NATIONAL CONFERENCE
on

MICROBIAL BIOPROSPECTING

PRESENT & FUTURE SCOPE

06th -07th March 2020

ABSTRACT BOOK

Organized by

Association of Microbiologists of India-LPU Unit,
Department of Microbiology,
School of Bioengineering and Biosciences,
Lovely Professional University, Punjab

भारतीय जीवाणुतत्ववेत्त संगठन
Association of Microbiologists of India

ज्ञान-विज्ञान विमुक्तये
डॉ. भूषण पटवर्धन
उपाध्यक्ष
Dr. Bhushan Patwardhan
Vice-Chairman

सत्यमेव जयते

विश्वविद्यालय अनुदान आयोग
University Grants Commission
(मानव संसाधन विकास मंत्रालय, भारत सरकार)
(Ministry of Human Resource Development, Govt. of India)
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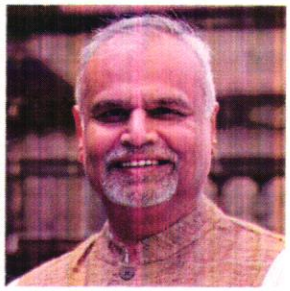

MESSAGE

It gives me immense pleasure to know that the School of Bioengineering and Biosciences of Lovely Professional University, Punjab is organizing a National Conference on the theme "Microbial Bioprospecting: Present and future Scope" during 6th and 7th March, 2020. This event is expected to provide varied scientific information and knowledge. This conference may enhance the knowledge of young minds and help them to strive for excellence in their respective fields by providing an opportunity for fruitful deliberations and interactions.

I extend my greetings to Sh. Ashok Mittal, Chancellor, Dr. Ramesh Kanwar, Vice Chancellor, Dr. Ashish Vyas, Organizing Secretary, member of organizing committee and all the delegates. I wish the conference all the best.

(Prof. Bhushan Patwardhan)

3rd February, 2020

सत्यमेव जयते

प्रो. आशुतोष शर्मा
Prof. Ashutosh Sharma

स्वच्छ भारत
एक कदम स्वच्छता की ओर

सचिव
भारत सरकार
विज्ञान और प्रौद्योगिकी मंत्रालय
विज्ञान और प्रौद्योगिकी विभाग
Secretary
Government of India
Ministry of Science and Technology
Department of Science and Technology

5th February, 2020

MESSAGE

I am delighted to learn that the School of Bioengineering and Biosciences of Lovely Professional University, Punjab is going to organize a National Conference based upon the theme "Microbial Bioprospecting: Present and future Scope" on 6th and 7th March,2020. This event will serve as an international platform for researchers, scientists, and academia to propagate their research to international scientific community besides enlightening the public on the recent and future trends in microbiology. Surely, this type of conference will bring all the researchers, students at one platform and would inculcate the much-needed research culture among the entire fraternity of Education in the country, thereby, contributing to the development of nation.

I wish the organizers of this conference a fruitful discourse.

(Ashutosh Sharma)

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Sh. Ashok Mittal
Honorable Chancellor
Lovely Professional University, Punjab, India

Dear Delegates,

As a part of an endeavor to harness the genetic resources of biodiversity in the world and to promote healthy research culture, Lovely Professional University is organizing a conference based upon the contemporary theme: Microbial Bioprospecting: Present & Future Scope.

The conference aims to encourage and promote high-quality research on issues of importance to the society in various areas of Microbiology through exchange of stimulating ideas and to turn the spotlight on current and future advances in this field. This conference is a step towards achieving our vision in becoming a world-class academic and research community that can benefit the society at large. This conference seeks to provide an insight into the recent research and cutting edge technologies, which will gain immense interest with the colossal and exuberant presence of adepts, young and brilliant researchers, industrial delegates and talented student community.

The entire conference is packed with thought provoking discussions and will create a confluence of accomplished scientists and budding researchers. This conference will be a platform for researchers and young enthusiasts to brainstorm and share ideas that can make a meaningful difference to the society. I am confident that this conference will enable us to find better ways of impacting the life of the global community by bringing into focus the current and the expected areas of challenge and addressing theme through effective and innovative approach.

I wish all the success to the organizers and look forward to a very interesting and fruitful conference ahead that would contribute to significantly enhance the research quotient of Indian Science community.

Best wishes

Ashok Mittal
Chief Patron
National Conference on Microbial Bioprospecting: Present & Future Scope.

Smt. Rashmi Mittal
Pro-Chancellor
Lovely Professional University, Punjab, India

Dear Delegates,

It is a great pleasure to welcome all delegates coming from near and far to Lovely Professional University to participate in the National Conference on Microbial Bioprospecting: Present & Future Scope.

As individual researchers, we must contribute to our society to the best of our abilities by carrying out research and development in our respective domains. This conference aims to bring together diverse world class experts to share their research findings and the practical knowledge for implementing the latest technology. By organizing such an intriguing event, the Association of Microbiologist of India-LPU Unit, Department of Microbiology, School of Bioengineering and Biosciences has provided the platform towards strengthening our relationships in knowledge sharing among budding researchers, eminent scientists, researchers and aspiring young minds from around the world to interact and provide the necessary thrust in the joint research collaborations and product commercialization within the research society.

Lovely Professional University has always promoted research and innovation in context of societal needs and challenges. In the form of live projects, our students are sensitized towards the modern-day requirements of the industry, and by its extension, the society. I hope this conference will translate this vision of LPU in full letter and spirit.

I wish you an engaging and productive conference participation and a huge success!

Best wishes

Rashmi Mittal
Patron
National Conference on Microbial Bioprospecting: Present & Future Scope.

Prof. Ramesh Kanwar
Vice Chancellor
Lovely Professional University, Punjab, India

Dear Delegates,

It is my great pleasure to welcome you to the 2020 National Conference on Microbial Bioprospecting: Present & Future Scope which is taking place on the beautiful campus of Lovely Professional University (LPU), Phagwara, Punjab on 6th and 7th March, 2020.

LPU is among the leading research universities in India and now leading in inter-disciplinary research by building partnerships with national and international centers of excellence. In one of such endeavor, Association of Microbiologist of India-LPU Unit, Department of Microbiology, School of Bioengineering and Biosciences LPU, is organizing the National Conference by bringing together researchers, industry fraternity, academicians and students to a common platform so that they can debate research opportunities related to emerging developments in the broader areas of microbiology for the betterment of society. This scientific program will foster discussions and hopes to inspire participants from attending this conference of microbiology to initiate collaborations within and across disciplines for the advancement of field. Therefore, this conference will provide an excellent podium for researchers to discuss basic and applied areas of research under the theme "Microbial Bioprospecting: Present & Future Scope" and bring on common areas of future research and collaborations. The various thematic sessions will showcase important scientific advances in a world of fast changes and complex interactions. On behalf of LPU family, I welcome all of you to attend the plenaries and oral presentations and invite you to interact with the conference participants during various sessions, allowing you multiple opportunities to have in-depth discussions on topics of your interest.

In addition, take some time to visit our beautiful campus and research laboratories during your stay at LPU campus. I wish you the best on the success of this conference.

Best Wishes

Dr. Ramesh Kanwar

Patron

National Conference on Microbial Bioprospecting: Present & Future Scope.

Prof. Lovi Raj Gupta
Executive Dean
Lovely Faculty of Technology and Sciences
Lovely Professional University, Punjab, India

Dear Delegates,

It is indeed gratifying to learn that the Association of Microbiologist of India-LPU Unit, Department of Microbiology, School of Bioengineering and Biosciences School of Bioengineering and Biosciences is organizing the Conference on Microbial Bioprospecting: Present & Future Scope (2020). On behalf of the organizing committee of this conference, I take pleasure in inviting and welcoming you at Lovely Professional University, Punjab from March 06-07, 2020 to witness and to become a part of this conference.

The aim of this conference is to bring together, a multi-disciplinary group of researchers, academicians and scientists from all over the world to present and exchange break-through ideas relating to the microbiology. It will promote top level research and globalize the quality research in general, thus making discussions, presentations more internationally competitive and focusing attention on the recent outstanding achievements in the field of microbiology, its future trends and needs.

As one of the leading academic institutions, it is one of our prime mission to provide the society-at-large with affordable means to find solutions to diverse problems and to lead quality lives. I urge the participants to deliberate upon and generate novel ideas for addressing the contemporary issues of regional, national and international significance, related to the fields of Microbiology. The conference aims to receive high-quality research contributions from across the globe and encourages the researchers to be a part of this science endeavor at Lovely Professional University.

I convey my best wishes to the organizing committee and extend a warm welcome to all the participants of the Conference on Microbial Bioprospecting-2020.

Best Wishes

Dr. Lovi Raj Gupta
Head, Advisory Committee
National Conference on Microbial Bioprospecting: Present & Future Scope.

Prof. Arun Karnwal
Department of Microbiology
Lovely Professional University, Punjab, India

Dear Delegates,

Welcome to Lovely Professional University, Punjab! On behalf of the Conference Committee, we are so excited to host the National conference under AMI-LPU UNIT for the first time at the Department of Microbiology. It is an honour and great privilege for me to chair this National academic event– the National Conference on Microbial Bioprospecting: Present & Future, Punjab (NCMB) from 6th – 7th March, 2020, in Punjab, India.

NCMB 2020 will explore the Present & Future aspects of Microbiology in sustainable development and application for the environment and living beings. The two-day program includes a variety of exciting lectures from reputed international level speakers, research presentations of growing researchers, panel discussions, and poster presentations. Whether you are a novice or an expert, NCMB 2020 offers opportunities of interest to all, and we endeavour to heighten your academic acumen.

The conference strives to impart new frontiers of knowledge in current scientific evidence-based information and technical skills in the field of Microbiology. We assure you to keep the presentations balanced, stimulating, and catering to your personal learning goals- thus reflecting the value of our meeting. The emphasis will be on an active academic program delivered by the masters in their fields.

The NCMB Team has very thoughtfully put up a well-versed scientific program for this event. We are committed to making NCMB 2020 a memorable event through more interactions and academics of an international scale. We will strive to keep up to your expectations with a galaxy of esteemed and eminent International level faculty. I extend my salutations to the pioneers and participants participating in this conference and greetings to my colleague.

Best Wishes

Prof. Arun Karnwal

Chairman, AMI-LPU Unit

Prof. Neeta Raj Sharma
Professor and Associate Dean,
School of Bio Engineering and Biosciences,
Lovely Professional University, Punjab, India

Dear Delegates,

It is a matter of great happiness for School of Bioengineering and Biosciences, Lovely Professional University that we are organizing two day National Conference on Microbial Bioprospecting: Present & Future Scope on 6th to 7th March, 2020 and I take this opportunity to welcome all the delegates to this conference .

The supreme theme of the conference is an exploration of Microbiology in diverse fields like pharmaceuticals, forensics, bioremediation, biodegradation, climate change and all these are going to benefit society at a global level. This conference is likely to be one of the finest opportunities for the intellectuals from all over the globe to participate and to share ideas over the same dais. I profoundly assure you that the organizers have spent all needful corpus of sweat and have appreciably networked with the advisory board members and all others associated with the event.

I am glad that professionals from different sectors are sharing the platform to discuss and deliberate on the present and future trends of microbial bioprospecting. I sincerely hope that such efforts should culminate in deriving at a multipronged strategy to tackle various societal issues.

We very much look forward to see you in Punjab on 6th and 7th March, 2020 and I hope the experience of two days will be engraved in your memory.

