Hamirpur-177005 (HP), India. ¹ Govt. collage Bilaspur-174001	Fabrication and electrical characterization of Ag/p-Si(111) Schottky diode at low temperature
PS07 (Poster)	Navjot Hothi ¹ and Shuchi Bisht ²	¹ Department of Physics, University of Petroleum & Energy Studies, Dehradun-248007, Uttarakhand, India ² Department of Physics, Kumaun University, Nainital-263002, Uttarakhand, India.	Confirmation of the Hadronic Mass Quantization from Experimental Hadronic Regge Trajectories
PS08 (Oral)	Kamalpreet Kaur ^a , OP Pandey ^b	^a Department of Physics, University of Petroleum & Energy Studies Dehradun 248 007, Uttarakhand, India. ^b School of Physics and Materials Science, Thapar University, Patiala 147 004, Punjab, India.	Wear behavior of spray deposited AMCs
PS09 (Poster)	Sonam Mahajan	Dept. of Physics, University of Petroleum & Energy Studies, Bidholi, Dehradun, Uttarkhand	Cooling of Mechanical Resonator Using a Bose-Einstein Condensate with Different Cooling Schemes
PS10 (Poster)	Anil Thakur ¹ , Mandeep Singh Gandhi ² , Pradeep Malhotra ¹ , Rajinder Kashyap ³	¹ Department of Physics, Govt. College Solan, Himachal Pradesh, India ² Department of Physics, Govt. College Paonta Sahib, Himachal Pradesh, India ³ Department of Chemistry, Govt. College Solan, Himachal Pradesh, India	Interaction of Benzene over Ag surfaces using first principle calculations
PS11 (Poster)	Alpana Thakur, Kanika Kumari, Priya, Chetna Kumari, Yogesh Singh	Department of Physics, MCM DAV College Kangra	Electrical, Thermal and Optical properties of Carbon Nanotubes: A Review

PS12 (Poster)	Sheetal Antil ^{1,2} , Manoj Kumar ³ , AS Maan ²	¹ Department of Physics, Hindu Girls College, Sonipat, 131001, India ² Department of Physics, Maharshi Dayanad University, Rohtak, 124001, India ³ Department of Physics, Govt. College for Women, Jind 126102, India	Spin orbit interaction effect on optical rectification of quantum wire in presence of electric and magnetic fields
PS13 (Poster)	Sheetal Antil ^{1,2} , Manoj Kumar ³ , AS Maan ²	¹ Department of Physics, Hindu Girls College, Sonipat, 131001, India ² Department of Physics, Maharshi Dayanad University, Rohtak, 124001, India ³ Department of Physics, Govt. College for Women, Jind, 126012, India	Influence of hydrostatic pressure for quantum wire in presence of magnetic field with spin orbit interaction
PS14 (Poster)	Pawan Kumar	Centre of Excellence, Govt. Degree College Sanjauli, Shimla.	First Principles Studies of Si Clusters

4. Mathematical Sciences

Abstract Number	Authors	Affiliations	Title of Paper
MS01 (Oral)	HC Taneja	Department of Applied Mathematics, Delhi Technological University, Delhi 110042	Information Theoretic Measure and Order Statistics
MS02 (Oral)	Satish Kumar	Department of Mathematics, Govt. Degree College Dharampur Solan	Construction of Maximum Distance Separable (MDS) Rhotrices from Cirulant Rhotrices
MS03 (Poster)	S Sivaprasad Kumar and Mridula Mundalia	Department of Applied Mathematics, Delhi Technological University, Delhi 110042, India	Coefficient Estimates for A Unified Class of Analytic Functions
MS04 (Poster)	Vijayata Pathania ¹ and Pallavi Joshi ²	¹ Department of Mathematics, H.P.U.R.C. Dharamshala 176218 ² Govt. Sr. Sec. School, Karasa,	Analysis of Rayleigh Waves in Thermoelastic Material with Voids under an Inviscid Liquid Half-Space

		Rohru	
MS05 (Poster)	Shweta Pathania	Department of Mathematics, M. C. M. D.A.V. College, Kangra (H.P.)	Modelling of axi -symmetric vibrations of plate in contact with liquid
MS06 (Poster)	Rajni Bala	Department of Mathematics, Punjabi University, Patiala, Punjab, India.	Semi generalized μ separation axioms in Generalized Topologies
MS07 (Poster)	Vijil Kumar	Indian Institute of Technology (Indian School of Mines), Dhanbad-826004, Jharkhand (India)	Particle Swarm Optimization Applied to Periodic Orbits
MS08 (Poster)	Rajni Sharma	DAV Institute of Engineering and Technology, Jalandhar	Analyzing a novel sixth order transformation method for finding multiple roots of nonlinear equations
MS09 (Poster)	Ashu Bahl	DAV college Jalandhar	Analysis of a novel sixth order method for solving nonlinear equations
MS10 (Oral)	Radhika Thakur ¹ and Moneesh Thakur ²	¹ Department of Basic Sciences, College of Forestry, Dr. Y. S. Parmar University of Horticulture and Forestry Nauni, Solan (Himachal Pradesh) ² Department of Veterinary Medicine, College of Veterinary Sciences and Animal Husbandry, Central Agricultural University, Selesih, Aizawl (Mizoram)	Study on Stable Lactation of Jersey Cross Breed

5. Environmental and Agriculture Sciences

Abstract Number	Authors	Affiliations	Title of Paper
ENV01 (Poster)	Nirankar Singh and Mohit Sharma	Department of Chemistry, Maharishi Markandeshwar (Deemed to be University), Mullana-133207, Ambala	Assessment of The Quality of Drinking Water Sources and Human Health in A Rural Area of Solan District, Himachal Pradesh
ENV02 (Poster)	Shriya, Sheetal Choudhary	School of Biological and Environmental Sciences, Shoolini University, Solan	Temperature stress mediated consequences on Morphology, Physiology and Secondary

	and Mamta Sharma	(Himachal Pradesh)	metabolites of <i>Datura stramonium</i> (L.)
ENV03 (Oral)	Pawan Kumar and Ritika Gangotia	Himalayan Forest Research Institute, Shimla	Habitat Preferences of Butterflies of Conifer Forests of Water Catchment Sanctuary Shimla, Himachal Pradesh
ENV04 (Poster)	Sanjeev Kumar, Kamal Sharma and Som Datt Sharma	College of Horticulture and Forestry, Neri, Hamirpur (Dr. Y. S. Parmar University of Horticulture and Forestry, Nauni, Solan) Himachal Pradesh	Cytogenetical study in <i>Pleurospermum brunonis</i> Benth. ex C.B. Clarke (Apiaceae) from district Sirmaur (H.P.) of the Western Himalayas, India.
ENV05 (Oral)	PC Pathania and Kailash Chandra	Zoological Survey of India, M-Block, New Alipore-700053, Kolkata (West Bengal)	Current Status of Microlepidoptera Diversity with Special Reference to Superfamily Tortricodea, From India
ENV06 (Poster)	Poonam Kumari and M.S. Thakur	Department of Biosciences, Himachal Pradesh University, Shimla, Himachal Pradesh-171005	Diversity and Abundance of Insect Pollinators of <i>Punica granatum</i> (Linnaeus) in Different Localities of Himachal Pradesh.
ENV07 (Poster)	Gaurav Sharma	Department of Biotechnology, Shoolini University, Solan, HP, India 174312	Soil analysis of different farming systems (conventional and in-conversion) in pea production in mid-hill condition of Himachal Pradesh (Solan)
ENV08 (Poster)	Gulshan Kumar and Hem Chander	Division Botany, Department of Bio-Sciences, Career Point University, Hamirpur (Himachal Pradesh)	Phyto-diversity and Ethnobotany of Angiospermic Flora of Bilaspur district (Himachal Pradesh), India
ENV09 (Poster)	Ranjan Sharma and Sanjay Sharma	P.G. Deptt. of Environmental Sciences, University of Jammu (Jammu and Kashmir)	A GIS based approach in drainage morphometric analysis of micro-watersheds of Jammu city and its environs (J&K), India
ENV10 (Oral)	Narender Sharma	Zoological Survey of India, Northern Regional Centre, 218, Kaulagarh Road, Dehradun – 248195 (Uttarakhand)	Role of genitalia in the identification of butterflies of the genus <i>Mycalesis</i> Hübner (Lepidoptera: Nymphalidae) from North West Himalaya
ENV11 (Poster)	Vishal Rana ¹ , Yogesh Kumar Walia ¹ and Vikas	¹ Department of Chemistry, School of Basic and Applied Sciences, Career Point University, Hamirpur (Himachal Pradesh)	Underground Water Contamination of Solan District of Himachal Pradesh: A Review

	Anand ²	² Thakur Post Graduate College of Education, Dhaliara, Kangra (Himachal Pradesh)	
ENV12 (Poster)	Priyanka Chauhan, Jyoti Dhatwalia and Amita Kumari	School of Biological and Environmental Sciences, Faculty of Basic Sciences, Shoolini University Solan (Himachal Pradesh)	Phytochemical Screening, Antioxidant, and Antibacterial Activity of Leaves of <i>Ficus auriculata</i> Lour. and <i>Osyris arborea</i> Wall. from Northern Himalayas
ENV13 (Poster)	Komal Sharma, Nidhi Chaudhary & Aniruddha Mitra	School of Biological and Environmental Sciences, Shoolini University of Biotechnology and Management Sciences, Solan (Himachal Pradesh)	Biofuel from cockroach and rice moth larva
ENV14 (Poster)	Zeba Manzar, Anjali Dhiman & Aniruddha Mitra	School of Biological and Environmental Sciences, Shoolini University of Biotechnology and Management Sciences, Solan (Himachal Pradesh)	<i>Drosophila</i> avoids bitter gourd extract in multiCAFE assay
ENV15 (Poster)	Swadeep Sood ^a and Deepak Pathania ^b	^a Department of Chemistry, Govt. Degree College Dhaliara. Himachal Pradesh-177103, India. ^b Department of Environmental Sciences, Central University of Jammu, Bagla (Jammu and Kashmir)	Photodegradation of congo red dye by Ag/ZnO nanocomposite of carboxymethyl cellulose hydrogel
ENV16 (Poster)	Yudhvir Singh ¹ , Bhallan Singh Sekhon ^{1*} , Madhu Sharma ² , Girdhar Gopal Soni ³ and Surbhi Sharma ⁴	¹ Department of Vegetable Science and Floriculture, Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya, Palampur (Himachal Pradesh) ² Department of Vegetable Science, Punjab Agricultural University, Ludhiana (Punjab) ³ ADVANTA India Ltd, Sonipat (Haryana) ⁴ Department of Agriculture, Government of Himachal Pradesh, Solan (Himachal Pradesh)	Exploring genetic mechanisms for developing Hybrids in economically important vegetables of Himachal Pradesh

ENV17 (Oral)	Shankharoop Ghoshal ¹ and SS Samant ²	¹ School of Biological and Environmental Sciences, Shoolini University, Solan (Himachal Pradesh) ² G. B. Pant National Institute of Himalayan Environment and Sustainable Development, Himachal Unit, Mohal, Kullu (Himachal Pradesh)	Krummholz Vegetation at the Alpine Treeline Ecotone Protecting Threatened Plant Species: Evidence from Western Himalaya
ENV18 (Poster)	Yourmila Kumari, DR Bhardwaj, Bhupender Dutt and Rishu Sharma	Dr. Y. S. Parmar University of Horticulture and Forestry, Nauni, Solan (Himachal Pradesh)	FOREST CERTIFICATION- a sustainable tool for forest management
ENV19 (Poster)	Anjna Sharma ¹ , Jadab Sharma ¹ , Indresh K. Maurya ²	¹ Center for Nanoscience and Nanotechnology, Panjab University, Chandigarh ² Department of Microbial Biotechnology, Panjab University, Chandigarh	High altitude medicinal plant extracts display potent antifungal activity against fungal spp.
ENV20 (Poster)	Seema Sharma*, Yash Pal Sharma and Pancy Thakur	Department of Forests Products, University of Horticulture and Forestry, Nauni, Solan (Himachal Pradesh)	Chemical studies in different parts of <i>Gloriosa superba</i> L.
ENV21 (Poster)	Mohd Issa ¹ , Harminder Pal Singh ¹ , Daizy R Batish ²	¹ Department of Environment Studies, Panjab University, Chandigarh ² Department of Botany, Panjab University, Chandigarh	Effect of <i>Vitex negundo</i> essential oil on the early seedling growth and oxidative metabolism of common weed- <i>Senna occidentalis</i>
ENV22 (Poster)	Pancy Thakur, YP Sharma, Ravinder Raina, Seema Sharma	Department of Forest Products, Dr. Y. S. Parmar University of Horticulture and Forestry, Solan (Himachal Pradesh)	<i>Valeriana jatamansi</i> : A gynodioecious medicinal herb of temperate Himalayas
ENV23 (Oral)	Pawan Kumar, PB Meshram and N Roychoudhary	Forest Protection Division, Tropical Forest Research Institute, P. O. RFRC, Jabalpur (Madhya Pradesh)	Insect Diversity of Mangrove Ecosystems of Bhitarkanika National Park, Odisha (India)

ENV24 (Oral)	Aniruddha Mitra, Tamanna Singh Thakur, Zeba Manzar, Anjali Dhiman & Riti Chauhan	School of Biological and Environmental Sciences, Shoolini University of Biotechnology and Management Sciences, Solan (Himachal Pradesh)	Bitter gourd extract – an environment friendly pest control agent for repelling fruit flies
ENV25 (Poster)	Vijay Singh	Department of Entomology, College of Horticulture and Forestry, Neri, Hamirpur (Himachal Pradesh)	Biological control agents (Phytoseiidae: Mesostigmata) fauna inhabiting sub-tropical fruit crops in Himachal Pradesh
ENV26 (Oral)	Christine Jeyaseelan	Amity Institute of Applied Sciences, Amity University, Noida (Uttar Pradesh)	Removal of Cr(VI) from water samples using dried and charred bagasse: A Comparative study.
ENV27 (Poster)	Sharma Shilpa, Vishwakarma, GS, Kumar Ravishankar and Mittal, Sunil	Department of Environmental Science and Technology, Central University of Punjab, Bathinda (Punjab)	Encapsulation of Essential oil constituents inside β -cyclodextrin and physico-chemical characterization of the microparticles.
ENV28 (Poster)	Ravishankar Kumar, Shilpa Sharma and Sunil Mittal	Department of Environmental Science and Technology, Central University of Punjab, Bathinda (Punjab)	Assessment of Water Quality & Agricultural Soil Property in Fatehgarh Sahib District of Punjab, India
ENV29 (Oral)	Sunil Dhar*, Vikas Pathania**and Dinesh Kumar**	*Department of Environmental Sciences, Central University of Jammu Jammu, J&K State, 183301. India **Department of Geology, Government Post Graduate College, Dharamsala, Himachal Pradesh, 176 215, India	Assessment of retreating glaciers: a study of Chandra basin, Lahaul and Spiti district, Himachal Pradesh, India
ENV30 (Poster)	Kumari Neha, Jyoti, Tammana and Shankharoop Ghoshal	School of Biological and Environmental Sciences, Shoolini University, Solan (Himachal Pradesh)	Assessment of Carbon Stock of Pinus roxburghii Sargent Trees of Shoolini University Campus and an Adjacent Pure Forest

ENV31 (Poster)	Ajay Chhantyal ¹ , Abheek Sharma ¹ , Anuradha Sourirajan ¹ , Kamal Dev ^{1,2} , Vikas Kumar ²	¹ Faculty of Applied Sciences and Biotechnology, Shoolini University, Solan (Himachal Pradesh) India ² Department of Food Science and Nutrition, University of Minnesota-Twin Cities St. Paul (Minnesota) USA	Solvent extraction effects on phytochemical constituents profiles and antioxidant activities of <i>Vitex negundo</i>
ENV32 (Poster)	Savita Kumari & Arti Jamwal	Botany Division, Department of Biosciences, Career Point University, Hamirpur (Himachal Pradesh)	Drought Stress Consequences on Secondary Metabolites of Medicinal Plants
ENV33 (Poster)	Anand Giri and Deepak Pant	Department of Environmental Sciences, School of Earth and Environmental Sciences, Central University of Himachal Pradesh, Dharamshala, Kangra (Himachal Pradesh)	Isolation of carbonic anhydrase producing bacteria from Himalayan Soil
ENV34 (Poster)	Minakshi ¹ , Komal Arora ² and Rajneesh Kant Sachdev ³	¹ Department of Biotechnology, I. K. Gujral Punjab Technical University, Kapurthala (Punjab) ² Department of Botany, DAV College, Jalandhar (Punjab) ³ Department of Food Science, I. K. Gujral Punjab Technical University, Kapurthala (Punjab)	Bio-herbicidal Potential of Essential oil of <i>Callistemon</i> sp. for Weeds Management - A Review
ENV35 (Oral)	Madan L Verma	Department of Biotechnology, Dr Y. S. Parmar University of Horticulture and Forestry, Neri, Hamirpur, Himachal Pradesh- 177001, India	Nanobiotechnology for sustainable biofuel production
ENV36 (Poster)	Madhu Rana, MS Thakur	Department of Biosciences, Himachal Pradesh University, Shimla (Himachal Pradesh)	Taxonomic studies of insect pollinator on <i>Valeriana jatamansi</i> Jones, of different altitudinal populations in Shimla Hill, Himachal Pradesh
ENV37 (Poster)	Poonam Dhiman and MS Thakur	Department of Biosciences, Himachal Pradesh University, Shimla (Himachal Pradesh)	Diversity and Distribution of Insect Pollinators of <i>Prunus persica</i> (Linnaeus) in Shimla District, Himachal Pradesh

ENV38* (Poster)	Neha Bhatt	Gurukula Kangri Vishwavidyalaya, Haridwar	A Kinetic Spectrophotometric Study for Finding a Cost Effective Method for Removal of Aminophenols in Water Samples
*Moved to Chemical Sciences as CH 51			
ENV39 (Poster)	Ateendra Pande ^a , Ankush Chauhan ^b and Rajesh Kumar ^{b,c}	^a School of Biological and Environmental Sciences, Shoolini University, Solan (HP)-173212 ^b School of Physics and Materials Science, Shoolini University, Solan (HP)-173212 ^c Himalayan Centre of Excellence for Renewable Energy, Shoolini University, Solan (HP)-173212	Environmental Sustainability Aspects of Light Emitting Diodes
ENV40 (Poster)	Anil Kumar ¹ , Dhananjay Mondal ² , Man Singh ²	¹ School of Nano Sciences, School of Chemical Sciences, Central University of Gujarat, Gandhinagar, Gujarat, India ² School of Chemical Sciences, Central University of Gujarat, Gandhinagar, Gujarat, India	Synthesis of silica nanoparticles and applied for purification of biodiesel
ENV41 (Poster)	Pihu Gupta and Deepika Slathia	Department of Environmental Sciences, University of Jammu, Jammu-180006	Changes in physicochemical properties of soil on application of different prepared composts
ENV42 (Poster)	Preet Pratima ^{1*} and N Sharma ²	¹ Department of Fruit Science, Dr. Y. S. Parmar, University of Horticulture and Forestry, Nauni, Solan (H.P.) 173230 ² Dean (Retd.), College of Horticulture, Dr. Y. S. Parmar, University of Horticulture and Forestry, Nauni, Solan (H.P.) 173230	Effect of deficit irrigation on proline, free amino acids and stomatal characteristics in various kiwifruit cultivars
ENV43 (Poster)	Niranjan Singh ¹ , Dharam Paul Sharma ¹ , Rajesh Kaushal ² , Kishore Kumar Thakur ¹ ,	¹ Department of Fruit Science, Dr. YS Parmar University of Horticulture and Forestry, Nauni, Solan-173230 Himachal Pradesh, India ² Department of Soil Science and Water Management, Dr. Y. S. Parmar University of Horticulture and Forestry,	Control of Apple Replant Problem with rootstocks and soil agro- techniques in Himachal Pradesh

	Sudarshna Kumari ³ and Neeraj Sankhyan ⁴	Nauni, Solan (H.P.), India – 173230 ³ Department of Plant Physiology, G. B. Pant University of Agriculture & Technology, US Nagar-263145 Uttarakhand, India ⁴ Department of Basic Sciences, Dr. YS Parmar University of Horticulture and Forestry, Nauni, Solan-173230 Himachal Pradesh, India	
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6. Polymer and Material Sciences

Abstract Number	Authors	Affiliations	Title of Paper
PMS01 (Poster)	Chetna Verma ¹ , Poonam Negi ² , Deepak Pathania ³ , Bhuvanesh Gupta ⁴	¹ Department of Chemistry, Shoolini University, Solan, HP, India ² Department of Pharmacy, Shoolini University, Solan, HP, India ³ Department of Environmental Sciences, Central University of Jammu, JK ⁴ Bioengineering Laboratory, Department of Textile Technology, Indian Institute of Technology, New Delhi-110016, India	Smart Biopolymer by graft functionalization of Tragacanth Gum
PMS02 (Oral)	Jincy Joy ^{1,2} , Alok R Ray ² , Bhuvanesh Gupta ¹	¹ Bioengineering Laboratory, Department of Textile Technology, Indian Institute of Technology, New Delhi-110016, India ² Centre for Biomedical Engineering, Indian Institute of Technology, New Delhi-110016, India	Hybrid Trilayered Vascular Graft based on Electrospun Gelatin for Small Diameter Blood Vessel Regeneration
PMS03 (Poster)	Sudha, Jyoti Chaudhary	Department of Polymer Science, Mohan Lal Sukhadia University, Udaipur (Raj.)	Synthesis of Acrylamide – Guar Gum – Methylmethacrylate (MMA) Based Bio-Degradable Hydrogel for Wastewater

			Treatment Application
PMS04 (Oral)	Archana	Chandigarh Group of Colleges, Landran, Mohali	Carbon Nanotube Properties and Application for Removal of Heavy Metal Ions: A Review Paper
PMS05 (Poster)	Saurabh Sharma, Kuldeep Kumar	Department of Chemistry, Career Point University Hamirpur (H.P.) INDIA-176041	Green Synthesis of ZnO Nanoparticles by using Plant Extract: Effect of pH
PMS06 (Oral)	Jitender Paul Sharma	Department of Physics, Gautam College Hamirpur (affiliated with HPU Shimla), H.P., India.	Optimization of polymer electrolytes with the effect of concentration of additives in PEO-NH ₄ HF ₂ based polymer electrolytes
PMS07 (Poster)	Balbair Singh Kaith, Preeti Mehta	Department of Chemistry, Dr. B.R. Ambedkar National Institute of Technology, Jalandhar, 144011 Punjab, India.	Gamma radiations fabricated semi-IPN: characterization and application as site specific drug release device
PMS08 (Poster)	Amit Kumar Sharma ^a , Balbair Singh Kaith ^a , Bhuvanesh Gupta ^b , Uma Shanker ^a , Vaishali Tanwar ^a	^a Department of Chemistry, Dr B R Ambedkar National Institute of Technology, Jalandhar (Punjab), India. ^b Department of Textile Technology, Indian Institute of Technology, New Delhi-110016, India.	RSM-CCD optimized fabrication of an eco-friendly ZnS nanocomposite adsorbent for the effective removal of Biebrich Scarlet and Crystal Violet: kinetic, equilibrium and thermodynamic studies
PMS09 (Poster)	Latesh Taneja, Neeraj Dahiya	Department of Physics, Hindu Girls College, Sonipat, Haryana, India	Study of properties of Ag-NPs for various applications using nanofluid interferometer
PMS10 (Poster)	Priya Bhalla ¹ , Balbair Singh Kaith ¹ , Uma shanker ¹ , Bhuvanesh Gupta ²	¹ Department of Chemistry, Dr. B. R. Ambedkar National Institute of Technology (NIT) Jalandhar (Punjab), India ² Bioengineering Laboratory, Department of Textile Technology, Indian Institute of Technology, New Delhi 110016	Response surface methodology directed synthesis of photocatalytic nanocomposite hydrogel for the effective removal-degradation of toxic dyes
PMS11 (Poster)	Susheel Kalia	ACC Wing, Indian Military Academy, Dehradun 248007, India	Poly(butylene succinate)-based Composites Reinforced with Enzymatically treated Curaua

			Fibers
PMS12 (Poster)	Manita Thakur, Suresh Kumar, Santosh Kumari	Department of Chemistry, Maharishi Markandeshwar University, Solan 173229, Himachal Pradesh, India	Synthesis of Polyacrylamide-Stannic (IV) arsenate nanocomposite ion exchanger: Enhanced photocatalytic activity
PMS13 (Oral)	Ravindra Chougale	Post-Graduate Department of Studies in Chemistry, Karnatak University, Dharwad-580 003,	Influence of TiO ₂ Nanoparticles on the Tensile Properties of PVA Films: A study
PMS14 (Poster)	Manjot Kaur ^a , Paviter Singh ^a , Ramovatar Meena ^b , Akshay Kumar ^a	^a Advanced Functional Materials Laboratory, Department of Nanotechnology, Sri Guru Granth Sahib World University, Fatehgarh Sahib-140 406, Punjab, India. ^b Nanotoxicology Laboratory, School of Environmental Sciences, Jawaharlal Nehru University, New Delhi-110 067, India	Nanostructured Aluminium Nitride for biomedical applications
PMS15 (Poster)	Ajay Kumar ^a , Deepak Pathania ^b , Amit Kumar ^c	^a Department of Chemistry, IEC University, Baddi, Himachal Pradesh, India ^b Department of Environmental Sciences, Central University of Jammu, Rahya-Suchani, Bagla Distt., Samba 181143, Jammu and Kashmir, India ^c Functional Materials, Nanshan District Key Laboratory for Biopolymers and Safety Evaluation, Shenzhen University, Shenzhen 518060, PR China	Nano ternary heterostructure of Ag ₀ /RGO/Bi ₂ O ₂ CO ₃ /ZnFe ₂ O ₄ for the solar light assisted photocatalysis of Cetirizine
PMS16 (Poster)	Kajal Sharma ^a , Ajay Kumar ^{a*} , Deepak Pathania ^b , Amit Kumar ^c	^a Department of Chemistry, IEC University, Baddi, Himachal Pradesh, India ^b Department of Environmental Sciences, Central University of Jammu, Rahya-Suchani, Bagla Distt., Samba 181143, Jammu and Kashmir, India	Biochar templated Ag ₀ /CuFe ₂ O ₄ /RGO ternary photocatalysts for the solar assisted degradation of 2-methyl-chlorophenoxy acetic acid

		^c Functional Materials, Nanshan District Key Laboratory for Biopolymers and Safety Evaluation, Shenzhen University, Shenzhen 518060, PR China	
PMS17 (Poster)	Ramanjit Kaur, N C Kothiyal, Jasman Singh	Nanosurface and Environmental Chemistry Laboratory, Department of Chemistry, Dr B R Ambedkar National Institute of Technology, Jalandhar – 144011 (Punjab), INDIA	Studies on early age hydration of cement mineralogical compounds incorporating carbon nanomaterials with the help of powdered X-Ray diffraction
PMS18 (Poster)	Anshu Sharma ¹ and Abhishek Awasthi ²	¹ Department of Physics, Maharaja Agrasen University, Baddi ² Department of Biotechnology, Maharaja Agrasen University, Baddi	Structural and Magnetic Properties of Cobalt Ferrite Nanoparticles Synthesized Using Okra Plant Extract
PMS19 (Poster)	Prianka Sharma & Sunaina	Department of Physics, Maharaja Agrasen University, Solan, H.P.	Structural & Optical properties of Mn-doped Tin Oxide Thin Films at Different Annealing Temperatures.
PMS20 (Poster)	Chhavi, Archna Rani	Department of Applied Chemistry, Delhi Technological University, Shahbad Daultpur, Main Bawana Road, Delhi, 110042, India	Development of Bio-Degradable Packaging Film of Nanocellulose Reinforced PVA For Food Packaging Application Using Agro Waste Sugarcane Bagasse
PMS21 (Poster)	Sahil Goel ^a , Nidhi Sinha ^b , and Binay Kumar ^a	^a Crystal Lab, Department of Physics & Astrophysics, University of Delhi, Delhi- 110007, India ^b Department of Electronics, SGTB Khalsa College, University of Delhi, Delhi- 110007, India	2D Yttrium-Doped Porous Nanosheets Based Ultra-Sensitive Flexible Piezoelectric Nanogenerator
PMS22 (Poster)	Sarvjeet Kaur	Department of Chemistry, IEC University, Baddi, Himachal Pradesh, India	Modification of activated carbon by pectin coating for zinc removal
PMS23 (Poster)	Anu ¹ , Naveen Thakur ² , Jitender Kumar ³	^{1,2} Department of physics, Career Point University, Hamirpur (H.P.) INDIA ³ Department of physics, Govt. Degree College Drang at Narla, Mandi (H.P.) INDIA	Antimicrobial study of (Zn, Co) co-doped copper oxide nanoparticles synthesized by using microwave assisted method

PMS24 (Poster)	Manisha ^a , Ajay Kumar ^a , Deepak Pathania ^b Amit Kumar ^c	^a Department of Chemistry, IEC University, Baddi, Himachal Pradesh, India ^b Department of Environmental Sciences, Central University of Jammu, Rahya-Suchani, Bagla Distt., Samba 181143, Jammu and Kashmir, India ^c Functional Materials, Nanshan District Key Laboratory for Biopolymers and Safety Evaluation, Shenzhen University, Shenzhen 518060, PR China	Magnetic Nano-heterostructured assembly of CoFe ₂ O ₄ /Cu ₂ O/g- C ₃ N ₄ for the visible light driven photocatalysis of Malathion
PMS25 (Poster)	Rachna ¹ , Uma Shanker ¹	Department of Chemistry, Dr B R Ambedkar National Institute of Technology Jalandhar, Punjab, 144011	Enhanced photocatalytic degradation of chrysene by ZnO@ZnHCF nanocubes
PMS26 (Poster)	Lalit Gularia ¹ and Deepak pathania ²	¹ Department of Chemistry, Govt. Degree College Bhorang, Hamirpur ² Department of Environmental Sciences, Central University of Jammu, Bagla (Rahya- Suchani), Distt. Samba, Jammu & Kashmir – 181143, India	Nanocomposite ion exchanger for separation and removal of heavy metal ions
PMS27 (Oral)	Atul Soni ¹ , Manish Kumar ¹ , Sunil Kumar ² , Samjeet Singh Thakur ³	¹ Department of Chemistry, Sri Sai University, Palampur, India ² Department of Chemistry, Govt. Degree College, Khundian, Kangra, India ³ Department of Chemistry, Govt. Degree College, Jogindernagar, Kangra, India	Synthesis of quantum confined copper oxide nanostructure
PMS28 (Poster)	Rohit Jasrotia ¹ and Virender Pratap Singh ^{1,2}	¹ School of Physics & Materials Science, Shoolini University, Bajhol, Solan, India ² Department of Physics, Govt. Degree College, Nerwa, Shimla. India	Analysis of Structural, optical and magnetic behaviour of Silver substituted Mg-Mn ferrite nanomaterials by sol-gel technique

PMS29 (Poster)	Monika Chandel ¹ , Virender Pratap Singh ^{1,2} and Mahavir Singh ³	¹ School of Physics & Materials Science, Shoolini University, Bajhol, Solan, India ² Department of Physics, Govt. Degree College, Nerwa, Shimla. India ³ Department of Physics, Himachal Pradesh University, Shimla-171005	Role of La/Ni substitution on the structural and magnetic properties of Y-type (Sr _{2-y} La _y Co ₂ Ni _x Fe _{12-x} O ₂₂) nanohexaferrites
PMS30 (Poster)	Kirti Singha ¹ , Virender Pratap Singh ¹ , Arun Kumar ² and M. Singh ²	¹ School of Physics, Shoolini University, Bajhol, Solan, India. ² Department of Physics, Himachal Pradesh University, Shimla-171001.	Effect of Ho/Ni/Mn dopants on structural and magnetic properties of Ba-Sr Z-type nanohexaferrite Ba _{1.5} Sr _{1.5} Co _{2-z} HozMnxNiyFe _{24-x-y} O ₄₁ (where x = y = 0.0, 0.1, 0.2, 0.3 & z = 0.0, 0.05, 0.10, 0.15, 0.20) nanoparticles matrix synthesized by Sol-gel auto combustion technique
PMS31 (Poster)	Rajneesh Kumar ¹ and VS Rangra ²	¹ Department of Physics, Govt. Degree College, Amb (HP), INDIA ² Department of Physics, Himachal Pradesh University, Shimla-5, INDIA	Far Infra- red study of Se ₉₂ Te _{8-x} Sn _x (x=0, 2 and 4) chalcogenide glasses
PMS32 (Poster)	Rajeev Kr Sharma ¹ , Rajesh Kumar ^{2,3}	1PG Department of Chemistry, DAV College, Jalandhar, Punjab- 144008 2I.K. Gujral Punjab Technical University, Kapurthala- Jalandhar Highway, Kapurthala, Punjab, India-144601 3PG Department of Chemistry, Jagdish Chandra Dayanand Anglo Vedic (JCDAV) College, Dasuya, Punjab, India-144205	2-Acrylamido-2-methylpropane sulfonic acid and Acrylic acid (AAc) grafted cellulose for metal ions sorption applications
PMS33 (Poster)	Rajesh Kumar ^{1,2} , Anirudh P. Singh ¹ , Rajeev Kr Sharma ³	¹ I.K. Gujral Punjab Technical University, Kapurthala- Jalandhar Highway, Kapurthala, Punjab, India-144601 ² PG Department of Chemistry, Jagdish Chandra Dayanand	Toxic metal ions sorption applications of 2-acrylamido-2-methylpropane sulfonic acid (AASO ₃ H) and glycidyl methacrylate (GMA) grafted cellulose

		Anglo Vedic (JCDAV) College, Dasuya, Punjab, India-144205 ³ PG Department of Chemistry, DAV College, Jalandhar, Punjab- 144008	
PMS34 (Oral)	Lalita	University Institute of Sciences, Chemistry Department, Chandigarh University, Gharuan, Mohali, Punjab 140413 INDIA	Applications of graft copolymers of AAc and binary comonomers onto chitosan in metal ions removal from aqueous solution.
PMS35 (Poster)	KK Choudhary ¹ , Uttam Sharma ² , Sachin S Chauhan ² , Jayshree Sharma ³ , AK Sanyasi ⁴ , J Ghosh ⁴ , Netram Kaurav ⁵ and SK Ghosh ⁶	¹ Army Cadet College, Indian Military Academy, Dehradun - 248007, India ² Department of Physics, Shri Vaishnav Institute of Technology and Science, Indore, India ³ Department of Physics, M.B. Khalsa College, Indore 452009, India ⁴ Institute for Plasma Research, Bhat, Gandhinagar 382 428, India ⁵ Department of Physics, Govt. Holkar Science College, Indore, India ⁶ School of Studies in Physics, Vikram University, Ujjain, India	Development of High Temperature Thermoelectric Materials Using Plasma Enhanced Chemical Vapour Deposition Technique
PMS36 (Poster)	Ritesh Verma ^a , Allah Dekama Jara ^a , Nisha Kumari ^a , Rahul Kalia ^a and Rajesh Kumar ^{a,b}	^a School of Physics and Materials Science, Shoolini University, Solan (HP)- 173212 ^b Himalayan Centre of Excellence for Renewable Energy, Shoolini University, Solan (HP)-173212	Fabrication and Characterization of Lead Free Polycrystalline Sample of Ba _{1-x} Mg _x TiO ₃ (x = 0.05, 0.10, 0.15) for Ferroelectric Applications
PMS37 (Poster)	Ankush Chauhan ^a , Satwinder Kour ^a , Anand Sharma ^a and Mamta	^a School of Physics and Materials Science, Shoolini University, Solan (HP)- 173212 ^b Himalayan Centre of Excellence for	Synthesis and Characterization of Barium Zirconium Titanate, BaTi _{0.95} Zr _{0.05} (BZT) by Hydrothermal Method

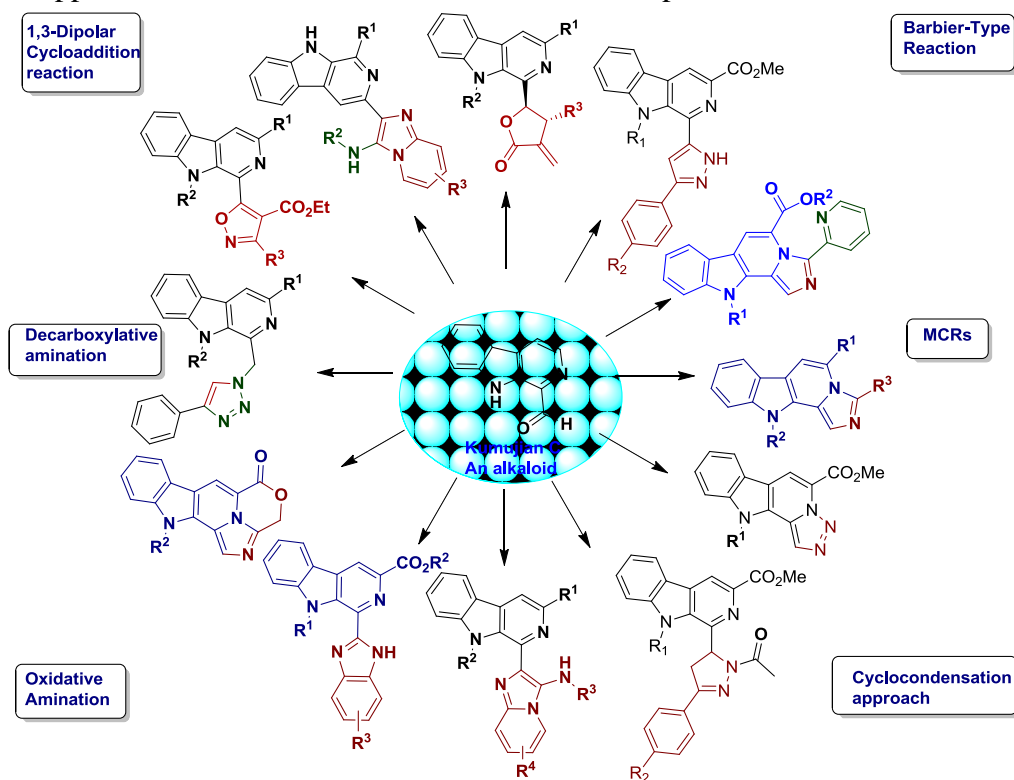
	Shandilya ^{a,b}	Nanotechnology, Shoolini University, Solan (HP)-173212	
PMS38 (Poster)	Pankaj Thakur ^{a,b} , Kritika Sood ^{a,b} , Rajesh Kumar ^{a,c}	^a Himalayan Center of Excellence in Nanotechnology, Shoolini University, Solan ^b School of Chemistry, Shoolini University, Solan ^c School of Physics & Material Science, Shoolini University, Solan	Biodegradable Cationic Gemini Surfactants, Gene Transfection & Gene Therapy: A Review
PMS39 (Poster)	D Thakur ¹ , A Sharma ¹ and DS Rana ²	¹ Department of Physics, Maharaja Agrasen University, Baddi, Solan, India ² Department of Environment Science, Central University of Himachal Pradesh, Dharamshala, India	Synthesis, Characterization and Enhanced photocatalytic degradation of dyes using Zinc oxide nanostructures
PMS40 (Poster)	DS Rana and N Thakur	Department of Physics, Himachal Pradesh University, Shimla-5, India	MoS ₂ and rGO-MoS ₂ Hybrids as Potential scaffold for the fabrication of hydrazine sensor
PMS41 (Poster)	Lavanya Tandon, Poonam Khullar	Department of Chemistry, B.B.K. D.A.V. College for Women, Amritsar 143001, Punjab, India.	Colloidal Gold Coated Silica Hybrid Nanoparticles-Protein Extraction and Cytotoxicity Abilities
PMS42 (Oral)	^{1,4} Allah Dekama Jara, ^{1,3} Mamta Shandilya and ^{1,2} Rajesh Kumar	¹ School of Physics and Materials Science, Shoolini University, Solan (HP)-173212 ² Himalayan Centre of Excellence for Renewable Energy, Shoolini University, Solan (HP)-173212 ³ Himalayan Centre of Excellence for Nanotechnology, Shoolini University, Solan (HP)-173212 ⁴ Hawassa University College of Natural and Computational Science, Ethiopia	Ab-initio study of Graphite Nanostructures for Spintronics Applications

Chemical Sciences

Department of Chemistry, Dr. B R Ambedkar National Institute of Technology, Jalandhar
144011, India

β -Carboline containing alkaloids are ubiquitously present in nature including plants, marine organisms, insects, mammals including human tissues and body fluids. These alkaloids are constitutionally a large group of indole alkaloids with different degree of aromaticity. This class of alkaloids is especially known to intercalate with DNA and display activities against cancer, CNS and infectious disorders. Owing to their immense significance, synthesis of a variety of β -carboline derivatives has been a subject of intense research. Though there exists several elegant strategies for the synthesis of this molecular framework, we have developed a surrogate approach for the Diversity-oriented synthesis of this skeleton. It was envisaged that 1-formyl-9*H*- β -carboline (an alkaloid (Kumujian C) isolated from picrasama quassoids) may serve as a potential precursor for obtaining β -carboline-derivatives containing D-ring.