Best Wishes

Dr. Neeta Raj Sharma
Convener
National Conference on Microbial Bioprospecting: Present & Future Scope

Prof. Ashish Vyas
Professor and Head
Department of Microbiology and Biochemistry
Lovely Professional University, Punjab, India

Dear Delegates,

It is a great privilege and honor to welcome all the delegates for being part of the National Conference on Microbial Bioprospecting: Present & Future Scope on 6-7th March 2020 at Lovely Professional University, Punjab. The premier event is being organised by Association of Microbiologists of India-LPU Unit, which reiterates the significance of this platform to bring together experts from academia and industry to discuss the current and futuristic trends in the diverse thematic areas of Microbiology. The organizing team, under the valuable guidance of our Chairman and Advisors, has put in the best efforts to create this prestigious conference as a nucleus of interface research between microbiology and allied life sciences.

The microbial world is the foundation of the biosphere and thus, microbiology is one of the fundamental biological sciences whose exploration from basic to applied research is indispensable for the betterment of human life. The conference aims to incorporate the novel research findings on use of microbes for the production of biofuels, chemicals, biomaterials, pharmaceuticals, therapeutics etc. Further, bioprospecting their applications for bioremediation, bioprocess engineering, microbial forensics and geochemical cycling is also encompassed along with emphasis on latest omic approaches for studying microbes.

The series of keynotes, lectures and presentations delivered by the eminent experts in the conference will contribute in exploring the potential of microbes for sustainable development for human welfare as well as promote implementation of advanced scientific strategies in real time. The conference will definitely serve as a platform for intellectual matching and sharing of expertise in various domains of microbiology and inspiring young minds to incubate their intellectual research ideas for microbe-based entrepreneurship.

I earnestly hope that the lush green and research oriented LPU campus will be a perfect host for the stimulating and brain-storming conference sessions, which will pave way for future collaborative research endeavours. With this note, I would like to wish you all a very sinformative and productive scientific feast at this beautiful LPU campus.

Best wishes

Dr. Ashish Vyas

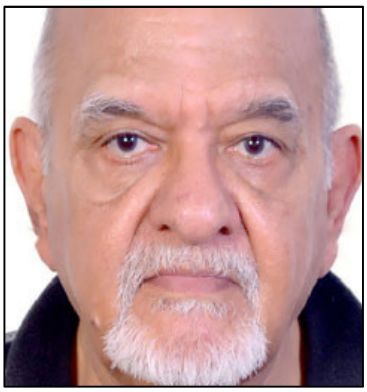
Organizing Secretary cum Treasurer, AMI-LPU Unit.

Organizing Committee

Chief-Patron	**Sh. Ashok Mittal** Chancellor, Lovely Professional University
Patron	**Smt. Rashmi Mittal** Pro-Chancellor, Lovely Professional University
	Prof. Ramesh Kanwar Vice Chancellor, Lovely Professional University
Head, Advisory Committee	**Prof. Lovi Raj Gupta** Executive Dean Lovely Faculty of Technology and Sciences Lovely Professional University
Chairman	**Prof. Arun Karnwal** President AMI-LPU Unit Lovely Professional University
Convener	**Prof. Neeta Raj Sharma** Professor and Additional Dean School of Bioengineering and Biosciences Lovely Professional University
Organizing Secretary and Treasurer	**Prof. Ashish Vyas** Secretary cum treasurer AMI-LPU Unit Lovely Professional University
Joint Organizing Secretary	**Dr. Gaurav Kumar, Dr. Arvind Kumar, Prof. Joginder Singh** School of Bioengineering and Biosciences Lovely Professional University

Keynote Speakers

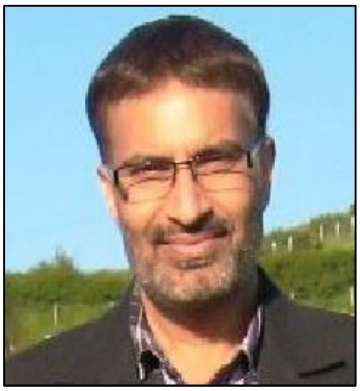
Prof. JS Virdi
AMI President, Former Professor and Head,
Department of Microbiology, Delhi University
(South Campus), New Delhi, India



Prof. PS Bisen
Prof Emeritus, Department of Biotechnology, Ex Vice
Chancellor, Jiwaji University, Gwalior, India

Dr. Belle Damodara Shenoy
Senior Scientist
CSIR-National Institute of Oceanography, Regional
Centre, Visakhapatnam, India.

Dr. Naveen Gupta
Associate Professor, Department of Microbiology
Punjab University, Chandigarh, India



Dr. Anil Kumar Puniya
Principal Scientist & I/C Anaerobic Microbiology Lab,
Dairy Microbiology Division
ICAR-National Dairy Research Institute, Karnal, India

Prof. Shamsher S. Kanwar
Professor, Departent of Biotechnology, Himachal Pradesh University, Shimla, India

Prof. Praveen Gehlot
Professor, Department of Botany, Jai Narain Vyas University, Jodhpur, India

Dr. Ravikant Ranjan
Scientist F, Drug Discovery and Development Division, Patanjali Research Institute, Haridwar, India

Genomic insights into clinical and environmental strains of *Yersinia enterocolitica* isolated from India

J. S. Virdi

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Yersinia enterocolitica is an important food- and water-borne zoonotic enteropathogen. In India, the first outbreak of gastroenteritis due to this bacterium was reported in 1996. In our laboratory, the organism was isolated from wastewater, pork, pigs (reservoir) and the stools of the diarrheic human patients. All strains were authenticated by WHO Reference Laboratory at Pasteur Institute.The Indian strains belonged to several serotypes. However, genotyping using REP- and ERIC-PCR showed that the strains belonged to only two clonal groups indicating limited genetic heterogeneity. Similar results were inferred from genotyping based on *rrn* and *gyrB* loci. Sequencing of beta-lactamase genes (*blaA*, *blaB*) also discerned two clonal groups. These studies also showed that the serotype 6,30-6,31 strains isolated from wastewater were genotypically different from the serotype 6,30-6,31 strains isolated from stools of diarrheic humans.

The detection of a large number of virulence-associated genes (*inv*, *ail*, *virF*, *ystA*, *ystB*, *ystC*, *myfA*, *fepA*, *fepD*, *fes*, *hreP*, *ymoA*, *tccC*, *sat*) in the Indian strains showed that Indian strains belonged to low virulence group. Multilocus variable number tandem repeat analysis (MLVA), multilocus enzyme electrophoresis (MLEE) and multilocus restriction typing (MLRT) and their analysis by minimum spanning tree and e-BURST suggested that the clinical strains probably originated from environmental strains by host adaptation and genetic change. Interestingly some functional parameters did not reflect the two clonal groups. Suppression subtractive hybridization (SSH) between clinical and environmental strains and proteomic analysis indicated that several iron-acquisition and storage genes were present in clinical strains but not in environmental strains. These are currently under study. Knowledge and expertise on beta-lactamase and other antibiotic resistance genes gained during this study is being used to develop a rapid test for detection of antibiotic resistance.

Probiotics and central nervous system

Prakash S. Bisen

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There has been a lot of research about the human microbes, some detailed investigations of the gastrointestinal microorganisms and its functions, and the highlighting of complex interactions between the gut, the gut micro biome, and the central nervous system. That acquire the involvement of the micro biome in the pathogenesis of various diseases. The gut micro biota is sensitive to internal and environmental influences, we have speculated that among the factors that influence the formation and composition of gut micro biota during life. Micro biome in human system is unequally distributed in the body and includes the aggregate of all microorganisms.

The most abundant micro biome in our body is gastrointestinal track. Which contain number of species of different microorganisms, among them (adults) Bacteroidetes, Actinobacteria and Firmicutes are dominate. The gastrointestinal micro biota is well studied than other human bacterial communities. There are studies have shown that, how exactly the intestinal micro biota has an impact on the health of its host.

Human gastrointestinal tract showed biggest associations of host, environments, and antigens. During the average human lifetime, tons of food transfer through the gut, with complex of microorganisms from the ambient environment, which poses threat on the intestinal entirety. Gut micro biome play a pivotal role in keeping up the resistance and the metabolic homeostasis effective and are protect against pathogenic microbes. Gut micro biota is a crucial modulator of brain development and subsequent adult behavior, and pathogenic microbes can be a reason of inflammatory diseases of the central nervous system. Epidemiological research has been shown a link between microbial infections early in life and neurological disorders, including autism and schizophrenia. The gut microbes can change the immune response by activating the immune system or through mediators that are able to penetrate the blood-brain barrier (BBB) or through other chemicals-related substances that have free access to the brain.

The Probiotics microbes offers numerous bonuses to the host, due to physiological capacities such as harvesting energy, strengthening gut integrity or shaping the intestinal epithelium protecting against pathogens and modulating host immune system. Research showed that, Microorganisms which live inside our gut are beneficial for the proper development of the central nervous system, for brain response and the regulation of host physiology, the ecosystem in the human gut is divers, there is potential for these processes to be disordered because of a changed microbial composition, which can be improved by daily up take of probiotics

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Fungal species complexes

Gunjan Sharma[1], *Belle Damodara Shenoy*[2]

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Taxonomy is a science that deals with the classification of organisms based on evolutionary traits. In Fungi, the phylogeny-centric delimitation has resulted in the reclassification of traditional lower fungi, and in some extreme cases discontinuation of well-known taxa such as Zygomycota. In the case of recently diverged fungal species and/or cryptic species, traditional morpho-taxonomic approaches are uninformative and misleading. The incorporation of molecular approaches (concatenation-based phylogeny, genealogical concordance analysis, and coalescence-based methods) in taxonomy has helped to comprehend the fungal species and species complexes. However, use of a single gene locus based phylogeny is not useful to accurately identify such species. Several economically important and ubiquitous plant pathogenic genera, including *Magnaporthe*, *Fusarium*, *Colletotrichum* and *Alternaria* are polyphyletic and thus their taxonomy is being revisited. Such nomenclatural type studies are important to provide the reference taxa and their associated molecular barcodes for future phylogenetic studies. With the recent advancements in the area of high-throughput sequencing technologies; comparative metagenomics and metatranscriptomics have emerged as powerful approaches to detect species and subspecies in mixed communities.

Being creative: Need of the hour

Simple ways to take research from classroom ⟶ Lab ⟶ Society

Naveen Gupta

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Imagination is more important than knowledge. For knowledge is limited to all we know and understand. While imagination embraces the entire world and all there ever will be to know and understand. Creativity can be god gifted in some people. However, creativity in science can also be cultivated to do meaningful science. Some of the important footsteps to increase the creative potential in science are to be 'happy but not satisfied', being alert, habit of wider thinking, asking questions, brain storming, feedback from others and most importantly enjoying the work to do. By doing science in a creative way we can take science from classroom to laboratory to society.

In modern cities majority of the sewage water is treated in sewage treatment plants (STP) but even after treatment it is mainly disposed of in natural water recourses. However tertiary treated sewage water (TT Water) can be used for number of alternate purposes such as irrigation, construction, service stations, recreational purposes like replenishment of lakes etc. However there are problems associated with the use of treated water for these purposes such as

- Improper treatment and irregular monitoring of the efficiency of STP'S
- Presence of excess nutrients such as phosphates and nitrates which lead to eutrophication
- Growth of sulphate reducing bacteria (SRB) which lead to foul smell.

By working in collaboration with Department of Environment Chandigarh all these problems were addressed.

For one year STP's of Chandigarh were monitored regularly and it was concluded that it is not the type of technology it is management of the STP's which determines the quality of treated water, with given recommendations quality of treated water was improved.