In this context, we have engineered an efficient, scalable and economic approach for the synthesis of 1-formyl-9*H*- β -carboline; a potential Aldo-X bifunctional Building Block. This precursor has been demonstrated to be a useful template for the facile synthesis of variety of β -carboline C-1 tethered and C-1 N-9 and C-1 N-2 fused molecular hybrids via utilization of established approaches. The results of these studies shall be presented and discussed.



A comparative Study of corrosion inhibition of mild steel by corrosion inhibitors

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In order to study synergistic effect, various combinations of caffeine, acetamide and benzalkonium chloride (BKC), ammonium ceric nitrate, myristic acid were investigated as corrosion inhibitors for mild steel. Mild steel is the raw material for the construction and fabrication of weapons and equipments. Corrosion rate and percentage inhibition efficiency of various combination of corrosion inhibitors (100, 200, 300 ppm) of different concentration of caffeine, acetamide, benzalkonium chloride (BKC), ammonium ceric nitrate, myristic acid in 0.01 M H₂SO₄ at two different temperature 298K and 318K by weight loss method and SEM. The results obtained revealed that value of inhibition efficiency decreases to a large rate in case of myristic acid and acetamide but to a slight decrease in case of BKC with the increase in temperature. The protection of metals from corrosion is analyzed by many technologies such as weight loss, Scanning Electron Microscope (SEM).

Synthesis of Quinoxalines by Copper-Catalyzed Oxidative Annulation of *o*-Phenylenediamines with 2-Phenylethylamines

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Quinoxaline, represents one of the well-known and important class of *N*-heterocyclic compounds, exhibits broad spectrum of biological and pharmacological properties. This scaffold is also an active core unit of several antibiotics, pesticides, herbicides, fungicides and functional materials.¹ In addition, quinoxaline moiety found in a variety of drug candidates such as brimonidine, clofazimine and varenicline. In consequent to these important applications, a large number of synthetic approaches have been developed to construct quinoxalines. Among these methods, condensation of α -diketones with 1,2-diamines, oxidative cyclization of phenylacyl bromides with diamines, and reaction of alkynes or ketones with 1,2-diamines via an oxidation process, have widely been used.²

As a part of our ongoing research on the transition-metal catalyzed oxidative cross-coupling/annulation reactions, we recently investigated a novel approach for the construction of quinoxalines from oxidative annulations of *o*-phenylenediamines with 2-phenylethylamines using copper catalyst in presence of molecular oxygen as an oxidant at room temperature.² We used less toxic and inexpensive copper(I) bromide and molecular oxygen as sole oxidant. Our approach is practical for large scale synthesis. This reaction has a broad substrate scope and exhibits excellent functional group tolerance. By using this approach, we could synthesize

several biologically active molecules, which are selective inhibitors of the platelet derived growth factor (PDGF) receptor kinase and the PDGF dependant DNA synthesis in Swiss 3 T3 cells. We will present the above described results in detail in this conference.

CH04

AQUEOUS SURFACTANT SOLUTION: AN IDEAL MEDIUM FOR RESTRICTING THE NANOPARTICLE'S GROWTH

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In aqueous solution, the surfactants exhibit a characteristic property to adsorb at the surface/interface, which involves transfer of surfactant molecules from bulk solution phase to the surface/interface. This adsorption tendency of surfactants is being exploited in stabilization of the Nanoparticles (NPs) synthesized through colloidal chemistry routes. In present research, colloidal HgS NPs with average sizes below 15 nm have been synthesized using simple chemical precipitation method in aqueous solutions of different surfactant. Three cationic surfactants of varying hydrophobic chain length and three anionic surfactants having different head group moieties have been tested. All these surfactants have been proven to produce well dispersed spherical shaped HgS NPs. The HgS NPs exhibited broad featureless UV-vis spectra which have been blue shifted as compared to bulk HgS due to nearly discrete energy states. The E_g values indicate marginal semiconducting characteristic of HgS NPs. The growth rate of the NPs has been significantly controlled by the nature of surfactant. However, the NPs in the powder form exhibit β -HgS phase irrespective of the surfactant used. The self-aggregation of NPs has been prevented by surfactant coating at the NP surface due to changed inter-particle potential. Further, it has been shown that the stabilizers (surfactants) have some preferred chemical moiety which binds the NP surface, hinders their unlimited growth, and eventually generates a preferred size of particles.

CH05

Behavior of Antihistaminic Drug in Aqueous Solutions of Various Inorganic Halides: Volumetric and Viscometric Studies

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The micellization behavior of an antihistaminic drug, diphenhydramine.HCl in aqueous solutions of inorganic halides has been investigated as a function of temperature ranges from 298.15-313.15 K, at an interval of 5 K by employing volumetric and viscometric measurements. The

behavior of drug has been investigated in presence of various inorganic halides viz. NaCl, KCl and RbCl ($0.01 \text{ mol}\cdot\text{kg}^{-1}$), and MgCl_2 , CaCl_2 and SrCl_2 ($0.002 \text{ mol}\cdot\text{kg}^{-1}$) in terms of solute-solute and solute-solvent interactions. The volumetric data have been used to calculate apparent molar volume (ϕ_v), isentropic compressibility (κ_s) and apparent molar compressibility (ϕ_κ), whereas parameters like viscosity of solution (η_s), relative viscosity (η_r) and viscous relaxation time (τ) have been computed from viscosity values. The variation of derived parameters with type of electrolytes and temperature has been attributed to drug-electrolytes interactions pertaining in water-electrolyte-drug ternary system.

CH06

Calcium Chloride influencing the Solvation Behavior of Caffeine, Theophylline and Theobromine: Volumetric, Acoustic, Viscometric and Calorimetry Approach

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The density (ρ), speed of sound (u), viscosity (η) and enthalpy of dilution (q) measurements for methylxanthines (caffeine, theophylline and theobromine) in aqueous solutions of (0.10 - 1.00) $\text{mol}\cdot\text{kg}^{-1}$ CaCl_2 covering a temperature range $T = (288.15 \text{ to } 318.15) \text{ K}$ and at $p = 101.325 \text{ kPa}$ have been accomplished using a density and sound velocity meter, Micro-Ubbelohde type capillary viscometer and Isothermal Titration Calorimetry, respectively. Transfer parameters evaluated from the data suggest that competition among various interactions exists at low and high molalities of $\text{CaCl}_{2(\text{aq})}$ solutions. The increase in bitterness and decrease in hydration number of methylxanthines with the m_B values have been observed. The dehydration effect of $\text{CaCl}_{2(\text{aq})}$ at low molalities on the methylxanthines has also been established using ITC.

CH07

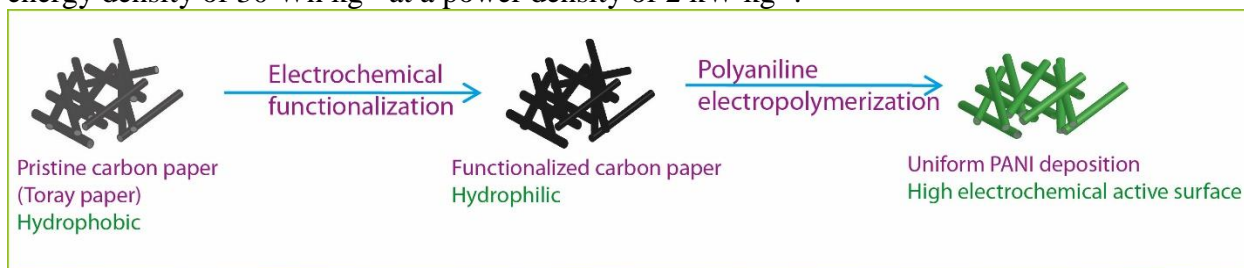
Induction of Superhydrophilicity in Polyaniline through Electrochemical Functionalization of Carbon Fiber Core in a Polyaniline-Carbon Fiber Composite for High Rate Electrochemical Capacitor

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Supercapacitors are highly desirable charge storage devices owing to their high-power density, simple construction, fast charge-discharge and long cycle life. However, low energy density has remained a pervasive issue for their widespread applications. Compared to carbon, conducting polymers like polyaniline, polyethylene dioxythiophene, polypyrrole, etc. show high energy density. Among conducting polymers, polyaniline (PANI) has very high theoretical capacitance of 2000 F g^{-1} . However, its practical capacitance has been limited by low electrochemically active surface area and unfavorable wettability towards aqueous electrolytes. In this paper, a strategy is demonstrated wherein high electrochemically active surface area of PANI has been achieved by the induction of superhydrophilicity together with the alignment of PANI exclusively on the surface of carbon fibers as a thin layer with minimal agglomeration.

Superhydrophilicity is induced in the carbon fibers by electrochemical functionalization of the Toray carbon paper, which further induces superhydrophilicity in the PANI layer electrodeposited on the carbon fibers and, thereby, ensuring high electrode-electrolyte interface. The carbon fiber paper is electrochemically functionalized by application of potential which generates a high electrochemically active surface as well as greater wettability (superhydrophilic) of the carbon fibers. Due to the strong interaction of anilinium chloride with the hydrophilic carbon fibers, PANI is deposited exclusively on the surface of the fibers without any appreciable aggregation or agglomeration of the PANI. The PANI-Toray paper assembly in the solid-state prototype supercapacitor can provide a high gravimetric capacitance of 1335 F g^{-1} as well as high areal capacitance of 1.3 F cm^{-2} at a current density of 10 A g^{-1} . The device also exhibits high rate capability delivering 1217 F g^{-1} at a current density of 50 A g^{-1} and a high energy density of 30 Wh kg^{-1} at a power density of 2 kW kg^{-1} .



CH08

Conductance and volumetric study to analyze the effect of vitamin C on the mixed micellization behavior of catanionic {sodium dodecylsulfate + cetyltrimethylammonium bromide} surfactants at variable temperatures

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The interactions among amphiphilic molecules and L-ascorbic acid (vitamin C) can be examined as models for the action mechanisms in multicomponent biological systems. The mixed micellar behavior of sodium dodecylsulfate (SDS) and cetyltrimethylammonium bromide (CTAB) at varying mole fractions of SDS has been studied in $(0.01\text{-}0.03) \text{ mol kg}^{-1}$ L-ascorbic acid_(aq) solutions using techniques viz., conductivity and density and sound velocity. From the CMC values of binary mixtures of surfactants, the degree of ionization (β) and thermodynamic parameters (ΔG_m° , ΔH_m° and ΔS_m°) have been evaluated at (298.15, 308.15, 318.15) K. Gibbs free energy (ΔG_m°) and enthalpy (ΔH_m°) of micellization values were observed to be negative; indicating that the process of aggregation was thermodynamically favorable. The positive values

for entropy of micellization (ΔS_m°) show that the process of micellization is entropically driven. Further, volumetric studies show that the hydrophilic-ionic interactions play a key role in the solubilization of the L-ascorbic acid in the mixed micellar system.

CH09

Intermolecular Interactions and Micellar properties of CTAB and DTAB in aqueous solutions of Antibiotic drug Cefepime at different temperatures: Volumetric and Compressibility Studies

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In this article, we have reported the interaction between Cefepime and CTAB (Cetyltrimethylammonium Bromide) / DTAB (Dodecyltrimethylammonium Bromide) with particular focus on the interaction mechanism and physico-chemical properties of the yielding drug-surfactant aggregates. Densities (ρ) and speeds of sound (u) of CTAB (cetyltrimethylammonium bromide) in aqueous solutions of Cefepime (0.001, 0.005, and 0.010 mol·kg⁻¹) have been measured at different temperature (293.15 - 313.15 K) at an interval of 5 K. The volumetric and compressibility parameters such as apparent molar volumes (V_ϕ), adiabatic compressibility, κ_s , apparent molar isentropic compression ($\kappa_{\phi,s}$), have been obtained from the experimental data for CTAB and DTAB in different solutions of Cefepime at different temperatures. These parameters have been further provide reasonable estimate for the critical micellar concentration of the surfactant, the affinity or binding constant for the interaction of drug with an equivalent micellar structure and the loading capacity of the equivalent micellar structure. These observations are potentially significant for drug formulation of poorly bioavailable drugs in pharmaceutical industries.

CH10

Behaviour of Cationic Surfactant in the Presence of Quaternary Ammonium Based Ionic Liquids (ILs): Micellar and Microbial Activity

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New series of quaternary ammonium based ionic liquids (ILs) containing tetraalkylammonium cation [R_4N^+ , where R (alkyl) = Pr (propyl), Bu (butyl) and Pen (pentyl)] has been synthesized by simple ion exchange method and characterised by NMR as well as FT-IR analysis. Then the impact of these different ILs on the micellar behaviour of cationic surfactant, DTAB

(Dodecyltrimethylammonium bromide) has been investigated in the temperature range (288.15 to 318.15) K by measuring the specific conductivities (κ) of the solutions. From the conductivity versus [surfactant] plots, critical micellar concentration (*CMC*) of surfactant has been determined. The observed variation in *CMC* has been discussed in terms of structural modulation in surfactant-IL complex caused by these additives. Further the thermodynamic parameters of micelle formation have been determined from temperature dependence of *CMC*. All the calculated parameters have been used to elucidate the electrostatic and hydrophobic contributions of IL for the building up of the micellar aggregates of the surfactant. The effect of these ILs on the antibacterial activity of surfactants has also been tested by measuring zone of inhibition and minimum inhibitory concentration (*MIC*) for DTAB in the presence of ILs against gram positive and gram-negative bacterial species.

CH11

Spectroscopic Analysis of Binding of Curcumin with Surfactant like Imidazolium based Ionic Liquid

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The present study reveals the modulation of photophysical properties of curcumin (an important drug for numerous biomedical applications) inside a micellar environment formed by ionic liquid (IL): 1-hexadecyl-3-methyl imidazolium chloride. It is known that the clinical applications of curcumin are severely limited because of its poor stability and low aqueous solubility (approx. 11 ng/ mL) under physiological conditions. To understand the physicochemical basis of interaction of curcumin with other biological/chemical molecules in a more appropriate manner, it is necessary to study its fundamental spectroscopic and physicochemical properties. The stability of the drug inside the IL-micelle can be calculated by using partition coefficient ($K_p = 4 \times 10^4$). Higher value of partition coefficient is attributed to the partition of drug from water phase to micellar environment. Remarkable change in fluorescence intensity with a strong blue-shift implies the gradual perturbation of intramolecular hydrogen bond (H-bond) present within the keto-enol moiety of the curcumin molecule and also, presence of curcumin inside IL-micellar environment of reduced polarity. The rate of degradation of curcumin is drastically decreased after partitioning into the IL-micelles. From the thermodynamic data, it can be inferred that curcumin is strongly bounded with the IL. Higher negative value of total free energy change ($-\Delta G$) implies that the binding interactions are thermodynamically favourable.

CH12

Triazole-tethered rhodamine based dual sensor for recognition of Cu^{2+} and Fe^{3+}

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Metal ions play an indispensable role in sustaining human life and precisely controlling the biological system and environment. Hence, recognition and sensing of metal ions have attracted attention of scientific community in the last few decades. Both Fe^{3+} and Cu^{2+} ions act as cofactor in many enzymatic reactions in human body. However, their excess accumulation becomes hazardous to human health and environment. The permissible amount in drinking water for Cu^{2+} and Fe^{3+} ions is 30 and $5.4 \mu\text{molL}^{-1}$ respectively as per W.H.O and U.S. Environmental Protection Agency. Nowadays, colorimetric or fluorimetric probes for detection of heavy metal ions have been reported due to their high sensitivity and selectivity. Among all metal sensors, rhodamine modified framework have emerged as effective sensor for Fe^{3+} and Cu^{2+} ions due to their long absorption and emission wavelength, large extinction coefficient, high fluorescent quantum yield, excellent photophysical properties and high stability towards light.

In this study, we have designed and developed triazole-tethered rhodamine based colorimetric and highly fluorescent probe for detection of Fe^{3+} and Cu^{2+} ions. The probe showed detection limit 1.09 and $2.50 \mu\text{M}$ for Fe^{3+} and Cu^{2+} ions respectively. The binding of ionic species could be easily detected by visual colour change. The binding mechanism, stoichiometry, selectivity of the probe towards Cu^{2+} and Fe^{3+} ions was well explored with various spectral techniques. The probe was also applied in living cells for monitoring of these two metal ions which further demonstrated its application in biological systems.

CH13

Investigating molecular interactions of Doxycycline Hyclate with aqueous LiCl Solutions at different temperatures: volumetric and acoustic approach

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The solution properties of Doxycycline Hyclate (DH) were investigated to explore molecular interactions with aqueous LiCl solutions at different temperatures. Apparent molar properties i.e apparent molar volume (Φ_V) and apparent molar isentropic compression (Φ_K) for DH within the concentration range (0.001-0.01) mol.kg^{-1} in (0.001, 0.01 and 0.15) mol.kg^{-1} aqueous LiCl solutions were calculated from experimentally measured densities (ρ) and Ultrasonic speed (u) values at $T=(298.15, 303.15, 308.15, 313.15 \text{ and } 318.15)\text{K}$ temperatures and at $P=101.325\text{kPa}$ pressure. The data of apparent molar properties were utilised to obtain various derived parameters such as partial molar properties (Φ_V^0 and Φ_K^0) and their experimental slopes (S_V and S_K), transfer partial molar properties ($\Delta_t\Phi_V$ and $\Delta_t\Phi_K$), hydration number(n_H) and Hepler's constant. The partial molar volume (Φ_V^0) and experimental slope (S_V) were obtained by using Masson's Equation which were interpreted for solute-solvent and solute-solute interactions respectively. The ultrasonic velocity of DH in water and aqueous LiCl solutions were used to determine adiabatic compressibility (β), intermolecular free length (L_f), and specific acoustic impedance(Z). The structure making/breaking ability of DH in aqueous LiCl were determined on the basis of Hepler's Equation. The volumetric and compressibility data suggests the existence of strong solute-solvent interactions in the studied systems.

Investigation of Molecular Interactions Studies of Binary Liquid Mixture by Ultrasonic Velocity, Density and Viscosity at 303.15 K and 308.15 K

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Molecular interaction studies using ultrasonic velocity, density and viscosity of the liquid binary mixture of iso butale alcohol and iso decyl alcohol with nitrotolune are reported at 303.15 and 308.15 J/ K over entire range of mole fraction. The molar volume (V^e) viscosity deviation and also isentropic compressibility can be calculated this values were substituted in Redlich kister type polynomial equation .

Palladium nanoparticles supported on triazine functionalised mesoporous covalent organic polymer as an efficient catalyst for Sonogashira coupling reaction

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A novel class of mesoporous covalent organic polymer (MCOP) was synthesised. The MCOP was fully characterized using powder X-ray diffraction analysis (XRD), ¹³C-solid state NMR spectroscopy, field emission scanning electron microscopy (FESEM), thermogravimetric analysis (TGA) and FT-IR. These nitrogen rich materials act as good supports for palladium nanoparticles (Pd NPs) and exhibit excellent catalytic activity towards Sonogashira coupling between aryl halides and alkynes. Hot filtration tests demonstrate that the presence of the triazine rings on the polymers is beneficial for enhancing the stability of Pd NPs. The polymers are also cheap, easy to synthesise and can be recycled up to five times with only a minor loss of activity.

Three-Dimensional TiO₂-AAPTMS@GO Nanocomposite: An Excellent Heterogeneous Catalyst for the Synthesis of 2,4,5-Triaryl-imidazoles

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A protocol for synthesis of TiO₂ over diamine functionalized graphene oxide (TiO₂-AAPTMS@GO) is described. The morphology, surface compositions, and textural properties of the catalyst were

investigated by a variety of physicochemical characterization techniques including High resolution transmission electron microscopy (HR-TEM), Field emission scanning electron microscopy (FE-SEM), X-ray diffraction (XRD), X-ray photoelectron spectroscopy (XPS), FT-IR and EDX methods. The catalyst exhibited superior catalytic activity in the one-pot synthesis of 2,4,5-triarylimidazoles with extraordinary stability and recyclability over at least five repeated catalytic test cycles.

CH17

Ligand free C-N coupling by using biomass derived carbon supported copper nanoparticles

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Left over fruit pulp waste was used to synthesis the mesoporous carbon material completely dispersed with copper oxide nanoparticles using hydrothermal carbonization method. The MC/CLP-Cu catalyst was characterized by various physicochemical techniques such as X-ray diffraction (XRD), transmission electron microscopy (TEM), scanning electron microscopy (SEM), X-ray photoelectron spectroscopy (XPS), RAMAN, EDX, and FT-IR. Finally, MC/CLP-Cu was used as a heterogeneous catalyst in N-arylation of indole/pyrrole with aryl halides under ligand free moderate conditions and was found to be an efficient, retrievable and reusable catalyst along with the advantage of higher yields of product, simple and cost effective method for N-Arylation.

CH18

Targeting neuronal Nitric Oxide Synthase (nNOS) enzyme: A key therapeutic target for treating neurodegeneration

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Nitric oxide (NO), a free gaseous signaling molecule, is involved in the regulation of the cardiovascular, nervous and immune system. The neurotransmitter function of nitric oxide mainly rely on dynamic regulation of its biosynthetic enzyme, nitric oxide synthase (NOS). There are three types of NOS, neuronal nitric oxide synthase (nNOS), endothelial nitric oxide synthase (eNOS) and inducible nitric oxide synthase (iNOS). Brain nNOS exists in particulate and soluble forms and the differential subcellular localization of nNOS due to the presence of PDZ domain may contribute to its diverse functions. Essentially, nNOS has evolved as important target in the therapy of neurodegenerative diseases including Parkinson's, Alzheimer's, Huntington's, and amyotrophic lateral sclerosis. Excessive production of Nitric oxide generates reactive nitrogen species (RNS). RNS cause nonspecific modification of protein, DNA and lipids which results in protein aggregates, DNA damages and changes in cell signaling leading to cell death. In the recent years, a lot of research had been undergone regarding the development of

selective molecules as nNOS inhibitors with few of them under clinical trials. Hence, nNOS inhibitors will provide boon for the treatment of various neurodegenerative diseases.

CH19

Uranium Distribution and its Risk Assessment in the Groundwater of Tarn-Taran district, Punjab

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Uranium has both radiological and toxicological properties, which is recognized as relevant pollutant in groundwater sources. The different sources of uranium can be natural or geogenic, mining or industrial activities and chemical based fertilizers used in agriculture. So, the objective of our present study is to study the uranium distribution in groundwater samples collected from Tarn-Taran district, Punjab along with its chemical and radiological threats to human population due to its ingestion residing in that area. This study has been carried out in a systematic manner in a grid-pattern in which the entire district was divided into grids of sample size $6 \times 6 \text{ km}^2$ and the sources chosen for the water collection were hand pumps and bore wells of varying depths. It was found that the uranium concentration lies within the range of $0.3 \text{ }\mu\text{g/L}$ to $223.6 \text{ }\mu\text{g/L}$ with the mean value of $35.2 \text{ }\mu\text{g/L}$. 44% and 17% of samples were found to be above than the maximum permissible limit of $30 \text{ }\mu\text{g/L}$ and $60 \text{ }\mu\text{g/L}$ given by WHO (2011) and AERB (2004) respectively. Risk assessment of uranium in groundwater has also been calculated using lifetime cancer risk, lifetime average daily dose and hazard quotient which is quite high than the permissible values recommended by AERB (2004). Further the correlations were found between the uranium concentration and different anions (such as carbonates/bicarbonates, chlorides, fluorides, nitrates, sulphates and phosphates) from which we can study the presence of different uranium complexes in the groundwater samples.

CH20

Volumetric, Viscometric and Acoustic behaviour of glycine and glycyglycine in aqueous organic acid at different temperatures

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Density (ρ), speed of sound (μ), and viscosity (η), measurements have been carried out on glycine and its dipeptide- glycyglycine ($0.05\text{-}0.40 \text{ mol kg}^{-1}$) in aqueous citric acid solutions ranging from pure water to $0.2, 0.4, 0.6$, and 0.8 mol kg^{-1} as a function of concentration at different temperatures ranging from 298.15 to 318.15 K have been determined. These data have

been utilized to calculate apparent molar volume (Φ_v), limiting apparent molar volumes (Φ_v^0), transfer volumes ($\Delta_{tr}\Phi_v^0$), viscosity-B-coefficients of Jones-Dole equation, apparent molar adiabatic compressibility ($\Phi_{k,s}$), limiting apparent molar compressibility ($\Phi_{k,s}^0$) and its transfer volumes ($\Delta_{tr}\Phi_{k,s}^0$) at infinite dilution. These stated parameters then further interpret to study the possible solute-solute & solute-solvent interactions and structural maker or breaker behaviour.

CH21

Adsorption behavior and photocatalytic mechanism of magnetic carbon supported nanohybrid for persistant aromatic pollutants from water system

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In laboratory scale experiment, we describe the remediation of noxious naphthalene (NP) and 2-naphthol (2-NP) from aqueous phase under visible irradiation. The activated carbon/ZnFe₂O₄ (AC/ZF) nanocomposite was synthesized by simple co-precipitation method. The various instrumental techniques such as Fourier transform infrared (FTIR) spectroscopy, X-ray diffraction (XRD) pattern, surface area analyzer Brunauer-Emmett-Teller (BET), vibrating sample magnetometer (VSM), field emission scanning electron microscopy (FESEM), high resolution transmission electron microscopy (HRTEM), small area diffraction (SAED) pattern, electron dispersive X-ray (EDX) and photoluminescence spectra (PL) were used to study the detailed anatomy of prepared nanocomposite. The XRD, HRTEM and SAED results indicated that AC/ZF composite has been prepared in nano-phase. The degradation of organic pollutants were studied by high resolution mass spectrometry (HR-MS), chemical oxygen demand (COD) and UV-visible (UV-vis) spectrophotometry. The degradation efficiency of 93.41% and 98.81% were recorded for NP and 2-NP using AC/ZF nanocomposite under synergetic adsorption-photocatalysis (AP) after 160 min of solar illumination, respectively. The augmented photocatalytic degradation of pollutants was mainly ensued due to mesoporous nature of nanocomposite and strongly improved charge separation efficiency of AC/ZF. The HR-MS of various intermediates observed during degradation has been studied in detail. Therefore, our investigations might expose a novel, economic and proficient photoactive material for the removal of highly noxious pollutants from water system.

Interactions of sodium valporate with Cationic surfactants: Calorimetric and Spectroscopic Approach

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Interactions of active pharmaceutical ingredients (API) with surfactant molecules remain an important research area due to the need to improve drug delivery systems. In present study, the various interactions present between a hydrophilic drug sodium valporate (SV) and cationic surfactants viz. tetradecyl trimethylammoniumbromide (TTAB), hexadecyl trimethylammonium bromide (HTAB) and cetylpyridinium chloride (CPC) in aqueous media have been explored by using various techniques. The partitioning of SV in the micelles of respective surfactants have been studied by using isothermal titration calorimeter (ITC) and various parameters like binding/partitioning constant (K), enthalpy, entropy, free energy and stoichiometry of binding have been determined in post-micellar regions. The outcomes reveal that CPC binds strongly to the SV as it provides more hydrophobic interactions and the positive values of ΔH° , are overcome by higher positive value of ΔS° which making the overall process thermodynamically favorable. In addition, the effect of SV on the micellization behavior TTAB, HTAB and CPC were also studied by using ITC measurements. Dynamic light scattering (DLS) and proton (^1H) NMR studies have been performed to determine the locus and SV molecules within micelles of HTAB, TTAB and CPC.

Oxidovanadium (IV) Complexes of Acetylsalicylhydroxamic Acid as Potential Antimicrobials: Synthesis, Characterization and Biological Activity

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The coordination chemistry of vanadium has seen enormous growth over the years due to the diversified applications and therapeutic potential of vanadium complexes. The hydroxamic acids $[\text{RCON}(\text{R}')\text{OH}]$ a key class of organic bio-ligands act as excellent chelating agents and efficient enzyme inhibitors. Of numerous hydroxamic acids, acetylsalicylhydroxamic acid as biochemically important ligand is known to exhibit diverse chelating behavior and potential pharmacological applications. Hence, new oxidovanadium (IV) complexes of composition $[\text{VO}(\text{AcSHA})_2]$ and $[\text{VO}(\text{acac})(\text{AcSHA})]$ where $[\text{AcSHA} \{ \text{C}_6\text{H}_4(\text{OH})(\text{CONHOCOCH}_3) \}]$ and $\text{acac} (\text{CH}_3\text{COCHCOCH}_3^-)$ are acetylsalicylhydroxamate (N-(acetyloxy)-2-hydroxybenzamide) and acetylacetonate ions] have been synthesized by the reactions of $\text{VOSO}_4 \cdot 5\text{H}_2\text{O}$ and $[\text{VO}(\text{acac})_2]$ with acetylsalicylhydroxamic acid (AcSH_2A). The characterization of complexes has been accomplished by elemental analyses, magnetic moment measurements, cyclic voltammetry and FTIR and mass spectral studies. Infrared spectra of complexes have suggested

bonding through carbonyl and phenolic oxygen atoms (O,O) coordination. The magnetic moment measurements and mass spectra of complexes indicated these to exist as monomers. The in vitro antimicrobial assay against pathogenic bacteria *Staphylococcus aureus*, *Bacillus cereus*, *Escherichia coli*, *Pseudomonas aeruginosa* and *Salmonella typhi* and fungi *Aspergillus niger*, *Alternaria alternata* and *Alternaria solani* by minimum inhibitory concentration (MIC) method has shown these as promising antimicrobial agents relative to Tetracycline hydrochloride and Fluconazole as respective reference drugs.

CH24

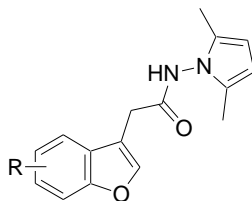
Synthesis of benzofuran linked pyrrole derivatives as anti-cancer agents

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Herein, we report the synthesis of benzofuran linked pyrrole derivatives **8(a-o)** using benzofuran-3-acetic acids. The benzofuran-3-acetic acids were converted into hydrazides and cyclized to title compounds by treating with hexan-2,5-dione. The obtained products were characterized by IR, ^1H NMR, ^{13}C NMR and mass spectral data. All the compounds were screened for anticancer activity against two cancer cell lines viz., *MDA-MB human adenocarcinoma mammary gland* and *A-549 human lung carcinoma*. The halogen and methoxy substitutions on benzofuran resulted as lead compounds.



8(a-o)

CH25

Volumetric and acoustic studies of Diclofenac Sodium Salt in Aqueous solutions of Sorbitol at Different Temperatures

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The interactions of Diclofenac sodium salt (DSS) with water and aqueous sorbitol as a function of temperature have been investigated by volumetric and acoustic studies. Densities and speed of sound of DSS 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. Density data was used to calculate apparent molar volume (V_ϕ), limiting apparent molar volume

(V_ϕ^0) and the slope (S_v). The ultrasonic speed was used to calculate adiabatic compressibility (β), intermolecular free length (L_f), specific acoustic impedance (Z). The positive values of $(\partial^2 \Phi_v^0 / \partial T^2)_p$ with temperature suggest that DSS acts as structure maker in water and aqueous sorbitol systems.

CH26

Adsorption-Desorption studies of methanol vapors on activated carbons

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The adsorption isotherms of methanol vapors have been studied on fibrous and granular activated carbon samples and were found to be of Type I of the BET classification in case of all the carbons. The adsorption data follows Langmuir adsorption isotherm equation. The Langmuir surface occupied by methanol vapors is smaller than the BET surface area of the carbons. Further, the amount of adsorption of methanol was considerably larger on fibrous activated carbons which are associated with larger amounts of the carbon-oxygen surface groups. This indicates that the adsorption of methanol takes place at some specific sites provided by the carbon-oxygen surface groups. In order to examine the influence of these surface groups on the adsorption of methanol vapors, the adsorption isotherms were studied on oxidized and degassed activated carbons. The adsorption increases on oxidation depending upon the oxidative treatment and decreases on degassing depending upon the temperature of degassing. This fact was further supported by adsorption-desorption studies of methanol vapors on oxidized and as-received ACC samples. It is seen that the sorption-desorption branches do not meet even at zero relative vapor pressure and the hysteresis persists throughout the entire range of vapor pressures. But no hysteresis loop was observed in the case of 950°-degassed samples which do not contain any chemisorbed oxygen. This shows that a certain amount of these vapors is irreversibly adsorbed or fixed at the oxygen containing sites on the carbon surface. It was found that each site containing a mole of CO₂ – evolving groups (acidic surface groups) chemisorbs one half mole of methanol. It is thus apparent that oxygen present as CO₂ – evolving groups provides active sites for the adsorption of methanol vapors.

Study on Micellar Behaviour of Bile Salts in aqueous medium of Ceftriaxone Sodium: Conductometric and Spectrometric Approach

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The micellization behaviour of two sodium salts of cholic acids (bio-surfactants) viz. sodium cholate (NaC) and sodium deoxycholate (NaDC) in the absence and presence of an antidiabetic drug, ceftriaxone sodium (Cft-Na) have been analyzed by applying electrical conductivity, UV-Visible and spectrofluorometric techniques. Electrical conductivity measurements of NaC (1 to 30) $\text{mmol}\cdot\text{kg}^{-1}$ and NaDC (0.5 to 11) $\text{mmol}\cdot\text{kg}^{-1}$ in (0.000, 0.001, 0.005 and 0.050) $\text{mol}\cdot\text{kg}^{-1}$ aqueous solution of Cft-Na have been carried out over a wide range of temperature (288.15 to 318.15) K. The conductivity, κ data have been employed to determine critical micelle concentration, *CMC* i.e. point of aggregation and the results have been discussed in terms of Cft-Na–NaC/NaDC hydrophobic and electrostatic interactions in aqueous medium. The obtained *CMC* values reveal the fact that the micellization tendency of the studied bio-surfactant increases in the presence of drug. The conductivity study (*CMC* determination) so obtained has also been corroborated by applying spectroscopic techniques i.e. UV-Visible (absorption spectra) and fluorescence (emission spectra) studies. The *CMC* values from all the applied techniques are found to be in good agreement. Moreover, the *CMC* shows a typical U-shaped profile with temperature which has been explained in terms of ion–ion, ion–polar and hydrophobic–hydrophobic group interactions around the hydrophobic part of bile salts. Furthermore, charged pseudo-phase separation model of micellization has been applied to grasp information on the intermolecular interactions existing in the present ternary system.

Study of Drug – Amino Acid Interactions at different temperatures: Volumetric and Ultrasonic Approach

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Volumetric and acoustic methods have been used to investigate the nature of interactions between antibiotic drug doxycycline hyclate and amino acids glycyl glycine and phenyl alanine. For this purpose densities and sound velocities of different concentrations of doxycycline hyclate i.e. (0.002 to 0.01) mol kg^{-1} have been measured in water and (0.002, 0.004 and 0.006) mol kg^{-1} aqueous solutions of glycyl glycine and phenyl alanine at four different temperatures i.e. $T =$

(305.15, 310.15, 315.15 and 320.15) K and at atmospheric pressure. The apparent molar volumes (V_ϕ), the partial molar volumes (V_ϕ^0), standard partial molar volumes of transfer ($\Delta_{tr}V_\phi^0$) for doxycycline hyclate in different concentrations of glycyl glycine and phenyl alanine have been evaluated using density data. Sound velocity data has been used to calculate apparent molar adiabatic compressibility ($\kappa_{\phi,s}$), partial molar adiabatic compressibility ($\kappa_{\phi,s}^0$) and partial molar adiabatic compressibility of transfer ($\Delta_{tr}\kappa_{\phi,s}^0$). The structure making/breaking behavior of drug is investigated from the sign of Hepler's constant i.e. $\frac{\delta^2 V_\phi^0}{\delta T^2}$ and from the temperature dependence of isobaric thermal expansion coefficient (α^0). The variation of partial molar adiabatic expansibility (E_ϕ^0) with temperature has been used to determine the caging effect. Other parameters like intermolecular free length (L_f), acoustic impedance (Z) have also been evaluated. It has been observed that ion-hydrophilic interactions between the drug molecule and amino acids are prevailing in the present ternary system (doxycycline hyclate + glycyl glycine/phenyl alanine + water). The drug is also behaving as structure maker in water as well as in other solvent systems.

CH29

Study of Kinetic Parameters of Poly (vinyl alcohol)/Boswellic acid Composite Films

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In this study pure polyvinyl alcohol (PVA) and polyvinyl alcohol/Boswellic acid (PVA/BA) films were prepared by solvent casting method. The thermal behavior of pure PVA and its composites has been studied by thermogravimetric analysis (TGA) and differential scanning calorimetry (DSC). From thermogravimetric study it was cleared that the decomposition behavior of PVA changed with addition of boswellic acid (BA). The DSC studies revealed that the increase in the composition of boswellic acid in PVA, slight decrease in the glass transition temperature (T_g), melting temperature (T_m) and decomposition temperature (T_d) was observed. Kinetic parameters including activation energy of degradation has been calculated using Coat and Redfern method. From the XRD it is clear that percent of crystallinity decreases with increase in the percent of boswellic acid (BA) in PVA could be due to development of semicrystallinity in PVA structure.