To explore the possibility of using TT water for the management of Sukhna Lake Chandigarh quality of TT water was compared with water of Sukhna Lake. It was found to be fit in all

aspects except excess of nutrients. An inherent technology was standardized using denitrifying and phosphate solubilizing bacteria; which completely removed these nutrients from TT water. Chandigarh administration has taken a note of the work and exploring the use of sewage water with this process for saving the Sukhna lake Chandigarh.

TT water is being used for irrigation in Chandigarh but the foul smell in it is the major problem. A process was standardized reduce the growth of SRB's by aeration and addition of acceptable chemicals which led to the complete removal of smell form TT water. Municipal Corporation has taken up the process and is going to apply it for solving the problem of foul smell.

Therefore microbial process can be used to convert waste water into asset and solving various problems related to society at large.

Gut microbiota and functional fermented foods

Anil Kumar Puniya

Principal Scientist, Dairy Microbiology Division, ICAR-National Dairy Research Institute, Karnal – 132001, Haryana, India

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The role of food in maintaining health and prevention of disease has progressed into the model of functional foods. Health benefits of fermented functional foods are a result of the ingested bioactive ingredients produced during fermentation or via ingested live microbes. Functional foods must achieve their effects in amounts normally consumed in a diet. Two different types of claims are proposed that relate directly to: 1) enhanced function claims; and 2) reduced risk of diseases. Functional food provides a health benefit that goes beyond nutritional benefit. Gut-microbiota is a group of trillions of live microbes that have evolved while populating the gastro-intestinal tract of human beings and the composition is host specific, and susceptible to environmental alterations. The microbiota is closely involved in host physiology (like nutritional status and stress response). The mechanisms how microbiota applies positive or harmful effects (relationship with human health and disease) remain mainly unclear. Modern techniques have made us aware of non-culturable microbes and of the relation between the microorganisms that live inside us. The microbiota is essential for proper growth, improvement of immunity, and nutrition. Certain lifestyle disorders like diabetes and obesity may possibly be explained by changes in the composition of microbiota. The advances in knowledge of gut microbiota will further our understanding of their role in health and disease by letting customization of prophylactic and therapeutic approaches. This presentation will deal with the trends of functional foods targeting diverse preventive health benefits, functions and importance of gut microbiota interactions and cause-effect mechanism in humans.

Microbial lipases-mediated biocatalysis in water-restricted media

Shamsher Singh Kanwar

Director IPRCC, Coordinator Bioinformatics Centre, Department of Biotechnology, Himachal Pradesh University, Summer Hill, Shimla-171 005, Himachal Pradesh, India

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Lipases also known as acyl hydrolases (EC 3.1.1.3) continue to retain prominence in bio-catalytic esterification reactions as they are endowed with the potential to retain catalytic activity in both aqueous as well as organic media. Lipases are ubiquitous in nature and are produced by animals and most of the microorganisms. Lipases of microbial origin, primarily those of bacterial and fungal strains represent the most widely used class of enzymes in biotechnological applications and organic synthesis. In past, a large number of lipases have been screened for their use as food additives (flavor modifying enzymes), industrial reagents (glyceride hydrolyzing enzyme), enantiomeric catalysis, stain removing (detergent additives) agents, digestive drugs and diagnostic enzymes in medical applications, neutraceuticals, surfactants and additives in cosmetics. The traditional reactions catalyzed by lipases in aqueous medium are often referred as hydrolysis that result in the release of alcohol and corresponding fatty acid(s) molecules during action on substrates such as glycerol or similar esters. Hydrolytic reactions are indispensable for the bioconversion of lipids (triacylglycerol) and often proceed with higher regio- and/ or enantio-selectivity. However, the reverse reaction referred as esterification could be achieved in organic media/ water restricted conditions (organic solvents or ionic fluids). Besides esterification, inter-esterification, trans-esterification, alcoholysis, acidolysis and amidation may be achieved by manipulation of reaction system and use of water-restricted media. The esterification reactions are often inhibited because of water molecules in the reaction cocktail that restrict forward reaction. Thus it becomes necessary to effectively remove these water molecules by using scavengers (usually molecular sieves) that could absorb water molecules quickly thereby relieving the inhibition and promoting the forward reactions. A variety of natural and synthetic moieties bearing alcoholic group are potential targets of ester synthesis using a range of acidic molecules. While performing reactions [esterification, interesterification, transesterification *etc*.] in organic solvents, enzyme being protein often loses its activity and hence it becomes essential to efficiently immobilize lipase on a suitable matrix that is compatible with the reaction system. Biocatalysis employing thermotolerant/

thermophilic lipase provides additional advantage of thermal stability, robustness, reusability and higher efficiency at relatively higher temperature(s) of reaction system. A lipase sourced from *Bacillus thermoamylovorans* could be successfully used for the syntheses of benzocaine (local anesthetic) and aspartame (artificial sugar).

Prosopisin, a novel antifungal protein from *Prosopis cineraria* seeds

*Dilip Singh Solanki, Praveen Gehlot**

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Prosopis cineraria (L.) Druce is a valuable keystone legume tree species and widely distributed in arid and semi-arid region of the Indian Thar desert. It is locally known as Khejri. Among the legume tree, it is the main source of amino acids as well as proteins. It contents high nutritive value, high protein, dietary fiber and used worldwide for food and cattle food. It is used in medicinal and cosmetic purposes since ancient times. It is also used for the treatment of asthma, bronchitis, dysentery, leucoderma, leprosy, muscle tumors, piles and wandering of the mind. It possesses antiviral, antibacterial, antifungal, anthelmintic and anticancer properties. Various plant parts viz. root, stem bark, leaves, Pod exhibited antimicrobial and antifungal properties. The study revealed that wide distribution of tree, easy availability of pod, high amount of seed proteins and their antimicrobial activity gives clue to isolate and purify seed protein and evaluate their antifungal efficacy against post-harvest rotten pathogenic fungi. Therefore, the study was undertaken to isolation, purification and characterization of *P. cineraria* seed against some phytopathogenic fungi. Antifungal protein from *P. cineraria* seeds was extracted and purified through ammonium sulphate precipitation, dialysis, ion-exchange chromatography and gel filtration methods and characterized by its SDS-PAGE, MALDI_TOF MS/MS, chitinase activity, thermostability and antifungal efficacy. The yield of purified antifungal protein was estimated 2.019 mg/g. Molecular mass of isolated protein was determined by SDS PAGE electrophoresis and found to be 38.6 kDa. The purified protein exerted antifungal activity against molecular diagnosed (ITS-5.8S gene) phytopathogenic fungi viz. *Lasiodiplodia theobromae* and *Aspergillus fumigatus*. The antifungal activity of the purified protein was retained after exposed up to 50°C for 10 min. it possesses chitinase activity and this was also retained over a heat treatment. The purified protein was characterized through MALDI-TOF MS/MS and peptide mass fingerprinting (PMF) search in Mascot database. Mascot database search revealed 15 peptides with their amino acid sequences that did not homologous to previously reported antifungal proteins and peptides. This antifungal protein designated new antifungal protein. Thus, it can be said aforesaid that new antifungal protein

opens up the possibility to use natural agents to effectively control of post-harvest fungal disease of fruits.

Anti-malarial potential of plant sourced products

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Malaria is still major vector borne disease causing annually 1-3 million deaths in tropical and sub-tropical region, mostly in the developing world. Almost 300–500 million people are infected annually with different malaria parasite species, *Plasmodium falciparum* being the most fatal, responsible for the deaths in children in sub-Saharan Africa. Although occurrence of incidence and fatality has decreased with time, emergence and spread of drug resistant parasite is still a major challenge. As the first line of defense against malaria, drugs groups like chloroquine and pyrimethamine, are proving ineffective against new drug resistant parasites.

Through collaborative effort, thousands of drug moieties and molecules are screened annually. However current drug discovery process takes more than a decade for final approval. Finding new potential candidate is difficult and time consuming task. Apart from traditional new drug discovery method, finding new combinations of known anti plasmodium drugs to overcome the resistance is also simple yet interesting approach. Repurposing of drugs for other diseases, as well as modification of older chemical scaffolds to optimize compounds has resulted in the exploration of exciting new drug candidates that are now being evaluated by different industry-academia collaborations.

Advance techniques are being employed to identify new anti-malarial medicines and its evaluation has become less labor intensive during initial stage of screening. Few popular screening methods for anti-malarial activity are bright field microscopic imaging, radioisotope based. With easy availability of techniques and tools SYBR labeling or enzymatic methods are becoming increasingly popular for lab based screening studies. More sensitive assays which track low parasite densities by ultrasensitive PCR are also being used in the cases, where initial screening provide promising results. After initial screening successful candidates are subjected to animal studies using rodent malaria model with final studies using field trials, which is long and rigorous process.

Our investigation of selected herbal origin products for anti-malarial activity is in nascent stage, with encouraging initial results. The current research is in progress to analyze the potential of the plant based product against malaria parasite. As many other plant derived

molecules have been already established as anti-malarial drugs, our research focus to study plant sourced material against malaria parasite is step in right direction.

Abstracts

Young Scientist Award Competition

YSA 1

In vivo and *in vitro* antiviral activity of carvacrol against Cauliflower Mosaic Virus (CaMV)

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As a causative agent of infection in plants, the global presence of virus is a threat to agricultural productivity. By spraying of the pesticides which reduces the population of vector, the effect of viral infection can be reduced. But the effect of these practices cannot be ignored either on humans or on the ecosystem itself. Presently, essential oils and its constituents have become a point of interest to utilize them as an antimicrobial and antiviral agent. In this study, efficacy of carvacrol, a compound found in *Origanum vulgare* essential oil, as anti-phyto viral agent against cauliflower mosaic virus (CaMV) was evaluated. The *in vivo* and *in vitro* antiviral activity of carvacrol was assessed at different concentrations (1, 1.5, 2, 2.5 and 3µl) dissolved in 1ml of DMSO against the cauliflower mosaic virus (CaMV) purified from *Brassica oleracea* infected leaves. Out of all the concentrations used, 3µl concentration of carvacrol in 1ml DMSO showed 85.1% inhibition rate against CaMV compared to roundup (positive control) that showed 76.2% inhibition rate. Affirmative results obtained by docking of carvacrol with P3 protein of CaMV showed an inhibitory effect of carvacrol against cauliflower mosaic virus. The results indicate that carvacrol has the potential to be used as an effective alternative for the treatment of cauliflower plant infected with CaMV.

YSA 2

Bioprocess development for ethanol production from rice straw

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The revolutionary enhancement for energy need, vigorous increment in industrialization and climate variations delivering and functioning as inducers to explore for an effective backup energy source that can conquer the environmental threats affected by fossil fuels. Within several resources of renewable energy, biofuels are the one with great potency to be substituted with fossil-derived fuels. Nevertheless, the present research on production of biofuels majorly emphasizes on lignocellulosic feedstock because of its sufficient accessibility and thermotolerant/thermophillic process requirements for a commercially achievable process. The present research work's objective was preparation of bioprocess method for the formation of bioethanol biofuel from paddy straw sources. Paddy straw was undergone preliminary treatment with sodium hydroxide (0.5 % NaOH, 10 % solid loading) for step-wise synchronous saccharification and fermentation with 20 % solid loading and cellic ctech2 enzyme at temperature 45 ˚C using *Kluyveromyces marxianus*. Eventually, 182 g of bioethanol was extracted from 1 kg of raw paddy straw. Concludingly, this research study shows the capacity of *Kluyveromyces marxianus* for bioethanol production from agronomic waste deposits at economic level.

YSA 3

Cd-induced physiological and biochemical alterations in *Brassica juncea* L.

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Heavy metal contamination has sharply increased since last few years and it poses a major environmental threat worldwide. Cadmium (Cd) is considered as most toxic metal for plants and animals because of its phytotoxicity and high water solubility. These heavy metals lead to the production of reactive oxygen species (ROS) like superoxide radicals, hydroxyl radicals, hydrogen peroxide etc., which disturb the normal metabolism of plants and cause oxidative burst. Plants possess certain osmoprotectants and other defensive mechanisms which help them to combat stress due to heavy metals. The present work was conducted to study the growth (root length and shoot length), level of osmoprotectants like proline, glycine-betaine and total osmolytes, photosynthetic parameters (chlorophyll content, carotenoids content, photosynthetic rate and transpiration rate), surface study of leaves, protein content, antioxidative enzymes (POD, SOD, CAT and APOX), metal uptake and generation of oxidative stress of 30-days old plants of *Brassica juncea* L. when subjected to different concentrations of cadmium metal (0.2, 0.4 and 0.6 mM). Results of present study were revealed that Cd metal caused reduction in growth and photosynthetic pigments of plants due to oxidative stress, whereas activities of antioxidative enzymes and level of osmolytes were enhanced at different concentration of Cd. These findings indicated that the defence system of *B. juncea* plants became activated when exposed to metal stress.

YSA 4

Standardization of a process for pulp biobleaching using cocktail of lignolytic and hemicellulolytic enzymes from *Bacillus tequilensis* LXM 55

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The growing awareness about the environment is increasing the need for eco-friendly industrial processes. One major area of concern is the pulp and paper industry. In the process of paper making, multistage bleaching method consisting of chlorination-alkali extraction and chlorine dioxide treatment; is usually followed for the removal of lignin from the pulp. The effluent from chlorine bleaching contains chlorinated organic substances which are toxic, bioaccumulating and thus harmful to the biological systems. Bio processing of pulps using microbial enzymes for biobleaching is one of the most suitable biological applications for the pulp and paper industry. A number of lignolytic and hemicellulolytic enzymes are required for the biobleaching of pulp in the paper industry. Despite the availability of various individual enzymes for pulp biobleaching, no bacterium has been reported which can produce cocktails of these enzymes. Present study is the first report of a cocktail of laccase (L), xylanase (X) and mannanase (M), from a single bacterium for pulp biobleaching. A novel strain of *Bacillus tequilensis* LXM 55 was isolated which produced thermo-alkali stable L+X+M. Enzymes yield was enhanced substantially by optimization of fermentation conditions. Treatment of mixedwood pulp with cocktail of enzymes led to significant reduction in kappa number and considerable enhancement in the brightness, whiteness and other pulp properties. Moreover, no mediator system was required for the application of laccase for pulp biobleaching. Enzymatically treated pulp used much lesser concentration of chlorine to obtain the same quality of paper as that of pulp treated without enzyme but with 100% chlorine. Therefore, cocktail of enzymes from *Bacillus tequilensis* LXM 55 having properties such as stability under extreme conditions, non-requirement of laccase mediator system and its economical production makes it highly suitable candidate for its application in pulp biobleaching.

YSA 5

Antioxidant, cytotoxic and antimalarial properties of *Elaeocarpus ganitrus* (Roxb.)

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E. ganitrus (Synonyms: *E. sphaericus*) commonly known as Rudraksha tree is a large evergreen broad-leaved tree of Elaeocarpaceae family. Various parts of this plant inclusing seeds, flowers and leaves are known for varous medicinal properties and traditionally applied for curing various problems including palpitation, lack of concentration, depression, nerve pain, stress, migraine, anxiety, epilepsy, asthma, hypertension, arthritis and liver diseases. In this contaxt the aim of the present study was to evaluate various medicinal properties of *E. ganitrus* leaves and identify lead molecules. During this study, aqueous extract of *E. ganitrus* demonstrated significant ($p < 0.05$) dose dependent antioxidant and antimalarial activity in various *in vitro* methods while extract also exhibited promising antioxidant and antimalarial activity in Swiss albino mice model. Extract also found to exhibit significant ($p < 0.05$) dose dependent cytotoxic activity in HepG2 cell lines. In the later part of the study active molecules were identified by using a combination of analytical techniques. These findings represent *E. ganitrus* as a potential source of natural antioxidant, cytotoxic and antimalarial compounds.

YSA 6

Cyanobacteria: a potent bioremediant under heavy metal stress

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Cyanobacteria, the photosynthetic prokaryotes form the ideal group of microorganism for bioremediation of heavy metals. They vary from single to filamentous structure and well known for nitrogen fixation thus recognized as bio-fertilizer. The cyanobacterial strains have very good potential in heavy metal accumulation as some species such as *Nostoc muscorum*, *Phormidium foveolarum, Anabaena* are the known genera for heavy metal accumulators. In the present study we have evaluated the metal accumulation potential of three cyanobacteria viz., *Nostoc muscorum*, *Phormidium foveolarum, Anabaena* exposed to some heavy metals (Cr, As and Cd). In order to understand the mechanism we have tested the antioxidants and lipopolysaccharides that are involved in adherence of these metals. These metal accumulator strains of cyanobacteria can be employed for heavy metal bioremediation and also as bio-fertilizer for metal contaminated field and reservoir as they afford time-based and spatial separation of heavy metals.

Abstracts

Oral Presentations

OP-1

Production of microbial levan by using sugarcane juice and agriculture waste

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The investigation was carried out in order to isolate levan producing bacteria from different soil samples of different geographical locations. Out of the 46 isolates the levan producing bacterium was identified as Khu95 strain of *Bacillus* species based on the 16S rRNA gene sequencing. The optimization of various physical and chemical factors on levan production by using Khu95 isolate was investigated. The results showed that out of sugarcane juice, sugarcane paste, and wheat hey, the best carbon source for levan production was sugarcane juice gave 0.063 mg/ml, and out of beef extract, ammonium sulphate and peptone, the best nitrogen source for levan production was beef extract which gave 0.025 mg/ml. At initial pH of 7, Khu95 isolate gave the highest levan production that was 0.018 mg/ml. The maximum production Levan production by Khu95 isolate at 37ºC which was 0.031 mg/ml. The optimal incubation period for levan production, was estimated at 0.036 mg/ml after 72 h of incubation, after which there was decline in the cell number as well as levan production was reported. Characterization of the levan polymer was done by FTIR spectroscopy and physicochemical properties. Our study concluded that Khu95 was able to produce levan with different optimization conditions and can be utilized for scale up production with higher amount of cheap raw materials.

OP-2

Detection of differential expression of proteins in Glioblastoma

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Glioblastoma (GBM), the most prevalent malignant primary brain tumor in adults, has poor prognosis with an average median survival of 6 to 14 months. In this study, we determined different expressions of proteins in normal or diseased serum samples with the help of 1-D & 2-D Gel Electrophoresis and Immunohistochemistry techniques. Bicinchoninic acid (BCA) method was performed that helps in identifying proteins in serum samples. We observed the various proteins by 2-D Gel Electrophoresis which were expressed in control samples but these proteins were not expressed in GBM patients gel and vice versa. The proteins numbered with 1A-15A were absent in GBM whereas 1P-3P present in GBM patients and 2-fold downregulation observed for 1D-14D proteins in GBM patients. In the same manner, Immunohistochemistry by using Hemotoxylin & Eosin stain helps in differentiating the variations in tissue taken from control and disease samples. Results show proliferation or more number of glial cells in GBM sample as compared to control samples. Here, we concluded that our findings confirmed the significance of previously reported proteins in glioma pathology and their prospective usefulness as biological markers.

OP-3

Biocontrol efficacy of potential biocontrol bacterial strains against verticillium wilt of cotton

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Cotton is an important cash crop growing at economic level throughout the world. Total production of cotton was 2.83 lakh hectares in 2018-19. It has been observed that significant occurs by attack of most devastating soil borne pathogenic fungus *Verticillium dahliae.* In the present study, seven endophytic bacterial strains were isolated from healthy cotton plant parts. Out of seven, *Pseudomonas sp.* and *Bacillus subtilis* have shown positive *in vitro* antagonism viz. 60.41% and 52.79% respectively by "Dual Culture Assay". *Pseudomonas* sp. showed inhibition zones of 8.56, 8.70, 7.4 mm size and *Bacillus subtilis* have shown 5.23, 6.66, and 6.23 mm clear inhibition zones in cellulase, protease and chitinase activity respectively. Furthermore, both strains were evaluated against *V. dahliae* along with soil solarization techniques for assessing their effect on wilt disease. Seed bacterization with *Pseudomonas sp*. helps to reduce wilt symptoms in natural fields and pot trials more than *Bacillus subtilis* when compared to non-bacterized (control) plants. In both pot experiments and field trials, growth parameters and yield of cotton were significantly higher in seed bacterized plants (*Pseudomonas* sp.*)* than *Bacillus subtilis*. Wilt or defoliation of leaves (67-97%) was observed and calculated at 0-4 rating scale of disease severity index after 135 days of sowing in non-bacterized plants. Results depicts that a combinatorial study of soil solarization and seed treatment with *Pseudomonas* sp. than *Bacillus subtilis* plays a significant role to control wilt disease of cotton in naturally infested fields and increases cotton yield.

OP-4

Comparative study of phosphate solubilizing bacteria isolated from uncultivated and agricultural soil

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Recycling of soil phosphorus (P) residual has a great potential to be used as a source of P to the plants. It is recommended that PSB with good potential should be isolated from the native areas for formulation of biofertilizer. Land use patterns significantly affect the soil quality by controlling the microbial structure and activity. This study was planned to find out whether the prevalence and phosphate solubilization activity of PSB is different in agricultural and uncultivated soils of Punjab. Phosphate solubilization potential of the potential isolates was determined under different temperature stress conditions. Significant variation in the total PSB count was observed with maximum number of isolates (86%) being present in uncultivated soil, only 14% were isolated from cultivated soils. Bacterial isolates from the uncultivated soil exhibit high inorganic P solubilization potential compared to the isolates from the agricultural soil. The mean solubilization index (SI) of the different isolates from the undisturbed soils and agricultural soils tested on 2nd day, 4th day and 7th day of incubation was 1.64, 2.87 & 2.32 and 1.68, 2.09 & 1.85 respectively . The mean SI did not vary significantly among the undisturbed and agricultural soils. Highest P solubilization was observed from isolates from uncultivated soils with a mean value of 39.72µg/ml. Significant difference was found in the P solubilization content after 24 hrs of incubation ($p<0.01$).Isolate A20 and A26 from the uncultivated soil exhibit high P solubilization potential at temperature induced stress, suggesting they can be used for biofertilizer formulations to work under diverse temperature range in the region of Punjab.

OP-5

Isolation and screening of zinc solubilizing bacteria from the polyhouse soil of Punjab region

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Zinc (Zn) plays an important role for metabolic process, crop yield and nutritional security in plants. However, deficiency of Zn is omnipresent affecting about 50% of the agricultural land globally. Zn deficiency in crops is due to the presence of soil insoluble Zn thereby affecting the phyto availability. The present study was planned to isolate zinc solubilizing bacteria from the polyhouse of Punjab region capable of converting insoluble Zn to soluble Zn thereby enhancing plant bioavailability. Using serial dilution method, a total of 24 zinc solubilizing bacteria that retained their potential on subculturing were isolated and selected for the present study. The mean solubilization index (SI) of the selected isolates was tested on the Bunt & Rovira media augmented with 0.1% ZnO for subsequent 7 days. The SI was highest for isolates 3, 17, 19, and 20 with value 6.23, 7.45, 7.14 and 8.25 while the lowest was observed for isolate 6 with value 1.6. Significant differences were found in the solubilization index among various isolates. Further quantification of the soluble Zn found in the media will be determined using Atomic Absorption Spectroscopy.