STARCH/PVA BIOCOMPOSITE BLEND FILMS: MECHANICAL PROPERTIES AND ANTIBACTERIAL ACTIVITY

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In the present paper, biocomposite films of starch/poly(vinyl alcohol) reinforced with delignified *Grewia optiva* fibre and methyl methacrylate (MMA) grafted fibres were prepared using citric acid as plasticizer and glutaraldehyde as the crosslinker. The biocomposite films were subjected to evaluation of mechanical properties, biodegradability and antibacterial properties. The antimicrobial activity of biocomposite films against pathogenic bacteria such as *Staphylococcus aureus* and *Escherichia coli* was also explored. The results confirmed that the biocomposite films may be used for food packaging.

2-Aminoquinazolin-4(3H)-one: A Bioinspired Organocatalyst for Selective Organic Transformation

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Hydrogen bond donor and acceptor molecules have emerged as powerful tool in sustainable organic transformations, which lead to selective organocatalysis enabling new reactions and approaches. These low molecular weight organic molecules possessing distinct hydrogen-bond donor motifs are associated with complementary functional or structural frameworks. In this context, inspired from nature and earlier reports, quinazoline moiety have been emerged as organocatalyst that have hydrogen bond donor as well as acceptor sites capable of interacting with variety of molecules. Inspired from their attractive structure, we have synthesized variety of thermally stable 2-aminoquinazolin-4-one molecules. These molecules possess hydrogen bond donor as well as acceptor sites along with Lewis basic sites which facilitate the selective reduction reaction of aromatic nitro compounds. Also, 2-aminoquinazolinones are found to catalyze reduction amination reactions for the synthesis of secondary and tertiary amines.

Development of Amine Functionalized Wrinkled Silica Nanospheres as Efficient and Recyclable Solid Base Catalyst and Their Application in Knoevenagel Condensation.

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A simple sol-gel approach has been utilized for the synthesis of Amine functionalized wrinkled silica nanospheres ($\text{WSiO}_2\text{-NH}_2$). The prepared nanomaterial was characterized by using various techniques, viz. FE-SEM, TEM, EDX, TGA, X-ray diffraction and FT-IR spectroscopy. The prepared amine functionalized wrinkled silica nanospheres have been synthesized, explored as an efficient and recyclable solid base catalyst for Knoevenagel condensation. Different aromatic aldehydes and active methylene compounds were used as reactants for analyzing catalytic efficiency of prepared material under very mild reaction conditions. The extraordinary catalytic activity of the $\text{WSiO}_2\text{-NH}_2$ nanospheres is due to the easy availability of amine sites to the reactant molecules. The prepared solid nanomaterial has high surface area and also larger pore size, which can be fully accessed by reactant molecules under catalytic conditions which facilitates the penetration and proper interaction of the reactant molecules with the basic amine groups on the $\text{WSiO}_2\text{-NH}_2$ nanospheres. This catalyst was recycled and could be used for five times without any appreciable loss in the catalytic activity. The catalytic activity of the prepared $\text{WSiO}_2\text{-NH}_2$ nanocatalyst was compared with the other reported solid base catalyst for the same reaction and it was found that the prepared nanocatalyst shows excellent activity.

Design and synthesis of fluorescent symmetric *bis*-triazolylated-1,4-dihydropyridines as potent anti-breast cancer agents

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The exploration of novel N-containing heterocycles having potential biological and pharmacological properties have attracted immense interest in present era. Among them, 1,4-dihydropyridines and triazoles have been recognized as versatile synthetic intermediates that provide access to variety of pharmacological active *N*-heterocycles.¹ Natural products containing 1,4-dihydropyridine ring can be used in pharmaceutical and agrochemical industries.² 1,4-Dihydropyridine ring in biological system is significant as it occurs in reduced form of NADH (nicotinamide adenine dinucleotide) and NADPH (nicotinamide adenine dinucleotide phosphate). 1,4-Dihydropyridines are well explored scaffolds for binding with multiple receptors and possess several activities like calcium channel antagonists, antitumor, anti-inflammatory, antimicrobial, antihistamine, anticonvulsant, and analgesic.³

In this study, we rationally synthesized a diverse library of fluorescent 1,4-dihydropyridine linked *bis*-triazoles through Hantzsch synthesis by the condensation of *o/m*-chloro substituted benzaldehyde, ethyl 3-oxo-4(prop-2-yn-1-yloxy)butanoate and ammonium acetate in presence of

Ba(NO₃)₂ as catalyst followed by the click reaction of resultant *bis*-alkynyl-1,4-dihydropyridine with various azides. The newly synthesized compounds were screened for their potential cytotoxicity against breast carcinoma (*MDA-MB-231*, *MCF-7*) cell lines using a commercially available standard drug (Tamoxifen). The in-vitro cytotoxicity study revealed that the two compounds among all synthesized hybrids are more potent than Tamoxifen against *MDA-MB-231* cell line and safe towards normal human embryonic kidney (*HEK-293*) cell line. Fluorescent nature of synthesized hybrids may extend their utility in cell imaging.⁴ The important details about biological properties of 1,4-dihydropyridine linked *bis*-triazoles would be more beneficial for design and synthesis of more potent anticancer drug.

CH34

A STUDY ON ENVIRONMENT FRIENDLY BIOLUBRICANTS BASED ON BRANCHED TERPOLYMERS

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At present, industry-wide efforts are started to substitute conventional petroleum-based chemical feedstocks with non-petroleum-based resources. There is a undeniable need to consider renewable resources as future raw materials for our present lubricants as this products is synthetic and used enormously. The "bio-lubricant" relates to all lubricants that biodegrade rapidly and which are non-toxic to human beings, plants, and animals. Recently the synthetic polyacrylate(s) are used extensively as an additives for base oil which causes the environmental problems. The use of modified or blending of vegetable oil with some polyacrylates may be the sustainable lubricating oil in future. Therefor the present investigation comprises the synthesis of terpolymers based on some long chain acrylates for their evaluation as lubricating oil additive (in terms of viscosity-index improvers, VII) in Mustard oil and Rice Bran oil. Each of them was characterized by NMR spectral techniques, Size exclusion chromatograph, differential scanning calorimetry and Rheometric analysis. The performances (viscosity-index) of prepared terpolymers additive were evaluated by standard ASTM methods.

CH35

Inhibition of amyloid fibrillation of bovine serum albumin by using zinc oxide and copper nanoparticles

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Fibrillation of proteins is found to be associated closely with several neurodegenerative diseases like Alzheimer's, Parkinson's disease etc. and several other developmental disorders. Therefore, identification of suitable inhibitors against amyloid fibrillation of proteins will find potential

applications against such diseases. In this context, some nanomaterials have demonstrated notable inhibition against fibrillation of different proteins and peptides. In this work, bovine serum albumin (BSA), a major carrier protein was selected as a model protein for studying amyloid fibrillation.

ZnO nanoparticles were synthesized by precipitation technique using ZnSO_4 and NH_4OH . The precipitate obtained was sonicated, rinsed three times with water and dried at $50\text{--}60^\circ\text{C}$ to obtain zinc oxide nanoparticles. Copper nanoparticles were synthesized through the chemical reduction of copper acetate with L-ascorbic acid. The synthesized nanoparticles were then characterized by scanning electron microscopy (SEM), energy dispersive X-ray spectroscopy (EDX), Dynamic light scattering (DLS), zeta potential. DLS study was carried out to determine the size of ZnO and Cu nanoparticles. The average size of the nanoparticles came out to be 119 nm and 81 nm respectively. SEM analysis was done to study the morphology of nanoparticles. The results reveals that ZnO nanoparticles have flake type shape and Cu nanoparticles have cubical shape. Zeta potential analysis was done to determine the charge on nanoparticles. Both the synthesized nanoparticles are being tested against fibrillation of BSA.

CH36

I₂-Mediated Expeditious Synthesis of β -Carboline C-1 Tethered annulated Thiazole Derivatives

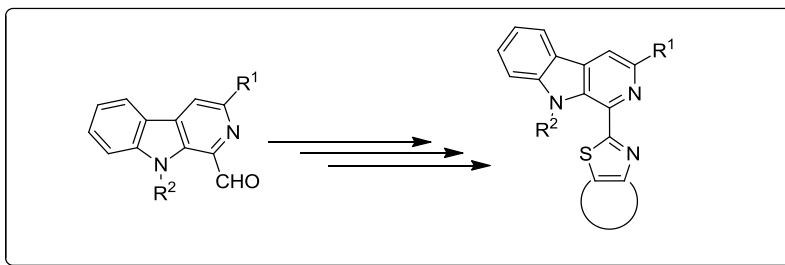
Manpreet Singh and Virender Singh

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The pyrido[3,4-*b*]indole scaffold (also known as β -carboline) exists in many synthetic compounds as well as natural products exhibiting diverse biological activities such as anti-Alzheimer,² antibacterial, anti-HIV, antitumor, and anticancer. Benzothiazole framework is a group of xenobiotic compounds containing a benzene ring fused with a thiazole ring, are used worldwide for a variety of therapeutic applications. Benzothiazole and their heterocyclic derivatives represent an important class of compounds possessing a wide spectrum of biological activities. The myriad spectrum of medicinal properties associated with benzothiazole related drugs has encouraged the medicinal chemists to synthesize a large number of novel therapeutic agents.

In this context, we have synthesized derivative of β -carboline containing benzothiazole derivatives through Three-Component Oxidative Annulation under Transition-Metal-Free Conditions. The results of these studies will be presented and discussed.



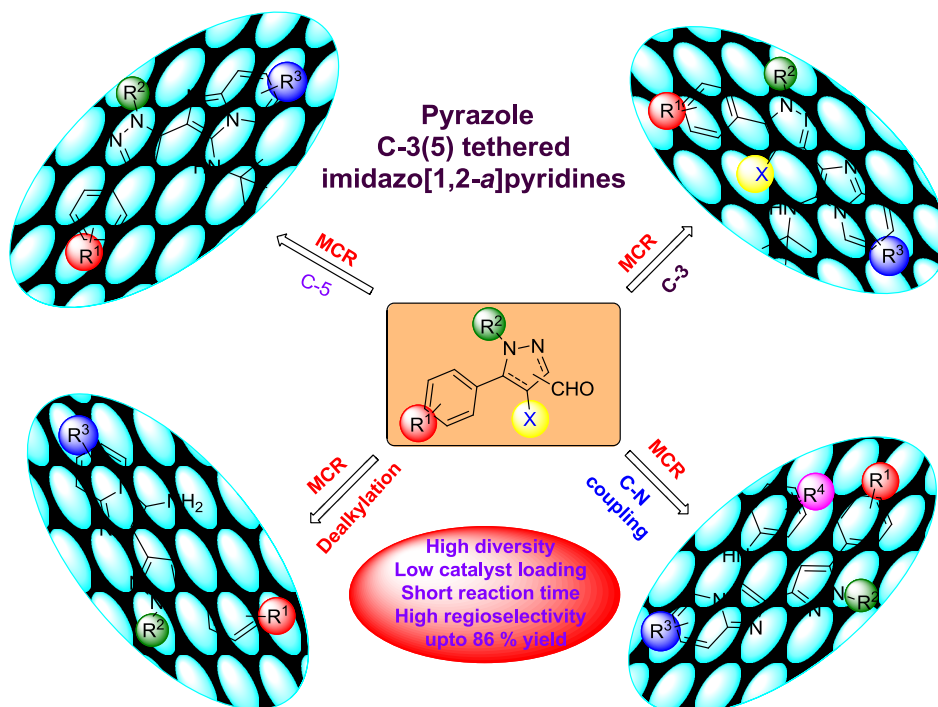
An Expeditious Approach Towards One-Pot Synthesis of Pyrazole Tethered Imidazo[1,2-*a*]pyridine Derivatives

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Among heterocycles, pyrazole derivatives have delivered vast spectrum of marketed drugs and biologically active framework to treat various life challenging diseases. Similarly, imidazo[1,2-*a*]pyridine is another privileged scaffold which has received considerable attention in organic and medicinal chemistry. In this regard, multicomponent approach have received noticeable attention of organic chemists and developed as a powerful tool for planning complex and novel molecular architectures. In this context, a library of compounds with wide range of diversity have developed by employing diversely substituted pyrazole containing imidazo[1,2-*a*]pyridine. The present protocol offers the advantages like simple methodology, low catalyst loading, short reaction time, appreciable atom economy, high diversity and easy to perform reaction.



An efficient synthesis of novel metal chalcone complex and its characterization

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Chemistry of chalcones is one of the significantly studied arena of chemistry because of their magnificent therapeutic potential in biological field. A wide research has already been reported on their anti-inflammatory, anti-cancer, anti-oxidant, anti-malarial, anti-HIV, antidiabetic properties. The diversity of biological activities of privileged chalcone is because of the reactivity of present bi-electrophilic group and keto-vinyl spacer between two aromatic rings. The cationic forms of vanadium complexes with oxidation state +4 V(IV) have been shown to modulate the cellular redox potential, regulate enzymatic phosphorylation, and exert pleiotropic effects in multiple biological systems. But the field of chalcone chemistry with vanadium metal is less explored. In the view of above fact, novel chalcone 1,3-Diphenylprop-2-en-1-one was synthesized by classic Claisen Condensation using acetophenone and benzaldehyde as substrate in 1:1 molar proportion in the presence of base (NaOH, KOH) as catalyst. Further, synthesized chalcone made to react with Vanadyl Sulphate ($\text{VOSO}_4 \cdot x\text{H}_2\text{O}$) in 1:2 molar ratio in ethanol for chalcone metallation. Physio-analytical characterization of chalcone and respective vanadium (IV) complex was done by elemental analysis along with FTIR, NMR, MASS, ^{13}C NMR to confirm their formation.

Molecular docking studies of indoles as topoisomerase inhibitors for discovery of new anticancer drugs

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Indole derivatives are biologically important compounds used as antimicrobial, antiviral, antitubercular, anti-inflammatory, anticancer, antidiabetic agents. Because of the wide variety of the biological applications of the indoles, their molecular docking studies, continue to be an interesting field of research. DNA-topoisomerase is an enzymes within cells that remove excessive supercoiling, torsional stress and maintaining sufficient supercoiling to ensure a stable compact genome. These enzymes are apparent in every cellular function involved with DNA—transcription, replication, recombination, and chromosome separation and complete their job in any of the above function by cleavage. Topoisomerase inhibitors are among the most active anticancer agents. Our present work focusses on in silico selection of indoles computationally and the inhibition of DNA-topoisomerase (topoisomerase1B-DNA complex (PDB ID:3M4A)

and human topoisomerase II beta in complex with DNA and etoposide(PDB ID:3QX3)) by the selected indoles. Using Autodock v4.0, docking studies of indoles have been carried out to understand the possibility to act as effective topoisomerase inhibitors.

CH40

Inhibition of amyloid fibrillation of bovine serum albumin by using zinc oxide and copper nanoparticles

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Fibrillation of proteins is found to be associated closely with several neurodegenerative diseases like Alzheimer's, Parkinson's disease etc. and several other developmental disorders. Therefore, identification of suitable inhibitors against amyloid fibrillation of proteins will find potential applications against such diseases. In this context, some nanomaterials have demonstrated notable inhibition against fibrillation of different proteins and peptides. In this work, bovine serum albumin (BSA), a major carrier protein was selected as a model protein for studying amyloid fibrillation.

ZnO nanoparticles were synthesized by precipitation technique using ZnSO_4 and NH_4OH . The precipitate obtained was sonicated, rinsed three times with water and dried at $50\text{--}60^\circ\text{C}$ to obtain zinc oxide nanoparticles. Copper nanoparticles were synthesized through the chemical reduction of copper acetate with L-ascorbic acid. The synthesized nanoparticles were then characterized by scanning electron microscopy (SEM), energy dispersive X-ray spectroscopy (EDX), Dynamic light scattering (DLS), zeta potential. DLS study was carried out to determine the size of ZnO and Cu nanoparticles. The average size of the nanoparticles came out to be 119 nm and 81 nm respectively. SEM analysis was done to study the morphology of nanoparticles. The results reveals that ZnO nanoparticles have flake type shape and Cu nanoparticles have cubical shape. Zeta potential analysis was done to determine the charge on nanoparticles. Both the synthesized nanoparticles are being tested against fibrillation of BSA.

CH41

Inhibition of copper-mediated aggregation of Human γ D-crystallin by diimine compound

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Cataract, a leading cause of global blindness originates due to the aggregation of eye lens protein (α - , β - , and γ - crystallin). The only currently available treatment for cataract is eye surgery, which is costly and risky. Hence, development of compound that can inhibit or even slow down

the aggregation process will have remarkable impact and by that a significant amount of medical cost could be saved.

Metal ions like Cu^{2+} , Zn^{2+} accelerate the process of oxidative damages of crystallin leading to their aggregation. Based on our earlier results (Ref: Chauhan. et.al/J. Biol. Inorg. Chem./2017/22/505-517) on the inhibition of copper-mediated aggregation of crystallin by Schiff bases, we had introduced another imine group in the best inhibitor molecule of our earlier series. Diimine compound had been synthesized and its inhibitory effect was studied against copper-mediated aggregation of recombinant human gamma D crystallin (HGD). Complexation between copper and diimine compound was studied using UV-Vis spectroscopy. Diimine compound at a concentration of 8 μM had shown ~72% inhibition of copper (100 μM)- induced aggregation of HGD. Whereas, to achieve similar % inhibition of Cu^{2+} -induced aggregation of HGD, ~40 μM of Schiff base inhibitor (best in that series) had been used.

To understand the interactions between HGD and diimine compound, fluorescence studies were also performed. The binding and quenching constants obtained from the Scatchard plot and modified Stern-Volmer equation are of the order 10^3 M^{-1} . Thermodynamic parameters revealed that the interaction of HGD with diimine compound is entropy driven with a predominant involvement of hydrophobic interactions. Using Forster's resonance energy transfer (FRET) calculation, the average binding distance between the donor (Trp of HGD) and acceptor (diimine compound) was found to be 6.52 nm. No major conformational changes in HGD due to the interaction with ligand was observed from synchronous fluorescence spectra and circular dichroism (CD) spectroscopy. Molecular docking studies also substantiated the experimental observations.

CH42

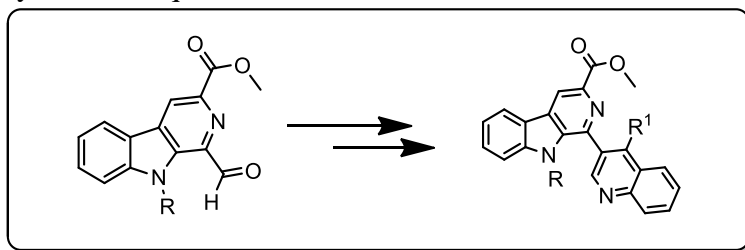
Application of A^3 -Coupling for the Synthesis of β -Carboline Tethered Quinoline Derivatives

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A^3 -coupling reactions involve the condensation of aldehydes, amines and alkynes, which yields the propargylamine derivatives under various catalytic conditions. By making use of the versatile reactivity of propargylamines, tandem reactions initiated by the functional group(s) in the in situ generated propargylamines constitute one of the most important applications of A^3 couplings. These tandem reactions are especially useful for the synthesis of heterocyclic compounds. Accordingly, we have performed the A^3 -coupling of 1-formyl β -carboline with terminal alkynes and amines for the synthesis of quinoline derivatives.



APPLICATIONS OF NANO MATERIALS: A REVIEW

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With the advances in the field of nanomaterials a huge number of fields have emerged which uses these nanomaterials. From industries of paint, electronics, electrical and many more, these nanomaterials are widely used. Most important application in electrical field is in the formation of lithium ion batteries. Along with these applications, nanomaterials are also used in diagnostic techniques and in various drugs especially for cancer. Nanomaterials are also used in targeted drug delivery system for the delivery of small and large drug molecules to the targeted organs. In brief these nanomaterials find use in every field of products and research

DDT in Placenta and its Association with Birth Weight

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An attempt was made to evaluate the relationship between placental DDT and birthweight. Among the agricultural chemicals, pesticides have been the most intensively considered for their association with preterm birth. Dichloro di phenyl trichloro ethane (DDT) is the most notorious pesticides because of its persistent nature, poorly excreted, its property to mimic estrogen hormone and biomagnified in the food chain, thereby increasing potential for human exposure. Organochlorine pesticides cross the placenta; this prenatal exposure has been associated with adverse pregnancy outcomes.

Total of 90 mother-child pairs were selected from Agra city. Organochlorine pesticides were measured in the placental tissue by Gas Chromatography equipped with electron capture detector. Regression analysis were performed between birth weight and organochlorine pesticide concentrations. There was a significant decrease in birthweight with increasing organochlorine pesticides such as with every unit increase in p,p-DDE and p,p-DDT the birthweight decreases by 6.85 gms, and 10.8 gms respectively. Preliminary results indicate that exposure to more organochlorine pesticides like HCH, methoxychlor, heptachlor and Aldrin may be related to a lower birthweight. Further robust multicentric studies are needed to conclude the link.

Ultrasonic and conductance studies of Metformin hydrochloride in water and in aqueous sorbitol solution at different temperatures

Shashi Kant Sharma & Inesh Kumar*

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

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The behavior of metformin hydrochloride (MH) in aqueous sorbitol solution was studied to explore molecular interactions at different temperatures. The ultrasonic and conductance studies were used for investigating the interactions of drug metformin hydrochloride in water and aqueous sorbitol system. The ultrasonic velocity (u) and molar conductance of metformin hydrochloride in water and in (2%, 4% and 6% by wt.) aqueous solutions of sorbitol have been measured at (305.15, 310.15 and 315.15 K) temperatures. The ultrasonic velocity data of MH in water and water-sorbitol system were used to determine adiabatic compressibility (β), intermolecular free length (L_f), and specific acoustic impedance (Z). The structure making/breaking behaviour of MH in water and water-sorbitol system was determined on the basis of Walden's product. The Walden product increases with increase in temperature for metformin hydrochloride in water and in aqueous solution of sorbitol at different temperature (305.15K, 310.15K, 315.15K). The temperature coefficient of Walden product for metformin hydrochloride in water and in aqueous sorbitol solution at different temperature (305.15K, 310.15K, 315.15K) is found to be positive which suggest that metformin hydrochloride acts as structure maker. This shows the structure making behaviour of metformin hydrochloride in water and aqueous sorbitol system.

Effect of Ethambutol Dihydrochloride (EMB) on Micellization Behaviour of Cationic Surfactant DTAB at Variable Temperatures

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Intermolecular interactions between cationic surfactant DTAB (dodecyl trimethyl ammonium bromide) and anti-tuberculosis drug ethambutol dihydrochloride (EMB) with different concentrations (0.001, 0.005 and 0.010 mol.kg⁻¹) have been studied conductometrically over a wide temperature range of 293.15K- 313.15K in aqueous medium. Critical micellar concentration (CMC) of the surfactant DTAB has been determined from the plots of specific conductivity (κ) vs. concentration values of solution. Fascinatingly, it has been found that there is decrease in CMC with increase in concentration of drug moiety. From the CMC as a function of temperature, various useful thermodynamic parameters such as standard Gibbs free energy change (ΔG_m°), standard enthalpy change (ΔH_m°) and standard entropy change (ΔS_m°) have been calculated. Further, the variation in these parameters with change in concentration and

temperature suggests the electrostatic and hydrophobic contributions of EMB for the building up of the micellar aggregates of the surfactant.

CH47

Density and viscosity study of BaCl₂.2H₂O in 2, 4 and 6 wt. % aqueous Mannitol, sorbitol and dulcitol solutions at 293.15, 303.15 and 313.15K.

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Densities and viscosities were measured for BaCl₂.2H₂O in the concentration range of 0.05 to 0.30 mol·kg⁻¹ in 2, 4 and 6 wt. % aqueous Mannitol, sorbitol and dulcitol solutions solution at 293.15, 303.15 and 313.15K. The apparent molar volumes (ϕ_V), limiting apparent molar volumes (ϕ_V^0), and viscosity B coefficients were calculated from the experimental data. Also, the partial molar expansibility (ϕ_E^0), Hepler's constant $(\partial^2 \phi_V / \partial T^2)_P$ and dB/dT temperature dependence of coefficient B (dB/dT) were estimated. Positive sign of $(\partial^2 \phi_V / \partial T^2)_P$, and negative temperature coefficient of B (i.e. dB/dT) indicated the structure maker behavior of BaCl₂.2H₂O. Feakin's transition state theory of relative viscosities of electrolytic solutions was also applied. The values of $\Delta\mu_2^{0\#}$ (free energy of activation per mole of solute) were found to be greater than the values of $\Delta\mu_1^{0\#}$ (free energy of activation per mole of solvent), confirming the structure maker behavior of BaCl₂.2H₂O.

CH48

Metformin hydrochloride - sodium dodecyl sulphate Interactions in Aqueous Solutions: Physico-Chemical Studies

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Micellization behaviour of sodium dodecyl sulphate (SDS) has been studied in the presence of Metformin hydrochloride (0.001, 0.005 and 0.01M) using conductance (κ), densities (d), and velocities of sound (v) studies in the temperature range 25 \square 45 °C at an interval of 10 °C. The critical micelle concentration (cmc) of sodium dodecyl sulphate (SDS) was determined from the plots of specific conductance (κ) of SDS. By using cmc data, various thermodynamic parameters like standard enthalpy of micellization ($\square H_m^0$), standard entropy of micellization ($\square S_m^0$) and standard free energy of micellization ($\square G_m^0$), that have direct bearing on the consequences of such interactions at the molecular level have been calculated. The apparent molar volume (ϕ_V) and apparent molar adiabatic compressibility (ϕ_K) have also been computed using densities and velocities of sound data.

Investigation of molecular interactions of the drug Streptomycin sulphate in different aqueous Mannitol solutions at different temperatures.

Nisha Kumari & Shashi Kant Lomesh

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Densities and speed of sound of the drug Streptomycin sulphate (0.001-0.01) mol.kg⁻¹ in aqueous Mannitol solutions (1%, 3%, 5%) were measured at different temperatures (298.15K-313.15K). Density data was used to calculate apparent molar volume (V_ϕ), limiting apparent molar volume (V_ϕ^0) and the slope (S_v). The ultrasonic speed was used to calculate adiabatic compressibility (β), intermolecular free length (L_f), specific acoustic impedance (Z). The positive values of $(\partial^2\Phi_v^0/\partial T^2)_P$ with temperature indicates that Streptomycin sulphate acts as structure maker in water and aqueous mannitol systems.

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A kinetic spectrophotometric study for finding a cost effective method for removal of aminophenols in water samples

Neha Bhatt

Gurukula Kangri Vishwavidyalaya, Haridwar (Uttarakhand)

Removal of toxic substances from wastewaters using low-cost alternatives is an important area of research in environmental sciences. Aminophenols are the compounds with wide spectra of

applications ranging from being used as dyeing agents in furs, hair, leather industries and as intermediates in the pharmaceutical industries. With the passage of time, their applications in other fields are also being explored. Aminophenols are certainly important in various fields but at the same time, their ill effects on environment cannot be ignored. Aminophenols are hazardous to humans, plants and animals in many ways. The major effects on human being are wheezing, cough, fatigue, dizziness, headache, asthma, chest tightness, skin allergy with added impact on kidneys also. Due to the severe exposure, aminophenols might cause mutations. High limits of aminophenols affect ecosystem as a whole especially aquatic ecosystem. The industries which discharge effluents laden with aminophenols, affect two types of water resources viz. ground water and rivers. Both of these resources are one of the major resources for human beings, plants and animals, which are being heavily affected by the aminophenols to a good extent and this problem is needed to be addressed before it crosses an alarming level. For all of the above mentioned reasons, research on aminophenols in different areas has been undertaken to ensure a cleaner environment for generations to come. This study provides an overview of the most recent trends in the determination of aminophenols in different areas focusing on improvement and optimization by kinetic methods. The present work discusses the development of a low-cost alternative for the removal of aminophenols by kinetic spectrophotometric method.

Biological and Medical Sciences

Electrocardiographic studies on extra-cardiac affections in dogs

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¹Division of Veterinary Medicine, Faculty of Veterinary Sciences and Animal Husbandry
R. S. Pura, SKUAST-Jammu (Jammu and Kashmir)

²Department of Basic Sciences, College of Forestry, Dr. Y. S. Parmar University of Horticulture
and Forestry, Nauni, Solan (Himachal Pradesh)

Present study was conducted to investigate characteristics of electrocardiography in gastroenteritis (GE) and urinary tract diseases (UTD) in dogs. The positive cases of GE (Group B) and UTD (Group C) affected dogs were screened for ECG and haemato-biochemical parameters as per the standard procedure and the outcome was compared and correlated statistically with healthy dogs (Group A). A decreased in amplitude of P wave, T wave and QRS complex were observed in both the affected groups (Group B and C) as compared to Group A. Additionally, a significant ($P < 0.05$) decrease in Hb, PCV, TEC, MCHC and TP, and increase in AST and ALT were noted in Group B. There was a significant positive and negative correlation between electrocardiogram and haemato-biochemical parameters in both of the affected groups. The study revealed that ECG and haemato-biochemical parameters had a significant role in extra-cardiac diseases i.e. gastroenteritis as well as urinary tract diseases in dogs.

BMS02

Glutathione-S-Transferase Gene Variants and Their Susceptibility to Type 2 Diabetes and Related Cardiovascular Complications in Asian Indians

**Jasvinder Singh Bhatti^{1*}, Sumanpreet Kaur², Navneet Kaur Saini^{1,2}, Gurjit Kaur Bhatti³,
Sanjay Kumar Bhadada⁴, Rajesh Vijayvergiya⁵**

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The genetic variations in glutathione-s-transferase (GST) genes leads to the susceptibility to T2DM and coronary artery disease (CAD). Present study investigated the contribution of GSTM1/T1 and GSTP1 polymorphisms in the development of T2DM and CAD in Asian Indians. We included 351 healthy controls, 337 T2DM patients, and 318 T2DM+CAD. Genotyping of GSTM1/T1 and P1 genes, measures of abdominal obesity (BMI and Waist circumference), lipid-profile alongwith oxidative biomarkers were measured in all the study participants. Results display pronounced values of WC, WHR, MDA and TAC in T2DM and T2DM+CAD subjects compared to controls ($p < 0.001$). Dyslipidemia was more evident in T2DM patients than controls. GSTM1(-) and GSTT1(-) genotypes (%) were significantly higher in T2DM, and T2DM+CAD subjects. Regression analysis of the data revealed significant association of GSTM1(-) and GSTT1(-) genotypes shows 2.3-fold and 1.6 fold increased risk of

T2DM, respectively. Contrary, GSTP1 gene did not show significant association with T2DM. Additionally, GSTT1(-) genotype alone shows 1.57-fold increased risk of CAD in T2DM subjects. Moreover, significantly reduced level of HDL-C was observed in the individuals carrying GSTM1(-) and GSTT1(-) genotypes. In conclusion, oxidative stress, abdominal obesity and null genotypes of GSTM1/T1 genes strongly contribute to the development of T2DM related CAD complications in Asian Indian population.

BMS03

A study on the wildlife mortality in Kangra valley of Himachal Pradesh

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ICAR – Indian Veterinary Research Institute, Regional Station, Palampur, Kangra (Himachal Pradesh)

A total of 52 wildlife carcasses were received for post mortem examination either from Dhauladhar Nature Park, Gopalpur or from the Department of Wildlife, Kangra, Himachal Pradesh during a 10 year period (2018 – 2018). These carcasses included those of Leopard (10), Leopard Cat (6), Monal (5), Sambar (4), Wild Pig (3), Koklass Pheasant (3), Asiatic Lion (2), Rhesus Monkey (2), Porcupine (2), Vulture (2), Horned Owl (2), Kite (2), Red Jungle Fowl (2), Ghoral (1), Himalayan Civet Cat (1), Kaliz (1), Cheek Pheasant (1), Peafowl (1), Khakharola/wild bird (1), African Grey Parrot (1) and Peacock (1). The important causes of death were mainly traumatic injuries in leopards and sambar; chronic renal failure, fibrino-purulent pneumonia and pericarditis in lion; multifocal glomerulonephritis and hepatitis in Himalayan civet cat; fibrinous pneumonia in monkeys; pneumonia and parasitic enteritis in birds; and egg bound syndrome and shock in poultry. The gross and histopathological observations will be discussed.

BMS04

Haematological alterations in a Demodicosis affected Dobermann Pinscher Dog – A Case Report

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²Department of Basic Sciences, College of Forestry, Dr. Y. S. Parmar University of Horticulture and Forestry, Nauni, Solan (Himachal Pradesh)

A seven months old black coloured dobermann female having body weight around 10 Kg was presented at Teaching Veterinary Clinical Complex, Selesih with a history of severe skin problem since August 2017. On history taking owner revealed that dog bathing is done every day by human soap. Vaccination is not done but deworming is done properly. Upon clinical examination, all the body parameters were normal. On dermatological examination, there is silver grayish scaling, diffused scab like lesions mainly on the ventral part of the body, presence

of dandruff, crusts, pruritus were found on all over the body. Skin scrapping were taken from the affected region. Skin scrapings were boiled in 10% KOH solution for 10 minutes. Sediment examination revealed presence of cigar shaped mites suggestive of *Demodex* species. On haematological estimation, there is an increased WBC count, MCH, MCHC and decreased RBCs count and Lymphocytes. Hence, a diagnosis of demodicosis was made and was treated accordingly, Tactic (12.5 %) @ 4 ml in 1 litre of water in a week used BID, Shampoo Micodin for bathing once in a week for bathing, inj. Genimec 0.2 ml given s/c after every one week up to three shots, inj. Rumeric 0.5 ml I/M given daily up to 7 days as a supportive therapy.

BMS05

Cytological studies in some Eastern Himalayan members of Family Pottiaceae

Meenakshi Sharma and Sunita Kapila

Department of Botany, Panjab University, Chandigarh

Pottiaceae, comprising of ten percent of the nearly 15,000 known moss species is the largest known family among the mosses. In the present study, seven species belonging to six genera are meiotically investigated. They were *Anoetangium bicolour*, n=13; *Barbula constricta*, n=14; *Hymenostylium recurvirostrum*, n=13; *Hyophila involuta*, n=13; *Hyophila kurziana*, n=13; *Semibarbula ranuii*, n=16 and *Tortella fragilis*, n=13. The chromosome counts for *A. bicolour*, *H. kurziana*, *S. ranuii* and *T. fargilis* were reported for the first time. The chromosome number in *B. constricta*, *H. recurvirostrum* and *H. involuta* confirms earlier reports for some other populations of these species. Laggards are observed in *B. constricta*, *H. involuta*, *S. ranuii* and *T. fragilis* which is the potential source for the aneuploidy in bryophytes.

BMS06

An enumeration of lichenized fungi from Sikandra Dhar region of District Mandi, Himachal Pradesh

Monika Thakur and Hem Chander

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Floristic studies were conducted to explore diversity of lichenized fungi in Sikandra Dhar region of district Mandi, Himachal Pradesh, North West Himalaya. A total of three hundred specimens of lichenized fungi were collected from twenty one localities (viz. Gehayin Ka Galu, Ghaadi, Churain, Darba, Murari Devi, Pandit Ka Naun, Sikandra, Chunathar, Jaba, Badi, Kashmali, Naina Devi, Kuntbhiyog, Doh, Bhauran, Chowk, Padhyan, Karni, Plasi, Matiyara and Samaila) during February – July 2018. The morpho-chemotaxonomic investigations of these specimens revealed the occurrence of twenty five lichen species [*Aspicilia calcarea* (L.) Körb., *Brianaria bauschiana* (Körb.) S. Ekman & M. Svenss., *Candelaria concolor* (Dicks.) Arnold, *Canoparmelia pustulescens* (Kurok.) Elix, *Chrysothrix candelaris* (L.) J.R. Laundon, *C. chlorina* (Ach.) J.R. Laundon, *Cladonia coniocraea* (Flörke) Spreng, *Dermatocarpon vellereum* Zschacke, *Heterodermia pseudospeciosa* (Kurok.) W.L. Culb, *Hyperphyscia syncolla* (Tuck. ex

Nyl.) Kalb, *Hypotrachyna masonhalei* Patw. & Prabhu, *Lecanora chlarotera* Nyl., *Parmotrema austrosinense* (Zahlbr.) Hale, *P. ravum* (Krog & Swinscow) Sérus, *P. tinctorum* (Despr. ex Nyl.) Hale, *Phaeophyscia ciliata* (Hoffm.) Moberg, *P. hispidula* (Ach.) Essl, *Physcia crispa* Nyl, *P. integrata* Nyl, *P. semipinnata* (Leers ex J.F. Gmel.) Moberg, *Punctelia neutralis* (Hale) Krog, *P. subrudecta* (Nyl.) Krog, *Pyxine asiatica* Vain, *P. isidiophora* (Müll. Arg.) Imshaug, *P. subcinerea* Stirt)] belonging to fifteen genera of ten families (Caliciaceae, Candelariaceae, Chrysotrichaceae, Cladoniaceae, Lecanoraceae, Megasporaceae, Parmeliaceae, Physciaceae, Psoraceae, Verrucariaceae). Parmeliaceae and Physciaceae are the dominant families with six species each followed by Caliciaceae with three species. All these taxa have been recorded for the first time from Sikandra Dhar region.

BMS07

An analysis of nutritional qualities and host specificity of most common edible macrofungi from Hamirpur region of Himachal Pradesh

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Present paper analyses the nutritional qualities and host specificity of most common edible macrofungi of Hamirpur region. For this, specimens of five most common edible macrofungi viz. *Auricularia auricula-judae*, *Ganoderma applanatum*, *Ganoderma lucidum*, *Pleurotus ostreatus* and *Schizophyllum commune* were collected randomly from twelve localities (Chheorin, Doh, Baru, Bohni, Saloni, Bhota, Tikkar- khattriyan, Kohin, Tikkar-sujanpur, Doli-sujanpur, Harson and Fafan). These macrofungi contain ash, protein, fats, carbohydrates, glucose, mannose, xylose, galactose, amino acids, fibre, phosphorus, magnesium, calcium, iron, zinc, magnesium, copper and chromium. *Auricularia auricula-judae* was found rich in carbohydrates (66.1%) and glucose (15%), *Schizophyllum commune* in fats (4.5%), *Ganoderma lucidum* in fibres (59%) and *Pleurotus ostreatus* in proteins (25.91%). These macrofungi were observed to grow on fifteen tree hosts viz. *Acacia catechu*, *Bauhinia variegata*, *Bombax ceiba*, *Citrus pseudolimon*, *Dalbergia sissoo*, *Dendrocalamus* sp., *Ficus benghalensis*, *Grewia optiva*, *Magnifera indica*, *Melia azedarach*, *Morus alba*, *Pyrus pashia*, *Tamarindus indica*, *Toona ciliata* and *Zizyphus jujuba* in the study area; out of these *Bauhinia variegata* was the most preferred host for four species. *Pleurotus ostreatus* exhibited host specificity with *Melia azedarach*.