OP-6

Prevalence of uro-pathogenic extended-spectrum β-lactamase (ESBL) *Escherichia coli* in the population of Birgunj, Nepal

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Extended-spectrum β-lactamase (ESBL) producing Uro-pathogenic *Escherichia coli* (*E. coli*) is a serious threat among the patients in developing countries like Nepal, with limited treatment options. This research was performed to determine the prevalence of Uro-pathogenic ESBL producing strains of *E. coli* from the urine sample of patients visiting National Medical College and Teaching Hospital, Birgunj (Nepal) and to determine their antibiotic susceptibility patterns. Urine culture was performed by conventional semi-quantitative culture technique for 385 urine samples, between August 2019 to October 2019. Isolation and identification of *E. coli* was done by standard techniques, including Gram staining, colony characteristics, and subculture on Eosin Methylene Blue agar and biochemical properties. Antibiotic susceptibility test of isolates was performed by modified Kirby Bauer Disc diffusion test. ESBL screening test was done by using third generation Cephalosporin and confirmation was done by Combined Disc Synergy Testing. Out of 385 urine samples, 123(31.94%) had shown significant bacteriuria and among them 94(76.42%) isolates were identified as *E. coli*. Among *E. coli* isolates, 60(63.82%) and 37(39.36%) were Multi-drug resistant (MDR) and ESBL producers respectively. Thus due to high prevalence of MDR and ESBL producing *E. coli,* regular surveillance of such MDR and ESBL strain is required for effective treatment.

OP-7

Optimized production of bioflavour and aroma compounds from industrial food waste by solid state fermentation with *Kluyveromyces marxianus*

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Kluyveromyces marxianus is a selective strain of yeast that has potential for flavour and aroma compounds production and is generally recognized as safe (GRAS) by United State Food and Drug Administration (US FDA) and European Union (EU) legislation. Thus using microbial bioflavour in food processing industries is also safe for human consumption and inhalation. This strain can be used as an alternative for commercial production of natural flavours. Moreover, employing industrial food waste as substrate for solid state fermentation (SSF) for microbial bioflavour production is an economic way to minimise the raw material cost. In this study, response surface methodology (RSM) was used for optimizing the production of fruity aroma compounds via solid state fermentation of pomegranate and sweet lemon peel by using potential yeast that is *Kluyveromyces marxianus.* As flavour and fragrance compounds are secondary metabolites, thus the best fermentation conditions for yeast growth and production of secondary metabolites were evaluated in this study. After fermentation of 5-7day the volatile aroma compounds were analysed in GC-MS. It was observed that secondary metabolites such as alcohol and esters produce in more percentage. Ester such as isoamyl acetate, isoamyl butyrate contributes to strong fruity aroma. Factors like nutrient and sugar content of the substrate, inoculum concentration of the culture, incubation time and temperature plays an important role in aroma compounds production. However, flavour compound extraction in using suitable solvent is another aspect for quantification of desirable products. This technique is a sustainable process for value added aroma compound production by SSF. Microbial bioflavours have many scope in food, feed and in cosmetic industries.

OP-8

Precision nutrition modulates microbial diversity and offers solution for mitigating effects of climate change in farming systems

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Climate change is threatening food production throughout the world. Coupled with practices that remodel soil architecture for farming, the changing microenvironments are driving agriculture towards unsustainability. Indiscriminate use of nutrients poses health as well as environmental hazards. Four different nutrient-application schemes were observed in a long-term experiments on rice-wheat and maize-wheat cropping systems. The nutrient-application included Farmer Field Practices (FFP), Recommended Dose of Fertilization (RDF), Green Seeker-based application (GS) and Site-specific nutrient management (SSNM). The bacterial diversity was analyzed for each of the above treatments in both the cropping systems. Further, the characteristics of isolated bacteria were noted. It is observed that judicious use of nutrients modulates soil microflora in a way that minimizes indiscriminate chemical usage as well as has implications for utilizing natural flora to meet plant needs. A healthy microflora offers a solution to changing climate and can be potentially deployed to address it.

OP-9

Exploring innovative chromium reducing SA7E strain of *Achromobacter* for bioremediation of wastewaters and contaminated lands

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Chromium is one of the heavy and toxic metal widely used in lot of industries these days. Hexavalent form is more toxic than trivalent form and hence need to be reduced to eliminate its dreadful effects. Innovative chromium reducing bacterial species SA7E was explored from wastewater of tanning industry. Its morphology, physiology as well as 16S rRNA gene sequence were characterized. The gene sequencing of SA7E indicated its similarity with genus *Achromobacter*. Complete reduction of chromium Cr (VI) was reported by this bacterium in 24 h at conc. of 100 mg L^{-1} under optimised conditions of maximum activity. The optimum temperature and pH at which SA7E reported maximum chromium reduction was 37 ºC and 8.0 respectively. Along with chromium reduction ability SA7E also possessed resistance against various other heavy metals. Consequently, SA7E strain of bacterium can possibly be used for reduction of chromium and heavy metals from wastewaters and contaminated lands.

OP-10

Isolation and characterization of gene expression during presymbiotic stage of *Rhizophagus irregularis* (Arbuscular Mycorrhizal Fungi)

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Arbuscular Mycorrhizal Fungi (AMF) are symbiotically associated with the roots of higher plants which enhance the overall nutritional status of the plant. It is known that the overall growth and development of plants do not only depend upon performance of specific genotypes, while also affected by association with the various types of microbes. Therefore, the major aim of the study was isolation and characterization of gene expression during the presymbiotic stage of AMF. In the present study total RNA was extracted from spores of *Rhizophagus irregularis* grown under Root Organ Culture (ROC). cDNA library was prepared using mRNA. Approx, 150 random clones were selected for EST sequencing analysis. Out of 150 clones, 35 clones consisted of cDNA inserts. Studies revealed that 2/3 of sequences were found no significant similarity with database EST sequences. However, 1/3 of sequences showed significant homology with EST database. Putative genes for gluconeogenesis, stress-regulated and cell cycle regulatory factors were discovered. Full-length mating gene was discovered using Rapid amplification of cDNA ends (RACE). The study revealed the presence of the putative mating-type gene in mycorrhizal species may evident in sexual origin of AMF. The present study also revealed variation within single AMF spore usually linked with the existence of a sexual life cycle.

OP-11

Effect of various treatments of sulfur and nitrogen sources on nitrogen and sulfur assimilating enzymes

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Nitrate reductase (NR) plays a pivotal role in nitrogen fixation in plants. NR begins nitrate assimilation by reducing nitrate to nitrite. Experiment was conducted to show the effect of various treatments of sulfur and nitrogen sources (T_1-Control, T_2-Single Super Phosphate (SSP), T_3-Urea, T_4 -Single Super Phosphate (SSP) + Urea, T_5 - Gypsum, T_6 -Ammonium Nitrate, T_7- Gypsum +Ammonium Nitrate) on nitrate reductase activity of mungbean seeds of variety PAU 911 at different stages of development. In control (T_1), the nitrate reductase activity increased from 0.063 (9 DAF) to 0.136 ηmole NO_3^- formed/min./g fresh weight (21 DAF). Effect of various treatments of sulfur and nitrogen sources on glutamate dehydrogenase (GDH) activity of mungbean seeds at different stages of development were studied. In control (T_1), GDH activity increased from 0.244 (9 DAF) to 01.002 µmole $NADP^+$ oxidised/min./g fresh weight (21 DAF). Effect of various treatments of sulfur and nitrogen sources on O-acetyl serine thiol lyase (OASTL) activity of mungbean seeds of variety PAU 911 at different stages of development are were also studied and it was found that in control (T_1), OASTL activity increased from 4.91 (9 DAF) to 14.27 ηmole cysteine formed/min./g fresh weight (21 DAF). Effect of various treatments of sulfur and nitrogen sources on glutathione reductase (GR) activity of mungbean seeds at different stages of development were also analysed and its study revealed that in control (T_1), the GR activity increased from 0.111 (9 DAF) to 1.014 µmole NAD^+ oxidized/min./g fresh weight (21 DAF).

OP-12

Anti-enterococcal activity of a thermophilic cyanobacterium, *Leptolyngbya* sp. HNBGU 003

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Enterococci, the opportunistic pathogens, pose several serious and life-threatening infections such as urinary tract infections, sepsis and endocarditis. The situation is worsening due to development of multiple drug resistance in these pathogens against the methicillin and vancomycin. On an average more than half of the enterococcal infections across the world are caused by the vancomycin-resistant *Enterococcoi* (VRE) and the physician are left with very limited choices against these infections. The severity of VRE infections becomes more intricate as VRE may acts reservoirs and horizontally transfer the drug resistance genes. Hence, the present study was carried out as a small endeavor to characterize the anti-VRE metabolite pool extracted from a thermophilic cyanobacterium, *Leptolyngbya* sp. The extract was selected on the basis of its highest antibacterial potential among the 12 non-polar cyanobacterial extracts tested for antibacterial activity against a drug sensitive strain of a gram-positive pathogen (*S. aureus ATCC 25923*) and a drug resistant strain of *Enterococcus faecium*. The thermophoillic cyanobacteria used in this study were isolated from a hot water spring (Taptkund, Badrinath) of Garhwal Himalaya, Uttarakhand. The selected extract inhibits the growth of VRE on Muller Hinton ager plates in a dose dependent manner in the range of 20-40 mg. The quantitative anti-VRE assays performed with the extract revealed the minimum inhibitory concentration (MIC) of 25 mg ml^{-1}. The subculture of VRE treated with the MIC of selected extract showed the bactericidal nature of it. Further, the GC-MS analysis of the selected extract revealed the presence of hydrocarbons and phenolics along with several other unknown compounds. Thus, the non-polar extract from the thermophilic *Leptolyngbya* sp. could be used for the isolation, identification and development of antibacterial compounds for the treatment of enterococcal diseases.

OP-13

Optimization and synthesis of silver nanoparticles using bacterial strain *Kocuria rhizophilla BR-1* isolated from beverage industry waste

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Biologically synthesized nanoparticles are gaining importance as they offer several advantages, such as the ease with which they can be scaled up, the cost-effectiveness of the process and the green route of production. In the present study, extracellular silver nanoparticles (AgNPs) were synthesized using the isolated bacteria *Kocuria rhizophilla BR-1* strain. The bacterium was isolated from liquid waste samples, collected from Sona Beverage Pvt. Ltd., Durg, Chhattisgarh and identified using molecular and biochemical characterization techniques. The phylogenetic analysis of isolated bacterial strain shows 98.78% sequence similarity with *K. rhizophilla TA68* strain. The DNA sequence of the isolate was submitted in Genbank with accession number MN889414. For synthesis of silver nanoparticles using isolated bacteria, the significant parameters such as pH, temperature, reaction time and silver nitrate concentration were optimized using response surface methodology (RSM). In the optimized conditions, silver nanoparticles were synthesized and characterized using UV- visible spectroscopy, X-ray diffraction and transmission electron microscopy. The UV-visible spectrum shows the characteristic peak of silver nanoparticles at 405 nm and X- ray diffraction analysis confirm the synthesis of crystalline nanoparticles. Further, the TEM analysis shows the synthesized nanoparticles are spherical in shape within the size range of 4-15 nm. Furthermore, the silver nanoparticles were evaluated for their antibacterial activity against gram positive and negative bacterial strains. The bacteriogenic synthesized AgNPs were found to have excellent antibacterial activity against *Escherichia coli, Staphylococcus aureus* and *Salmonella typhimurium* bacteria. The present study shows the first time data on the extracellular synthesis of silver nanoparticles using *Kocuria* spp.