BMS08

Immunomodulatory and anticancer potential of Pectin-Guargum-Znic oxide nanocomposite

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Cancer is a dreadful disease which is continuously spreading with enhanced mortality rate. The

integration of the cancer immunotherapy and nanotechnology is a powerful approach to specifically target cancer cells without having any effect on normal tissues. In this context, our lab has synthesized Pectin-guar gum-zinc oxide (PEC-GG-ZnO) nanocomposite to potentiate anticancer capabilities of human immune cells. TEM images showed the hexagonal shape of nanocomposite with the size range of 50-70 nm. The lymphocyte proliferation assay depicted that immunostimulatory activity of the PEC-GG-ZnO on peripheral blood lymphocytes. Immunoenhancing effect of nanocomposite was confirmed by increased cytokine (IFN- γ , IL-2 and TNF- α) production and by immune cells phenotyping (CD3, CD8, and CD56). Moreover, we also found that nanocomposite pretreated human lymphocytes displayed enhanced cytotoxicity towards lung (A549) and breast carcinoma (MCF-7) cells as compared to untreated lymphocytes. The hemolysis assay revealed that synthesized PEC-GG-ZnO nanocomposite is biocompatible at 2.5 mg/ml. The toxicity mediated through PEC-GG-ZnO nanocomposite revealed its direct anticancer potential towards A549, cervical adenocarcinoma (HeLa) and prostatic small cell carcinoma (PC-3) cancer cells. We found that nanocomposite caused apoptosis of cancer cells by arresting cell cycle, decreasing mitochondrial membrane potential, reactive oxygen species generation and activation of Caspase-3 and Poly-(ADP-ribose) polymerase. Taken together, the immunostimulatory and anticancer traits of PEC-GG-ZnO nanocomposite has a strong potential to serve as a promising cancer therapeutic agent (Patent: 201611007222 and 201711021290; Published in Materials and Engineering: C; 2018, 90:494-503).

BMS09

Beekeeping vis-à-vis hybrid cropping system

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Beekeeping is a profitable venture in which honeybees are reared in wooden boxes, managed and then various bee products like honey, propolis, wax etc are extracted. Beside these valuable products, honeybees also contribute in the pollination of crops thereby increasing the productivity. It is well known fact that bee pollinated crops are more healthy and disease resistant. Therefore, beekeeping has strong connection with agriculture and horticulture.

The present study was carried out on the hybrid crop of sunflower grown in Arni University campus, Indora (H.P.), during May-June, 2018. Sowing was done in the month of April and flowers appeared in Mid of May. Foraging of sunflower by honeybees, in terms of pollen and nectar intake was noted on 20 colonies of *Apis mellifera*. Average pollen intake per minute per colony was 10 ± 2.3 , which was less than expected. Also, the nectar inflow was less as there was hardly any increase in honey stores inside the boxes. There was no any significant increase in egg laying and brood rearing among the colonies. Though previous workers have reported sunflower as flora of bee interest, but results obtained during the current study were less than expected, reason behind this might be hybrid variety of sunflowers used in the study. It may be concluded that hybrid crops which are being getting used nowadays for increasing the crop productivity, may not prove beneficial for honeybees. However, study can further be validated by carrying out pollination studies with both traditional as well as hybrid crop at different places.

Effect of heavy metals copper and nickel on some biochemical contents of *Mnium cuspidatum*

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Bryophytes, presently survived in three lineages i.e., mosses, liverworts and hornworts, represent an ancient group of early land plants. Of these lineages, mosses are ubiquitous as they are provisioned with some morphological and structural adaptive strategies that enable them to grow successfully wherever they occur. Mosses have a remarkable capacity to absorb heavy metals and this mainly depends upon the total area of the leaf surface and also thin walled parenchymatous tissues. The Present study was undertaken to find the known biochemical responses so as to evaluate bioaccumulation potential of moss *Mnium cuspidatum* under various phytotoxic concentrations of metals. Ten different regimes were made and were sprayed with 10, 20, 40, 60, 80, 100, 150, 200, 350 and 500 ppm different concentrations of Nickel and Copper at regular intervals. The eleventh treatment served as control, and was irrigated with distilled water. It was found that exogenously supplied Copper and Nickel to *Mnium cuspidatum* significantly stressed the biochemical contents.

Effect of thermal processing on antimicrobial activity of indigenous cattle milk

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The primary function of milk is to nourish and protect the health of neonates. Transfer of antimicrobial components during milk secretion is a key biological function, it is therefore reasonable to expect that maximum protection of neonates is conferred during early stages of their lives. Within milk, a range of proteins, peptides, enzymes and complex carbohydrates are known to possess antimicrobial activity. Antimicrobial activity in milk and its protein fractions of indigenous cattle was evaluated against different microorganisms including *Escherichia coli*, *Staphylococcus aureus*, *Rhodococcus equi*, *Shigella flexneri* and *Bacillus cereus*. Antimicrobial activity against *E. coli* and *S. aureus* was observed in milk and whey protein fraction in all the thermal treatments i.e. pasteurization at 63°C, 72°C and boiling temperature. However, no antimicrobial activity was noticed against *E. coli* and *S. aureus* with casein protein fraction. The work outlined herein reveals that milk subjected to heat treatments exhibited higher antimicrobial activity. This might be due to release of antimicrobial peptides after thermal treatments. Further investigations are warranted to unravel the molecular basis of antimicrobial activities reported herein.

Impact of drought stress on enzymatic antioxidants of medicinal plants

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Medicinal plants have been the integral part of our life since thousands of years. These are reservoirs of curative elements used in the treatment of several ailments. Each medicinal plant has hundreds of biological and chemical compounds that work synergetically. The antioxidative defense system is very important to detoxify harmful effects of biotic and abiotic stresses. Among the environmental stresses, drought stress is one of the most adverse factors of the plant growth and productivity. Drought stress progressively decreases CO₂ assimilation rates due to the reduced stomatal conductance. Plant tissues contain several types of enzymes to control the level of reactive oxygen species (ROS) and to protect the cells under stress conditions. Drought stress mainly causes an excessive accumulation of ROS leading to the induction of the enzymatic antioxidants such as superoxide dismutase (SOD), catalase (CAT), peroxidase (POD), Glutathione peroxidase (GPX), glutathione reductase (GR). The activities of SOD and POD antioxidants increase while that of CAT decrease due to oxidative stress induced by the drought stress.

BMS13

Therapeutic potential of essential oils from two North Western Himalayan *Citrus* spp. for treating *Candida albicans* Infections in humans

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Traditional medicinal plants of North Western Himalayan region offer a wealth of phytocompounds, including essential oils (EOs) that can be explored for antifungal activities. Essential oils are naturally occurring volatile liquid, complex compounds with strong odour. The essential oils from plants have been known since antiquity to possess various biological activities such as antimicrobial, antioxidative, analgesic, sedative, antiviral, insecticidal, spasmolytic, anticancer and anti-inflammatory properties. The present study was conducted to analyse the antifungal potency of essential oils from leaves of indigenous varieties of *Citrus aurantium* and *Citrus pseudlimon* collected from Solan, Himachal Pradesh. Furthermore, the essential oils were characterized using Gas chromatography–mass spectrometry (GC-MS) analysis for the identification of phytocompounds. Fresh leaves from selected medicinal plants were collected and essential oils were extracted using hydro-distillation method. The percentage yield of essential oils was observed to be 0.2% from *Citrus aurantium* and 0.16% from *Citrus pseudlimon*. The antifungal activity was tested against *S. cerevisiae* (H1086) as a standard control and two pathogenic strains of *Candida albicans* (ATCC90028) and (MTCC277). Essential oils from both the plants showed a broad range of antifungal activity against all tested strains, which was quite evident from the Minimum Inhibitory Concentration (MIC) value of

essential oils ranging from 0.15% to 0.62%. GC-MS analysis of *Citrus aurantium* essential oil showed the presence of various phytochemicals such as 2- β Pinene (100%), Δ -3 Carene (84%) and Di-limonene (28%). These phytoconstituents are being characterized for synergistic potential of essential oils with antibiotics against fungal pathogens. Therefore, it can be concluded that essential oils of medicinal plants serve as a simple and cost effective alternative remedy for curing fungal infections.

BMS14

Genetic diversity of wild *Viola* species from mid hills of Himachal Pradesh using ISSR markers

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Genetic diversity is an important driving force behind adaptation, natural selection and conservation of wild plant species. *Viola* (family Violaceae) commonly known as 'Banksha' is a highly medicinal herb of Indian Himalayan region. It is a large genus with more than 800 species round the globe. Out of these only 35 species find distribution in India, and seven in Himachal Pradesh. Present investigation deals with the analysis of inter- and intra-specific genetic diversity in three of these species (*Viola pilosa*, *V. canescens*, *V. kashmiriana*) collected from two districts (Kullu and Solan) of the state by using a set of five ISSR primers (ISSR-A, ISSR-B, ISSR-C, ISSR-D, ISSR-E). Results of interspecific genetic diversity between these species showed a total of 32 bands, out of which 25 were polymorphic with 78.13 % average polymorphism. Intraspecific genetic diversity was also studied in genotypes of *V. pilosa* collected from Solan and Kullu districts and *V. canescens* collected from Kullu district. Result showed a total of 23 bands in *V. pilosa* genotypes from Kullu district and 18 bands from Solan district with 21.73 % and 22.22% polymorphism, respectively. Highest polymorphism was observed with ISSR-A primer and lowest was observed with ISSR-C primer in both districts. The comparative analysis of *V. pilosa* of Solan and Kullu district showed total 26 bands (12 polymorphic and 14 monomorphic) having 46.14 % polymorphism. On the other hand, *V. canescens* collected from different sampling sites of Kullu district was characterised with total 21 bands, out of which seven were polymorphic and remaining fourteen were monomorphic with 33.33% average polymorphism. Cluster analysis revealed more similarity between the *V. canescens* and *V. pilosa* as compared to the *V. pilosa* and *V. kashmiriana* or *V. canescens* and *V. kashmiriana*. The ISSR analysis showed significant genetic diversity between the species, therefore highlighting adaptation of the *Viola* species in their respective habitats. Non-significant genetic diversity among the population of *V. pilosa* and *V. canescens* supports cleistogamous nature of the flowers.

Evolution and Biology of CRISPR System: A new era tool for genome editing

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It is an evolution in its own kind that a technology changed the interface of biology in such a short expanse of time. Merely five years ago, scientists reported that the CRISPR-Cas (clustered regularly interspaced short palindromic repeats-CRISPR associated) system is the part of bacteria and archaea's adaptive immune system which helps in withstanding the attack against invading viruses by acquiring genetic records of invaders to facilitate robust interference upon reinfection. In this review, we discussed the evolution of CRISPR along the time and recent advances in understanding the vivid mechanisms by which Cas proteins respond to foreign nucleic acids and how these systems have been harnessed for precise genome manipulation in a wide array of organisms. With the advancement in this technology, it will become easier to genetically modify the plants for crop improvement.

Antimicrobial activity and phytochemical analysis of *Plagichasma appendiculatum* Lehm. & Lindenb.

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In recent years, due to increased cases of antibiotic resistance, search for natural antimicrobial agents is gaining popularity. In this regard, development of natural antimicrobial molecule with novel targets represents an attractive approach. In the present study, we have evaluated the antimicrobial activity of a Northwest Himalayan bryophyte -*Plagichasma appendiculatum* Lehm. & Lindenb. in four common solvents (butanol, ethanol, methanol and water) against six bacterial and fungal strains. In agar well diffusion assay, the methanol and butanol extracts showed promising antimicrobial activity against *Escherichia coli* and *Candida kefyr* respectively among all the tested microbial strains. Combination of the methanol extract with the well-known clinically approved antibacterial drug resulted in the killing of *E.coli* cells at non-inhibitory concentration. Notably, methanol extract caused the cell wall damage of *E.coli* cells as confirmed by confocal microscopy, flow cytometry and scanning electron microscopy (SEM). Gas Chromatography-Mass Spectrometry (GC-MS) and Fourier-Transform Infrared Spectroscopy (FTIR) were used to identify the phytocomponents of the active extracts. This study suggests that the methanol extract of *P. appendiculatum* Lehm. & Lindenb. can be used for the treatment of antimicrobial infections.

***In vitro* antidiabetic properties of two traditional antidiabetic plants (*Ficus benghalensis* and *Psidium guajava*)**

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Presently, plants are being used as a potential source to improve blood glucose level and to prevent complications of type 2 diabetes mellitus. Present investigation was carried out to check the *in vitro* antidiabetic properties of two such plants, *Ficus benghalensis* and *Psidium guajava*. As the leaves contain more amount of phytochemicals than other plant parts, the methanolic and aqueous extract of leaves were made. Both extracts were found to contain significant amount of phytochemicals that showed the potency towards diabetes. The analysis was done by *in vitro* enzymatic method (alpha-amylase inhibition assay) and glucose uptake assay. The aqueous extract of guava has the minimum IC₅₀ value (0.151) than *Ficus benghalensis* methanolic (IC₅₀ = 0.221) and aqueous extracts (IC₅₀ = 0.253). *Psidium guajava* extract shows higher amylase inhibition activity as compared to *Ficus benghalensis*. Further, the guava extract inhibited the glucose uptake significantly than *Ficus benghalensis*. Results showed that guava has better results against diabetes.

Ethnomedicinal uses of some plants from District Hamirpur of Himachal Pradesh for the treatment of malaria

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Malaria is caused by parasitic protozoan belonging to genus *Plasmodium*. The disease is most commonly transmitted by an infected female Anopheles mosquito. It causes many symptoms that typically include fever, tiredness, vomiting and headache. Hamirpur, the smallest district in the state of Himachal Pradesh, falls in the Shivalik range of Himalayan hills. This region is a rich repository of herbal, horticultural and agricultural plant species, and the local people widely make use of various plant parts/ products for fulfilling their daily requirements of food, fodder, fiber, shelter and primary health care. Present investigation highlights some of the traditional ethnomedicinal plants used by the locals of this district against malaria.

Studies on two *Asterella* P. Beauv. species exhibiting mycorrhizal associations

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Six populations of *Asterella multiflora* and eight populations of *Asterella wallichiana* collected from different habitats of Jammu region were screened for the presence of mycorrhizal associations. Mycelial strands were seen passing through both smooth walled and tuberculated rhizoids in both the species. Fungal structures like H/Y connections and vesicles were frequently seen. Vertical Section (V.S.) of thallus of *A. multiflora* was found to have fungal invasion in storage zone particularly in the midrib region of the thallus. An attempt was also made to study the effect of various ecological factors on mycorrhizal associations in these bryophytes. Of the two species, *Asterella multiflora* was found to be negatively correlated with altitude whereas pH had no effect on both the species. As far as the effect of various macronutrients is concerned, mycorrhizal associations in both the species were found to be negatively correlated with phosphorus levels in the soil. None of the taxa exhibited any relationship with Potassium (K) or Organic Matter (OM) of the soil. However, Organic Carbon (OC), however, was found to affect the degree of colonisation positively in *Asterella wallichiana*.

BMS20

Formulation of gum arabic stabilized nanoemulsion of *Eucalyptus globules* oil and its antimicrobial activity

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Eucalyptus oil, especially *Eucalyptus globulus*, is the most common species in the international pharmacopeia. It is well known medicinal plant due to the bioactive components present in it. The main component in this oil is eucalyptol or 1, 8 cineol which is a potential source of biological and consist of significant pharmacological properties. Eucalyptus oil exhibits tremendous anti-bacterial properties and have excellent source of minerals and fat soluble vitamins. Apart from nutritional and therapeutic indices of this oil, oxidative and thermal stability is matter of apprehension. Therefore, present study was carried out to formulate gum arabic stabilized nanoemulsion of eucalyptus oil and its antimicrobial assessment. For optimization of oil-in-water nanoemulsion coating or aqueous phase was kept constant, whereas oil phase was varied from 1-8% respectively. On the basis of maximum stabilizing properties of gum arabic emulsion samples with 2% eucalyptus oil was selected for characterization and assessment of antimicrobial activity. Droplet size and zeta potential of nanoemulsion was evaluated and FTIR spectrum revealed vibrational bands of oil phase and coating material, respectively. UV-Visible spectrum of nanoemulsion also unveiled maxima at 350 nm and minima at 800 nm, respectively. Thermal stability of nanoemulsions were evaluated at 80°C for 7 days and non- significant difference were observed in creaming stability of nanoemulsion.

Morphological characterization of selected nanoemulsion was done by inverted light microscopy. The nanoemulsion was highly stable, transparent and found to be effective bactericidal activity against tested pathogen. Antimicrobial activity was assessed by agar well diffusion assay and nanoemulsion exhibited significantly higher microbial activity against *E. coli*, *K.pneumoneae*, *S.typhimurium*, and *S.aureus* in comparison with positive control as well as eucalyptus oil, respectively.

BMS21

***In silico* study of *Sesame indicum* bioactive compounds with angiotensin converting enzyme**

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Sesamin, Sesamol and Sesamolin compounds were reported from *Sesame indicum* have antihypertensive effect. However, the mechanism via which these compounds effect in blood pressure regulation is still unclear. Therefore, present study was designed to target this compound on Renin angiotensin system a hormonal cascade which regulates the blood pressure. In silico protein-ligand docking of Sesamin, Sesamol and Sesamolin with angiotensin converting enzyme was carried out by AutoDock tool 1.5.6 and structure of the compound were drawn by the Marvin sketch 17.21.0 software. The binding of the compound to the active site of the drug target was observed by chimera 1.9. Sesamin, Sesamol and Sesamolin showed very low binding affinity with angiotensin converting enzyme the drug target and partially blocked the active sites of the enzyme. Sesamin showed the -10.2kcal/mol, Sesamol showed the -5.6kcal/mol and Sesamolin showed the -9.8kcal/mol with angiotensin converting enzyme. Sesamin and Sesamolin compound showed better binding energy with angiotensin converting enzyme than sesamol which is further better than in comparison to Captopril (standard) -5.5kcal/mol. Findings of the present study indicate the possible mechanism of action of these compounds and provide new perspective for the drug development against high blood pressure regulation. It also showed that angiotensin converting enzyme is very potential drug target for hypertension.

BMS22

***In vitro* anti-obesity study of three Himalayan herbs**

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Obesity is a serious problem in all age groups around the world including India. Present study was carried out to check the anti- obesity efficiency of three wild herbs [*Centella asiatica* (L.) Urb., *Dactylorhiza hatagirea* (D.Don) Soó, *Podophyllum hexandrum* Royle] *in vitro*. They were collected from different localities of Himachal Himalaya and their ethanolic extracts were used

for this purpose. Lipase inhibitory assay and amylase inhibitory assay was done to check the activity of plant against obesity. *C. asiatica*, *D. hatagirea* and *P. hexandrum* showed the lipase activity ranging between 72-75%, 82-84% and 88-91%, respectively, whereas it was 70-72%, 81-84% and 87-91% in case of amylase inhibitory assay.

BMS23

***Monascus purpureus* Went used for the production of pigment and their application in model food products**

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Monascus purpureus Went is non-pathogenic mold with red-purplish color. It generally develops on starch containing substrates such as white rice and red yeast rice. During growth this mold breaks down starchy substrates into different metabolites and produce pigments as secondary metabolites. A total of twelve pigments are produced by this species out of which six are well known. Monascin and ankaflavin are the yellow pigments; monascorubrin and rubropunctatin are yellow; and monascorubramine and rubropuntamine are red colored. Some of these natural pigments can be successfully utilized to color food stuffs as they are quite health friendly as compared to synthetic coloring agents. In meat processing industry, monascorubramine can be used as substitute for nitrite in red meat. In addition to the food industry, *M. purpureus* pigments are used in some cosmetics and medicines.

BMS24

Association studies of *TLR2* gene polymorphism with schizophrenia in Jammu and Kashmir population

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Toll like receptor 2 (*TLR2*) gene is located on chromosome 4 and involved in encoding toll like receptors that are pattern recognition molecules that initiate inflammation. Dysregulation of the immune system contributes to the pathogenesis of neuropsychiatric disorders including schizophrenia. Evidences from various studies indicated that dysregulation of *TLR-2* gene may have a role in the physiopathology of schizophrenia. Schizophrenia (SCZ) is a severe mental biological disorders with multifactorial manner of transmission and inheritance associated with environmental, developmental and genetic set off. It is a strongly heritable disorder that involves genes and metabolic mechanisms in a combined effect, each conferring a small increase in the overall disease burden. Their true etiology is not fully understood, however recent studies showed some relationship between SCZ and inflammation. Some investigators have reported the role of *TLR* in SCZ as high inflammation status is usually seen in SCZ patients. As summarised

below, we have surveyed the literature reporting association of *TLR-2* variations and dysfunction with above mentioned psychotic disorder. Some knock out studies suggest that the dysregulation of the innate immune system by a *TLR-2* dysfunction may contribute to the development and/or pathophysiology of schizophrenia-like behaviors via Akt-GSK-3 α /b signaling. The proposed role of this polymorphism has shown associations in some parts of the world and the presence of high frequency of polymorphism in different population in this study indicated that this genetic polymorphism can act as a candidate allele in the studied population group. These results provide evidence that this functional genetic variation of *TLR-2* underlie the pathophysiology of schizophrenia in the population. Further studies will be done with greater sample size for more authentic results.

BMS25

Association studies of *BDNF* gene polymorphism with schizophrenia in Jammu and Kashmir population

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Brain-derived neurotrophic factor is a protein which is encoded by *BDNF* gene and found in the brain and the periphery. *BDNF* gene is located on chromosome 11 and involved in the regulation of neuronal development, learning and memory processes. Evidences from various studies indicated that *BDNF* may be involved in the pathogenesis of schizophrenia. In the present study, we found association of *BDNF* SNP rs10835210 with Schizophrenia in J&K population. SNP (rs10835210 $p=0.001$) was showing significant variation when compared with healthy controls. The genotypic frequencies were found to be 37% (subjects) and 74% (controls) for wild type GG, 50% and 10% for heterozygous genotype GA and 12% and 14% for mutated homozygous genotype AA, in subjects and controls. The calculated odds ratio for the SNP rs10835210 is 0.4643 (<1 means that the exposure is associated with lower odds of outcome). The calculated power of study i.e., <60 , ideally should be >80 , suggested that study could not be taken as conclusive. The proposed role of this polymorphism has shown associations worldwide and the presence of high frequency of polymorphism in the said population in this study indicated that this genetic polymorphism can act as a candidate allele in studied population group. These results provide evidence that this functional genetic variation of *rs10835210* underlie the pathophysiology of schizophrenia in the population.

Antimicrobial and antioxidant properties of red pigment extracted from psychro-halophilic bacterium *Rhodonellumpsychrophilum* strain GL8

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Historically, pigments are integral part of human life. The increasing demand of pigments has paved way to synthesize pigments from petrochemical source. Synthetic pigments are harmful to health and environment and consumers are now more aware and demanding products with natural pigments. Plants, animals and microorganisms are the major sources of natural pigments. Among these, microorganisms are more suitable for pigment production due to easy culturing condition and high growth rates, and therefore offers huge biotechnological potential in different industries and for the environment. In the current study, we isolated a psychrophilic and red coloured bacteria from Pangong Tso lake of Leh and Ladhak. By 16S rDNA sequencing, psychrophilic bacteria has been identified as *Rhodonellumpsychrophilum* strain (GL8). 16S rDNA sequence of 1370 bp was submitted to the GenBank under accession no. MH031708. 1. The *R. psychrophilum* strain (GL8) is Gram-negative, rod shaped, non-motile and produce intense red pigment. The optimum growth of *R. psychrophilum* strain (GL8) was observed between pH 5-9 and 4°C. *R. psychrophilum* strain (GL8) could also grow in a medium containing 1 M NaCl, suggesting halotolerant nature of the bacteria. *R. psychrophilum* strain GL8 showed lipase, catalase and L-glutaminase enzyme activity. The intracellular red color pigment was extracted using ethanol from *R. psychrophilum* (GL8). Purified pigment showed antimicrobial activity against *Escherichia coli*, *Candida albicans* (MTCC 277), *Saccharomyces cerevisiae* (H1086) and *Candida albicans* (ATCC 90028). The DPPH radical scavenging assay showed that red pigment has higher radical scavenging activity with IC₅₀ value 13.159 µg/mL. The UV absorbance spectra of the red pigment showed maximum absorption at 500nm and has been identified by LC - MS/MS spectra.

CRISPR/cas9: Platforms for genome editing in crop plants

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The clustered regularly interspaced short palindromic repeat (CRISPR)-associated protein 9 (Cas9) genome editing system (CRISPR/Cas9) is adapted from the prokaryotic type II adaptive immunity system. The potential genome editing techniques i.e. Meganucleases, TALENs (transcription activator- like effector nucleases), ZFNs (zinc finger nucleases), and CRISPR-Cas9 (Clustered Regularly Interspaced Short Palindromic Repeats) are gaining much importance after the decreased popularity of Genetic modification technology. The CRISPR/Cas9 tool surpasses other programmable nucleases, such as ZFNs and TALENs, for its simplicity and high efficiency. It has gained popularity within five years and became a highly utilized research

tool across the world because of its precision and negligible side effects on environment as compared to GMOs. Various plant-specific CRISPR/Cas9 vector systems have been established for adaption of this technology to many plant species. In this review, we present an overview of current advances on applications of this technology in plants emphasizing general considerations for establishment of CRISPR/Cas9 vector platforms, strategies for multiplex editing, methods for analyzing the induced mutations, factors affecting editing efficiency and specificity, and features of the induced mutations and applications of the CRISPR/Cas9 system in plants.

BMS28

Antimicrobial and sensing properties of dextrose stabilized silver nanoparticles

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Silver nanoparticles were synthesized by reduction of sodium borohydride and stabilized with dextrose. For optimization of capping agent different concentrations of dextrose were used and on the basis of UV-visible characterization minimum amount of dextrose required for stabilization of silver nanoparticles was optimized. LSPR maxima was almost similar for all the nanoparticle samples, however difference in strong absorbance was observed. Average particle size and zeta potential of dextrose stabilized silver nanoparticles was confirmed by dynamic light scattering technique. Morphological and structural characterization was done using transmission electron microscopy. FTIR spectrum confirmed the functional characteristics of nanoparticles. Three different dyes were used for the photocatalytic reduction assay and silver nanoparticles showed significantly higher reduction in dye as compared to unmodified nanoparticles. Sensitivity of LSPR region of silver nanoparticles was determined by different concentration of hydrogen peroxide and change in UV-visible spectrum confirmed the sensitivity of LSPR region. Antimicrobial activity against *Staphylococcus aureus* and *Escherichia coli* was assessed and dextrose stabilized silver nanoparticles exhibited significantly higher zone of inhibition as compared to unmodified silver nanoparticles.

Studies on genetic fidelity of micropropagated plants of strawberry (*Fragaria* × *anannasa* Duch.) using molecular markers

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Strawberry (*Fragaria* × *anannasa* Duch.) is an important member of Rosaceae family having high level of natural antioxidants such as carotenoids, vitamins, phenols, flavonoids and dietary glutathionine metabolites. In the present study, Genetic fidelity of tissue culture raised plants of strawberry (*Fragaria* × *anannasa*) was analyzed by using RAPD and ISSR markers. The *in vitro* cultures of strawberry were maintained and multiplied on MS medium supplemented with 2.0 mg/l BA, 2.0 mg/l GA₃, 30g/l of sucrose, 100 mg/l of mesoinositol and 8 g/l agar. A total of 20 ISSR Primers and 15 of RAPD primers were tried to generate ISSR and RAPD profile. RAPD and ISSR banding pattern of regenerated plants were compared with that of original mother plant. In case of ISSR 14 primers were found to be informative out of 20 primers whereas, in case of RAPD seven primers were found to be informative out of 15 primers. The banding pattern was found to be monomorphic. Hence denoting the genetic stable nature of micropropagated plants of about 3 years old cultures of strawberry cv 'Ofra'.

Food quality and safety: An alarming concern from farm to fork

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Food quality and safety are of concern to every individual. The quality of fresh produce is often judged by visual characteristics such as size, shape, color, freedom from blemishes which, it could be argued, are enhanced by pesticide and fungicide applications. Concerns about the possible consequences of using increasing amount of chemical fertilizers have led to a strong interest in alternative strategies to ensure competitive yields and protection of crops. Indiscriminate use of pesticides and herbicides could cause diverse changes in biological balance as well as lead to an increase in the incidence of cancer and other diseases, through the toxic residues present in the edible produce. Up to now, industrialized production methods have clearly shown severe limitations such as a worldwide contamination of the food chain and water by persistent pesticide residues and reduced nutrient and flavor contents through low-cost intensive food production. The present study highlights the increasing trend of pesticides by the farmers to increase the food production and the amount of pesticide that resides in the final produce that reaches a consumer. An alternative survey also focuses on the use of integrating organic practices

by the certified organic farmer groups (OFG's). A parallel analysis has been drawn by comparing the different patterns of cultivation on persistence of pesticides residues which travels through a producer cultivation chain and reaches a food consumption criteria thus, surpassing the set Maximum Residual Limits (MRL). The Pesticide residues analysis by GCMS in the present studies, revealed a lower percentage of residues in organic tomato fruits as compared to the control. The detection of Propargite was found to be at par with the MRL limits in conventional treatment as compared to control, whereas the acephate residues were found out of the MRL limits under control, as compared to the organic treatment, which was observed well under MRL limit at low concentrations, which could be further reduced to negligible level if continuous organic practices are carried out for a 3-4 years time period. A considerable reduction of 0.28ppm in propargite residues, 0.03ppm in Deck, 3.77ppm in acephate was recorded under organic treatment (T_3) over the control during two consecutive years of study. The studies revealed that though the organic treatments didn't involved the use of chemical fertilizers, pesticides etc during entire cropping period, the possible reason for the presence of lower pesticide residues may be attributed to the produce that may be exposed to the chemicals already in the soil from previous use and the compounds that percolate through soil.

BMS31

Survey of ethnoveterinary medicines used by shepherds during seasonal migration in tribal areas of Himachal Pradesh

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Present study documents the plants used as the source of ethnoveterinary medicines by the shepherds of Kinnaur district in Himachal Pradesh during their seasonal migration. Shepherds are very close to nature as they spend most of their time in forests and pastures with their livestock. They keep on migrating to various places along with their livestock in search of quality grazing patches. Shepherds of Kinnaur district travel from higher ranges to low hills or plains in winter season and start their back journey in the month of April (summer season). Information on various ethnoveterinary medicines used by these shepherds was collected (May 2017 to July 2018) through personal interview method using a pretested questionnaire. The most commonly used plant parts were leaves, roots, seeds and the whole plants. A critical review of the literature and the results of present study suggest that the use of traditional veterinary remedies are still very prevalent and important in livestock rearing in tribal areas in Himachal Pradesh. However, there is urgent need to link such traditional knowledge to modern research activities so as to accelerate the rate of drug discovery more precisely.

Comparison of antifungal potential of essential oil and methanolic extracts from leaves of the medicinal plant *Zanthoxylum armatum* DC

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Zanthoxylum armatum DC is an important medicinal plant mentioned in Indian traditional medicinal system. It belongs to *Rutaceae* family. The English name of the plant is ‘Winged prickly ash’ and commonly known as ‘Timru’ or ‘Toothache tree’. Timur is known as an important magical plant because every part of the plant has medicinal properties and are used in indigenous medicine preparation against various diseases. The pharmacological activities of *Zanthoxylum armatum* include anti-inflammatory, antifungal, anticancer, antibacterial, insect repellent, hepatoprotective, anesthetic, carminative, antioxidant, cardiac stimulant properties etc. Presently, this plant is placed in endangered category by International Union for Conservation of Nature (IUCN) due to significant medicinal properties and continuous increasing demand. In the present study, essential oil extracted from fresh leaves and methanolic extracts of leaves were analysed for their antifungal potential using agar well diffusion method. Essential oil was extracted through hydro-distillation method whereas cold maceration method was used for the extraction of methanolic extracts of leaves. Antifungal activity of methanolic extracts and essential oil was checked against pathogenic yeast strain i.e. *Candida albicans* (MTCC277) and non-pathogenic yeast strain *Saccharomyces cerevisiae* (H1086). Essential oil fraction exhibited higher antifungal activity zone of inhibition (ZOI) of 15 ± 0.5 mm than methanolic extracts of leaves zone of inhibition of 10.3 ± 0.5 mm against *C. albicans* (MTCC 277), which was comparable to the standard antibiotic Amphoterecin B zone of inhibition of 15 ± 1 mm. But essential oil and methanolic extracts showed fungicidal effect against both the fungal strains. Therefore, the present study showed the importance of essential oil of *Z. armatum* in treating fungal infections.

***In vitro* anti-obesity study of Himalayan herbs formulation**

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Obesity is a serious problem in all age groups all over the world. There are several medicines available in the market which fights the obesity problem but they have so many harmful effects. To overcome this problem we investigated three wild herbs [*Centella asiatica* (L.) Urb., *Dactylorhiza hatagirea* (D.Don) Soó, *Podophyllum hexandrum* Royle] from Himachal Pradesh as an alternate medicine. The extract of different herbs was tested for their photochemical contents. *Centella asiatica* was found to be rich in total flavonoid content (0.164), total phenolic

content (0.631), total tannin content (0.980), Lipase inhibitory assay (88-91%) and amylase inhibitory assay (87-91%) as compared to rest of two herbs.

BMS34

Comparison of honey yield among artificially fed and unfed honeybee colonies

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Honeybees are the social insects which provide honey, wax and many other valuable products. Keeping in mind, the contribution of honeybees in pollinating the crops, beekeeping has strong connections with agriculture. Honeybees consume pollen (male germ plasma) and nectar (juices) from the flowers and fruits. Food sources are not available for bees round the year in our country. During lean periods, bees are shifted to distant places so that population can be maintained for next floral season. Concept of artificial feeding has also come up in minds of researchers to solve the problem of dearth period. In the current study carried out in Arni University (Kangra, H.P.), efforts were made to develop an artificial diet for honeybees and its impact on honey production was analyzed. It was found that bees which were fed with artificially formulated diet produced more honey in next floral season. Average honey production from diet fed colony was approximately 10 kg per colony in three month as compared to 4 kg per colony in control colonies which were not fed any diet. Reason behind this might be ample brood rearing and bee population maintained in experimental colonies which led to more nectar collection and honey production in next blooming season. Hence, it is recommended that bees can be fed with artificial diet (s) during lean periods so that full advantage of next floral season can be obtained.

BMS35

Protective efficacy of curcumin on antioxidant status and histopathological alterations in pancreas of cadmium exposed albino mice

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Cadmium (Cd) has been reported to be a pollutant of several industries, e.g. the Cd-Nickel batteries, dyes, paint pigments, plastics, fertilizers and some agricultural sources. Cadmium is a naturally occurring heavy metal, which can be found in water, air, food as well as in cigarette smoke. *Curcuma longa* L. has been traditionally used in Asian countries as a medical herb for several pathologies due to its antioxidant, anti-inflammatory, antimutagenic, antimicrobial and anticancer properties. This study was aimed to investigate the protective effects of curcumin on the antioxidant enzymes i.e. glutathione peroxidase (GPx), Superoxide dismutase (SOD),

Catalase (CAT) and histopathology against the cadmium chloride induced toxicity in the pancreatic tissue of albino mice. Twenty mice were divided into four equal groups. Group 1 was given distilled water only and considered as control group, group 2 received 1 mg/kg b.w of cadmium chloride, group 3 received 1 mg/kg b.w of cadmium chloride and 100 mg/kg b.w of curcumin, group 4 received 100 mg/kg b.w of curcumin and served as positive control. All treated groups were given an acute dose of cadmium chloride on alternate days and chronic dose of curcumin for 15 days. The results showed an adverse effect of cadmium on antioxidant activity and pancreatic structure while curcumin showed protective effect on glutathione peroxidase (GPx), Superoxide dismutase (SOD), Catalase (CAT) activity and improvement of exocrine and endocrine part of pancreas.

BMS36

Histopathological changes on alloxan induced diabetic mice kidney after administration of *Carissa spinarum* L. methanolic leaf extract

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Carissa spinarum L. is an evergreen, thorny shrub found in the Himalayan areas of Indo-Pakistan subcontinent. The plant has a number of ethno-medicinal applications. Pharmacologically this plant is used for the treatment of asthma and pulmonary diseases, anticancer, diarrhea, hepatoprotective, cardioprotective and reproductive dysfunction. Present study is aimed to study effects of *C. spinarum* methanolic leaf extract in alloxan treated mice kidney tissues. Mice were given intraperitoneal injection of alloxan monohydrate to a dose of 150 mg/kg body weight and divided into four groups with three mice in each group. First group served as control and were given distilled water. Second group mice were given *Carissa* leaf extract orally to a dose of 800 mg/kg body weight and diabetic control mice were given *Carissa* leaf extract orally to a dose of 600 and 800 mg/kg body weight for 28 days. Fasting blood sugar levels were determined after regular intervals and prior to dissection. A significant decrease in blood glucose levels with extract administered groups was observed as compared to diabetic mice with during the period of experiment up to 28 days stage. The histopathological studies of kidneys of diabetic mice revealed degeneration of renal architecture, but repairative changes were observed after treatment with administration of *Carissa spinarum* leaf extract.

Methanolic Extract of *Bistorta macrophylla* is rich in antioxidants and potent bioenhancer of antifungal antibiotics

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Bistorta macrophylla (D.Don) Soják is a flowering plant of Polygonaceae family. It has been used traditionally for the cure of tuberculosis, inflammation, pyretic fever, flu, lung disorders, diarrhoea, vomiting, arthritis, gout, kidney stones or hyperacidity and hypertension. The present study was aimed to investigate the phytoconstituents, antioxidant, antifungal and synergistic activity of methanolic extract of rhizome of *B. macrophylla*. Screening of phytocompounds revealed the presence of phenolic compounds, tannins, flavonoids, carbohydrates, alkaloids; whereas glycosides, terpenoids and saponin were absent. Methanolic extract of *B. macrophylla* showed approximately 7-fold higher phenolic content (191.18 ± 29.18 mg/gm GAE) as compared to flavonoid content (26.71 ± 3.21 mg/gm RE). DPPH radical scavenging and FRAP assays of the methanolic extracts of *B. macrophylla* (IC₅₀ value $9.414 \mu\text{g/ml}$ with DPPH assay and $31.02 \mu\text{M}$ Fe (II) equivalents) were comparable to ascorbic acid (IC₅₀- $9.66 \mu\text{g/ml}$ with DPPH assay and $21.06 \mu\text{M}$ Fe (II) equivalents). The extract of *B. macrophylla* showed comparative antifungal potential with respect to fluconazole, but more than amphotericin B. The minimum inhibitory concentration (MIC) value of extract was more as compared to both the antibiotics against *S. cerevisiae* (H1086), *Candida albicans* (MTCC277), and *C. albicans* (ATCC90028). Methanolic extract of *B. macrophylla* showed enhancement of antifungal potential of fluconazole and amphotericin B against *S. cerevisiae* (H1086), *C. albicans* (MTCC277), *C. albicans* (MTCC277). Therefore, the present study revealed the importance of *Bistorta macrophylla* in enhancing the antifungal potential of fluconazole and amphotericin B and manages the drug resistance problem to treat fungal infections.