OP-14

Optimization of culture conditions for the production of alkaline cellulase enzyme produced from *Fusarium oxysporum* VSTPDK

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Alkaline cellulase producing *Fusarium oxysporum* VSTPDK was isolated and screened from soil of Kapurthala district Punjab, India. This organism produced endoglucanase (CMCase) and exoglucanase (FPase) when grown at different range of parameters pH (6, 7, 8, 9, 10 and 11), temperature (30, 40, 50 and 60°C), incubation time (4th 6th 8th 10th and 12th day) and nitrogen source (NH_4SO_4, NH_4Cl, $NaNO_3$ and NH_4HCO_3). Carboxymethylcellulose (CMC) and cellulose powder were used as sole carbon source. In this research, statistical tools called Response Surface Methodology (RSM) were used for optimization of cellular enzymes by selecting three important parameters after one factor at a time (OFAT) approach. Using OFAT, optimum production of both CMCsase (3.52U/ml) and FPase (4.07U/ml) were achieved after 8 days incubation at pH 8, temperature 30°C and 1.0g/L ammonium sulphate while RSM produced CMCase 3.91U/ml and FPase 4.26U/ml respectively when incubated for 8 days at pH 8.5, temperature 45 and 3% ammonium sulphate concentration. Optimization of the culture conditions using RSM lead to an increase of 0.39U/ml (CMCase) and 0.19U/ml (FPase). The use of RSM has gained considerable attention in the past decade in optimization of various physico chemical parameters and nutritional factors. Its application in different industries may find ways of selecting different factors influencing cellulase activity. The fungus has the ability of producing a considerable amount of cellulase enzyme at a pH of up to 10 and 50°C. To our knowledge, this is the first report of alkali thermophilic *oxysporum* VSTPDK from Punjab, India.

OP-15

Alterations in biochemical parameters and antioxidant enzymes in yellow mosaic virus resistant versions of soybean cultivar JS335

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Jawahar soybean 335 commonly known as JS335 is a high yielding soybean cultivar occupying more than 50% of the soybean growing area of India but it is highly susceptible to yellow mosaic diseases (YMD). Present investigation reports the biochemical changes and level of antioxidant enzymes in soybean genotype JS335 (Susceptible), wild species G. soja, G. max Cv. SL525 and newly developed JS335 resistant versions (JS×GS, JS×SL). Collection of sample leaves from all genotypes was done after the appearance of disease symptoms at 10 days interval under field conditions. Disease symptoms were not observed in G. soja, SL525 and newly developed resistant versions (JS×GS, JS×SL) whereas JS335 showed reduced leaf size and chlorotic yellow patches on leaf lamina. Higher levels of dry matter content, seed yield and 100 seed weight was observed in resistant lines (JS×GS, JS×SL) in contrary to susceptible genotype JS335. Lower levels of antioxidant enzymes and phenolic enzymatic constituents were noticed in resistant lines (JS×GS, JS×SL) in contrast to susceptible genotype JS335. Similar trends were observed in phenolic constituents and non-enzymatic antioxidants such as glutathione, proline, hydrogen peroxide, malondialdehyde and glycine-betaine. A significant increase was noticed in all biochemical parameters and antioxidant enzymes from day 1 to day 30 post YMD infection with lower mean content in newly developed resistant lines. Alterations in biochemical and physiological parameters indicated better resistance in newly developed resistant (JS×GS, JS×SL) lines which might help the farmers to adopt JS335 under local environment of Punjab.

OP-16

Development of putative probiotics to improve health and survival rate in early age of commercial fish

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This study was conducted to isolate novel strain of Probiotics and evaluate their potential as Probiotics to control disease outbreaks and increase the production in fish farming. Traditional methods to overcome the same are antibiotics and Chemotherapeutics but due to their adverse consequences like drug resistance and bioaccumulation in the system decrease the consumers demand. For the study sixty four bacterial strains were isolated from gastrointestinal tract of seven healthy fish. Only six isolates F1F4, FIH4, F2H4, F3 1 (2), and F1F2 showed antibacterial activity against *Pseudomonas aeruginosa*. By 16S rRNA gene sequencing analysis followed by BLAST, the strains were identified as *Bacillus subtilis* strain F1F4, *Enterococcus faecium* strain F1H4, *Bacillus safensis* strain F2F4, *Bacillus subtilis* strain F3 1(2), *Bacillus velezensis* strain F1F2 and *Enterococcus gallinarum* strain F1H3, respectively. All the above isolates showed positive results in Invitro assessment. For cross check the probiotic potential were evaluated in *Cyprinus carpio* by supplemented probiotic enriched feed for 60 days. Results of the study revealed that weight gain, survival rate and growth performance was statistically significant ($p<0.05$) in probiotic treated groups as compared to positive control and negative control and all the isolates served as promising effective probiotics in fish farming.

OP-17

Effect of rhizobial inoculation (PGPR) on *dalbergia sissoo* (Shisham) growth under net house condition for sustainable management of land

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The continuous harvesting of forest for fuel and fodder purpose led to decreased nitrogen content in the forest soils. It is valuable tree used in various household product so good quality seedling for out planting of the tree. Biological nitrogen fixation by bacteria is alternative way for reducing the dependence on fertilizer requirement and to maintain the fertility of soil. The Effect of rhizobial inoculation (PGPR) on *Dalbergia sissoo (*shisham*)* growth under net house condition for sustainable management of land" was studied during the investigation from 2016-2018. A total of 65 isolate were isolated from nodules of *Dalbergia sissoo* selected from Himachal Pradesh and Uttrakhand. On the basis of standard authentication test the total of 46 isolates were found as *Rhizobium* spp. The isolate from Himachal Pradesh (DBD1) showed maximum phosphate solubilization (175.0 µg/ml), and produce (65.23%) iron chelators (76.00 µg/ml) of and auxins (68.00 µg/ml). Whereas, from Uttrakhand DRT5 isolate showed maximum phosphate solubilization (165.0 µg/ml), and produce (54.36%) iron chelators with (68.00 µg/ml) of auxins production. The selected two rhizobial isolates (DBD1 and DRT5) showed maximum inhibition against tested fungi. The plant growth promoting traits of two isolates enable them to be used as biofertilizers which significantly increased root, shoot parameters and nitrogen fixation efficiency. The NPK content of soil with these biofertilizers was also found high over uninoculated control. So the selected rhizobial strains can be used for quality seedling production for out planting which also maintain the fertility of soil.

OP-18

Enhancement of bacterial Polyhydroxybutyrate production utilizing biphasic approach

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Polyhydroxybutyrate is a biological polymer with lots of industrial and biomedical applications. It is produced by bacteria under stress conditions. The current work was carried out with the aim of finding out high PHB producing bacterial strains from various agriculture field regions of Punjab and their PHB production enhancement. A total of twelve isolates were found to be producing PHB under stress conditions. The level of PHB production enhances after full growth of bacterial biomass takes place. After achievement of the stationary phase major PHB accumulation takes place in these bacterial isolates. Isolates accumulated larger amounts of PHB when they were transferred to Biphasic condition with sufficient amounts of carbon and depleted conditions of nitrogen. Under such circumstances it was observed that by utilizing 3% lactose, cell dry weight was 4.22 g/l, PHB production was 1.487 g/l and yield was 35.28% for a specific strain MD5 whose initial PHB production was 12.43% only. These results exemplify the fact that higher carbon concentrations and depleted nitrogen content favors the PHB production under biphasic approach. The bacterial strain was identified as *Bacillus circulans* through 16s rRNA characterization.

OP-19

Computational prediction of T cell epitopes for dengue peptide vaccine

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Dengue has been reported as the quickest spreading mosquito-borne viral human disease and a serious universal public health concern. The infection of viruses to the human population is mainly caused by the bite of an *Aedes* mosquito. In an estimate it is found that annually around 100 - 125 million new dengue incidences are reported from approximately 120 endemic countries. The lone licensed dengue vaccine was not effective to prevent the disease globally. Many dengue vaccines are under clinical trial but there are concerns about the trial reports on safety and efficacy of vaccines. In these circumstances an epitope based peptide vaccine would be safe and efficacious against dengue disease. In this study, the computational prediction of T cell epitope for peptide based dengue vaccine from virus strain BR/97-111(1) is performed. NetCTL 1.2 server is consulted for the prediction of T cell epitopes and super types of MHC class I binding. VaxiJen 2.0 server was used to identify antigenic T cell epitope. ToxinPred is used to predict toxic and non-toxic peptides. Selected epitopes tested for conservancy with protein sequences. PEP-FOLD is used for 3D molecular structure of peptide and Path Dock molecular docking tool was used to analyse the interaction between epitope ligand and receptor MHC class I. In depth analysis of these results suggests that the predicted epitopes could be used as potent vaccine candidate against global dengue disease challenges, although an experimental validation is required for final confirmation.

OP-20

Sustainable microbial technology for improved nutrient status and bacterial population in carnation rhizosphere under polyhouse conditions

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Carnations (*Dianthus caryophyllus* L.) are the most popular world-wide and commercially important cut flowers. In order to achieve excellent quality of these cut flowers throughout the year, nutrient (NPK) requirement of plants is accomplished through chemical fertilizers. However, indiscriminate use of chemical fertilizers pose a long term negative impact on the environment and human health. Thus, optimum doses of nutrition need to be standardized by balancing organic and inorganic nutrients for sustainable crop production. In the present studies, endophytic bacterial community of carnation was explored, characterized and applied in adequate bioformulations under integrated nutrient management system. Two efficient endophytes *viz*. SR1 (*Bacillus* sp.) and NH3 (*Pseudomonas* sp.) isolated from carnation roots were selected to check their efficacy under polyhouse conditions alone and in combination with variable doses of chemical fertilizers. The treatment combinations were created as, T_1: Absolute Control, T_2: 100%RDF (Recommended doses of fertilizers), T_3: 75%RDF+SR1, T_4: 75%RDF+NH3, T_5: 50%RDF+SR1, T_6: 50%RDF+NH3, T_7: SR1 and T_8: NH3. The application of 75% NP+SR1 and 75% NP+NH3 increased the available NPK content in soil thereby improving the soil nutritional conditions. Also, a significant increase in microbial population was recorded with the application of endophytes as compared to the uninoculated control. Hence, these bacterial endophytes act as potential tools in reducing the agro-chemical use by 25% during carnation cultivation besides improving soil quality and fertility.