***Rheum emodi* Wall. ex Meisn.: A broad spectrum bioenhancer of antibiotics against bacterial and fungal pathogens**

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Rheum emodi Wall. ex Meisn. (Himalayan rhubarb) is used as a medicinal herb in the greater Himalayas. The present study investigated the phytochemical, antimicrobial, antioxidant and synergistic properties of methanolic extracts of rhizome of *R. emodi*. The methanolic extract showed the presence of phenolics, tannins, flavonoids, carbohydrates, glycosides and phytosteroids. Methanolic extract showed higher total phenolic content (258 ± 6.87 mg/gm GAE) as compared to flavonoid content (50 ± 2.6 mg/gm RE) and inhibited the growth of Gram positive (*Bacillus subtilis*, *Staphylococcus aureus*), and Gram negative (*Escherichia coli*, *Klebsiella pneumonia*) bacteria. Minimum inhibitory concentration was comparatively less for Gram-negative (0.2 - 0.39 μ g/ml) as compared to Gram-positive bacteria (0.78 - 1.56 μ g/ml). When tested against yeast, *R. emodi* extract also showed comparatively more growth inhibition to *Candida albicans* (MTCC277) and *C. albicans* (ATCC90028) as compared to *Saccharomyces cerevisiae* (H1086). Methanolic extract of *R. emodi* showed synergistic antifungal activity when combined with fluconazole (*S. cerevisiae* and *C. albicans*) and amphotericin B (*S. cerevisiae*) and converting the extract from fungistatic to fungicidal. Combination of erythromycin and tetracycline with *R. emodi* extract showed synergistic antibacterial activity against *E. coli* and *K. pneumonia* and a combination of *R. emodi* extract with tetracycline demonstrated antibacterial activity against *K. pneumonia*. Moreover, extract alone showed fungistatic activity, but specific fungicidal activity when combined with amphotericin B or fluconazole. Therefore the present study demonstrated that a combination of *R. emodi* rhizome extract or their bioactive molecules can be used as enhancer of efficacy of synthetic drugs/antibiotics for the cure of bacterial and fungal diseases.

BMS39

Toxicological effects of Dichlorvos on liver and heart of *Cyprinus carpio* L. **Sushma Sharma and Rajinder Kumar**

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The use of chemical pesticides is one of the major reasons of contamination of various water bodies in developing countries like India. Among different group of pesticides organophosphorus compounds (OPs) have been widely used insecticides due to their low persistence and high effectiveness for insect and pest eradication. Among different OPs, Dichlorvos is widely used pesticide in agricultural practices throughout the world. It is widely used insecticide which is effective against various insects like aphids, caterpillars, thrips, mushroom flies etc. Its use has been matter of concern due to ill effects to non target organisms. Present study is aimed to investigate toxicological effects of dichlorvos on the liver and heart of Indian carp viz. *Cyprinus carpio* L. Carp was divided into five groups containing three fishes in each group. Group 1 fishes were designated as control. Fishes of group 2, 3, 4, 5 were placed in 1.0ppm, 1.4ppm, 1.7ppm and 2ppm concentrations of dichlorvos for the period of 10 days. Various biochemical alterations were observed after the exposure of different concentrations of dichlorvos. Increase in superoxide dismutase (SOD), catalase (CAT) and lipid peroxidation level (LPO) and decrease in total protein content was noticed after dichlorvos administration in both liver and heart. In liver infiltration of blood cells, hemorrhage, nuclear degeneration, hypertrophic nuclei, pyknotic nuclei, congestion of nuclei, dilation of sinusoids, infiltration of nuclei and enucleated areas at

some places was depicted after dichlorvos treatment. Heart revealing hemorrhage, infiltration of blood cells, infiltration of nuclei, congestion of nuclei, degenerated nuclei, cells with needle shaped, spindle shaped nuclei some enucleated areas at some places.

BMS40

Characterization of cellulase from thermophilic *Bacillus* sp. of hot springs of Himachal Pradesh

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Thermophiles are the organisms that live and grow in extremely hot environment that would kill most other organisms. They can be isolated from a number of marine and terrestrial geothermally heated habitats, including shallow terrestrial hot springs, hydrothermal vents, sediment from volcanic islands, and deep sea hydrothermal vents. Thermophiles have been documented as a valuable source of industrial enzymes called thermozymes which are thermostable. So in the present investigation, thermophilic microbial strains isolated from hot springs of northern Himalayan region of Himachal Pradesh were studied for cellulase activity. Cellulose a principal component of plant cell walls, consists of linear polymers of β -1,4-linked glucose molecules that are organized into higher order fibrillar structures. Degradation of cellulose involves a complex interplay between different cellulolytic enzymes. Among others, it has been widely accepted that three types of cellulases including endoglucanases (EC 3.2.1.4), exoglucanases (EC 3.2.1.91) and β -glucosidases (EC 3.2.1.21) act synergistically to convert cellulose to glucose. Two bacterial isolates *Bacillus* sp. PW1 (KU711837) and *Bacillus* sp. PW2 (KU711838) were isolated from Tattapani hot spring of Himachal Pradesh. Two bacterial isolates (PW1 and PW2) were found to be positive for cellulase activity. Optimum pH and temperature for growth and activity of bacterial isolates was found to be pH 8 and 80°C respectively. Maximum Cellulase activity for PW1 and PW2 were found to be 1295 U/mg and 1168 U/mg respectively at optimum temperature (80°C) and pH (8). Salts of heavy metal ions (Hg^{2+} , Ca^{2+} , Mg^{2+} , Mn^{2+}) enhanced the growth and cellulase activity of bacterial isolates. SDS-PAGE and zymogram analysis of PW1 extracellular protein analysis revealed the presence of 30 kDa and 70 kDa proteins with cellulase activity.

BMS41

Insect visitors of *Bauhinia variegata* L. with special reference to honeybees

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Nutritional stress, shrinking natural areas and increasing ecological pressure, has caused a decline in populations of insect pollinators world-wide. It is necessary to identify various blooming species of plants which provide forage to insect fauna to maintain pollination services

in various ecosystems. The present study revealed that flowers of *Bauhinia variegata* L. provided an excellent forage to large number of insects including *Apis mellifera*, *A. cerana*, *A. florea*, *Xylocopa latipes* Drury, *Xylocopa virginica* L., *Vespa orientalis* L., *Polistes olivaceus* F., *Musca domestica*, *Sarcophaga nodosa*, *Rhingia campestris*, *Chrysomya megacephala*, *Danaus chrysippus* L., *Pieris canidia*, *Pieris brassicae* L., *Papilio polytes*, *Papilio demoleus* L., *Pelopidas sinensis*, *Terias hecabe* L., *Macroglossum stellatarum*, *Blissus leucopterus* as well as the species related to genera *Ophyra*, *Megachile*, *Amegilla*, *Halictus*, *Nomia*, *Delta* and *Eristalinus*. Maximum abundance of honeybees was recorded during morning hours, which started decreasing after 1000 hours. Average foraging frequency was 8.5, 6.3 and 3.4 flowers per minute in case of *A. cerana*, *A. mellifera* and *A. florea* respectively. Preference to *B. variegata* during forestation programs may help for conservation and flourishing of insect pollinators.

BMS42

***Papaver rhoeas* L., an excellent pollen plant for honeybees**

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The availability of pollen is essential for the growth, development and reproduction of *Apis* species. It is important to identify flora of bee interest and multiplication of such plants will help to manage bee forage for increasing honeybee carrying capacity of a particular area. In urban ecosystems ornamental plants help to increase the bee forage potential *Papaver rhoeas* (family, Papaveraceae) is one such plants having large and showy flowers which provide abundant amount of pollen to wild and domesticated honeybees. Maximum abundance (25 bee/m²/min.) of all the three honeybee species. (*Apis mellifera*, *A. cerana* and *A. florea*) on the bloom of experimental plant was recorded during morning hours (800-1100). The visitation of foragers was very frequent. Average time spent per flower was maximum in case of *A. florea* (average 45 seconds), followed by *A. mellifera* (20 S) and *A. cerana* (17 S). The bees showed strong attraction towards the bloom. Competition between *A. cerana* and *A. mellifera* was noticed, foragers of one species tried to displace other from flowers. So growing of these plants for ornamental purposes at suitable places may help to conserve various types of honeybees.

BMS43

Effects of organophosphate Dichlorvos on gills and heart of *Cirrhinus mrigala* Hamilton

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Utilization of pesticides in India is 3% of its total worldwide consumption and these pesticides are increasing at the rate of 2-5% per year. Among many pesticides the organophosphate pesticides have become most widely used insecticides which replace many organochlorine compounds. Dichlorvos is one of the most commonly used organophosphate in developing

countries. Fishes are the most important inhabitants of the aquatic ecosystem which are most frequently exposed to and affected by the poisonous pesticides. The present study was carried on the gills and heart of *Cirrhinus mrigala* (Indian major carp) at 1ppm, 1.4ppm, 1.7 ppm and 2ppm concentrations. Fish were kept in water tank for 10 days. An organophosphate dichlorvos was dissolved in water tank. The fishes were dissected after 10 days. Histological changes in gills of *Cirrhinus mrigala* showed aneurism, congestion, hyperplasia, hemorrhage, necrosis of epithelium, swelling of gill lamellae with vacuolation, edema, proliferation of epithelial cells, lamellar fusion, curling of secondary lamella and loss of structural integrity of lamellae. Heart revealing at 1ppm, 1.4ppm, 1.7 ppm and 2ppm concentrations, pyknotic nuclei, some needle and spindle shaped nuclei, some nuclei were hypertrophied, hemorrhage and congestion of blood vessels, nuclear atrophy and degeneration of nuclei were also observed.

BMS44

Analysis of physical, chemical and biological quality of Motia Lake, Bhopal

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Here, physicochemical and biological analysis of Motia Lake was attempted in different sessions. The parameters such as temperature, salinity, turbidity, pH, DO, COD, BOD, alkalinity etc were studied in different sessions throughout year. The results on physico-chemical parameters of water and soil clearly indicate highly productive nature of the Motia Lake. The study indicated seasonal variation of different physical and chemical parameters. High values of DO during summer result in death of fishes in lake. The fish diversity in Motia lake was represented by 20 genera belonging to the respective orders. They included major carps, exotic carps, murels, cat fishes and other species. The total fish production during the period was found to be 264.65 Kg/ha/y. The change in the planktons concentrated was recorded at different seasons. The phytoplankton abundance was evident during monsoon season. The ratio between phytoplankton to zooplankton was found to be 29.29: 1.00.

BMS45

Bioherbicidal potential of essential oils: A review

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Environment impact and health related issues of chemical herbicides have led researchers to find ecofriendly and biodegradable herbicides. Natural plant products can provide an array of such compounds which show strong allelopathy towards weeds. Efforts of more than half century have documented many natural plant products that can be used as bioherbicides. Amongst these, volatile essential oils seem quite promising for weed management. Plants of family myrtaceae, asteraceae, labiateae, acanthaceae etc. have been reported to be phytotoxic to different weed

species of wastelands and agricultural ecosystems. Few products based on essential oils have been commercialized under brand names such as Greenmatch Ex, Matron II, Weedzap, EcoExempt HC, WorryFree etc. Despite many publications on herbicidal properties of essential oils, few products have been approved as bioherbicides for mass scale weed management programmes. Therefore practical implication of these studies needs to be explored in future.

BMS46

Plant growth promoting activities of bacteria isolated from salt affected soils

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The salinity stress causes a major threat for plant growth, yield, and biomass production. The present study was conducted with the aim to isolate bacteria from salt affected soils which possess plant growth promoting (PGP) activities. We found E_{Ce} and pH of soil samples were ranged from 10.5 to 42.8 dS/m and 7.99-8.80 respectively. One hundred nine phenotypically different bacteria were isolated and were screened for the ammonia excretion, Indole acetic acid, HCN production and phosphate solubilisation. It was found that isolate HB6P2 showed highest production of ammonia and IAA production (12.3 ppm and 14.01 ppm respectively). HB6T2 showed positive results of HCN production and HB10NA showed positive results of phosphate solubilisation.

BMS47

***Cordyceps sinensis*: Potential drug target for plethora of diseases**

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The genus *Cordyceps* is an important kind of medicinal fungi belonging to the Ascomycota, Pyrenomycetes, Hypocreales, and Clavicipitaceae. *Cordyceps* are specific macrofungi present as a parasite on larvae and pupae of insects. As a pleomorphic fungus distributed worldwide, *Cordyceps* is particularly distributed in tropical forests and humid temperate. Out of 400 species, *C. sinensis*, also called as “winter worm, summer grass,” is recognized as the most famous tonic herb in traditional Chinese medicine (TCM) for centuries. Both fruiting portion as well as the larvae of these fungi possesses potent bio-active compounds and their composition was almost found to be similar in both. The important bioactive molecules present in this endoparasitic fungi are ribonucleosides, mannitol, sterols, organic acids, polysaccharides, proteins, polyamines, amino acids dipeptides, vitamins (Vit E, K, and water-soluble vitamins B1, B2, and B12) and a variety of trace elements (K, Na, Ca, Mg, Fe, Cu, Mn, Zn, Pi, Se, Al, Si, Ni, Sr, Ti, Cr, Ga, V, and Zr). Several studies showed the antioxidant, anticancer, immunomodulatory, anti-diabetic, anti-inflammatory, Aphrodisiac, Anti-fatigue, apoptotic, liver, lung and kidney protection activity of

this fungus. This fungus because of its outstanding curative properties has huge application in health care product and showed attractive huge financial gains for the collectors. However, there is an urgent need to devise methods of effective cultivation methods and to ensure effective process technologies for utmost recovery of bio-active principles. Further, crude extracts of *Cordyceps sinensis* needs to be well characterized chemically to imply therapeutic importance.

BMS48

***In silico* analysis of natural plant compounds of *Hibiscus sabdariffa* L. against angiotensin type 2 receptor**

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Renin angiotensin system (RAS) plays a major role in maintaining homeostasis of cardiovascular system by maintaining the fluid and electrolyte balance. Biological functioning of RAS is mediated by octapeptide angiotensin II. Ang II bind to two different receptors AT1R and AT2R which have opposing effect to each other to mediate its action. AT2R abundantly present in fetus and neonates and believed to promote vascular growth while its concentration depletes in adults. AT2R is regarded as the protective arm of RAS system. It mainly counteracts the effects produced by AT1R. AT2R also plays a role in mediating anti- proliferation, vasodilation, cellular differentiation and apoptosis. Therefore, present study was carried out on the natural compound present in medicinal plants for screening *in silico* activity via AT2R. Here, we taken *Hibiscus sabdariffa* compounds Delphinidin 3-O- β -sambubioside and cyanidin-3-sambubioside are anthocyanins, member of flavonoid group. *In silico* protein-ligand docking of Delphinidin 3-O- β -sambubioside and cyanidin-3-sambubioside with AT2R was carried out by AutoDock tool 1.5.6 and structure of the compound were drawn by the Marvin sketch 17.21.0 software. The binding of the compound to the active site of the drug target was observed by chimera 1.9. Delphinidin 3-O- β -sambubioside showed the -10.1kcal/mol and cyanidin-3-sambubioside showed the -9.8kcal/mol with angiotensin type 2 receptor. The agonist of AT2R seralin drug has been shown -9.0kcal/mol binding affinity which are lesser than this compounds. Findings of the present study indicate the possible mechanism of action of these compounds and provide new perspective for the drug development against high blood pressure regulation via vasodilating effect. It also showed that angiotensin type II receptor is very potential drug target for hypertension.

Variety of orchid habits and habitats in Himachal Himalaya

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Himachal Himalaya is a mountainous tract lying between 30°22'–33°12'N latitudes and 75°47' and 79°04'E longitudes. The climatic variability owing to undulating topography and wider altitudinal range (350-7000 m amsl) is well reflected in its diverse biotic elements. A total of 85 orchid species exhibiting varied life modes have so far been recorded from here. Except for eleven species that are epiphytic, all others are ground growing in habit and these include seven that are mycoheterotrophic. The epiphytes are mainly distributed in subtropical valleys of Kangra, Kullu, Mandi and Sirmour districts up to 2000 m altitudes. They often subsist on pulses of water and nutrition and possess well developed velamenous roots and fleshy leaves for absorption and storage of water. They generally prefer lichen and moss covered broad-leaved hosts with soft and spongy bark as their abodes. The ground orchids are mainly distributed in subtropical and temperate climates. They occupy a variety of ecological niches to satisfy their physico-chemical requirements, and generally come out only during rainy season. New shoots appear with the advent of favourable conditions, from the perennating organs like rhizomes, tubers, tuberoids, and pseudobulbs. Some of their common habitats are: open grassy or gravelly slopes; moist, humus rich and more or less shady forest floors; and disturbed localities along forest borders and road embankments. Species such as *Androcorys monophylla*, *Crepidium acuminatum*, *Cypripedium cordigerum*, *Epipactis veratrifolia*, *Habenaria aitchisonii*, *H. intermedia*, *H. pectinata*, *Herminium lanceum*, *Nervilia concolor*, etc. are better represented in the disturbed habitats which are ecologically marginal and apparently more xeric. Though the associated ground vegetation of orchids varies with the locality, ferns, mosses, liverworts and grasses are the most common elements in different habitats. *Cymbidium macrorhizon*, *Epipogium aphyllum*, *E. roseum*, *Gastrodia falconeri*, *Galeola lindleyana*, *Neottia inayatii* and *N. listeroides* are the mycoheterotrophic orchids growing here; they are achlorophyllous and possess only scale leaves. *C. macrorhizon* representing the only achlorophyllous species of the genus met in India grows on grassy slopes littered with pine needles. All other species, on the other hand, occupy moist, shady and humus-rich floors mostly in mixed forests.

Nematodes Associated with Okra(*Abelmoschus esculentus* (Linn) Moench) in Ghuwarwin area of District Bilaspur, Himachal Pradesh

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Non segmented round worm, thread worms or pin worms commonly called as Nematodes. Its body is elongated, cylindrical, bilaterally symmetrical and tapering towards both end. It is pseudocoelomate and dioecious with sexual dimorphism. Although currently only about 4100 have been described, their impact on human by inflicting heavy losses in agriculture is substantial. Its impact on agriculture by way of inflicting is quite substantial. In the District Bilaspur of Himachal Pradesh, in the present study on nematodes, two types of nematodes have been detected from the roots and rhizosphere of okra crop. It has been estimated that a single acre of soil from arable land may contain as many as 3,000,000,000, nematodes. These two are ectoparasitic and endoparasitic. The present study also reveals that percentage of *Helicotylenchus erythrinae* is quite high in some parts of the Ghumarwin of Bilaspur District. Okra is susceptible to root-knot nematodes damage. If Okra is to be grown in areas prone to nematode attacks Nematicide must be sprayed prior to planting. Non chemical management of nematodes can be accomplished through the use of soil solarization, crop rotation or the use of nematodes suppressive crops.

Cardiomyocyte remodeling in chronic fenoterol dose administered murine model

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β_2 -Adrenoceptor agonists such as fenoterol are anabolic in skeletal muscle, and because they promote hypertrophy and improve force producing capacity, they have potential application for enhancing muscle repair after injury. Synthetic β_2 -adrenoceptor agonists were initially developed for acute asthma treatment, to facilitate bronchiolar smooth muscle dilation. Fenoterol has been used to treat asthma by opening up the airways in the lungs. Despite their muscle anabolic properties, β -agonists have also been associated with some undesirable side effects, including increased heart rate (tachycardia) and muscle tremor, which have so far limited their therapeutic potential. Since the early 1990s, the use of β -agonists for the purpose of enhancing sporting performance has become increasingly prevalent. In fact, many athletes are not aware of the deleterious cardiovascular effects of chronic high-dose β -agonist administration and in many cases rely on anecdotal information about these compounds from nonscientific sources. The

intent of this study is to characterize the effect fenoterol on healthy murine hearts. Histological analysis demonstrated an increase in left ventricular extra cellular matrix (ECM) collagen content in a control compared group. Cardiac hypertrophy was commonly observed in mice when were treated chronic doses of β -agonist fenoterol. In adult mice treated daily with an oral dose of fenoterol (1.4 mg/kg) for 4 wk, cardiac hypertrophy was observed. Cardiomyocyte hypertrophy along with necrosis occurred against a background of zero damage in control group. The cardiac hypertrophy in fenoterol-treated mice was associated with an increase in midventricular collagen deposition. Furthermore, it is possible that similar damage can contribute to a deterioration of cardiac functions.

BMS52

Cloning and expression of cellulases from *Aspergillus niger* RSO-1

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Lignocellulosic biomass is most abundant biopolymer on earth which has status of near zero cost. Production of cellulases (cellobiohydrolase, endoglucanase and β -glucosidase) using cheap substrates of lignocellulosic origin can lead to reduction in the cost of cellulases. The reduced cost in turn can help in their widespread usage among various industries including pulp and paper, textile, detergent, agriculture, food and feed and waste management. In the present study a novel strain of fungus identified as *Aspergillus niger* RSO-1 was used for cellulase production. After verifying production of all the three cellulases, we attempted to clone gene fragments *Cbh* II, *Egl* B and *Bgl* I encoding for cellobiohydrolase, endoglucanase and β -glucosidase respectively using cDNA based approach. *A. niger* RSO-1 spores were harvested and inoculated in potato dextrose broth containing 0.5% w/v avicell at 28°C, 120rpm to obtain vegetative mycelium. Mycelium was harvested from medium after 4 days of incubation, washed with nuclease free water (Invitrogen, USA) and 100mg of dry mycelium was crushed to fine powder using RNase free DEPC treated pestle mortar using liquid nitrogen. Fine homogenized mycelium was used for Total RNA extraction by RNA extraction kit NucleoSpin RNA plant kit (Takara, USA). The fast processing time and use of column format was able to provide intact Total RNA from fungal biomass to synthesize good quality cDNA. cDNA was synthesized using Revert Aid cDNA synthesis kit (Thermo fisher, USA) and quality of cDNA was checked by PCR. Standardization of PCR protocol for target gene amplification was completed and cloning was attempted. Transformants were confirmed by sequencing and activity was checked on LB agar plate supplemented with corresponding substrates.

Transcription factor 7 like-2 (*TCF7L2*) gene polymorphisms rs12255372, rs7903146 and the association with type 2 diabetes in North Indian population

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Type 2 diabetes mellitus (T2DM) is a multifactorial disorder that has become a major health problem in many countries. The prevalence of T2DM is increasing at an alarming rate and has become a personal, social, and economic burden worldwide. It is a common disease with a multifaceted display of inheritance, which is considered to be a consequence of the relationship between genetic and environmental factors. The investigation of genetic susceptibility to T2DM is ultimately an effort to associate disease phenotype with underlying genotype. The aim of present study was to investigate the association of possible role of *TCF7L2* gene polymorphism with the risk of T2DM in North Indians. We genotyped two of the associated SNPs (rs7901346 and rs12255372) in a case-control cohort consisting of 380 T2DM cases and 384 controls matched with respect to age, sex and geographical origin and medical history and anthropometric measurements were taken. All the clinical parameters including total cholesterol (TC), triglycerides (TG), HDL, LDL, VLDL, and glucose were done to correlate the relation among the *TCF7L2* gene polymorphisms- rs12255372 and rs7903146 genotypes. The rs12255372 genotype was amplified using the PCR-RFLP method and rs7903146 using allele specific PCR. Here, we report replication of association between T2DM and two SNPs in the case-control (rs7901346 and rs12255372) samples from North Indians. Logistic regression analysis of the rs12255372 (G/T) polymorphism showed that odds ratio for GT genotype was 0.736 (95% CI, 1.082-.500; P=0.119) and for TT genotype it was 1.894 (95% CI, 3.220-1.114; P=0.018) when compared with GG genotype. The frequency of the TT genotype was significantly higher in diabetics than in controls (21.3% vs. 11.1%) and was found to be significantly associated to T2DM risk. In (rs7903146) (C/T), polymorphism, frequency of CT and TT genotype was variable (42.2% vs. 52.1% and 11.5% vs 15.8%) in healthy human study subjects and T2DM patients. The T allele was significantly associated with risk for T2DM under a dominant model of inheritance [1.83(1.36-2.45) P =0.00006]. This replication strengthens the evidence for involvement of *TCF7L2* in T2DM in our study population.

Pollen analysis of some honey samples from Shimla hills of the Northwest Himalayas

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Comprehensive melissopalynological studies were conducted on honey samples collected from Indian hive bee, *Apis cerana* F. colonies located in Shimla and Solan hills of Himachal Pradesh with different altitudes and climatic zones. A total of 70 honey samples were analysed which were collected during summer and autumn seasons from 35 different localities of Shimla and Solan hills of Himachal Pradesh. Of these, 34 honey samples i.e 17 of summer and 17 of autumn season were from 17 different localities of Shimla hills, whereas 36 samples, i.e. 18 of summer and 18 of autumn season were from 18 different localities of Solan hills of Himachal Pradesh. Scanning Electron Microscopic studies of 33 plant species of 19 different families were also conducted to know detailed pollen morphology. The size varied from 14.0µm x 11.0µm to 155.1µm x 148.0µm i.e. smallest in *Woodfordia fruticosa* and largest in *Abelmoschus esculentus* in different pollen micrographs.

Physical Sciences

Uranium detection in drinking water samples of Galore area of district Hamirpur Himachal Pradesh, India

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Uranium is a naturally - occurring element found at low levels in almost all rock, soil and water. It is both radioactive and a chemically toxic element. Uranium gets into drinking water when the natural resources containing uranium are dissolved in groundwater. Uranium dissolves as water passes through soil and rock layer. Groundwater is expected to contain higher levels of uranium than surface water. The amount of uranium in well water varies with the concentration of uranium in the bedrock. In the present article uranium concentration will be estimated with the help of LED fluorimetry from different samples collected from Galore area of Hamirpur district, Himachal Pradesh, India. The uranium concentrations in water samples have been found in the safe limits as per WHO 2011.

Static Correlation Functions of Coupled Electron-Hole Quantum Wire System at Finite Temperature

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In this paper, we report numerically computed static correlation functions (*viz.* static structure factor and pair-correlation function) of the coupled electron-hole quantum wire system at finite temperature using the Singwi-Tosi-Land and Sjölander (STLS) approximation. Results are presented for selected values of temperature and linear electron (hole) number density at fixed wire width and inter-wire spacing. Our calculations reveal an interesting interplay between thermal and correlation effects. The inclusion of static local-field correction factor for the calculation of static correlation functions is seen to bring a qualitative and quantitative change in the properties of the coupled electron-hole wire system.

Effect of magnetic field on Self-focusing of Q-Gaussian Laser Beam in Relativistic plasma

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In the present paper, we have studied the self-focusing of q-Gaussian laser beam in plasma by taking into account relativistic nonlinearity. The propagation characteristics of the q-Gaussian laser beam is studied while taking into account static magnetic field which modifies the quiver motion of electrons as the natural frequency of the oscillating electron changes on addition to cyclotron frequency as the laser beam propagates in the plasma. The beam width parameter is derived and plotted for the normalized distance of propagation using well known WKB and paraxial ray approximation. Various parameters are studied like q- value, intensity and magnetic field which influence the beam width parameter during its propagation.

Chi-Square Analysis and bounds on Sterile Neutrino Flux in the Solar Neutrino Data

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The study of Solar neutrinos flux have played a decisive role in the development of neutrino physics and consequences thereof in particle physics, astrophysics and cosmology. It took several decades to have complete understanding about the enigmatic nature and behaviour of these particles. The energy spectrum of solar neutrinos given by standard solar models is seen by different experiments as they are sensitive to different neutrino energy ranges. The rare 8B neutrino flux is the high energy tail of solar neutrinos for which statistically significant

measurements have been made so far, but this is just tip of an iceberg. As such, the study of low energy neutrinos can give us better understanding and showcase the possibility of species other than three active neutrino flavors, mainly the sterile neutrinos (ν_s) in solar neutrino flux. In the light of latest data available from various solar neutrino experiments including Borexino (3MeV/5MeV) and KamLAND Solar phase we perform Chi-square analysis and, in a model independent way, derive the bounds on sterile neutrino component present in the solar neutrino flux. We update the limits on the sterile neutrino component obtained by the previous works using data from SNO solar Salt phase (SNO-I, SNO-II, SNO-III) and from Super Kamiokande (SK-I, SK-III, SK-IV and SK Combined) experiments. We have classified the data in five different cases using *RNC*, *RCC* and *RES* from all the experiments and used 17 data points to perform Chi Square analysis. We also presented plots between the with the normalization factor f_B . As such we retrieve the upper bounds existing in the literature and present the more stringent bounds on the sterile neutrino component.

PS05

A Model for Estimating the Unexplained Matter

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We present an unique property of the interstellar medium in terms of the rigidity and fluidity at the particular region of the galaxy, which gives us an estimate of the structure and mass distribution of the galaxies. Here, we introduce some external parameters like rigidity parameter and fluidity parameter in order to obtain the observed rotational velocity curves of the galaxies. By doing this we find some specific relations between these parameters which can help in understanding the large scale structure of the galaxies. To explain the spirality of the galaxies we assume the interstellar medium to be a viscous fluidic on which the galaxy is floating just like a whirlpool formed on the sea. Therefore, we use the rotational dynamics for the cosmic fluid, in which the viscus drag is provided by the gravitational force. Here the central black hole in the nucleus of a galaxy is equated with the low pressure zone of a whirlpool. In this work we also discuss the various density distribution profiles of the unseen dark matter.

Fabrication and electrical characterization of Ag/p-Si(111) Schottky diode at low temperature

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The current–voltage characteristics of Ag/p-Si Schottky diode measured over the temperature range 80–300 K have been studied on the basis of thermionic emission diffusion mechanism. The equivalent Schottky barrier height and diode ideality factor are determined by fitting of measured current–voltage data in to thermionic diffusion equation. It is observed that the barrier height decreases and the ideality factor increases with decrease in temperature and the activation energy plot exhibit non-linear behavior. These characteristics are attributed to the Gaussian distribution of barrier heights. The capacitance–voltage characteristics of Ag/p-Si Schottky diode are also studied over wide temperature range. From the measured capacitance–voltage data the built-in voltage and acceptor density (NA) in silicon is estimated.

Confirmation of the Hadronic Mass Quantization from Experimental Hadronic Regge Trajectories

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This contribution provides a validation to the earlier proposal of hadron mass quantization in the units of 70 MeV mass quanta. The linear experimental Hadronic Regge Trajectories constructed from the recent 2014 Particle Data Group Listings serve as a prominent tool in solving the Hadronic mass spectrum mystery. Application of the Barut's solution to relativistic Balmer formula helps in deriving quark masses for mesons and baryons. This astonishingly produces the quark masses very close the 70 MeV mass quanta, which turns out to be the mass quantum for building hadrons. The slight deviation from this mass quantization is also evidently explained.

Wear behavior of spray deposited AMCs

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The investigation has done to analyze the effect of ceramic particulates in AMCs (aluminium metal matrix composites). The lightweight Al-Si alloy is used as matrix and SiC particles are used as reinforcing particulates. The composites are manufactured by the spray atomization and co-deposition technique. The wear tests have been performed at various normal loads and temperatures with the help of pin on disc machine at constant velocity. The wear rate of spray formed composites are significantly lower than Al-Si alloy. The microstructure of spray formed composite consists of fine size equiaxed grains. The reinforced particles are equally distributed throughout the matrix of the composite. The as prepared samples were studied using scanning electron microscope (SEM) and X-ray diffraction (XRD) techniques. Mode of wear mechanism has been analyzed from SEM micrographs of the worn pin surface and collected debris during dry sliding.

COOLING OF MECHANICAL RESONATOR USING A BOSE-EINSTEIN CONDENSATE WITH DIFFERENT COOLING SCHEMES

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A detailed study is presented to show the possibility of approaching the quantum ground-state of a hybrid optomechanical quantum device. It is formed using a Bose-Einstein condensate (BEC) confined inside an optical cavity having a movable end mirror. Cooling is attained with two experimentally realized schemes, one using back-action cooling and other using cold-damping quantum feedback cooling. In both the schemes, it was found that by increasing the two body interaction, the mechanical oscillator reaches its quantum ground state.

Interaction of Benzene over Ag surfaces using first principle calculations

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Interaction of Benzene molecule with Ag surface has been studied using density functional theory (DFT). SIESTA code has been used to study the periodic slabs of Ag using periodic boundary conditions. Surface potential energies are in good agreement with experimental results. Calculations provide that cluster is not too reactive and can be used as chemical model for other electronic properties.

Electrical, Thermal and Optical properties of Carbon Nanotubes: A Review

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Carbon nanotubes (CNTs) are one of the wonders of modern science discovered. CNTs have been regarded as the stiffest and the strongest material ever developed and received considerable interest in research because of their unique atomic structure, dimensions and attractive properties. In the past decade, researchers have made several attempts and efforts exploiting the exceptional properties of CNTs towards the development of CNTs applications. Nowadays the carbon nanotubes derived products have smeared into our life step by step and before long they will function as essential components for technology innovations. A recent direction of research has been to try to gain further understanding by use of computation methods and models which appeared with the advancement of computer technology.

Spin orbit interaction effect on optical rectification of quantum wire in presence of electric and magnetic fields

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Understanding the manipulation of spins in nanostructures has resulted in an increase in data storage density in hard drives over the past decade of more than two orders of magnitude. Following this remarkable success, the field of ‘spintronics’ or ‘spin based electronics’ is moving beyond effects based on local spin polarization and is turning towards spin-orbit interaction effects. We study the energy dispersion relations of the spin split subbands in a quantum wire subjected to external transverse electric and magnetic fields in the presence of Rashba spin orbit interaction. For an infinite superlattice wire, we have investigated the influence of external electric field and magnetic field on the nonlinear optical rectification of a parabolic confinement wire in the presence of Rashba spin orbit interaction. We have used density matrix formulation for obtaining optical properties within the effective mass approximation. The results are presented as a function of quantum wire radius, electric field, magnetic field, Rashba spin orbit interaction strength and photon energy. Our results indicate an increase of electric field redshifts the peak positions of nonlinear optical rectification. The role of confinement strength and spin orbit interaction strength as control parameters on this nonlinear property have been demonstrated.

Influence of hydrostatic pressure for quantum wire in presence of magnetic field with spin orbit interaction

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The influence of Hydrostatic pressure and temperature on the optical absorption and refractive index changes of a parabolically confined quantum wire placed in an external magnetic field has been investigated. We have obtained detailed effects of these two parameters on the optical, electronic and the physical properties of a quantum wire taking into account the Rashba Spin Orbit Interaction. The results are related to linear, nonlinear and total absorption coefficients and refractive index change as a function of photon energy photon energy while keeping Hydrostatic

pressure, temperature, magnetic field and Rashba spin orbit interaction strength as parameters. We also have demonstrated the effect of Hydrostatic pressure on effective mass of electron and interlevel energy spacing is also analyzed.

PS14

First Principles Studies of Si Clusters

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Clusters are in between atoms and bulk matter. Using Quantum Espresso ab- initio package we found most stable structures for Si_3 , Si_7 , Si_{10} , Si_{13} , $\text{Si}_{13}\text{H}_{12}$, $\text{Si}_{13}\text{H}_{14}$ and $\text{Si}_{13}\text{H}_{16}$ and visualized the resulting structures using XCRYSDEN. We also analyzed these structures using symmetry, density of states, valence band width and band gap values. In case of hydrogenated Si clusters broader valence band and narrower band gap has been found well to correlates with stability.

Mathematical Sciences

Information Theoretic Measure and Order Statistics

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Order statistics have been used in a wide range of problems like detection of outliers, characterization of probability distributions, quality control and strength of materials. Some information theoretic aspects of order statistics have been discussed in literature. Ebrahimi et. al. (2004) studied some information theoretic properties of order statistics based on Shannon entropy and Kullback-Leibler measure. Arghami et. al. (2011) discussed Renyi entropy measure based on order statistics. We have introduced past Renyi entropy measure based on order statistics and have studied characterization result for that. Further we have introduced dynamic cumulative Renyi entropy of order statistics and have shown that the distribution function is characterized uniquely. Specifically we review the various information theoretic measures specifically, dynamic and cumulative, studied in order statistics and their applications.

Construction of Maximum Distance Separable (Mds) Rhotrices From Circulant Rhotrices

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Maximum Distance Separable (MDS) rhotrix which have useful applications in cryptography and coding theory. There are numerous properties of rhotrices which are analogous to those of matrices. In this way, rhotrices become a new paradigm of matrix theory and this new field attracted the researchers for its mathematical enrichment. Matrices play an important role in the designing of block ciphers and hash functions in cryptography. In this paper we introduce Circulant rhotrix over $GF(2^n)$. Further, we construct MDS rhotrices using Circulant rhotrices.

COEFFICIENT ESTIMATES FOR A UNIFIED CLASS OF ANALYTIC FUNCTIONS

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In the present investigation, coefficient bounds has been determined for a newly defined class of analytic univalent functions, which unifies many earlier known classes. Further, sharp bounds for the Fekete-Szegő coefficient functional and second Hankel determinant are found and subsequently the estimates for the first four coefficients are derived. A sharp bound for a coefficient functional associated with the r th root transformation is also obtained and various special cases of our results has been pointed out.

MS04

Analysis of Rayleigh Waves in Thermoelastic Material with Voids under an Inviscid Liquid Half-Space

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The present investigation is to study the surface wave propagation in a semi-infinite isotropic thermoelastic material with voids under a homogeneous inviscid liquid half-space. The frequency equation is derived after developing the mathematical model. The compact secular equations that govern the Rayleigh surface waves in the considered medium have been derived after obtaining the formal wave solution for various field functions. Also the secular equations in mathematical form for Rayleigh wave propagation are derived for stress free, insulated/impermeable and isothermal/iso-concentrated boundaries, or for the thermoelastic solid half-space, elastic half-space with voids in contact with inviscid liquid. The path of surface particles is also obtained for Rayleigh wave propagation in a homogeneous isotropic thermoelastic half-space with voids. The particle paths during the Rayleigh wave motion are found to be elliptical, which degenerate into straight lines when there is no phase difference between the pairs of surface displacement functions. The amplitudes of the displacements, the volume fraction field, and the temperature field in both the media are obtained and discussed for a particular model to depict the voids and isotropy effects. Some special cases are also deduced from the present investigation. The study may find applications in the development of gyroscopic devices and designed of surface acoustic wave devices.

MS05

Modelling of axi -symmetric vibrations of plate in contact with liquid

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In the present paper the thermoelastic axisymmetric vibrations in a thermoelastic circular plate partially in contact with liquid is studied. The Kirchhoff-Love plate theory and coupled thermoelasticity has been used to model the transverse disturbance and temperature change in the plate. The liquid is assumed to be viscous, incompressible and at uniform temperature. The dispersion relations that govern the natural frequency of vibrations of the system and the mode shapes have been derived. The dispersion relations have been computed numerically with the help of MATLAB software. The computed results have been plotted graphically for comparison and illustration purpose. The study may find applications in fluid-storage tanks, fuel tanks, dam-reservoir systems, naval structures etc.

MS06

Semi generalized μ separation axioms in Generalized Topologies

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This paper introduces some variations of semi open sets from topological spaces to generalized topological spaces. Also it defines some separation axioms related to these semi generalized open sets and investigates them to find whether they are valid in the set up of generalized topology where the condition of closedness of open sets for finite intersection is missing.

MS07

Particle Swarm Optimization Applied to Periodic Orbits

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The concept of the optimization of non-linear function using particle swarm methodology is introduced. Particle swarm optimization technique is a population based random process. The evolution of several model is outlined and an implementing of one of the model is discussed. In this paper the method is applied to find the family of periodic orbits around the co-linear

Lagrangian points L1 and L2, i.e., the construction of periodic orbits for the circular restricted three body problem (CRTBP) like Sun-Earth-Spacecraft system and The Newton Raphson method is applied to locate the Lagrangian points of CRTBP. Nevertheless, it is very simple and intuitive, the particle swarm algorithm shows to be absolutely correct to find the optimal initial condition of periodic orbits with great numerical accuracy.

MS08

Analyzing a novel sixth order transformation method for finding multiple roots of nonlinear equations

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In this paper, a novel sixth-order transformation method is proposed and analyzed for finding multiple roots of nonlinear equations, when the multiplicity of the root is not known explicitly. The proposed method does not require the evaluation of second derivative. Numerical examples are presented to demonstrate the robust and efficient behavior of the proposed scheme. The basins of attraction of the proposed method are also presented in comparison to existing transformation methods in the literature.

MS09

Analysis of a novel sixth order method for solving nonlinear equations

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In this work, an efficient three-step iterative method of convergence order six for solving nonlinear equations is analyzed. The convergence behavior of the proposed method is discussed using two approaches: (i) testing by numerical examples and (ii) dynamic study using basins of attraction. It is proved that the present method has an edge over existing methods, particularly when applied to polynomial equations with complex coefficients.

MS10

Study on stable lactation of Jersey cross breed

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Milk yield data (1978-2014) of four Jersey cross breed cows were taken from the Dairy Farm of Department of Silviculture and Agroforestry, Dr. Y. S. Parmar University of Horticulture and Forestry, Solan. Data were used for stability analysis of milk yield of Jersey cross breed cows

based upon Wricke's Ecovalence model. Study on Wricke Ecovalence indicates a generalized estimate of study of performance based on means under more than two months. Ecovalence is generally expressed in percentage. As percentage of Ecovalence (W_i) is inversely associated with lactation stability, a low percentage of W_i indicates high stability of performance.

Environmental and Agriculture Sciences

Assessment of the quality of drinking water sources and human health in a rural area of Solan district, Himachal Pradesh

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A study to assess the quality of drinking water sources and health conditions of the natives in a rural location of Solan District (30.89° N, 77.17° E) was conducted during February-May in 2018. Water samples were collected from four different sites covering two different and the only sources of water supply (Bawadi and Hand pump) in the village selected for the study. These collected samples were tested for the quality parameters such as pH, electrical conductivity, TDS, total hardness, calcium hardness, magnesium hardness, ions such as Cl^- , CO_3^{2-} , HCO_3^- , Na^+ , K^+ and selected metals (Fe, Pb and Cr). The Indian Standard methods were followed for the collection and analysis of water samples. A health survey was also conducted to check the current health conditions of the natives. The results of health survey and chemical analysis of water samples collected from Bawadi and hand pump have been discussed in this paper and compared with the permissible limits of WHO and BIS.

Temperature stress mediated consequences on morphology, physiology and secondary metabolites of *Datura stramonium* L.

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Temperature is one of most important environmental issues, emerging as key environmental factor which affect the activities and properties of plants in various ways. *Datura stramonium* (L.) is one of the multipurpose plants of Himalayan regions known with innumerable medicinal properties, belongs to family Solanaceae. To evaluate the effect of extreme temperature on plants, they were subjected to six conditions which included 50°C, 40°C, 30°C, 25°C, 20°C and 10°C. Seedlings grown at 25°C condition were treated as control. Results revealed that extreme temperature conditions affect the morphological parameters of plant adversely. A linear increase in the antioxidant activity (Enzymatic and Non-enzymatic) was observed with increase in the temperature conditions. High Performance Liquid Chromatography was used for the quantitative analysis of alkaloids (Atropine and Scopolamine) present in plant extract, results revealed that the concentration of compounds increased with high and low temperature conditions. The present study revealed the protective mechanism of plant against oxidative damage caused by adverse climatic conditions and was maintained by high content of enzymatic and non-enzymatic antioxidants.

Habitat preferences of butterflies in conifer forests of Water Catchment Sanctuary, Shimla, Himachal Pradesh

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The present study provides information on Habitat Preferences of Butterflies of Conifer Forests of Water Catchment Sanctuary of Shimla, Himachal Pradesh for the first time. As a part of the biodiversity impact assessment, a survey was carried out to study the butterfly diversity. The aim of the study was to identify species of conservation priority, their seasonality and to know the butterfly diversity potential of the area. Surveys were carried out during three different seasons (pre-monsoon, monsoon, post-monsoon from Feb 2017 to Jan 2018). Pollard walk method was used to assess the diversity. Total 755 individuals belonging to 29 species of 5 families were recorded and maximum numbers of individuals (268) were recorded during Pre-monsoon (Feb-May). The results of present study revealed that maximum number of species belonged to family Nymphalidae (12 species), followed by Lycanidae (8 species), Pieridae (7 species), Hesperidae (2 species) and Papilionidae (1 species). Percentage composition of each family revealed that Nymphalidae constituted around (41%) of the total butterfly fauna, followed by Lycanidae (38%), Pieridae (18%) Papilionidae (1%), Hesperidae (2% each). Species diversity, evenness and species richness was calculated by Shannon-Weiner Diversity index, Jaccard Evenness index and Margalef's Richness index. Species diversity was found highest in Nymphalidae (1.06) and lowest in family Papilionidae (0.28); evenness was highest in family Nymphalidae (4.43) and lowest in Hesperidae (0.81). Similarly species richness was highest in family Nymphalidae (0.36) and lowest in Hesperidae (0.24). From the conservation point of view the study area is undisturbed forest, rich in flora and fauna species and the findings suggested that it holds a rich and unique diversity of butterflies. Such studies on monitoring the butterfly diversity and abundance offer valuable information on their population dynamics. Large scale study on ecologically important species is required to fully explore the area thus a detailed study of butterfly fauna in these areas is in progress to conclude comprehensive information on habitat preferences of Butterflies.

ENV04

Cytogenetical study in *Pleurospermum brunonis* Benth. ex C. B. Clarke (Apiaceae) from district Sirmaur of Himachal Pradesh, NW Himalaya

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Presently, cyto-genetical studies have been carried out on *Pleurospermum brunonis*, collected from Tisri (3,000m) and Churdhar (3,600m) of district Sirmaur of Himachal Pradesh in the Western Himalayas show chromosomal report of $2n=22$. The species is cytologically worked

out for the first time at world level. Further, meiotic course is found to be highly abnormal with the presence of cytomixis, chromatin stickiness, multiple associations, laggards and bridges at different stages of meiosis I & II. The cytomixis is observed from early prophase-I upto telophase-II stage of meiosis. The percentage of PMC's (pollen mother cells) involved in chromatin transfer is quite high and may involve group of PMC's. PMC's with hypo- and hyper-ploid chromosome numbers are also observed. Cytomixis and other meiotic abnormalities are also reported for the first time in this species and seem to be directly under genetic control. The meiotic abnormalities include the presence of unoriented bivalents at metaphase I, laggards and chromatin bridges at anaphases and telophases. The frequency of chromatin stickiness is seen to be very high. Microsporogenesis is abnormal with the formation of micronuclei and production of heterogenous sized fertile pollen grains with reduced pollen fertility.

ENV05

Diversity of Microlepidoptera in India with special reference to superfamily Tortricioidea

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The insects (phylum Arthropoda: class Insecta), constitute the most diverse creatures on Earth. Among them, the Lepidoptera includes moths, butterflies and skippers (scaly winged insects) and forms the third largest order after the orders Coleoptera and Diptera. They have great economic importance due to their diversity and association with various vegetation in different climatic zones. Their larvae are found throughout the year, which feed on whole body of plants, leaf litter, animal waste, stored products, bird nests etc. On global basis, there are about 158570 species under the order Lepidoptera, of which 138656 species are moths and the remaining butterflies (Zhang, 2011, 2013). The Indian diversity of Lepidopterans is about 15000 species belonging to 82 families, of which 13359 species under 78 families are moths (88%) and the remaining butterflies (12%) (Chandra, 2011 & ZSI, 2011). Small primitive moths fall under the group Microlepidoptera which forms artificial division of the order Lepidoptera. Consultation of literature shows that as many as 45735 species belonging to 4626 genera of 73 families under 19 superfamilies of Microlepidoptera, are represented globally (Nieukerken *et al.*, 2011). Among the Superfamilies, like Gelechioidea, Tortricioidea, Tineoidea, Zygaenoidea, Cossioidea, Gracillarioidea Ypnometoidea and Pterophoroidea are more represented while others such as Simaethistoidea, Alucitoidea, Carposinoidea, Schreckensteinoidea, Epermenioidea, Urodoidea, Immoidea, Choreutoidea, Galacticoidea and two unassigned superfamilies are less represented.

The work on Microlepidoptera in India is very scanty and has received only scarce attention owing to their characteristic features like minute size, poor flight capacity and dispersal mechanism and other problems in their biosystematics studies. The Microlepidopteran diversity known from India is about 2500 species which share about only 5.5% of the global diversity (45735 species). They belong to 800 genera (17% of the world genera) under 37 families of 13 Superfamilies. Under the Superfamily Tortricioidea, a single family Tortricidae has the diversity of 10387 species belonging to 1071 genera of world over (Nieukerken *et al.*, 2011), of which only 459 species belonging to 148 genera have been reported from India (Hampson, 1892;

Meyrick, 1912-1936). The members of nearly half of the total number of families are still remaining untouched for their biosystematics studies, which itself suggest that the study on this group is a gap area of research. In view of above, at the end of the 20th century, the Ministry of Environment and Forests, Government of India launched a scheme titled, All India coordinated project in Taxonomy (AICOPTAX) to revamp the taxonomic studies on gap areas of biodiversity groups of animals and plants. Biosystematic studies on Microlepidoptera are one among the priority gap area of research in India. Under this scheme, the ministry sanctioned certain Coordinating Centre to undertake taxonomic studies.

Salient features of Microlepidopteran characteristics such as their morphology, including male/female genitalic features, nomenclature and classification, diversity and distribution of the Superfamilies Tortricoidea are also discussed.

ENV06

Diversity and abundance of insect pollinators of *Punica granatum* L. in different localities of Himachal Pradesh

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Present study were conducted on diversity and abundance of insect pollinators of *Punica granatum* in different localities of Himachal Pradesh. Study areas are Darlaghat, Jatoli temple Kararaghat, Jubbad, Karsog, Aalsindi and Potter's Hill. Observation of insect pollinators conducted from 8:00 to 11:00 AM and 2:00 to 4:00 PM in sunny days. During study 9 species of insect pollinators collected from the localities which belong to order Hymenoptera and Diptera. Among all the insect pollinators, Honey bee was most dominated pollinator. Higher foraging activities of insect pollinators occurring in morning.

ENV07

Soil analysis of different farming systems (conventional and in-conversion) in pea production in mid-hill conditions of Himachal Pradesh

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Pea is most popular and widely grown, annual pulse grain playing an important role in the upliftment of the economy of hilly area farmers. The application of chemical pesticides have increased in recent time, but has gradually contributed to increased environmental hazards, soil deterioration, thus disturbing the beneficial microbes and biological balance, leading to various dreadful diseases like cancer. Keeping in view the above burning criteria, the studies were conducted focusing on the in-conversion phase of a chemical cultivation system to an organic cultivation system. The results highlight the various parameters like soil health and pesticide residual analysis and their differential behaviour in both the systems (Chemical and Organic). A baseline survey was conducted for comparing differences in behaviour of farmers towards in-conversion phase for which SOGG group (Salogara Organic Growing Group) of Solan-HP was taken in to account, whereas Basal area farmers were selected or chemical cultivation pattern of

pea cultivation. A comparative analysis was drawn between two systems. The results revealed that there was an increase in microbial count of fungus (68 ± 2.51) and PSB (68.66 ± 1.52) in chemical soil as compared to in-conversion stage (66.66 ± 2.08 , 62.66 ± 2.51). It can be concluded from the present studies that soil microbial load in the chemical soil is more than organic soil because organic farms are under in-conversion stage and as the time passes and farmers keep on using the organic manures and organic practices there is a possibility of increasing microbial load in the soil. Also the pesticide residues were not found in the organic samples and they were above the limit or at par in the chemical pea samples and market pea samples.

ENV08

Phyto-diversity and ethnobotany of angiospermic flora in Bilaspur district of Himachal Pradesh

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The present paper deals with the documentation of field observations on the traditional use of medicinal and aromatic plants by inhabitants of Bilaspur district of Himachal Pradesh. The study area is inhabited by two dominant tribes, *Kohalies* and *Gujjars*. These tribes depend directly on plant resources for their basic necessities (food, clothes and shelter) as well as their primary health care system. A large number of plants of local flora are used to cure various ailments of human and livestock. First-hand information about hundred wild plants from Ghumarwin, Jhanduta and Naina Devi regions have been recorded by conducting extensive field surveys during February to September, 2017. The information is represented in a tabulated form as scientific names of plants in alphabetic order followed by family and herbarium accession number of the collected voucher specimens. Information on vernacular names of plants, parts used, detailed botanical description, global as well as regional distribution and ethnomedicinal uses are given in detail. Information on traditional usage as well as phyto-diversity of species reported in the literature has also been included so as to present a comprehensive view. The present study explores indigenous knowledge about traditional ethnomedicinal usage of hundred plants belonging to 44 families for the treatment of various diseases. The dominant families are Poaceae with 7 plant species; Fabaceae, Lamiaceae, Apiaceae, Apocynaceae with 5 plant species each and Rutaceae, Moraceae, Solanaceae, Euphorbiaceae with 4 plant species each. Out of 100 plants, 19% leaves, 17% seeds, 14% fruits & roots, 13% flowers & bark, 4% whole plant & stem, 1% bulbs & rhizomes of plant species are used for the treatment of various diseases. A wide range of diseases ranging from cough and cold to asthma and bronchitis, and cuts and wounds to snakebites are treated by the traditional healers with the help of local plant remedies. This study documents valuable information for traditional remedies and contributes to the usage of medicinal plants in the research area.

GIS based approach in drainage morphometric analysis of micro-watersheds of Jammu city and its environs, Jammu and Kashmir

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Remote sensing (RS) and Geographical information system (GIS) techniques are now-a-days in use for assessing various terrain and morphometric parameters of the drainage basins and watersheds, as it provide a flexible environment and an important tool for the manipulation and analysis of spatial information. Morphometric analysis is the measurement and mathematical analysis of the configuration of the earth's surface, shape and dimension of its landforms. The morphometric parameters of basin can address linear, areal and relief aspects. An attempt has been made to study drainage morphometry which deals mainly with the geometry, more emphasis being placed on the evaluation of morphometric parameters such as stream order (Nu), stream length (Lu), mean stream length (Lsm), stream length ratio (RL), bifurcation ratio (Rb), mean bifurcation ratio (Rbm), drainage density (Dd), stream frequency (Fs), drainage texture (Dt), form factor ratio (Rf), circularity ratio (Rc), elongation ratio (Re), length of overland flow (Lg) and constant channel maintenance (C). Jammu city, the winter capital of the state of Jammu and Kashmir is located on both the banks of the river Tawi and lies between 32° 38" and 32° 48" North latitude and 74° 47" and 74° 50" East latitude. By using Arc GIS 10.5 software, there are total 24 micro-watersheds have been delineated using drainage extracted from ASTER Digital Elevation Model (DEM). The study area possesses the dendritic drainage pattern with maximum 5th order of stream which is mainly controlled by physiographic and lithological conditions of the area.

Role of genitalia in the identification of butterflies of the genus *Mycalesis* Hübner (Lepidoptera: Nymphalidae) from North West Himalaya

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The butterflies of the genus *Mycalesis* Hübner are commonly known as "The Bushbrowns". They are found in the hilly terrain at low elevations, forests, scrubs and wetter parts where they fly close to the ground. In the male genitalia of *Mycalesis* species, teumen is broad, aedeagus tubular, uncus and brachia are long and pointed. In the present study, a total six species viz. *Mycalesis francisca sanatana* Moore, *M. heri* Moore, *M. nicotia* Westwood, *M. mineus mineus* Linnaeus, *M. persius blasius* Fabricius and *M. lepcha lepcha* Moore, have been collected from certain localities falling within an altitudinal range varying from 300 m to 2100m in the Shivalik hills and Lesser Himalaya. *M. heri* Moore is included in the Schedule II, Part II of the Wildlife (Protection) Act, 1972. On the examination of various morphological characters, particularly the external male and female genitalia of all the species, it is revealed that all the six species are

broadly congeneric and form a natural group. The male genital structures such as the uncus, brachia, tegumen, vinculum, valvae, saccus and aedaeus of all the species broadly agree with each other, and thus the presently studied species are clearly congeneric. In the female genitalia of Mycalesis species, the signum is always wanting. The earlier authors have given taxonomic keys on the basis of external morphology. None of the authors has used the genitalic characters in keys which are otherwise quite consistent in different biological species. An updated key and illustrated account of the external male and female genitalia will be discussed.

ENV11

Underground water contamination in Solan District of Himachal Pradesh: a review

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Water is a major constituent of the human body and purity of the water is a vibrant issue of concern. Quality of the water is decreasing day by day due because of various reasons. Natural underground water resources get contaminated due to industrial waste disposal, weathering of rocks, leaching of soils, etc. Its quality can be assessed by investigating various parameters including TDS, BOD, COD, temperature, nitrate, sulfate, chlorides, total alkalinity, etc. Exceeding the ppm limits of heavy metals such as Cu, Fe, Pb, Hg, etc. may lead in to the development of some chronic diseases. Present review documents the level of contamination in underground water of Solan District of Himachal Pradesh.

ENV12

Phytochemical screening, and antioxidant and antibacterial activity of leaves of *Ficus auriculata* Lour. and *Osyris arborea* Wall. from North Himalaya

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There are various chemical compounds present in the plants that impart medicinal properties to them. The present research work was undertaken for estimating phytochemical screening, and antioxidant and antimicrobial activity of methanol and chloroform extract of leaves of *Ficus auriculata* Lour. and *Osyris arborea* Wall. Both of them showed the presence of secondary metabolites (carbohydrates, flavanoids, triterpenoids, phenols, tannins and alkaloids). Glycosides are present only in methanol extracts of both of these plants. While studying the antimicrobial activity of plant extracts, maximum activity was shown in *Ficus auriculata* at 240µg/ml (18.33±0.67) and minimum activity was at 100µg/ml (10.33±0.33) against *Escherichia coli*. In

case of plant extract of *Osyris arborea* maximum antimicrobial activity was found at 240µg/ml (17.33±0.33) against *S. aureus* and the minimum activity was at 100µg/ml (12.00±0.57) against *E. coli*. The study also confirmed the antioxidant activity of both plants. IC₅₀ value of methanol extract of *Ficus auriculata* is 2.64mg/ml and ascorbic acid value is 0.40mg/ml, whereas IC₅₀ value of chloroform extract of *Ficus auriculata* is 3.57mg/ml and ascorbic acid value is 6.8mg/ml. In case of *Osyris arborea*, its methanol extract has IC₅₀ value of 0.59 mg/ml and ascorbic acid value is 1.03mg/ml, whereas IC₅₀ value of chloroform extract of *Osyris arborea* is 6.69mg/ml and ascorbic acid value is 1.03mg/ml. The results of present studies provide a scientific basis to homemade remedies and thus validate the traditional uses of these plants. Further, purification and structural elucidation of these compounds and their mode of action may yield significant antibacterial agents from these plants.

ENV13

Biofuel from cockroach and rice moth larva

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Fossil fuel depletion and environmental degradation are the main problems throughout the world. Many researchers are working to produce fuel from biological sources. Biofuel has a less damaging effect on the environment, and is made from renewable sources, thereby avoiding fossil fuel depletion. The use of insects as a source of biofuel has been gaining importance in recent years. We produced biofuel from the cockroach *Periplaneta americana* (order Blattodea) and from rice moth larva *Corcyra cephalonica* (order Lepidoptera) by extracting their lipids by Soxhlet extraction using petroleum ether as a solvent. Biofuel was produced by transesterification of insect lipids with catalyst (NaOH) and alcohol (methanol) in 6:1 ratio to obtain methyl esters (biodiesel) and glycerol (by product). GC-MS was done for the identification of compounds present in the biodiesel. Biodiesels obtained from insect lipids were characterised to test their properties as compared to fuel in diesel engines. Their acid value, peroxide value and saponification value were determined. The results show that biofuel obtained from insects under optimum conditions is an excellent substitute for fossil fuel.

ENV14

***Drosophila* avoids bitter gourd extract in multiCAFE assay**

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Bitter gourd contains antifeedant compounds, thereby acting as an aversive stimulus to insects. It has been used in controlling some insect pests. Compounds from bitter-gourd are environment friendly and rather than having an adverse impact on human health, they have medicinal properties. *Drosophila melanogaster* is a model system suitable for understanding various

mechanisms of insect physiology, due to the existence of numerous tools for manipulating and understanding the biology of the model, and hence can be used to study the mechanism by which the chemicals from bitter-gourd affect insects. Additionally, some fruit fly species are pests of fruit cultivation and cause damage to the young developing fruits. The effect of bitter gourd compounds have not yet been tried out on fruit flies. We tested whether *Drosophila* can be repelled by bitter ground extract with the help of multiCAFE assay. Two strains of flies were tested – a wild strain from the university campus, and Canton S strain (a laboratory strain). Flies of both strains avoided bitter gourd and preferred sucrose over bitter gourd extract. Our results demonstrate that bitter gourd has an aversive effect on *Drosophila* and can potentially be used in controlling fruit fly menace in fruit cultivation.

ENV15

Photodegradation of Congo red dye by Ag/ZnO nanocomposite of carboxymethyl cellulose hydrogel

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Present paper reports the preparation of Ag/ZnO nanocomposite of carboxymethyl cellulose hydrogel. The different conditions were optimised to get the maximum yield of hydrogels. Itaconic acid (IA) and Lactic acid (LA) were grafted onto carboxymethyl cellulose (CMC) using N, N¹-methylene-bis-acrylamide (MBA) as cross linker and potassium persulphate as initiator. The nanocomposite was synthesised by co-precipitation method using magnetic stirrer and was characterized by FTIR, SEM, TEM, XRD, TGA and EDX. FTIR and SEM results characterised the grafting of itaconic acid and lactic acid onto carboxymethyl cellulose. TEM analysis showed the particle formation in the nanorange. The nanocomposite was used for the comparative study of degradation of Congo red dye in the visible light directly and adsorption (dark) followed by degradation (light).

ENV16

Exploring genetic mechanisms for developing hybrids in some economically important vegetables of Himachal Pradesh

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To counter the multifaceted challenges like climate change, food security and nutritional security, spotlight on hybrids is the need of the hour. Developing hybrids pertaining to

vegetables would help better in countering the above-mentioned challenges. The utilization of genetic mechanisms in hybrid breeding of vegetables is not only of great scientific interest but it is also of immense practical significance. These mechanisms include self-incompatibility (SI), male sterility and gynoeism. Keeping this in view, cauliflower and cucumber, the most extensively cultivated and economically important vegetables of Himachal Pradesh were taken up for research. Development of SI and cytoplasmic male sterile (CMS) lines in the cauliflower and gynoeicous lines in cucumber was the major objective of research to facilitate the production of hybrids. The hybrids developed through the exploration of these systems were then evaluated over the locations to ascertain their performance for yield and horticultural traits. Hybrids performing better/ comparable over the locations for yield potential and quality traits in comparison to private sector hybrids are under testing for determining their performance over the years. Best identified hybrids from these studies could help the farmers in many ways. Besides increasing the turnover through the low production costs, high yields, uniformity and quality, farmers could be benefitted through the technology transfer of these genetic mechanisms by producing and selling hybrid seeds.

ENV17

Krummholz vegetation at the alpine treeline ecotone protecting threatened plant species: Evidence from Western Himalaya

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The alpine treeline is defined as the line marking the highest patches of forest within a given slope or series of slopes on a mountain. It is one of the most conspicuous ecological boundaries, and is probably the most stressful location in the high altitude forests and is hence a sensitive warning system of climate change. The alpine treeline ecotone is the transitional zone from the timberline to the tree species limit, where the timberline is the upper limit of the closed forest and the tree species line/limit is the uppermost location where seedlings or saplings of tree species can be found. Krummholz is a German term for the shrub-like crippled forms of tree species that tend to lie on the ground instead of standing erect. They are found at or above the alpine treeline ecotone, struggling to survive under tremendously adverse conditions that ultimately restrict tree growth. In Western Himalayas they are represented by *Rhododendron campanulatum* D. Don and *Juniperus communis* L. In the present study the species of spermatophytes were documented in quadrats along an elevation gradient in the alpine treeline ecotone region in the upper Beas valley above village Kothi, in Kullu district of Himachal Pradesh. The slope containing the alpine treeline species *Quercus semecarpifolia* Sm. was selected. The treeline edge exhibited a remarkably high phytodiversity than the other elevational sites as expected. The most interesting find was the presence of threatened plant species only under the quadrats of krummholz vegetation. Such threatened species was otherwise supposed to be found throughout the elevation gradient but was probably over exploited in the open areas because of its medicinal and commercial value, but were hidden out of sight under the

krummholz belt. Hence the alpine treeline ecotone of the western Himalayas should be conserved because of the high phytodiversity harboured by it and also because of the special protecting potential of threatened plant species by the krummholz vegetation.

ENV18

Forest certification - a sustainable tool for forest management

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Sustainable forest management call for a long term commitment by all the stakeholders, including those concerned about the attainment of millennium development goals. The debate about forestry practices should continue in the effort toward balancing social, economic and ecological aspects of human well being. Several environmental agreements and forest policies, it remains a challenge to save the earth's biodiversity rich and climate change mitigating forests, many of which are vanishing at an alarming rate. Lack of good governance and illegal logging are considered among important reasons for deforestation, more so the object persistent poverty among forest-dependent communities and forest- fringe villages. Forest certification is an innovative initiative in this context. Increasing environmental awareness and ethical consumerism has led to forest certification as an effective tool for communicating the quality environmental and social performance of good forest management. The goal of credible certification system is to ensure that the forest products are derived from responsibly managed forests be that in a phased approach to certification under trying circumstances, such as in the tropics. The certification standards, criteria and indicators and the chain of custody enables the identification of forest product obtained through legitimate harvesting, this assures access to reputed retailer and major market, whereby the role and responsibility of committed forest owners and managers should be appropriately recognized and rewarded more so in this era of globalization, contribute towards improving trade and market mechanisms, leveraging sustainable management of forest and related resources, and promoting harmony between humanity and the environment.

ENV19

High altitude medicinal plant extracts display potent antifungal activity

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An attempt was made to evaluate the antifungal activity of *Paeonia emodi* (commonly known as Himalayan Peony) in four common solvents (acetone, chloroform, methanol and water) against six fungal strains. The methanolic seed extract (MSE) showed the promising antifungal activity against *Candida albicans* (6.25 mg/mL), *Candida glabrata* (3.12 mg/mL) and *Candida parapsilosis* (12.50 mg/mL). The combination of MSE with well known commercial antifungal drugs amphotericin B (Amp B), nystatin (NYS) and fluconazole (FLC) showed the killing of *C.*

glabrata at non-inhibitory concentrations (Fraction inhibitory concentration index were 0.40 for Amp B, 0.36 for NYS and 0.50 for FLC respectively). Notably, the MSE indicated cell wall damage of *C. glabrata* cells as confirmed by confocal microscopy, flowcytometry and scanning electron microscopy (SEM). The MSE was fractionated by Thin Layer Chromatography (TLC). The TLC-bioautography was used to determine the bioactive compound present in the MSE. The column chromatography was used to separate the possible bioactive compounds from MSE. Further, Gas chromatography mass spectrometry (GC-MS) and Fourier- transform infrared spectroscopy (FTIR) were used to identify the phytochemicals of the MSE and it revealed that 13-Docosenamide/9-Octadecenamide/trans-13-docosenamide (89.70%) as predominant compound in chloroform/methanol solvent system separation (7:3 ratio). This study suggests that the chemical compounds present in the MSE of *P. emodi* could be used for treatment of *C. glabrata* infection.

ENV20

Chemical studies in different parts of *Gloriosa superba* L.

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Gloriosa superba L. is a tuberous, perennial climber with wavy-edged yellow and red peltate flowers and is used to cure diseases like gout, rheumatism, arthritis, ulcers, also have properties like anthelmintic, purgative, abortifacient (due to which also called as Garbhaghatini), antipyretic etc. The medicinal value of the plant is mainly due to the presence of alkaloids in it. Among all chemical constituents, major is colchicine which is an amino alkaloid derived from two amino acids phenylalanine and tryptophan present in it. The current study was designed to quantify colchicine in different parts of plants grown at sub - temperate climate by using HPLC-UV. The plant samples were extracted with soxhlet for two hours using methanol as extracting solvent. The seeds were found to contain the highest content of colchicine when compared to other parts of the plant. The colchicine content varied from 0.051-0.695% in different parts under study. The parts studied were seeds, tubers, stems and leaves. The results of the study showed the presence of colchicine in all parts under study.

ENV21

Effect of *Vitex negundo* L. essential oil on the early seedling growth and oxidative metabolism of common weed - *Senna occidentalis* (L.) Link

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Vitex negundo L. (Nirgundi or five leaved chaste tree) is a tropical large shrub or a small tree. It is commonly referred to as Sarvaroganivarini i.e. remedy for all disease and has an ancient history of being utilized for various medicinal and household purposes. Keeping above points in mind, we planned a study

for the investigation of chemical composition of its essential oil with the help of GC-MS. Attempt was also made to investigate the herbicidal potential of its essential oil by analyzing its effect on the early seedling growth and oxidative metabolism of a common weed - *Senna occidentalis* (L.) Link. For this, seeds of *S. occidentalis* were treated with various concentrations of essential oil ranging from 0.1 % to 1.0 %. GC-MS analysis revealed β -caryophyllene, α -phellandrene, etc. as major constituents. The oil was found to have herbicidal potential as it constrains early growth and development of the weed. It also distressed the oxidative metabolism of the test weed as observed in terms of increased concentration of free radicals along with the elevated activity of antioxidant enzymes.

ENV22

***Valeriana jatamansi* Jones: A gynodioecious medicinal herb of temperate Himalayas**

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Valeriana jatamansi Jones (syn. *V. wallichii* DC) commonly known as Mushkbala or Sugandhbala in hindi and Tagar in Sanskrit is an important medicinal and aromatic plant of temperate Himalayas reported to occur at an altitude zone of 1500-3000 m. The rootstock contains medicinal properties and is used in both traditional and modern medicine. Traditionally it is used for treating epilepsy, leprosy, insomnia, hysteria and used as mild sedative for nervous tension, stress and anxiety, high blood pressure and intestinal colic. The therapeutic properties of the plant are due to the presence of valepotriates present in the rootstock. Due to its high demand it is being ruthlessly extracted from its natural habitat which has led to impart it an endangered status. The species is gynodioecious in nature with co-existence of female and hermaphrodite plants growing sympatrically in a population which do not differ much in vegetative characters but show variation in floral characters. The present investigation was focused on comparative studies between the two floral morphotypes i.e. female and hermaphrodite plants for various qualitative and quantitative morphological parameters viz. leaf, stem and root types, plant height, leaf length, leaf width, number of leaves, number of flowering spikes, petiole length, petiole diameter, fresh and dry aerial and underground biomass along with valepotriates content. The results revealed no significant variations in female and hermaphrodite plants except plant height and number of leaves. Valepotriates content in two types of plants, however, showed significant differences.

Insect diversity at mangrove ecosystems of Bhitarkanika National Park, Odisha (India)

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The mangroves of coastal area of Bhitarkanika National Park (Odisha) occupy an area of around 212 Km². They are distributed in 3 zones i.e. Mahanadi delta, Brahmani and Bhitarkanika. Major part of the Mangrooves is located in the Bhitarkanika National Park in District Kendrapada, Odisha and has richest diversity of Mangrooves in India. Thirty four species of insects were recorded in mangroves of Bhitarkanika, Dangmal and West Orasahi Forest Blocks of the state of Odisha. Out of these 21 belonged to butterflies {(Lepidoptera : Rhopalocera), viz. *Appias albina* (Boisd.), *Appias libythea* (Fab.), *Phalanta phalantha* (Drury), *Colotis amata* (Fab.), *Tirumala limniace* (Cramer), *Danaus melanippus* (Cramer), *Elymnias hypermnestra* (Linn.), *Euploea core* (Cramer), *Eurema blanda* (Boisd.), *Eurema hecabe* (Linn.), *Hypolimnna bolina* (Linn.), *Leptosia nina* (Fab.), *Melanitis leda* (Drury), *Papilio polytes* Linn., *Papilio polytes* Linn. (form *stichius*), *Parenonia ceylanica* (C.& R. Feld.), *Pelopidas mathias* (Fab.), *Junonia atlites* (Linn.), *Junonia almana* (Linnaeus), *Udaspes folus* (Cramer) and *Zetides agamemnon* (Linn.)}; seven species belong to moths {(Lepidoptera : Heterocera), viz. *Altha nivea*, Walker, *Acosmeryx anceus* (Stoll), *Ascotis* sp., *Belipa apicata* Moore, *Chaerocampa* sp., *Cleora* sp. and *Sylepta derogata* Fab.}; one species each of honey bee and ant (Hymenoptera); one species of Damselfly and three species of Dragonflies (Odonata) and one species each of grasshopper and stick insect (Orthoptera). During the survey, *Hibiscus tiliaceus* L. (Malvaceae), a back mangrove commonly known as Bania was found to be severely infested by lepidopteran caterpillars of a moth, *Sylepta derogata* Fab. (Lepidoptera: Pyralidae) in Bhitarkanika Island. The study on insect and floral diversity is of immense importance in elucidating possible interactive relations between various taxa.

Bitter gourd extract – an ecofriendly pest control agent for repelling fruit flies

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Bitter gourd has several bitter tasting compounds that can be used as antifeedants to repel insect pests. These compounds are environment friendly and are reported to have beneficial effects on human health. Some fruit fly species act as pests of fruit cultivation, causing substantial damage to growing fruits. Though bitter gourd compounds have been found to repel some lepidopteran pests, whether bitter gourd compounds can be used to repel fruit flies has not been tested yet. Hence we investigated whether the fruit fly *Drosophila melanogaster* can be repelled by bitter gourd extract through feeding assays. We tested two strains of flies – a wild strain from the

university campus, and Canton S strain (a laboratory strain). We found that flies of both strains avoid bitter gourd extract and prefer sucrose over bitter gourd extract in two types of feeding assays – two choice assay, and multiCAFE assay. The viability of flies developing in food mixed with bitter gourd extract was also lower than that of flies developing in normal food. These results show that bitter gourd extract acts as an antifeedant and can be used to generate novel plant based insect repellents that can be used to control fruit fly pests.

ENV25

Investigation on some Phytoseiidae (Mesostigmata) species inhabiting sub-tropical fruit trees in Himachal Pradesh

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In the present investigation nine species of family Phytoseiidae: Mesostigmata were observed and identified inhabiting some sub-tropical fruit trees in Himachal Pradesh. The species recorded were *Amblysius aerialis* (Muma), *Amblysius herbicolus* (Chant), *Euseius finlandicus* (Oudemans), *Euseius alstoniae* Gupta, *Neoseiulus paspalivorus* (DeLeon), *Phytoseius roseus* Gupta, *Typhlodromus* (*Anthoseius*) *himalayensis* Gupta, *Typhlodromus* (*Anthoseius*) *mori* Gupta and *Typhlodromus* (*Anthoseius*) *dargeelingensis* Gupta. The species of genus *Typhlodromus* (*Anthoseius*) inhabited majority of fruit crops investigated. These predators were found in association with different stages of phytophagous mites. Among these identified predatory mite species *Neoseiulus paspalivorus* and *Typhlodromus* (*Anthoseius*) *dargelingensis* were the new record inhabiting sub-tropical fruit trees in the state. There is need to find out the potential species of these predators for mass multiplication which can use against pest mites and other soft bodied arthropods.

ENV26

Removal of Cr(VI) from water samples using dried and charred bagasse: A Comparative study

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Carcinogenic properties of Chromium (VI) are well known since a long time. World Health Organization has recommended a maximum allowable concentration of Cr(VI) in drinking water at 0.05 mg/l. Main source of chromium release in to the environment is industrial setups. Present study deals with the removal of Cr(VI) using bagasse in the dried and charred form by the process of adsorption. The sorption studies were done by batch method and detected using UV-visible spectrophotometer at 540 nm for Cr(VI). Various parameters like pH, mass of adsorbate, concentration of adsorbent, time of contact were optimized. It was observed that under optimized conditions, the percentage efficiency for the removal of Cr(VI) was upto 85%. Adsorption

studies were carried out using Langmuir and Freundlich adsorption isotherms. The adsorption kinetics and thermodynamic parameters have also been documented.

ENV27

Encapsulation of essential oil constituents inside β -cyclodextrin and physico-chemical characterization of the microparticles

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Essential oils are secondary metabolites that are basically involved in defense mechanism of plants. They have several properties in different sectors like perfume industry, pharmaceuticals etc. Moreover, their biological properties have been reported against bacteria, virus, fungi, nematodes and other pests and pathogens of crops. However, their beneficial properties cannot be explored due to their volatile nature, thermal instability and rapid oxidation on exposure to air. Therefore, the present work was carried out to encapsulate the essential oil constituents i.e., eugenol and β -caryophyllene. Encapsulation was carried out using biodegradable polymer i.e. β -cyclodextrin. The encapsulated material was further subjected to physico-chemical characterization to verify the encapsulation of guest material inside the host material. Peaks obtained in GC-MS analysis using DCM as solvent confirmed the presence of eugenol and β -caryophyllene. λ_{\max} for eugenol and β -caryophyllene was observed at 280 nm and 230 nm using UV-Vis spectrophotometer. Encapsulation of eugenol and β -caryophyllene was also confirmed by taking absorbance at 280 nm and 230 nm, respectively. On the other hand, β -cyclodextrin (control) didn't show absorbance at 200-400 nm. Surface Electron Microscopy (SEM) revealed the morphology of the encapsulated material with rough surface, cracks and sharp edges. Encapsulated particles were reported to have size in micrometers via SEM and were therefore, referred as microparticles. The most informative technique i.e., Fourier Transform Infra-Red Spectroscopy, also confirmed the interaction of guest and host molecule. The FTIR spectrum of eugenol showed characteristic peaks at 3516 cm^{-1} (OH), $2842\text{--}3000\text{ cm}^{-1}$ (C-H stretching), and 1511 cm^{-1} , 1611 cm^{-1} and 1638 cm^{-1} (C=C aromatic ring). The FTIR spectrum of β -caryophyllene showed bands at $3067\text{--}2856\text{ cm}^{-1}$ and $1671\text{--}885\text{ cm}^{-1}$. Thermal property of eugenol and β -caryophyllene was also improved by encapsulation. Thermogravimetric analysis (TGA) curve for eugenol and β -caryophyllene showed 100% weight loss in the range of 30°C – 215°C whereas the weight loss of encapsulated eugenol and β -caryophyllene occurred in the range of $300\text{--}580^{\circ}\text{C}$, respectively.