OP-21

Nucleotide composition and codon usage bias analysis in Canine Circovirus to study viral adaptation in different species

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Canine Circovirus (CaCV) or Dog Circovirus (DogCV) causes hemorrhagic gastroenteritis, thrombocytopenia, vasculitis, hemorrhages and neutropenia and is usually found as co-infection with other canine infectious agents like Canine Parvovirus and Canine Distemper virus in pet dogs and wild canines (wolf, fox, badger). Codon usage bias and nucleotide composition has been extensively used to find out the evolutionary features of the viruses which will determine their survivability to the suitable host. Nucleotide composition and codon usage bias of cap & rep gene of 88 CaCV strains were compared in this study. The overall nucleotide composition of CDSs at third codon position (A3% C3% G3% T3%) along with overall GC% and AT%, GC12 and GC3 were analysed. The Aromo and values, effective no of codons (ENC) and relative synonymous codon usage (RSCU) values were also analysed using codon W 1.4.2 and CAIcal server. The results show that CaCV genome is AT rich and A/T ending codons were preferred then GC ending codons. Nc-GC3 plot of CanineCV revealed that selection pressure was dominant over mutational pressure. The correlation analysis between CAI, Gravy and Aroma indicate natural selection over mutational pressure. The RSCU values of Cap & Rep genes were analysed to find out overrepresented codons.

OP-22

Deciphering the diversity and load of actinomycetes associated with the rhizosphere of *Arnebia euchroma* (Ratanjot): A critically endangered plant of Himachal Pradesh

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Owing to its critically endangered status and medicinal importance, *Arnebia euchroma* (Ratanjot) plant that grows in the Trans-Himalayan region of Himachal Pradesh was selected for deciphering the diversity and load of actinomycetes associated with its rhizosphere. Rhizospheric soil samples of *A. euchroma* were collected from two districts *viz*., Kinnaur and Lahaul and Spiti of Himachal Pradesh. The collected samples were processed for elucidating the diversity and load of actinomycetes using standard plate count technique. Fifteen different morphotypes of actinomycetes from Nako, 16 from Gue, 5 from Kibber and 7 from Chango (total 33) were obtained from processed samples. All the isolates were purified and preserved on nutrient agar slants at 4°C for future use. A statistically significant difference in the actinomycetes load was observed at four different sites *viz.,* Nako, Chango, Gue and Kibber and on four different media *viz.,* Starch Casein Agar (SCA), Actinomycetes Isolation Agar (AIA), Nutrient Agar (NA) and Kenknight and Munaier's Medium (KM) used for their isolation. The maximum actinomycetes load of Log CFU/mL=1.44) was recorded at Chango followed by Nako (Log CFU/mL=1.40) and Gue (Log CFU/mL=1.38) while, Kibber (Log CFU / mL=1.33) observed a minimum load. Similarly, their maximum actinomycetes load of Log CFU/mL=1.48 was observed on SCA followed by AIA (Log CFU/mL=1.41), NA (Log CFU/mL=1.29) and KM (Log CFU/mL=0.88) which proved that SCA was the best medium. Morphological, physiological and biochemical characterization of all isolates was as per the standard methods described in Bergey's Manual of Determinative Bacteriology and tentatively identified as *Streptomyces* spp.

OP-23

Evaluation of biological behaviour of *Tylophora indica* leaf extracts and nisin towards selected food pathogenic microbes

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Food, a well-known nourishing source, is a significant agent for food-borne ailments when consumed in biologically contaminated form. Such contamination also leads to wastage and loss of food from the food chain due to changes in food characters such as colour, odour, taste and texture along with ill health of the consumers. Subsequently, the therapeutic interventions of such cases involve the use of antibiotics globally, which has widely helped in the emergence of multidrug resistant strains (MDR) when practised illegitimately. To tackle such devastating situations, the natural antimicrobial agents, especially plants and their extracts are being observed as the alternative solution. In view of this scenario, the antimicrobial potentials of crude extracts of *Tylophora indica* leaves has been evaluated against selected potential food pathogens (*E. coli, P. aeruginosa, S. aureus, B. subtilis* and *L. monocytogenes)* alone and in combination with Nisin, an FDA approved bacteriocin and food preservative. Two different methods were employed for crude plant extraction where higher extractive was found with methanolic extract. Different concentrations of commercial Nisin were combined with prepared plant extracts to observe their antimicrobial efficacy by well diffusion technique. Individually, methanolic extract was a better potential with 100 mg/ml being effective against all test strains, nisin inhibited all strains at 2500 IU/ml concentration. In conjugation, 20 mg/ml of aqueous extract with 1000 IU/ml of nisin concentration was found to be most influential with *L. monocytogenes* and *S. aureus* being most sensitive pathogens. This study looks forward to evaluate the potentials of *T. indica* leaves aqueous extracts to be an efficient preservative or therapeutic agent against food borne pathogens.

Abstracts

Poster Presentations

PP-1

Studies on occurrence of arbuscular mycorrhizal fungi in rhizosphere soil of different crops in Himachal Pradesh

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Himachal Pradesh in India is well known for growing some economically important agricultural and horticultural crops having high neutraceutical values. These crops are often infected by various soil borne diseases. Farmers and orchardists of these areas make indiscriminate use of fungicides for their control. However with the growing public concern on the mammalian toxicity of these chemicals, they are now shifting to natural farming. Keeping this in view, studies were undertaken with the objective to investigate the arbuscular mycorrhizal fungal status in rhizosphere soil of the crops like mustard, maize, wheat, ginger, turmeric, apple, litchi and citrus (*Kinnow*) so that AM fungi can be exploited in the ecosystem management under changing climatic scenario because of their chemotoxic abilities. In order to carry out this study, soil samples were collected from four zones of Himachal Pradesh. It included low hills (350-650 m amsl), mid hills (651-1800 m amsl), high hills (1801-2200 m asml) and very high hills (above 2200 m amsl). The study revealed that the abundance of *Glomus* was highest in high hills (Shimla for apple fruit crop) followed by mid hills (Solan for pea, ginger, turmeric crops). Similarly *Acaulospora* and *Scutellospora* population was highest in high hills. *Gigaspore* population was highest in very high hills (Kinnaur for apple fruit crop). Among these AM fungi, *Glomus* population was highest (28.2) while *Gigaspore* population was found to be lowest (1.5). Among *Glomus* species, *G. caledonicum, G. geosporum, G. globiterum, G. gerdemannii, G. halonatus, G. flavisporum, G. intraradices, G. mosseae, G. pansihalos, G. dimorphicum, G. melanosporum, G. tubaeforme, G. aggregatum*, *G. australe*, *G. macrocarpum*, G. *manihotene, G. reticulatum, G. maculosum* and *G. pallidum* . The AM fungal spectrum revealed that *Glomus* and *Acaulospora* were predominantly present in all the

agro-climatic zones. Maize (*Zea mays*) and fenugreek (*Trigonella* sp.) were found the best host indicator plants for multiplication of *Glomus* spp in the present study.

PP-2

Isolation, identification and characterization of pigment producing bacteria from vermi-compost manure and check the antimicrobial activity of extracted pigment

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The main objective of the present study was to isolate the microorganisms from vermicompost manure, capable of producing pigment with antimicrobial activity. Soil sample was collected from vermicompost bin. Pigmented colony was isolated and inoculated into the nutrient broth for 3-4 days at 37ºC. These colonies were observed for Gram's nature and morphological characters such as size, shape, color, texture, opacity, elevation, margin and mobility. Isolation and identification was done by VITAK-2 method and the effect of pH on the growth and pigment was checked. Extraction of pigment was done by liquid-liquid extraction method using chloroform and separated by using separating funnel. This pigment was further purified by Thin Layer Chromatography (TLC). Antimicrobial activity was checked. It was observed that pigment production was increased as the temperature increased from 10ºC and maximum growth was observed at 37ºC, and intensity of pigment was increased when transferring at 4ºC. The growth and pigment production was maximum observed from pH 6 to 8. Pigment produced by bacteria also has inhibitory effect on bacteria such as *Candida albicans, Escherichia coli, Staphylococcus aureus, Bacillus subtilis* etc. and this concluded that pigment have inhibitory effect on both gram positive and gram negative bacteria. Pigment has fluorescent property. After the experiment, with review of literature it was concluded that the bacteria was *Pseudomonas aeruginosa* and the pigment produced was pyocyanin. Thus the current study can be a useful step for large-scale production of pigments, their purification and application in various industries.

PP-3

Prevalence of *Candida* sp. in cancer patients

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Cancer is defined as an uncontrolled growth of abnormal cells with the potential to spread in different parts of the body. Patients suffering from cancer often have a weakened immune system due to chemotherapy and/or radiation therapy which clusters these patients to a risk group with high chances of getting microbial infections. Candidiasis is one of the most common fungal diseases among cancer patients while *Candida albicans* (approximately 50-60%) is the most prevalent etiological agent followed *C. tropicalis* (approximately 15-25%), and other *Candida* sp. such as *C. glabrata, C. krusei, C. parapsilosis* and *C. kefyr* (approximately 1-5%). These *Candida* species are known to cause various diseases in cancer patients such as oral thrush, mucocutaneous candidiasis, urinary tract infections (UTIs), bloodstream infections and genital yeast infections and makes life miserable to cancer patients. Fluconazole is one of the first-line drugs used for the treatment of oral candidiasis in cancer patients while Amphotericin B is usually used for invasive candidiasis and newer drugs like echinocandins are reserved for therapy of refractory candidiasis. Antifungal effect of these drugs is very helpful in the effective management and treatment of cancer patients suffering from *Candida* sp. However nowadays studies show increasingly resistant among *Candida* sp. towards fluconazole and Amphotericin B which poise a serious threat in the healthcare industry. In this context, present the study is an effort to summarize the prevalence and trend of antibiotics sensitivity among various *Candida* sp. reported in cancer patients.

PP-4

Aflatoxin detoxification potency of *Senna spectabilis* DC. leaf extract – structural analysis and biological toxicity of degradation product of aflatoxin B_1

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Aflatoxins are extremely carcinogenic, teratogenic and hepatotoxic to both humans and animals, and they can cause severe illnesses and economic losses. In the present study, an aflatoxin B_1 (AFB_1) detoxification activity has been identified in aqueous extract of *Senna spectabilis* leaves. The parameters for toxin detoxification have been studied in detail to explore its practical application for decontamination of AFB_1. The results of aflatoxin detoxification assay revealed that ~96% reduction in total AFB_1 content over controls was recorded after 48h incubation with *S. spectabilis* leaf extract at 37°C. Further, AFB_1 detoxifying efficacy of *S. spectabilis* extract was studied under different parameters *viz.*, heat, incubation time and dialysis (10-12 KD). It showed that the active component in *S. spectabilis* was water-soluble, heat-stable and having high molecular weight (non-dialyzable). In order to confirm the detoxification of AFB_1 by *S. spectabilis* extract, the reaction mixture after incubation of AFB_1 with extract for 48h was analyzed using UV-spectroscopy and LC-MS. For checking the biological toxicity, the degraded product/s of AFB_1 was assessed by chromosomal aberration assay in maize model followed by cytotoxicity assay in human erythrocytes and human epithelioid lung cell line-A549. The biotoxicity assays in maize, human erythrocytes and A549 tumour cell line confirmed that the toxicity of AFB_1 was decreased when treated with *S. spectabilis* extract. The outcome of the study clearly implies that degraded compounds are less toxic than AFB_1 at the concentrations tested. These results show that *S. spectabilis* extract can transform AFB_1 into less toxic or nontoxic molecules.

PP-5

Comparative assessment of phycoremediation and biogas potential of microalgal species in treated sewage wastewater

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Sustainable energy is the need of the 21st century as depletion of fossil fuels and elevated concern of climate change has compelled the present generation to find various alternatives. Till date, many sources have been recommended to replace the fossil fuels but no one has matched their efficiency. Microalgae being one of the oldest on the earth are being considered nowadays due to their ability to grow at a rapid pace and their use as a non-food biomass. Moreover, the ease of cultivation of microalgae in any wastewater provides a better alternative to mass algal production for biofuels. In the present work *Anabaena ambigua*, *Chlorella pyrenoidosa* and *Scenedesmus abundans* have been cultivated in the treated sewage waste water (SWW) for their biomass, phycoremediation efficiency and bioenergy production potential under controlled conditions. In the phycoremediation experiment, all the microalgal species showed up to 52-88% reduction in the nutrient concentration from the 3:1 ratio of treated SWW at the end of the 25 days. The biogas yield of 618-925 ml/g VS with 48-65% of methane content was obtained for the microalgal species cultivated in the treated SWW for 45 days.