Assessment of water quality and agricultural soil property in Fatehgarh Sahib District of Punjab, India

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Present study was aimed to analyze quality of water and agricultural soil in Fatehgarh Sahib District in Malwa region of Punjab. For this, around 80 water and 50 soil samples were collected from different sites of Fatehgarh Sahib District during pre-post monsoon session. Soil parameters like pH, EC, total nitrogen, organic carbon, total and available phosphorus, available sodium and potassium and total calcium were studied. In case of water, basic parameters like pH, EC, TDS, salinity, hardness, alkalinity, fluoride, phosphate, sulfate and chloride is estimated. Heavy metals like U, As, Pb, Al, Cr, Fe, Mn, Co, Zn were also analyzed in both soil and water samples. The results indicated that soil parameters like pH, EC, organic carbon, nitrogen increases post monsoon whereas parameters like potassium, phosphorus decreases post monsoon. The reason behind that the significant increase in OM in post monsoon indicates the increase of microbial activities and decrease in phosphorus and potassium in post monsoon is due to leaching. Toxic metals like U, As and Se were minute in soil samples. Chromium was found in majority of the soil samples. In case of water samples, the majority of samples were fit for drinking purposes.

ENV29

Assessment of retreating glaciers: a study of Chandra basin, Lahaul and Spiti district, Himachal Pradesh, India

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Most glaciers in the mountainous region such as Himalayas have retreated and lost mass since mid-19th century (Bolch et al 2012) in response to the climatic warming (Hansen and Lebedeff, 1987). In the Indian Himalayas, glaciers cover 23,000 sq km and this is one of the largest concentrations of glacier-stored water other than the Polar Regions (Kulkarni and Buch, 1991).

Valley glaciers and other related formations are part of geomorphic patterns of the Himalayas. Chandra-Bhaga basin is the largest snow/ice fed area of Himachal Pradesh situated between Pir Panjal range in south and the Great Himalayan range in north and occupies an area of about 7510 sq km. More than two hundred glaciers have been identified in this basin, of which 43 lies on its southern side (Pir Panjal range) and flow into the main stream of the Chandra-

Bhaga River where as on its northern side 157 glaciers of different orientations have been recognized flowing into the main river Chandra-Bhaga.

In the Chandra basin the variations in the length of the glaciers is within the limits of 0.8 km to 29 km but the length of a number of glaciers (about 35%) range from 2 to 4 km. The maximum spread of glaciers is up to a height of 6632 m (MSL), while the minimum has been observed at 4410m. These glaciers are in medium - low latitude and high in altitude which is above 4000m. ELA observations between 1980 to 2011 recorded for 22 benchmark glaciers of the study area reveals an average rise of about 53 meters in the span of 31 years. Further, it is observed that the average altitude of ELA towards south of Great Himalayan Range is at 5325.14 meters and in the glaciers North of Great Himalayan Range it is at 5192.66 meters and further north of Great Himalayan Range the value stands at 5080 meters. Glaciers situated further north of Great Himalayan Range, because of higher altitude probably explains the higher altitudinal position of ELA in the glaciers of in this region of Chandra basin. Moreover individual glaciers behave in a different manner due to the factors other than climate, such as morphology of the valley, shape and size, aspect and slope etc.

Higher value of deglaciation (19.29%) between 1980-2011 in the Chandra basin is perhaps as a result of fast melting of the small glaciers as compared to the larger ones. If the effect of small glaciers are removed from form in the analysis the deglaciation values hovers at around under (10%) in the last three decades. However some larger glaciers like Samundra Tapu and Gepangath glaciers have shown the values of deglaciation at 11% and 18% respectively, perhaps due to the presence of moraine dammed lakes at their snout/s.

Within a big basin like Chandra basin, larger glaciers (>6 Sq km) are restricted to the Great Himalayan Range (GHR) between Pir Panjal in the South and Zaskar in the North over the geological formations of Precambrian metamorphites; predominantly comprising low grade Haimantas and Salkhalas Group. Another regions which drains into the Chandra river is towards the north, proximal to Spiti area and comprises Palaeozoic and Mesozoic sedimentary sequences. Comparatively in this region the glacier size is small (usually < 3 sq km) and the rate of retreat is also high here. These Glaciers lie in the relatively dry zone of Himachal Pradesh. Geomorphologically the terrain here is different with valley size smaller and the slope of the glaciers on the higher side. Erosional processes appear to be intense here.

Geological, geomorphological and climatic attributes within larger basins like Chandra basin and its influence in the differential retreat of glaciers is significant. In the Chandra basin apart from climatic reason, geomorphologic peculiarities seem to have played a significant role in the fast melting of the glaciers peculiarly of smaller size. This effect has permeated into the overall scenario of the basin which reveals about 19.29% deglaciation in the last three decades, which is undisputedly of the higher side. There appears to be a hint of lithological control on the deglaciation as well, which definitely warrants further investigation. Fast melting of smaller sized glaciers towards north of GHR despite being at higher altitude is mainly due to higher slopes, their size and aspect, facilitated by vigorous gully erosion process as observed in the Paleozoic/Mesozoic sedimentary sequences of Spiti region of Himachal Pradesh. Deposition of Holocene sediments is less conspicuous in the valley systems of these glaciers. Combined role of geomorphology / lithology and differential rates of deglaciation is also discussed.

Assessment of carbon stock of Chir Pine population on Shoolini University campus and an adjacent pure forest

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Forest ecosystems represent the largest terrestrial carbon sinks on the planet. Present investigation deals with assessment of carbon stock of Chir Pine (*Pinus roxburghii* Sargent) population on Shoolini University campus and a nearby forest. For this the biomass in different tree components were estimated using allometric equations and the results were converted in to carbon values using the IPCC default carbon fraction of 0.47. The CO₂-e was also calculated by multiplying the carbon stock values with 3.67. The pine population on the Shoolini University campus and the nearby forest showed similar structural characteristics (DBH, age, height) and hence, the potential carbon stock of the campus could be evaluated. Total tree carbon density in the nearby pure pine forest was estimated to be 107.21±13.97 Mg/ha. The total tree carbon stock and total tree CO₂-e at the Shoolini University Campus were 39.36 Mg and 144.44 Mg, respectively. The potential carbon stock and CO₂-e values of the campus, if the entire area was an intact forest, were about 14 times higher than the present values of the respective stocks. The total tree carbon stock of the *Pinus roxburghii* Sargent trees of the campus was equivalent to that of an area of 0.367 ha of a pure forest of a similar structure as the adjacent forest. The trees in the large diameter classes held much more stocks compared to those in the lower diameter classes. Hence, it is important to protect the trees in the large diameter classes to conserve the carbon stock providing part of the ecosystem services of the Chir Pine trees on the campus.

Solvent extraction effects on phytochemical constituents profiles and antioxidant activities of *Vitex negundo* L.

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Vitex negundo L., a member of family verbenaceae is widely distributed small tree. It possesses a number of pharmacological actions against wide spectrum of diseases in traditional system of medicines. All parts of the plant especially its leaves contain a number of secondary metabolites such as alkaloids, phenols, flavonoids, glycosidic irridoids, tannins and terpenes. Because of the richness in phytochemicals, the plant is attributed to possess a number of therapeutic uses; antimicrobial, anti-inflammatory, astringent, bronchodilator, CNS-depressant, detoxicant, diuretic, emmenagogue, anticancer and hepatoprotective etc. The study was devoted to analyze the effect of three different solvents on phytochemicals, antimicrobial and antioxidant potential

of leaves of *Vitex negundo*. Qualitative and quantitative phytochemical analysis was determined. The antimicrobial potential was determined by broth dilution method and broth dilution method against four bacterial and three fungal strains. *In vitro* antioxidant property was determined using 2,2 Diphenyl-1-picryl hydrazyl (DPPH) and Ferric Reducing Antioxidant Power (FRAP) assay. Total phenols were found to be higher in methanol extract (88.30 ± 6.46 mg/g gallic acid equivalents) followed by ethyl acetate extract (53.66 ± 0.83 mg/g gallic acid equivalents) and chloroform extract (49.91 ± 1.25 mg/g gallic acid equivalents). Total flavonoids were found to be higher in methanol extract (56.82 ± 10.45 mg/g rutin equivalents) followed by chloroform extract (9.66 ± 3.21 mg/g rutin equivalents) and ethyl acetate extract (8.52 ± 0.81 mg/g rutin equivalents). Antioxidant studies showed that methanolic extract showed higher antioxidant potential as compared to ethyl acetate and chloroform extract. These results clearly indicated that highly polar solvent methanol can be considered as a better solvent than ethyl acetate and chloroform, for the extraction of phytochemicals with antioxidant potential.

ENV32

Effects of drought stress on secondary metabolites in medicinal plants

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Plant growth and productivity is adversely affected by nature's wrath in the form of various biotic and abiotic stresses. Among these stresses, drought stress is one of the most adverse factors for plant growth and productivity. It reduces growth and yield of medicinal plants. These plants produce various secondary plant products such as terpenoids, lignin, flavonoids, tannins, alkaloids, cyanogenic glycosides, glucosinolates etc. with an economic value in normal conditions but drought stress can result in an enhanced production of the secondary metabolites. Plant secondary metabolites have been a fertile area of chemical investigation for so many years, driving the development of both analytical chemistry and of new synthetic reaction and methodologies. Secondary metabolites not only play vital role in plant defense against herbivory and other interspecies defenses but they are also used by humans in medicines, pharmaceuticals, flavorings, fragrances, agrochemicals, biopesticides, food additives and drugs.

ENV33

Isolation of carbonic anhydrase producing bacteria from Himalayan soil

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The atmospheric concentrations of greenhouse gases such as carbon dioxide, methane, chlorofluorocarbons, and nitrous oxides are gradually increasing due to various anthropogenic activities. CO₂ is the most abundant greenhouse gas, being produced primarily by the burning of fossil fuels such as coal, oil, and natural gas, so do the demands for an efficient and inexpensive carbon sequestration system. Various methods currently available for reducing the levels of

atmospheric CO₂ are to, either reduce emissions or reduce formation. However, it is unlikely to reduce formation in the near future. The biomimetic approach is one of the available eco-friendly approaches of carbon sequestration. Carbonic anhydrase ubiquitously found in all kingdoms of life and are mostly zinc metalloenzymes that catalyze the inter conversion between carbon dioxide and bicarbonate. CAs are among the fastest enzymes known, which have a maximum catalytic efficiency approaching the diffusion limit of $10^8 \text{ M}^{-1} \text{ s}^{-1}$. To validate the role of carbonic anhydrase (CA) in calcite precipitation was performed with and (blank) without bacteria in CO₂ enrichment experimental system. The results showed that the precipitation rate of calcium was significantly faster in the bacterial system.

ENV34

Bio-herbicidal potential of essential oil of *Callistemon* sp. in weed management - a review

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Callistemon R. Br. (Family Myrtaceae) is an aromatic plant rich in essential oil. Buds, leaves, flowers, stems, seeds, roots, fruits, etc. of its species are good source of such essential oils. The oil is characterized by the dominance of 1, 8-Cineole, α -pinene and α -terpineol, which shows maximum phytotoxicity against weeds such as *Ageratum conyzoides*, *Sorghum halepense*, *Leptochloa chinensis* and *Commelina benghalensis*. The oil inhibits germination and early growth of weeds by altering the photosynthetic and respiratory metabolism of plants. Essential oil also possesses antimicrobial, insecticidal and therapeutic potential. Keeping in view the above information this review is framed to document bio-herbicidal potential of essential oil of *Callistemon* sp. in weeds management.

ENV35

Nanobiotechnology for sustainable biofuel production

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Nanobiotechnology is emerging as a new frontier to advance biofuel production. Robust nanomaterials support possessing nanoscale dimension has surpassed the conventional support for immobilizing enzyme due to inherent features like higher surface area, greater enzyme loading, higher mass transfer rate, selective, nonchemical separation from the reaction mixture and cost effectiveness. To economise the bioenergy (an energy produced from agriculture/forest residues rich in cellulose polymer or organic matter by employing enzymatic hydrolysis) production, enzyme plays an important role in loosening/ hydrolysing cellulosic structure to release monomeric sugars suitable for biofuel production. It is opined that such enzymes should be immobilized to a support which provides thermostability, easier recovery and ensures reusability. Present study was undertaken to develop a model for immobilizing enzymes such as

β -glucosidase and cellulase (enzymes involved in cellulose hydrolysis) onto functionalized nanomaterial. The functionalization and binding of enzyme on nanoparticles was further characterised by spectroscopic studies. Immobilized nanoparticle-enzyme conjugate can be reused thus economising the process of energy generation. The results of the study encompassing use of various novel nanomaterials for immobilizing enzymes involved in biomass hydrolysis will be discussed during presentation.

ENV36

Taxonomic studies of insect visitors in *Valeriana jatamansi* Jones populations at Shimla, Himachal Pradesh

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Present studies were conducted in forest areas of Shimla to document the diversity and distribution of insect visitors in *Valeriana jatamansi* Jones – an important medicinal herb. Study areas were located at Chaura Maidan, Sanjauli, Dhalli, Mashobra, Kufri and Annadale. The vegetation at these localities was also analyzed by standard random sampling methods. A total of 12 insect species belonging to Orders Hymenoptera, Diptera, Coleoptera and Lepidoptera were observed visiting *V. jatamansi* flowers.

ENV37

Diversity and distribution of insect pollinators in *Prunus persica* (L.) Batsch populations in Shimla District, Himachal Pradesh

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Present study was conducted to investigate diversity and distribution of insect pollinators of *Prunus persica* (L.) Batsch in some areas of Shimla District in Himachal Pradesh. Study sites were located in Summerhill, Mashobra, Lakkar Bazaar and Panthaghati. During study period, twelve species of insect pollinators were collected from these localities, which belong to Orders Hymenoptera, Diptera, Lepidoptera and Coleoptera. Honey bees were the most dominated pollinators amongst all insect species recorded.

ENV38*

A kinetic spectrophotometric study for finding a cost effective method for removal of aminophenols in water samples

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Removal of toxic substances from wastewaters using low-cost alternatives is an important area of research in environmental sciences. Aminophenols are the compounds with wide spectra of

applications ranging from being used as dyeing agents in furs, hair, leather industries and as intermediates in the pharmaceutical industries. With the passage of time, their applications in other fields are also being explored. Aminophenols are certainly important in various fields but at the same time, their ill effects on environment cannot be ignored. Aminophenols are hazardous to humans, plants and animals in many ways. The major effects on human being are wheezing, cough, fatigue, dizziness, headache, asthma, chest tightness, skin allergy with added impact on kidneys also. Due to the severe exposure, aminophenols might cause mutations. High limits of aminophenols affect ecosystem as a whole especially aquatic ecosystem. The industries which discharge effluents laden with aminophenols, affect two types of water resources viz. ground water and rivers. Both of these resources are one of the major resources for human beings, plants and animals, which are being heavily affected by the aminophenols to a good extent and this problem is needed to be addressed before it crosses an alarming level. For all of the above mentioned reasons, research on aminophenols in different areas has been undertaken to ensure a cleaner environment for generations to come. This study provides an overview of the most recent trends in the determination of aminophenols in different areas focusing on improvement and optimization by kinetic methods. The present work discusses the development of a low-cost alternative for the removal of aminophenols by kinetic spectrophotometric method.

***Moved to Chemical Sciences as CH 51**

ENV39

Environmental sustainability aspects of light emitting diodes

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Light emitting diodes (LEDs) are relatively new light sources, but are widely used for many different purposes alongwith lighting purpose. Despite this, there is little available information allowing planners and designers to evaluate and weigh different sustainability aspects of LED lighting when making decisions. The new framework of sustainable indicators allow prioritization when choosing any product and are in line with long-term environmental sustainability goals established in society. This work was an effort to know about the different branded LEDs and to find that how they are better than other existing light options. Cost and energy analysis of five different brands (Bajaj, Crompton, Eveready, Surya and Syska) of LEDs has been done and the results were recorded and presented graphically. In the cost analysis of five brands it was found that Eveready was the most cost effective. In energy efficiency, Bajaj was recorded as the lowest energy efficient brand. In life assessment test of all the LEDs, Crompton had the maximum life in all the three wattages (7W, 12W, 18W). This analysis has proved that switching to LEDs is the need of the hour and Crompton LEDs were found very much environmental friendly.

Synthesis of silica nanoparticles and applied for purification of biodiesel

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The aim of this master plan of research work has been designed for purification of crude oil to high quality fuel through synthesized silica nanoparticles from the precursor sodium meta silicate used in the presence of sulfuric acid. For high quality fuel, bio-diesel needs purification of crude biodiesel to improve the quality specifications at international norms. The methods implemented for it have been carefully monitored with modification in some steps of published literatures of purification of biodiesel refining process. purification of biodiesel provides high quality biodiesel fuel using dry washing process, in which silica nanoparticles have absorb residual material from crude bio-diesel and improved quality biodiesel fuel. This research is expected to be beneficial for world-class oil industries. The new method useful to the design of silica nanoparticles with physical, chemical and compatible properties of surface functionalized of silica nanoparticles widely used in different areas of science and technology as desires. Specialty of synthetic silica nanoparticles using analytical tools to analyze essential properties such as pH, surface tension, viscosity, zeta potential, particle size, UV, FTIR, NMR, XRD spectra and SEM.

ENV41

Changes in physicochemical properties of soil on application of different prepared composts

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There is an urgent need for quick and effective response to deal with tremendous amount of waste overloading the municipal systems throughout the world. Waste generated by countries like India have high proportion of organic waste. To manage organic waste, composting is the best and cheapest management solution instead of filling up landfill sites. The use of organic bio-fertilizers and compost has got a tremendous boost during last few years, throughout the world. In the present research work, attempt has been made to prepare composts using different methods viz. vermicompost (C1), garden compost (C2), machine compost (C3) and kitchen waste compost (C4) from different sources of waste and to study the changes in physicochemical properties of soil (control) amended with different compost samples at different concentrations (15%, 25% and 40%). Compost samples prepared by using different methods were collected in polybags, properly grinded and analyzed for different physicochemical characteristics viz. pH, electrical conductivity, moisture content, particle density, bulk density, porosity, water holding capacity, total nitrogen, organic carbon, C:N ratio, organic matter, available potassium, available phosphorus, calcium and magnesium. Based on the present findings, the best and ideal results for improving the soil quality according to Indian standards of best compost quality were

observed in the order of Kitchen waste compost (C4) followed by Garden compost(C2), Vermicompost (C1) and Machine compost (C3). The findings revealed that the application of various composts to soil enhanced its nutrient content and physicochemical properties at different compost application rates. Thus, compost prepared using different methods could be a better choice and viable option for increasing crop productivity over inorganic fertilizers.

Keywords: Compost, Garden Compost, Kitchen waste, Machine compost, Productivity, Vermicompost

ENV42

Effect of deficit irrigation on proline, free amino acids and stomatal characteristics in various kiwifruit cultivars

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Kiwifruit requires heavy water for its cultivation, it cannot be grown in areas water scarce areas. Thus, there is a need to screen out cultivars which have potential to grow in such areas where water resources are limited. Keeping in view this point, the present investigation was carried out. The five kiwifruit cultivars viz., Allison, Hayward, Abbott, Monty and Bruno were subjected to two irrigation levels viz., irrigation at 80 per cent and 60 per cent Field Capacity (FC) with four replications, in Randomized Block Design. The deficit irrigation treatment resulted in an increase in leaf proline, free amino acid contents and stomatal pore density and reduction in stomatal pore size. The per cent increase in leaf proline content and free amino acid contents and stomatal density was found to be highest in cultivar Bruno and the least in cultivar Hayward. However, the per cent reduction in stomatal pore length and stomatal pore width was found to be highest in Bruno and the least in Hayward under deficit irrigation treatment. The performance of Bruno cultivar was found to be the best under deficit irrigation treatment in terms of all these mentioned attributes. The cultivar Hayward was found to be drought sensitive.

Control of Apple Replant Problem with rootstocks and soil agro-techniques in Himachal Pradesh

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Apple orchards planted in late sixties in Himanchal Pradesh and North Western Himalayan region have shown symptoms of declining productivity as these plants have completed their economic life span. Due to limitation relates to availability of land and choice of crops for smaller micro climatic niches and incomparable economic equivalence of other fruits with apple, orchardists are compelled to replant old apple orchard sites. There has been a substantial increase in the proportion of declining orchards; a trend which need to be reserved. Therefore, standardization of suitable agro-techniques is urgently revered to combat replant problem in apple for better field survival rate and productivity under replant conditions in order to sustain the apple industry in the state. In the present study 20 treatments were preformed comprising of four apple rootstocks i.e. Seedling, M.793, MM.111 and M.7 and five different soil treatments i.e. control, soil fumigation, PGPR, biocontrol and combined (Soil fumigation + PGPR + Biocontrol) with three replications. The data waiter during the years 2015 and 2016 revealed that M.793 rootstock had significantly maximum plant growth and vigour parameters, soil enzyme and biological activity. Among the treatments, the highest growth and vigour parameters, soil enzyme and biological activity were recorded to be maximum in the combined treatment. The interaction between rootstocks and treatments revealed that combinations of M.793 × combined treatment recorded maximum growth and vigour traits, dehydrogenase activity, urease activity, phosphatase activity, phytase activity, bacterial counts, fungal counts and actinomycetes counts compared to other rootstocks and treatment combinations under replant situations, which can be exploited for effective management of replant problem in apple.

Polymer and Material Sciences

Smart Biopolymer by graft functionalization of Tragacanth Gum

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Smart materials transmit and respond to stimuli against external factors by producing a useful effect. The smart polymeric materials respond with a considerable change in their properties to small changes in their environment such as pH, temperature, humidity and light. Smart materials can be either synthetic or natural. The use of natural polymers has increased in recent times; due to the advocacy of “green” materials. Natural polymers are biogenic and their biological properties such as cell recognition and interactions, enzymatic degradability, resemblance to the extracellular matrix and their chemical flexibility make them materials of choice for biomedical applications.

Modification of natural polymers enhances their properties and versatility so that these materials may be used for specific applications. Due to the presence of various reactive groups in their structure, polysaccharides can be easily modified both chemically and biochemically. Tragacanth Gum (TG) is one such polysaccharide which has excellent biocompatibility, hydrophilicity and functionality. TG may be functionalised in such a way that it offers smart behaviour while still retaining its inherent properties. Grafting is a convenient method for the addition of new properties to natural polymers without minimum loss of basic properties of the substrate. The graft polymer consists of a main polymer chain or backbone covalently bonded to one or more side chains. TG may be grafted with itaconic acid so that the modified polymer retains carboxyl functionality for pH sensitivity. The application of this polymer in colon drug delivery has been proposed.

Hybrid Trilayered Vascular Graft based on Electrospun Gelatin for Small Diameter Blood Vessel Regeneration

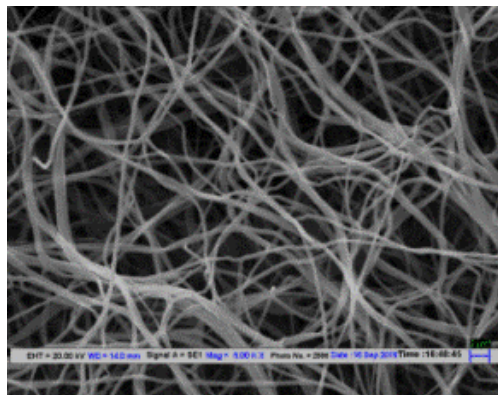
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An attempt to mimic the native extracellular matrix of blood vessel using electrospun gelatin, protein based vascular grafts can improve the biocompatibility of the grafts compared to the clinically available inert grafts based on e-PTFE and Dacron. Hence, a novel approach in the

development of hybrid tri-layered electrospun vascular scaffold based on gelatin hydrogels for blood vessel reconstruction has been proposed.



Microfiberous Electrospun Tubular Nanofibrous Trilayered Graft based on Gelatin Hydrogels

The hybrid morphology from nanofibrous in the innermost layer to microfibrinous in the middle and the outermost layer was observed along with a microporosity of 180-220 μm . The mechanical strength of the graft with strength of 1.5 ± 0.9 MPa and an elastic modulus of 1.3 ± 0.4 MPa validated its physical eligibility as a vascular graft. Its advantage was manifested by the human umbilical vascular endothelial cell migration and infiltration; confluent within the scaffold within 3 weeks. The cells were seen to spread and proliferate along the length of the fibres. Neo blood vessel formation and collagen deposition by 2 weeks of subcutaneous implantation along with a healthy profile of the rat within 3 months of arterial implantation makes this graft eligible as a biodegradable and biocompatible off-shelf coronary by-pass graft a much required aspect in the field of cardiovascular tissue engineering.

Synthesis of Acrylamide – Guar Gum – Methylmethacrylate (MMA) Based Bio-Degradable Hydrogel for Wastewater Treatment Application

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A hydrogel is a 3-D crosslinked network of polymer chains which is hydrophilic in nature. Hydrogels have the tendency to absorb a high amount of water since they can contain up to over 90% water in their polymer matrix. Hydrogels can be natural or synthetic based on monomer unit used for their synthesis. Hydrogels also possess a degree of flexibility very similar to natural tissue, due to their significant water retention properties. Our main objective is to prepare bio-degradable hydrogel based on acrylamide-guar gum and Methylmethacrylate using water as a solvent which can be used for wastewater treatment applications since the hydrogel formed shows good water absorption and retention properties as well as is bio-degradable in nature. In this process, guar gum, as well as Methylmethacrylate, is dissolved in distilled water which is used as a solvent under continuous stirring and then both are mixed with each other and then glutaraldehyde as a cross-linking agent and ammonium persulfate as initiator with high stirring speed and at a temperature of 60-70⁰C is added to the above solution. Thermal treatment of the reactants in the presence of persulfate results in the formation of a cross-linked hydrogel, which has application in wastewater treatment.

Carbon Nanotube Properties and Application for Removal of Heavy Metal Ions: A Review Paper

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Carbon nanotube has various applications in the field of nanotechnology, nanomedicine, transistors, actuators, sensors, membranes, and capacitors. The important features of CNTs are their light weight, small size with a high aspect ratio, good tensile strength, and good conducting characteristics, which make them useful as fillers in different materials such as polymers, metallic surfaces and ceramics. This review paper is discussing about the removal of heavy metal ions by carbon nanotube.

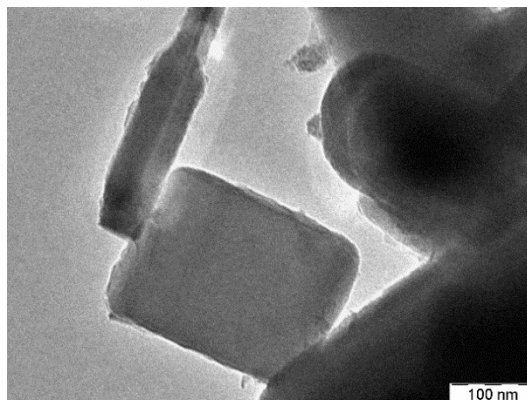
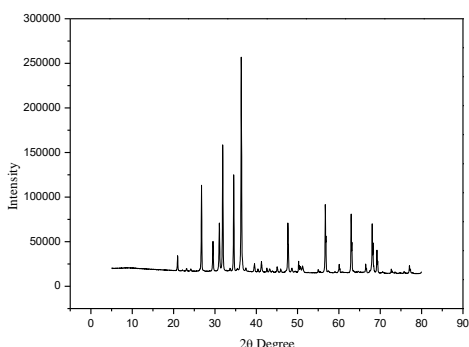
Green Synthesis of ZnO Nanoparticles by using Plant Extract: Effect of pH

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The universe comprises the particles with different shape and size. Size of the particle mostly defines the applications of the particle in the various fields. The last few decades attract the researchers towards the particles with the size range of 1-100 nm and the particles in this range are known as nanoparticles (NPs). The appeal of NPs in physics, chemistry and biology, made the study of NPs inter-disciplinary, interesting and innovative. The objective of present work is to synthesize ZnO NPs of uniform shape and size by employing green method. Therefore, we have synthesized ZnO NPs at neutral and 12 pH by using precursor, zinc acetate and plant extract of *Aloe vera* under constant stirring at 343.15 K. The crystalline structure of synthesized ZnO NPs has been confirmed by the XRD spectra. From XRD data, the size of NPs at neutral and 12 pH has been found to be 38 and 40 nm, respectively. The ZnO NPs of cuboidal and rod like shapes have been formed as indicated by TEM images. The surface morphology and elemental detection analysis have also been investigated via SEM/EDS technique. Results show the uniformity in the shape of NPs at high pH value as compared to low pH value.



Optimization of polymer electrolytes with the effect of concentration of additives in PEO-NH₄HF₂ based polymer electrolytes

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Nanocomposite polymer electrolytes were prepared by adding nano-sized fumed silica in different proportions upto 3 wt% to polyethylene oxide (PEO) based polymer electrolytes

containing 10 wt% ammonium bifluoride (NH_4HF_2). Since the increase in conductivity depends upon the concentration and particle size of the nano filler, therefore in the present case, optimum ionic conductivity of 1.19×10^{-5} S/cm has been observed at room temperature for 3 wt% fumed silica addition in PEO- NH_4HF_2 polymer electrolytes after which the conductivity is observed to decrease. Further, addition of different concentrations of high dielectric constant propylene carbonate (PC) as a plasticizer in the optimized composition of PEO- NH_4HF_2 -fumed silica nanocomposite polymer electrolytes has increased the number of free ions due to dissociation of salt/ion aggregates and hence the ionic conductivity and dielectric properties. Maximum conductivity value of 1.55×10^{-4} S/cm has been obtained at room temperature for PEO-10wt% NH_4HF_2 -3wt% fumed silica polymer electrolytes containing 0.3 (ml) PC with low activation energy value of 0.35 eV. Temperature dependence of ionic conductivity of polymer electrolytes having different concentrations of PC has been studied and observed to obey Vogel-Tamann-Fulcher (VTF) behavior. The reduction in melting temperature, % crystallinity and % weight loss has been observed in nanocomposite polymer electrolytes containing different concentrations of PC as studied by DSC and TGA respectively. Although, mechanical property of polymer electrolytes deteriorates with the addition of plasticizer, yet special attention has been taken to optimize the concentration of PC to achieve maximum ionic conductivity values, free standing ability without any deterioration. The change in mechanical properties with PC concentrations (tensile strength and % elongation break) has also been studied by UTM.

PMS07

Gamma radiations fabricated semi-IPN: characterization and application as site specific drug release device

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Presented work deals with the fabrication of site specific drug release device. Semi-interpenetrating network (Semi-IPN) was synthesized using gamma radiations as initiators and was castoff as drug delivery device to investigate release profile of diethyl carbamazine citrate in 9.2, 7.0 and 2.2 pH media. Optimized reaction parameters for semi-interpenetrating network film were: gamma dose 2.5 KGy/hr, solvent 25 ml, acrylic acid 4.6 mol/L, MBA 5.1×10^{-3} mol/L and pH 9.0. Sample was characterized by using X-RD, SEM, TGA, FT-IR techniques and was found to be thermally more stable than hybrid backbone showing 6400% water uptake efficacy in alkaline media. Sample degraded upto 80.3% at a degradation rate of 1.147(mg/min) in the vermi-composting degradation. Amongst 9.2, 7.0 and 2.2 pH media both the drugs showed their maximum release in 9.2 pH media. Release behavior of *diethyl carbamazine citrate* was found to be non-Fickian in 9.2, 7.0 pH and Fickian in 2.2 pH solutions. Semi-IPN sample exhibited higher values of D_i than D_L , thus can be successfully used as colon and intestine specific release device somewhere, drug released rate should be fast in the beginning followed by sustain release thereafter.

RSM-CCD optimized fabrication of an eco-friendly ZnS nanocomposite adsorbent for the effective removal of Biebrich Scarlet and Crystal Violet: kinetic, equilibrium and thermodynamic studies

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The present work represents the RSM-CCD optimized synthesis scheme of semi interpenetrating network (semi-IPN) NaAla-Gel-cl-polyAAm and ZnS based nanocomposite adsorbent NaAla-Gel-cl-polyAAm/ZnS. The super adsorbents were derived from sodium alaginate-gelatin hybrid backbone and evaluated for the removal of biebrich scarlet and crystal violet dye from the contaminated aqueous fluid. Under optimized reaction parameters, semi-IPN NaAla-Gel-cl-polyAAm showed maximum swelling percentage of 3191.73 %. The semi-IPN was converted into ZnS nanocomposite under pre optimized reaction conditions through swelling shrinking technique. The synthesized materials were characterized through SEM-EDS, HRTEM, XRD and FTIR. All the samples possess high dye removal efficiency. Maximum dye removal percentage of 97.37% was observed with ZnS nanocomposite for the removal of Biebrich Scarlet. The adsorption isotherm data indicated that Langmuir and Freundlich adsorption isotherm fitted well for Biebrich Scarlet and Crystal Violet, respectively. Pseudo 1st order and pseudo 2nd order kinetics along with intraparticle diffusion was followed in case of Biebrich sScarlet and Crystal Violet dye, respectively. ΔG° , ΔH° and ΔS° values indicated the thermodynamic feasibility of the reaction. Excellent recyclability and reusability of the adsorbent materials suggested the applicability of the adsorbents towards textile industry and water purification purpose.

Study of properties of Ag-NPs for various applications using nanofluid interferometer

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Acoustic properties of aqueous solution of $AgNO_3$ at various concentrations, in presence of Tannic Acid at a fixed concentration (1×10^{-4} M/L) are studied by ultrasonic method. Tannic acid, a compound derived from plant extracts, is used as the reducing and stabilizing agent to synthesize Ag-NPs and also enables variation of the mean size of Ag-NPs by taking a suitable concentration ratio of $AgNO_3$ and Tannic acid in distilled water. Ag-NPs are synthesized at room temperature and further stabilized with the aid of sonication. The temperature dependence of

acoustic properties is studied and discussed in this paper. Acoustic properties were measured using multi-frequency nano fluid interferometer. It is found that there is a systematic increase in ultrasonic velocity upto 60°C for almost all the concentrations studied and thereafter its value decreases, while this velocity decreases with increasing concentration of AgNO_3 in solution at higher concentrations only. This study is important to find optimum concentration required for a particular application. The present result will be useful as data for various applications.

PMS10

Response surface methodology directed synthesis of photocatalytic nanocomposite hydrogel for the effective removal-degradation of toxic dyes

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The present study deals with the use of response surface methodology combined with central composite design (RSM-CCD) for precise optimization of nanocomposite hydrogel. Semi-IPN was synthesized initially by crosslinking of grafted chains of poly(AAm) onto aqueous extract of *Commiphora mukul* using N, N'-methylene bisacrylamide. The semi-IPN was converted to IPN form in presence of bismuth ferrite nanoparticles to form nanocomposite hydrogel as final product. The samples were characterized using FT-IR, SEM-EDX, XRD and HRTEM. Thermal studies were also carried out using TGA/DTA/DTG technique. The synthesized nanocomposite hydrogel was utilized for removal as well as degradation of anionic dye brilliant blue. The removal was allowed to be occurred in dark till equilibrium. After the maximum removal, dye was allowed to be degraded in sunlight as well as in UV-visible light for 4 hrs to get the final comparison of two conditions. Desorption of the dye from nanocomposite was carried out to check complete degradation within 4 hrs. The overall study of removal and degradation was considered for adsorption, kinetic and thermodynamic study.

PMS11

Poly(butylene succinate)-based Composites Reinforced with Enzymatically treated Curaua Fibers

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Abstract: The reinforcing potential of enzymatically treated curaua fibers in biodegradable poly(butylene succinate) (PBS)-based composites was elucidated in the present study. Cellulase and pectinase were used for the enzymatic treatment of curaua fibers. Untreated and enzymatically treated curaua fibers were characterized in terms of ATR FT-IR (Fig. 1), thermal stability (TGA), crystallinity (XRD) and surface morphology (SEM).

The composite characteristics were investigated by mechanical test (tensile and flexural resistance), thermal stability and SEM micrographs of the fractured surfaces. Enzymatic treatments resulted in a significant change in morphology of curaua fibers, while their thermal stability and crystallinity were not affected much. SEM investigation of tensile fractured surfaces of composites showed strong adhesion between curaua fibers and matrix.

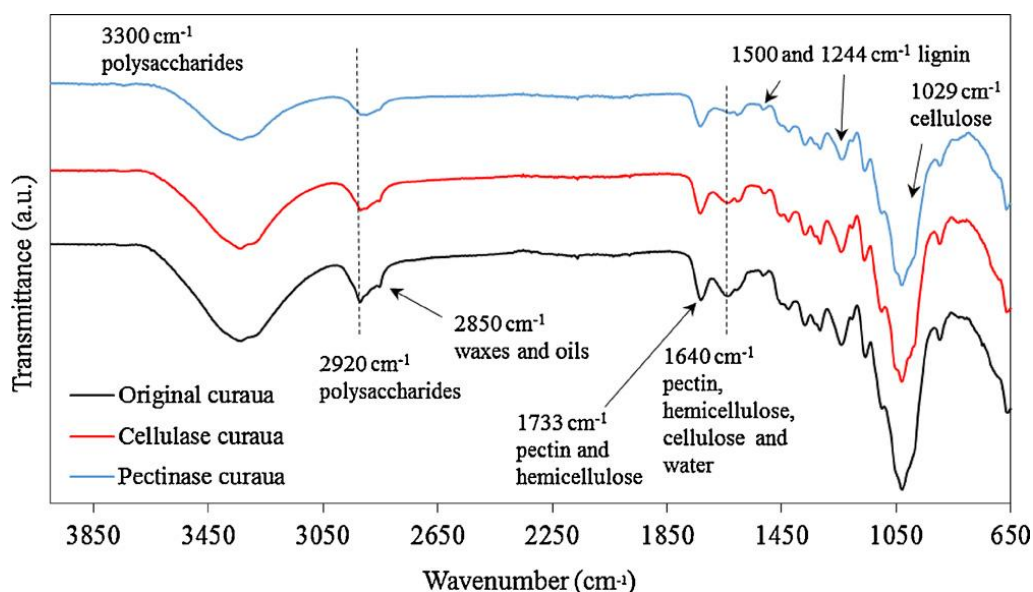


Fig.1. ATR FT-IR of original, cellulase and pectinase treated curaua fibers

PMS12

Synthesis of Polyacrylamide- Stannic (IV) arsenate nanocomposite ion exchanger: Enhanced photocatalytic activity

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Polyacrylamide-Stannic (IV) arsenate nanocomposite (PA/SANC) ion exchanger was synthesized using sol-gel method. PA/SANC shows higher ion exchange capacity 0.82 meq/g as compared to SA (0.42 meq/g). pH titration curve inferred the multifunctional nature of PA/SANC with three inflection points. XRD studies show the semi crystalline nature of PA/SANC with sharp intensity peaks. TEM results confirmed the size of composite lies in nano-range. PA/SANC was explored for the photocatalytic degradation of sunset yellow (SY). It has been observed that 88.97% of SY was degraded within 3 hours of solar illumination. Pseudo first order kinetic model was also studied with higher value of regression coefficient ($R^2 = 0.0983$).

Influence of TiO₂ Nanoparticles on the Tensile Properties of PVA Films: A study

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In the current study, green synthesized TiO₂ nanoparticles incorporated novel PVA/TiO₂ polymer nanocomposites have been prepared at room temperature via solutions blending and solvent evaporating technique. The tensile properties and phase morphology of the prepared neat PVA and PVA/TiO₂ polymer nanocomposites were investigated using universal testing machine (UTM) and scanning electron microscope (SEM) respectively. Tensile strength and young's modulus increases with increase in TiO₂ (0.02g to 0.06) nanoparticles content in PVA matrix whereas elongation at break decreases with increase in TiO₂ (for 0.08g) nanoparticles content in PVA matrix. Added TiO₂ nanoparticles in PVA matrix showed smooth and homogeneous phase morphology except 0.04 g of TiO₂ nanoparticles in PVA matrix. The obtained films are environment friendly material which could be applied as biodegradable plastics for food packaging and agricultural applications.

PMS14

Nanostructured Aluminium Nitride for biomedical applications

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High surface acoustic wave (SAW) velocity make Aluminium Nitride a potential candidate for biosensor chip system. Material biocompatibility is the primary requirement to be use in biological applications. In this work, nanostructured aluminium nitride has been synthesized using solvothermal method at 500 °C. Structural and morphological analysis confirmed the cubic phase of AlN showing spherical morphology. The detailed biocompatibility studies of these nanostructures were performed on both healthy (HEK-293) as well as cancerous (HeLa) cell lines. MTT assay was used for screening the cell viability which showed 90% and 81% viability of HEK-293 and HeLa cell lines respectively at dose concentration of 800 mg/ml. Furthermore, AlN does not induce free radicals in sufficient amount to generate oxidative stress. Thus, cytotoxicity analysis showed AlN as a non-toxic material to both the cell lines. This work proposes nanostructured AlN to be safer for biomedical applications.

Nano ternary heterostructure of $\text{Ag}^0/\text{RGO}/\text{Bi}_2\text{O}_2\text{CO}_3/\text{ZnFe}_2\text{O}_4$ for the solar light assisted photocatalysis of Cetirizine

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Herein, we report the facile laboratory scale synthesis of ternary photocatalysts $\text{Ag}^0/\text{RGO}/\text{Bi}_2\text{O}_2\text{CO}_3/\text{ZnFe}_2\text{O}_4$ (ARBZ) for the solar assisted degradation of Cetirizine (CTZ) a common drug used as antihistamine. The internal and external morphology of ARBZ has been studied by Fe-SEM and HR-TEM. XRD, BET and FTIR etc. have been used to investigate the possible crystallinity, surface area and functional groups of the as fabricated photocatalysts. ARBZ demonstrate excellent efficiency toward the degradation of CTZ owing to its better charge recombination rate and high surface area. 90 min degradation result depict that about 94.07% of CTZ has been degraded over 90 min of solar radiation exposure. The photodegradation results has been analyzed in terms of reaction kinetics, radical scavenging experiments (to identify active radical species), LC-MS and COD analysis. The degradation pathway for the degradation of CTZ have been proposed on the basis of HR-MS analysis.

Biochar templated $\text{Ag}^0/\text{CuFe}_2\text{O}_4/\text{RGO}$ ternary photocatalysts for the solar assisted degradation of 2-methyl-chlorophenoxy acetic acid

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Biochar templated magnetic $\text{Ag}^0/\text{CuFe}_2\text{O}_4/\text{RGO}$ (BACR) nano-photocatalysts with excellent photocatalytic activity has been prepared by co-precipitation method. The potential of as fabricated BACR has been evaluated by the solar driven photodegradation of noxious herbicide 2-methyl-chlorophenoxy acetic acid (MCPA) as target pollutant. Nano-BACR photocatalysts has been characterize by Fe-SEM, HR-TEM, XRD and FTIR. The parameters such as effect of catalysts dosage, pH, pollutant concentration etc. has been investigated. BACR is capable to degrade 88.56% of MCPA over a 60 min of degradation experiment. The major photogenerated radical has been identified by the ESR analysis. The degradation and mineralization of MCPA

has been investigated in terms of reaction kinetic, radical scavenging experiment, intermediate analysis and TOC analysis. The mechanism of photodegradation has been proposed on the basis of HR-MS analysis.

PMS17

Studies on early age hydration of cement mineralogical compounds incorporating carbon nanomaterials with the help of powdered X-Ray diffraction

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In the present study, the prominent role of carbon nanomaterials (GO or FCNT) and hybrid carbon nanomaterials (CNMs and Hybrid-CNMs) during the early stage of hydration has been investigated. The growth of hydration products on the nucleation sites provided by incorporation of CNMs and Hybrid-CNMs was investigated using PXRD. Hydration rates were dominant in case of hybrid CNMs in comparison to CNMs due to additional nucleation sites provided by the 3-D hybrid framework of FCNT+GO. Further, hydration rate was prevalent in case of Hybrid-CNMs without polycarboxylate ether based superplasticizer (PCE-SP) at earlier ages (i.e. up to 6 hours) while it was predominant in case of Hybrid-CNMs with PCE-SP at later ages of 48 hours. Moreover, TGA results reveal that the samples incorporating CNMs and Hybrid-CNMs formed higher quantity of C-H as compared to control sample. All these results i.e. accelerated hydration rates and additional C-S-H production as shown by SEM images, densified the cement microstructure leading to improved durability of cementitious matrix.

PMS18

Structural and Magnetic Properties of Cobalt Ferrite Nanoparticles Synthesized Using *Okra* Plant Extract

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In this work, we have followed a green method for synthesizing cobalt ferrite nanoparticles using *Okra* plant extract which are annealed at three different temperatures. The effect of the plant extract on the structure and magnetic behavior of cobalt ferrite nanoparticles is investigated by X-ray diffraction and Vibrating Sample Magnetometer. The XRD spectrum reveals the formation of good crystalline nature of the samples. The presence of active ingredients in the plant extract stabilized the metal oxide nanoparticles. The addition of *Okra* plant extract leads to the variation in crystallite sizes and lattice parameters of cobalt ferrite nanoparticles annealed at three temperatures. The M-H hysteresis curves of all the samples show the magnetic behavior. We conclude from these results that more optimization is required to improve the structure and

magnetic properties of these samples. *Okra* plant extract is easily available; the green method used in the synthesis of the samples can also be acquired for large-scale synthesis.

PMS19

Structural & Optical properties of Mn-doped Tin Oxide Thin Films at Different Annealing Temperatures

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In this study, we have discussed the influence of Mn doping on SnO₂ thin films prepared by sol-gel technique. Undoped and SnO₂: Mn films were deposited by the dip coating method onto glass substrate. Pristine SnO₂ thin film has been annealed at 300°C. SnO₂: Mn thin films have been annealed at different temperatures 300°C, 400°C & 500°C. XRD investigations and optical properties have been studied. It is observed that annealing temperature plays an important role on the physical properties such as crystal quality, crystallite size and band gap. It is observed that the incorporation of Mn doping into the SnO₂ film causes drastic decrease in the crystallite size at same annealing temperature. The UV spectra shows high transmittance for the pure tin oxide thin film and lower transmittance for the Mn doped films annealed at different temperatures. The measured band gap was found to be 3.5 eV for pristine SnO₂ thin film. This value is smaller than the reported value of bulk SnO₂ (3.6 eV). The measured optical band gap increases from 2.51 eV to 3.4 eV with increase in annealing temperature as the crystallite size increases. The purpose of this study is to investigate the effect of annealing temperature on the band gap of the films so that the optical properties of the material can be tuned for suitable applications and new devices.

PMS20

Development of Bio-Degradable Packaging Film of Nanocellulose Reinforced PVA for Food Packaging Application Using Agro Waste Sugarcane Bagasse

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Sugarcane bagasse is the matter that remains after stalks of sugarcane are crushed to extract the juice. This is utilized as a reinforcing material in the matrix of Poly (vinyl alcohol), a synthetic polymer to develop a nanocomposite bio-degradable packaging film for few dairy products (milk, paneer and curd). The bagasse is acid hydrolyzed to obtain nano cellulose which is then used at different weight ratios to reinforce PVA films. Further turmeric is added to resist microbial attack onto the films and enhanced their durability. Moreover turmeric acts as natural pH indicator which helps to develop films as an intelligent and smart packaging material. Mechanical properties like tensile strength show increasing values with increasing weight ratios of nanocellulose without much affecting the elongation at break of films. Further swelling test,

pH test, anti-microbial test, soil burial test, thermogravimetric analysis and optical test were carried out to characterize and analyze the films. Keywords: Nanocellulose, Poly(vinyl alcohol), nanocomposite.

PMS21

2D Yttrium-Doped Porous Nanosheets Based Ultra-Sensitive Flexible Piezoelectric Nanogenerator

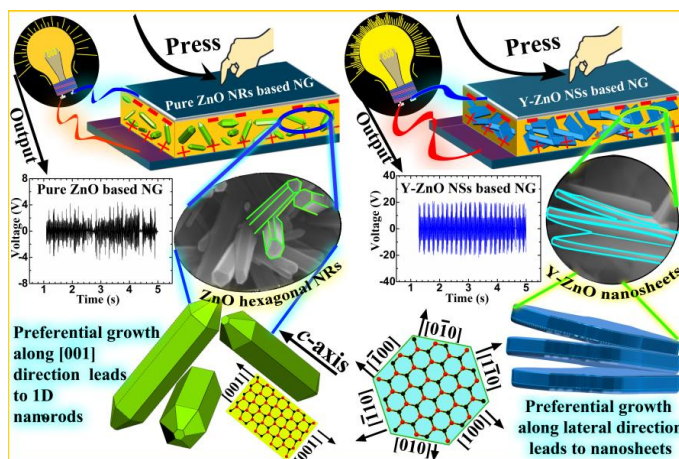
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ZnO nanocrystals with two different morphologies namely one-dimensional (1D) pure ‘pencil-like’ ZnO nanorods (NRs) and two-dimensional (2D) yttrium(Y)-doped ZnO nanosheets (NSs) were synthesized by wet chemical co-precipitation route. A king sized piezo-response ($d_{33} \sim 420$ pm/V) was achieved for Y-ZnO NSs, which is largely enhanced as compared to pure ZnO ($d_{33} \sim 12.4$ pm/V). Finally, both pure and Y-doped ZnO nanocrystals have been used as the building blocks for fabricating flexible piezoelectric nanogenerators (NGs). The Y-doped ZnO NSs based NG displayed an ultra-sensitive response under gentle finger tapping (~ 0.01 kgf per tap) and generated an output voltage of around 20 V which is much higher than that of pure ZnO NRs based NG (~ 2 V) and thus it can be used in near future for powering various self-powered devices.



Modification of activated carbon by pectin coating for zinc removal

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In this study, the technical feasibility of commercial activated carbon (CAC) for Zinc removal is investigated in batch studies using biosorption method. Surface modifications of CAC with pectin (PMAC) and/or oxidizing agents (MAC), such as nitric acid is also conducted to improve removal performance. The results of their Zn removal performances are statistically compared. CAC, which have been oxidized with nitric acid, have show Zn adsorption capacities (93% at 24h) and CAC coated with pectin (97% at 24h), respectively, suggesting that surface modification of a carbon adsorbent with pectin shows more adsorption sites on their solid surface for metal adsorption. The surface of PMAC and MAC was characterized by scanning electron microscope (SEM) analysis, Fourier transform infrared spectroscopy.

PMS23

Antimicrobial study of (Zn, Co) co-doped copper oxide nanoparticles synthesized by using microwave assisted method

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Nanoparticles have particular physical and chemical properties that allow the formation of new composites nano-materials, which have important applications in biology and medicine such as infections control. Antibiotics can be used to control the infectious of several diseases but with the time bacteria becomes resistant to the particular antibiotics. This is a major challenge of researchers to search for different strategies to treat bacterial infections. Nanotechnology is the field which can help to overcome the problem of microbial resistance due to specific properties of nanoparticles. In this article antimicrobial activities of (Zn,Co) co-doped CuO nanoparticles have been studied by using well diffusion method. The average crystallite size of synthesized (Zn, Co) co-doped CuO nanoparticles calculated by Debye Scherrer formula was around 11-16 nm. Staphylococcus aureus (MTCC 737), Bacillus subtilis (MTCC 441), Escherichic coli (MTCC 739) and Pseudomonas aeruginosa (MTCC 1688) bacteria has been used to check the antimicrobial activities. CuO nanoparticles showed good antimicrobial activities.

Magnetic Nano-heterostructured assembly of $\text{CoFe}_2\text{O}_4/\text{Cu}_2\text{O}/\text{g-C}_3\text{N}_4$ for the visible light driven photocatalysis of Malathion

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Herein, we report the laboratory scale fabrication of ternary magnetic $\text{CoFe}_2\text{O}_4/\text{Cu}_2\text{O}-\text{C}_3\text{N}_4$ (CCC) nano-hetero assembly for the efficient photodegradation of harmful insecticide Malathion (MT). The hetero assembly of CCC has been characterized by the modern sophisticated techniques such as Fe-SEM, HR-TEM, XRD, BET and FTIR etc. CCC demonstrate excellent photocatalytic activity owing to its efficient reduction in charge recombination rate and high surface area. The photodegradation results shows that about 91.26% of malathion has been degraded over 90 min solar radiation exposure. The photodegradation results has been evaluated in terms of reaction kinetics, active species identification experiments, HR-MS and COD analysis. The $^*\text{O}_2^-$ radical were found to be the major active species in photodegradation, which is also supported by the band structure analysis. The possible degradation pathways for the degradation of MT have been proposed on the basis intermediates identify by the HR-MS.

Enhanced photocatalytic degradation of chrysene by $\text{ZnO}@\text{ZnHCF}$ nanocubes

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Chrysene being a priority pollutant due to its persistent nature and toxicity is of environmental concern. Recently, incorporation of metal oxides into heterogeneous nanomaterials with advanced characteristics is fascinating. Therefore, green synthesis of crystalline nanocubes (100 nm) of $\text{ZnO}@\text{ZnHCF}$ using plant extract of *A. indica* was carried out for degradation of chrysene. Under daylight, exponential decrease in concentration of chrysene was obtained with time revealing its high photo-activity. Nanocomposite was characterized through various techniques such as PXRD, FESEM, BET and DRS. Photodegradation of chrysene was analysed at variable concentration, dose, pH, time and source. At optimum catalyst dose (25 mg) and neutral pH, degradation of chrysene (2 mg L^{-1}) upto 90% followed first order kinetics and Langmuir isotherms. Comparing with constituents, doped nanocubes were more efficient for chrysene degradation. Moreover, it reduced the $t_{1/2}$ value of chrysene manifolds than that of ZnO and ZnHCF nanoparticles. GC-MS results revealed the presence of smaller and safer by-products

(malealdehyde, propionic acid and but-2-ene-1,2,4-triol) formed by oxidation of chrysene by •OH free radical. The catalysts were also found reusable for ten cycles without significant loss in activity. Overall, due to greater active sites, high surface activity, low band gap with charge separation and semiconducting nature, ZnO@ZnHCF nanocatalyst might be believed to be a promising photocatalyst for environmental protection.

Keywords- Nanocomposite, photodegradation, Chrysene, Toxic.

PMS26

Nanocomposite ion exchanger for separation and removal of heavy metal ions

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Zr(IV) tungstophosphate based nanocomposite ion exchanger was explored for the separation and removal of heavy metal ions from water system. The nanocomposite was characterized using soem latest techniques. TEM results confirmed the nano size of composite material. The nanocomposite shows higher for ion exchange capacity 0.80 meq/g as compared to ZTP (0.32 meq/g). Effect of temperature was also studied and GT/ZTP shows good thermal stability upto 300°C. Distribution coefficient studies illustrates that the GT/ZTP have higher K_d values for Cd (II) as compared to others. On the basis of distribution coefficient values Some binary separations of metal ion pairs such as Cd(II)-Al(III), Cd(II)-Ni(II), Pb(II)-Mg(II), Mg(II)-Zn(II), Pb(II)-Cu(II), Co(II)-Cu(II), Al(III)-Co(II) and Ni(II)-Zn(II) were attempted using naocomposite ion exchanger column.

PMS27

Synthesis of quantum confined copper oxide nanostructure

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Copper oxide nanoparticles, with crystalline size 20-40nm have been prepared using coprecipitation method by employing sodium dodecyl sulphate (SDS) as capping agent. The surface morphology of the samples was characterised by scanning electron microscopy (SEM), Fourier transform infrared (FT-IR) spectroscopy and ultraviolet-visible (UV-Vis) spectroscopy was also used for analysis of prepared samples. Ultraviolet-visible (UV-Vis) measurements, Tauc plot blue shift of the optical band gap suggesting the movement of size towards quantum confinement for the synthesized nanostructures.

Analysis of Structural, optical and magnetic behaviour of Silver substituted Mg-Mn ferrite nanomaterials by sol-gel technique

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A series of Silver Doped Magnesium-Manganese ($\text{Mg}_{0.9}\text{Mn}_{0.1}\text{Ag}_x\text{Fe}_{2-x}\text{O}_4$), $x = 0.0, 0.1, 0.2, 0.3$ & 0.4 nanoparticles have been synthesized by sol-gel technique. Silver ($Z=47$) has the highest electrical conductivity of all metals, but it is not widely used for electrical purposes as it is very expensive. X-Ray Diffraction (XRD) has been performed for calculating crystallite size, interplanar spacing, volume, lattice constant, density, strain etc. The crystallite size is calculated from Debye-Scherrer's formula which is found to be in the range of $51\text{-}65\text{ nm}$ with lattice constant 8.4 \AA . The FESEM and EDS analysis have also been done which indicates that the grain size of the synthesized nanomaterials is found to be in the range of $1.38\text{ }\mu\text{m}$ along with elemental composition. Fourier Transform Infrared Spectroscopy (FTIR) has also been performed. From the FTIR analysis, the bands around $3440\text{-}3433.20$, $2055.09\text{-}2076$ and $1628\text{-}1643.01$ represent the H-O-H stretching vibration of the absorbed water, H-O-H bending vibration of absorbed water and the C=O stretching characteristic peak of the synthesized samples. The peak around 640 cm^{-1} shows the tetrahedral phase and the peak around 516.98 cm^{-1} shows the octahedral phase. The M-H study has been performed by Vibrating Sample Magnetometer (VSM), the value of saturation magnetization (M_s) is calculated and having values 25.31 emu/g , 26.62 emu/g , 28.10 emu/g , 30.26 emu/g , 28.78 emu/g for $x = 0.0, 0.1, 0.2, 0.3$ & 0.4 nanomaterials samples, respectively. From these values, it is depicted that the saturation magnetization (M_s) goes on increasing with increasing the Silver content for $x = 0.1$ to $x = 0.3$ but its value decreases for $x = 0.4$. Also, the coercivity (H_c) shows the same trend as the saturation magnetization (M_s) suggests that the coercivity (H_c) is found to be increase with the increase in doping content having values in the range of 9.11 Oe ., 23.53 Oe ., 46.69 Oe . and 52.42 Oe for $x = 0.0, 0.1, 0.2, 0.3$ but it decreases to 46.45 Oe for $x = 0.4$. The main achievement of our research work is that we enhanced the values of saturation magnetization (M_s) as compared to research work of other researchers.

Role of La/Ni substitution on the structural and magnetic properties of Y-type ($\text{Sr}_{2-y}\text{La}_y\text{Co}_2\text{Ni}_x\text{Fe}_{12-x}\text{O}_{22}$) nanohexaferrites

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A series of (La - Ni) doped $\text{Sr}_{2-y}\text{La}_y\text{Co}_2\text{Ni}_x\text{Fe}_{12-x}\text{O}_{22}$ ($x = 0.0, 0.1, 0.2, 0.3$ and $y = 0.0, 0.010, 0.020, 0.030$) Y-type hexaferrites were synthesized by sol-gel technique. The X-ray diffraction (XRD) patterns confirm single phase Y-type hexaferrite and various other parameters like lattice constants (c and a), cell volume (V_{cell}), X-ray density (d_x), bulk density (d_b) and porosity (P) have been calculated from XRD data and were found in range of $c = 43.7316 - 44.7214 \text{ \AA}$, $a = 5.8798 - 5.8321 \text{ \AA}$, $V_{\text{cell}} = 1309.303 - 1317.304 \text{ \AA}^3$, $d_x = (5.014 - 4.987) \text{ g/cm}^3$, $d_b = (3.774 - 3.128) \text{ g/cm}^3$ and $P = 0.7527 - 0.6262$, respectively. FESEM images showed that particles are of plate like shape which are found useful in microwave devices. Fourier transform infrared spectroscopy (FTIR) studies revealed the information about the positions of the ions and their bonds within the lattice structure of the this hexaferrite. The magnetic parameters are studied by vibrating sample magnetometer (VSM) and the Mössbauer analysis of the synthesized samples were also studied. The magnetic parameters viz. saturation magnetization (M_s), remnant magnetization and coercivity (H_c) obtained from hysteresis loops show increased value with increasing the La/Ni content in nanohexa ferrite matrix. The M_s values were found to be in the range of $37.571 - 46.327 \text{ emu/g}$ and corresponding Coercivities is found to be $H_c = 26.188 - 282 \text{ Oe}$. These values make these materials suitable for magnetic storage, radar technologies and wireless communication applications.

Effect of Ho/Ni/Mn dopants on structural and magnetic properties of Ba-Sr Z-type nanohexaferrite $\text{Ba}_{1.5}\text{Sr}_{1.5}\text{Co}_{2-z}\text{Ho}_z\text{Mn}_x\text{Ni}_y\text{Fe}_{24-x-y}\text{O}_{41}$ (where $x = y = 0.0, 0.1, 0.2, 0.3$ & $z = 0.0, 0.05, 0.10, 0.15, 0.20$) nanoparticles matrix synthesized by Sol-gel auto combustion technique

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A series of Z-type-Ba-Sr hexaferrites $\text{Ba}_{1.5}\text{Sr}_{1.5}\text{Co}_{2-z}\text{Ho}_z\text{Mn}_x\text{Ni}_y\text{Fe}_{24-x-y}\text{O}_{41}$ (where $z =$ where $x = y = 0.0, 0.1, 0.2, 0.3$ & $z = 0.0, 0.05, 0.10, 0.15, 0.20$) nanoparticles were prepared by sol-gel auto combustion method. The crystal structure and magnetic properties of the sample were investigated with X-ray diffractometer, Vibrating Sample Magnetometer and Mössbauer

Spectroscopy. X-ray diffraction analysis confirmed the formation of single phase z-type hexaferrite structure and the average particle size calculated was found to be in the range of 30 – 45nm, the lattice parameter “a” increases whereas the value of lattice parameter “b” decreases with increase in the concentration of Ho^{3+} , Mn^{2+} , and Ni^{2+} dopants, Further structural parameters viz. unit volume(V_{cell}) increases from $1595.27 (\text{\AA})^3$ to $1644.08(\text{\AA})^3$, X-ray density (d_x) decreases from 5.13 g/cm^3 to 5 g/cm^3 , Bulk density(d_b) decreases from 3.97 g/cm^3 to 3.52 g/cm^3 and Porosity (P) increases with substitutions (Ho-Ni-Mn) in $\text{Ba}_{1.5}\text{Sr}_{1.5}\text{Co}_2\text{Fe}_{24}\text{O}_{41}$. XRD study also revealed that nanoferrites are of the crystalline nature with space group p63/mmc. The magnetic parameters such as saturation magnetisation (Ms) was found to decrease from 44emu/g for $z = 0.0$ to 35.6emu/g for $z=0.20$ whereas magnetic coercive field (Hc) increases from 80Oe for $z=0.0$ to 246 Oe for $x = 0.20$ with increasing Ho-Ni-Mn concentration. The Mössbauer analysis of samples also supported our VSM results.

PMS31

Far Infra- red study of $\text{Se}_{92}\text{Te}_{8-x}\text{Sn}_x$ ($x=0, 2$ and 4) chalcogenide glasses

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In the present work, FTIR study of the $\text{Se}_{92}\text{Te}_{8-x}\text{Sn}_x$ ($x=0, 2$ and 4) thin films has been studied. FTIR spectra were taken in wavelength region $50\text{--}600 \text{ cm}^{-1}$. The parameter like probability density of bond formation is calculated. With the addition of Sn, Far-IR spectra shift toward high frequency side and new bands start forming in the spectra. The Sn atom appears to substitute for the selenium atoms in the outrigger sites due to large bond formation probability.

Glassy alloy of $\text{Se}_{92}\text{Te}_{8-x}\text{Sn}_x$ ($x=0, 2$ and 4) were prepared by melt quenching technique. Materials (99.999% purity) weighed according to their atomic percentage and sealed in evacuated ($\sim 10^{-5}\text{Pa}$) quartz ampoules. The sealed ampoules are kept in a furnace where temperature was increased up to 900°C at a heating rate of $3\text{--}4^\circ\text{C}/\text{min}$. and then the ampoules were frequently rocked for 8 h at the highest temperature to make the melt homogeneous. From XRD study, it is found that samples are of amorphous nature. The far –infrared spectra of different glassy alloys were recorded using Perkin Elmer 1600 FT-IR Spectrometer.

2-Acrylamido-2-methylpropane sulfonic acid and Acrylic acid (AAc) grafted cellulose for metal ions sorption applications

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Cellulose extracted from rice husk was functionalized through free radical grafting with 2-acrylamido-2-methylpropane sulfonic acid and acrylic acid in the presence of N,N'-Methylenebisacrylamide cross-linker and potassium persulfate initiator. To ascertain the grafting, the synthesized copolymer Cell-g-AASO₃H-co-AAc was characterized by FESEM, FTIR, XRD and thermal analytical techniques. The swelling behavior of the grafted copolymer, analyzed as a function of pH followed the order 7.0 > 9.4 > 2.2. The sorption characteristics of the grafted copolymer were studied as a function of contact time, temperature, pH, and concentration for Ni(II) and Cu(II) ions. Maximum adsorption of Ni(II) and Cu(II) ions was observed at pH 6.0 and temperature of 30 °C after a contact time of 120 min. Among the various kinetic and adsorption isotherm models, the experimental adsorption data were best fitted in pseudo-second-order kinetic model and Langmuir isotherm model for metal ions. From Langmuir adsorption isotherm, maximum sorption capacities of 112.74 and 109.77 mg/g for Ni(II) and Cu(II) ions, respectively were found.

Toxic metal ions sorption applications of 2-acrylamido-2-methylpropane sulfonic acid (AASO₃H) and glycidyl methacrylate (GMA) grafted cellulose

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The sorbent Cell-g-AASO₃H-co-GMA was synthesized through grafting of 2-acrylamido-2-methylpropane sulfonic acid (AASO₃H) and binary comonomer glycidyl methacrylate (GMA) using potassium persulfate (KPS) as free radical chemical initiator and N,N'-methylene bisacrylamide (NMBA) as cross-linker onto the cellulose extracted from rice husk. The graft copolymer was characterized through different characterization techniques like FTIR, FESEM,

XRD, and TGA/DTA. The swelling behavior of the graft copolymer was evaluated at 2.2, 7.0 and 9.4 pH and compared with the ungrafted cellulose to explore their applications for sorption of metal ions from their aqueous solutions. The sorption parameters were elaborated for Ni(II) and Cu(II) ions. The sorption of metal ions was investigated as a function of contact time, temperature, pH and concentration. The mechanism of the sorption and the interactions between sorbent Cell-g-AASO₃H-co-GMA and metal ions were studied using different kinetics and adsorption isotherms models. The adsorption data for metal ions fitted well with the pseudo-second-order rate equation and Langmuir adsorption isotherm.

PMS34

Applications of graft copolymers of AAc and binary comonomers onto chitosan in metal ions removal from aqueous solution

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In this study, removal of toxic metal ions Pb(II), Cu(II), Fe(II) and Cr(VI) by the Ch-g-poly(AAc) and Ch-g-poly(AAc-co-CM) was investigated. For this factor affecting the uptake of metal ions by the hydrogels were optimized such as contact time, temperature, pH and metal ion feed concentration. Solutions of individual metal ions with 5.00 mg/L concentration were prepared and metal ions immersed in the individual metal ion solution for the percent uptake. For non-competitive sorption study preferential order of sorption was Cu(II) > Fe(II) > Pb(II) > Cr(VI) ions. The grafted samples show maximum P_u of Cu(II) ions and Fe(II) ions at pH 7.0 whereas Pb(II) ions and Cr(VI) ions were sorbed maximum in the medium of pH 9.4. Among the graft copolymers Ch-g-poly(AAc) showed best results for sorption of 94.40 % for Cu(II) ions in 6 h contact time 30 °C and pH 7.0. Ch-g-poly(AAc-co-AAm) showed maximum uptake of 92.60 % for Cr(VI) ions in 6 h contact time and 87.80% for Pb(II) ions in 3h contact time at 25 °C and pH 9.4. Maximum 89.60 % uptake of Fe(II) ions was reported for Ch-g-poly(AAc-co-GMA) in 6 h contact time at 25 °C and pH 7.0. Sorption data for the chitosan and graft copolymers was modelled by pseudo-first-order and pseudo-second-order kinetic models so as to understand the adsorption mechanism. The data fits well in pseudo-second order kinetic model.

Development of High Temperature Thermoelectric Materials Using Plasma Enhanced Chemical Vapour Deposition Technique

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High temperature thermoelectric materials are potential candidates for creation of electricity from waste heat, dissipated at high temperatures from mega industrial machines and nuclear reactors. Such materials should have high thermo electric figure of merit $ZT (=S^2\sigma T/\kappa)$ and tolerance to high temperatures of the order of kilo Kelvin. Tungsten remains a suitable choice for this purpose, as it has high Electrical Conductivity (σ), high Seebeck Coefficient (S) and can withstand high temperatures. Though, the Thermal Conductivity (κ) of Tungsten is high, which can be decreased significantly by producing a thin layer of Tungsten nanoparticles deposited on a conducting plate. Creation of nanoparticles increases the interface volume ratio and enhances the scattering of phonons with grain boundaries, results in decrease the thermal conductivity. Coating of tungsten nanoparticles on graphite has been carried out by radio frequency induced plasma enhanced chemical vapour deposition (rf -PECVD) and characterized by X-ray diffraction spectroscopy.

Fabrication and Characterization of Lead Free Polycrystalline Sample of $\text{Ba}_{1-x}\text{Mg}_x\text{TiO}_3$ ($x = 0.05, 0.10, 0.15$) for Ferroelectric Applications

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Polycrystalline sample of lead free, $\text{Ba}_{1-x}\text{Mg}_x\text{TiO}_3$ where ($x = 0.05, 0.10, 0.15$) have been fabricated by a hydrothermal method. Single-phase perovskite-type X-ray diffraction patterns were observed and the samples had a phase with a tetragonal structure at room temperature for all the compositions. The SEM image of powder showed agglomeration with the increment of Mg element. Small grains with average grain sizes of $\sim 20 \pm 5 \text{ nm}$ uniformly distributed over the mesocrystals. TEM specimens showed well-dispersed spherical barium magnesium titanate

nanoparticles and diameter of these particles were around 270-300 nm. Dielectric measurements indicated diffused phase transition behaviour for $x = 0.05$, 0.10 and 0.15 . The peak ϵ_r values decreased from ~ 5880 at $x = 0.05$ to ~ 4583 at $x = 0.10$ and further decreased to ~ 4064 for $x = 0.15$. The transition temperature (T_C) of $x = 0.05$ showed a broad Curie peak, typical of a diffuse ferroelectric with Curie point, $T_c \sim 123^\circ\text{C}$.

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Synthesis and Characterization of Barium Zirconium Titanate, $\text{BaTi}_{0.95}\text{Zr}_{0.05}$ (BZT) by Hydrothermal Method

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Barium zirconium titanates, $\text{BaTi}_{0.95}\text{Zr}_{0.05}$ (BZT) nano-material synthesized by hydrothermal method have been characterized by various techniques such as transmission electron microscopy (TEM), scanning electron microscopy (SEM), synchrotron X-ray diffraction and EDX. XRD showed that the samples had a phase with a tetragonal structure at room temperature. The peaks at the diffraction pattern were sharpened, which indicated a high crystallinity degree and crystallite size ≤ 100 nm. The TEM and SEM analyses showed uniform nanoparticles. Samples showed mesocrystals particles with fractured surface. The particles are found to be more crystalline and less agglomerated.

PMS38

BIODEGRADABLE CATIONIC GEMINI SURFACTANTS, GENE TRANSFECTION & GENE THERAPY: A REVIEW

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The interaction of the lipoplexes with the prototypical biological rind may deliver imperative evidence of altered brands of forces (electrostatic interaction, hydrophobic interaction so on) convoluted amid the cationic lipoplex and the anionic cell membrane, precisely the endosomal membrane. The interior as well as the peripheral morphology of the lipoplexes may be expedient to regulate the competence of lipoplexes in gene transfection. Evidently, the conformational fluctuations in the lipoplex morphology will eventually expedite superior cell permeation as well as transfection of the gene. Therefore, coalescing altered portrayal techniques and interpreting the clandestine mechanism intricate in lipoplex formation, next-generation novel gene delivery

system may be successfully developed. Our literature review advocates that the variants in the alkyl tail length and spacer/head group and resulting physicochemical properties of the Gemini-based lipoplexes (e.g. particle size, zeta potential, N/P ratio, morphology, internal structure) has substantial impact in improving the gene transfection of lipoplexes, both *in vitro* and *in vivo*. Reviewing the interaction behavior of Gemini surfactants with DNA in a lipoplex can aid in understanding the mechanism(s) involved in the condensation of DNA. Furthermore, the eventual efficacy of nonviral gene delivery systems will depend on the rate, extent and duration of transfection, and the ability of the gene delivery systems to precisely interrelate with target cells *in vitro* as well as *in vivo*. Having been aware of the aforementioned features of a cationic lipoplex, one can design an efficient non-viral gene delivery vector including Gemini surfactant with appropriate modifications. Numerous cationic lipidic carriers have been tried and established as gene delivery transferors, still there's a requirement for further growth and perfections in the designs of cationic biodegradable lipidic carriers for gene transfection.

PMS39

Synthesis, Characterization and Enhanced photocatalytic degradation of dyes using Zinc oxide nanostructures

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Herein, we report photocatalytic properties of zinc oxide (ZnO) nanoparticles synthesized by solution combustion method using urea as fuel. The synthesized nanoparticles were characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM) attached with energy dispersive spectroscopy (EDS) and UV-visible spectroscopy. The detailed analysis revealed that the synthesized nanoparticles were well-crystalline and grown in very high density. The structural and optical properties of the as-synthesized nanocones confirmed a pure and well crystalline product possessing wurtzite hexagonal phase. The prepared nanoparticles were used as efficient scaffold for photocatalytic degradation of various dyes. The detailed photocatalysis results revealed that in presence of an appropriate amount of ZnO nanoparticles as photocatalyst, a significant dye degradation of methyl orange (MO) was observed in 80 min. This work demonstrates that the simply synthesized ZnO nanostructures could be efficient photocatalyst for the photocatalytic degradation of various organic dyes and chemicals.

MoS₂ and rGO-MoS₂ Hybrids as Potential scaffold for the fabrication of hydrazine sensor

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In this work we have demonstrated the synthesis of MoS₂ and rGO-MoS₂ nanostructures. The synthesized nanostructures were characterized in detail in terms of their morphological, structural and optical properties. The morphological investigations, done by field emission scanning electron microscopy (FESEM) while the phase composition and the structure of MoS₂ and rGO-MoS₂ nanostructures were examined by X-ray diffraction and high-resolution transmission electron microscopy. The elemental composition examined by energy dispersive spectroscopy (EDS). The prepared nanoparticles were used as effective electron mediators for the fabrication of efficient hydrazine amperometric sensors. Further fabricated hydrazine sensor exhibited a good sensitivity of $0.57 \mu\text{A } \mu\text{M}^{-1} \text{ cm}^{-2}$ and $8.99 \mu\text{A } \mu\text{M}^{-1} \text{ cm}^{-2}$ and detection limit of $13.37 \mu\text{M}$ and $0.85 \mu\text{M}$ respectively for MoS₂ and rGO-MoS₂. Thus from the above discussion it is concluded that the as synthesized MoS₂ and rGO-MoS₂ hybrids are the potential scaffold for the sensing of hydrazine.

Colloidal Gold Coated Silica Hybrid Nanoparticles-Protein Extraction and Cytotoxicity Abilities

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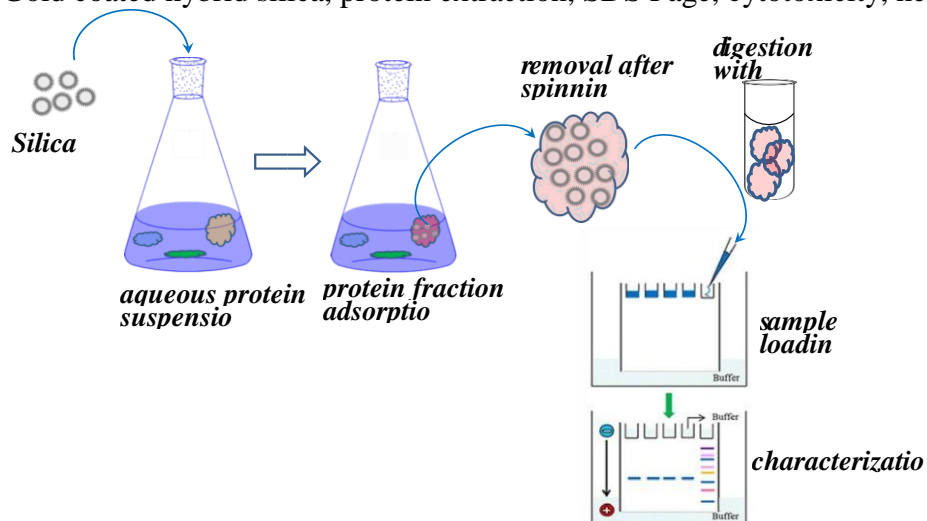
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Monodisperse non-hybrid and hybrid colloidal silica of ≤ 200 nm decorated with small Au nanoparticles (NPs) were synthesized in a simple single step method. Non-hybrid silica NPs were synthesized in the absence and presence of different twin tail cationic surfactants while tiny Au NPs were grown under in situ reaction conditions on non-hybrid silica synthesized previously by using cationic dextran. Bio-applicability and cytotoxicity of both hybrid as well as non-hybrid silica NPs were tested by using them for the extraction of protein fractions from complex aqueous protein solutions, and treating them with blood cells, respectively. Both non-hybrid and hybrid silica NPs demonstrate excellent ability to extract proteins fractions predominantly of relatively low molecular masses i.e ~ 80 kDa. Extraction preferences between both kinds of silica became prominent when predominantly hydrophobic proteins such zein and rice proteins were used rather than mainly polar protein like BSA. Applicability for more complex biological fluid like serum indicated the competitive extractions among strongly versus weakly bound proteins. With significant bearing in in vivo conditions, hybrid silica was potentially toxic

towards the blood cells in comparison to non-hybrid silica. It stems from the collective interactions of silica as well as nanometallic surfaces of Au NPs to interact with the blood cells causing hemolysis and hence, may not be the suitable vehicles for drug release in systemic circulation.

Key words: Gold coated hybrid silica, protein extraction, SDS Page, cytotoxicity, hemolysis.





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