PP-6

Development of expression vectors for the riboflavin over producing fungus *Eremothecium ashbyii*

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Eremothecium ashbyii is a filamentous hemiascomycete fungus, a natural overproducer of riboflavin and thus an industrially important organism. Since it is important from an industrial point of view, an understanding of the biochemical as well as genetic reasons behind riboflavin overproduction is of interest both from the point of view of fundamental as well as applied research. Keeping this in view molecular tools for genetic manipulation of this organism were constructed using plasmids constructed for the related organisms - *Ashbya gossypii* and *Saccharomyces cerevisiae.* The present study was undertaken with an aim to characterize these molecular tools. Two candidate genes were chosen the *S. cerevisiae SPR*3 gene homologue which is known to play a role in cytokinesis in *S. cerevisiae*. The cytokinesis process in yeast is analogous to the process of septation in filamentous fungi. Hence this gene was chosen with a view to aiding in future studies on the regulation of septation and its role riboflavin secretion in *E. ashbyii*. The second candidate gene was the *S. cerevisiae RAD* 14 homologue which is known to play a role in the Nucleotide Excision Repair pathway in *S.cerevisiae.* The NER pathway maybe implicated in combating riboflavin toxicity in *E. ashbyii*. Hence this gene was chosen with a view to aiding in future studies. Reporter plasmid constructed in an earlier study were used. These were the pSV-2 plasmid which harboured the *E.a RIB1*promoter fused to the *Lac*Z reporter gene and the pSV-4 plasmid which harboured the *E.a RIB3*promoter fused to the GFP gene. PCR was carried out to exclude the *RIB1*promoter in pSV-2 and achieve a targeted integration of the *RAD*14 like gene which was amplified from the *E.ashbyii* genomic DNA. This fused the *lac* Z gene to the *RAD*14 like gene in the final plasmid which was designated as plasmid BB. In a similar manner the *SPR*3 like gene was amplified from the *E.ashbyii* genomic DNA and cloned into PCR amplified pSV- 4 wherein the *RIB*3p and GFP genes were excluded.

A second PCR of the resulting plasmid was carried out and *Lac*Z was inserted fused to the *SPR* 3 gene. This plasmid was designated plasmid D. Both these plasmids were characterized by sequencing followed by homology searches. While the former revealed homology to the *S.cerevisiae HOG* I gene which plays a role in the osmotic stress response, the latter showed homology to a family of *S. cerevisiae* zinc finger proteins, *S. cerevisiae SPR* 3 gene and *Neurospora crassa CDC* 12 gene involved in cell cycle regulation.

PP-7

Opportunities and challenges for microbial degradation of PET

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Polyethylene terephthalate (PET) is a polymer moulded by the esterification response between the terephthalic acid and ethylene glycol. This polymer is utilized in the manufacture of various plastic products such as water bottles, storage containers and also used in food packaging applications. In view of its growing demand, prompts produce the enormous proportion of waste causing the biological issue. The waste produced from this is presently so omnipresent in nature. The solution of the plastic waste issue is to increase the value of plastic waste, by utilizing it as a sole carbon source in the process. Microbial degradation is a key factor to reduce plastic pollution. It gives an opportunity to increase the efficiency of resource usage in the lab scale process for the microbial degradation of PET. Microorganisms degrading PET is one such accepted and eco-friendly approach as they have the capability to degrade this polymer into its oligomer and monomer. It involves the initial depolymerization resulting in the small molecules which are further degraded and very crucial to differentiate the enzymes that are involved in these two distinctive processes. The diversity of known microbes and enzymes acting on this polymer is still limited. The main challenge lies in the initial breakdown of this polymer and along with this it is a time-consuming process.

PP-8

Antioxidant, antibacterial and antiangiogenic activities of green synthesized nanoparticles using juvenile wheat grass extract

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The green synthesis of silver nanoparticles is emerging as a potent approach to harvest the potential of silver and plant extracts in improving health. This method is a simple, cost effective, non-toxic and eco-friendly than earlier physico-chemical approaches. Juvenile wheat grass extract has been well proven for its anti-cancerous and anti-oxidant potential. In this study juvenile wheat grass extract mediated synthesis of silver nanoparticles was approached. The characterization of nanoparticles was done by UV-VIS spectroscopy and transmission electron microscope (TEM). The DPPH scavenging activity and anti-angiogenic activity by Chorioallantoic membrane (CAM) assay was further evaluated. The UV-VIS spectroscopic absorbance peak at 380 nm confirmed the formation of silver nanoparticles while TEM confirmed the spherically shaped silver nanoparticles with an average size of 16.5 nm. Further, to explore the biological activities of these green synthesized nanoparticles, in *vitro* studies were carried out. The nanoparticles synthesized using wheat grass extract showed significant free radical DPPH scavenging activity and antibacterial activity against Gram-negative bacteria *Escherichia coli*. In addition, wheat grass nanoparticles were also demonstrated to possess anti-angiogenic potential by CAM assay. To best of our knowledge this is the first study which confirms the biosynthesis of silver nanoparticles using juvenile wheat grass extract and explored them as antioxidant, antibacterial and antiangiogenic agents.

PP-9

Isolation and screening of indole producing endophytic bacteria from abiotic stress bearing plants

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Plants are well known for their medicinal properties from many decades. Most of the medicinal plants are located in the alpine and sub-alpine region. The present research deals with the isolation of indole acetic acid producing endophytes from five stress bearing plants *Lantana camara, Phoenix dactylifera, Hemerocallis fulva, Salvia rosmarinus, Commiphora wightii.* The total numbers of isolates obtained were 45. They were further tested for indole acetic acid production. It was found that out of 45 isolates DP.3.L.1 isolate produces indole acetic acid. Further quantification was done by colorometric technique using the Salkowski's reagent. Standard curve was used to evaluate the amount of IAA produced. Different tryptophan concentration (0.1-13%) was taken. The amount of IAA produce was 2.7µg/ml at 2%, 8.3 µg/ml at5%, 10 µg/ml at 7%, and 12 µg/ml at 12% and 12.7 µg/ml at 13%. It was concluded that amount of IAA production was increased with increase in concentration of tryptophan. Thus such IAA producing bacterial endophytes can be used in future as biofertilizer as well as for the growth promotion of medicinal plants.

PP-10

Effect of culture containers on growth and antioxidant potential of *Spirulina* Sp.

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Increased research and development is constantly being funneled for larger production and use of algae to satisfy its ever-growing demand. The ability of algae to treat and prevent several types of diseases ranging from viral infections to heart disease as well as cancer undoubtedly surges constant interest and investigation of their value with regards to human health and nutrition. The current study was carried out to understand the influence of the material and the colour of the container used for algal cultivation in the laboratory on the growth and antioxidant potential of a *Spirulina* sp. Fresh biomass of *Spirulina* sp. was inoculated in different culture vessels of 150 mL capacity containing BG-11 medium and grown at 30 ±2°C for a period of 30 days with 12:12 h photoperiod and 24 h of aeration. The biomass obtained post-harvest was dried at 60°C for determination of chlorophyll content as well as its antioxidant potential. Methanolic extracts of the culture were prepared to analyze the total antioxidant capacity by phosphomolybdenum method. Free radical scavenging capacity was determined by DPPH method and its bioactive profile detected using GC-MS. Results of the study revealed that chlorophyll ratio (chl a: chl b) in green glass bottles was higher as compared to transparent ones while the antioxidant and radical scavenging capacity was higher in algae cultivated in transparent glass bottles. Compounds like 9-Hexadecenoic acid; phytol known to have antioxidant, anti-inflammatory, anti-cancer activity were revealed from the GC-MS results. The containers used for cultivating microalgae thus seem to play a significant role in enhancing not only the growth but also the antioxidant potential of *Spirulina* sp.

PP-11

Preservation of archival documents by intrinsic *Bacillus* cohabitants

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Archival documents are permanent preserved materials crucial to the nation as well as individuals and form an important part of history and research. These archives undergo deterioration over time due to different chemical, physical and biological agents; thereby, making their preservation and maintenance imperative. Several species of bacteria and fungi have been reported acting as biological deteriorating agents. Filamentous fungi have been studied to cause mechanical as well as chemical damage by either hyphae formation or production of organic acids and pigments. Degradation of cellulosic material by fungi further lays down a nutrient rich medium for bacterial growth causing inhabitation and damage to the archival material. Additionally, microbial species from dust or through personnel handling may contaminate the surface of the archives. However, *Bacillus* species are known to be ideal biocontrol agents because of antagonistic activities against fungi by metabolite production. The present study deals with isolation of three such *Bacillus* species namely *B. tequilensis, B. licheniformis and B. subtilis* from deteriorated archival paper. Primarily, isolation, identification and growth parameters of these *Bacillus* spp. were studied. Identification was carried out by colony characterization, biochemical studies and 16S rRNA sequencing. The comparison of antifungal activity was carried out by using pour plate method. Inhibition activity by the *Bacillus* cultures against *Aspergillus niger, Trichoderma spp., Candida albicans, Fusarium oxysporum* and *Cladosporium spp*. proved their involvement in preservation of archival paper from fungal deterioration.

PP-12

Optimization of cost effective lactobacilli probiotics biomass culture in whey within fermentation vat applicable in aquaculture

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This study was undertaken to find the maximum efficacy of molasses, magnesium nitrate and calcium sulfide towards the propagation of Lactobacilli for probiotic yield in whey culture, containing 30% (w/v) lactose, 15% whey protein and 6% lipid content within a self-designed 15 liters fermentation vat. The central focus of this design targets to cultivate Lactobacilli within whey in a simple farm level fermenter and to analyze the optimum doses inorganic and organic bio-augmenting principles to substantiate the growth and maximum yield of probiotics biomass. A relative comparison among the four factors showed *Lactobacillus lactis* propagated in whey, had given maximum yield at 0.56% sucrose, 1.93% glucose, 0.62% nitrate and 0.06% sulphate. These results may contribute to cultivate *Lactobacillus lactis* in whey media formulated properly with those factors to get a maximum probiotics yield at an ambient temperature. Propagation of *Lactobacilli* in such a simply designed fermenter seeks for the confirmation of yield consortium for its microbial diversity if any by FAME analysis prior to be used for aquaculture feed preparation.

PP-13

Genetically modified chickens for virus resistance

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Virus diseases are common in poultry farming that's due to birds, chickens etc. As in case of bird flu there was high mortality rate among poultry birds owing to their less resistance or no resistance against viruses. From birds these virus pathogens can disperse to the humans also because they use them as food. Till today new viruses are extend in poultry farming. To increase the resistance of birds or chickens against these viral diseases, we require to create genetic modified chickens or transgenic chickens that have resistance against viral diseases. We can edit the gene sequence with the help of Crisper/Cas9 technique that edit the virus effected gene sequence. The virus make bond with the cell proteins that is known as chicken NHE-1 (chNHE-1). CRISPR Cas9 restricted at that site where the virus shows symptoms by continuous change in its RNA structure. Due to unstable structure of RNA, CRISR edit DNA genome sequence to stop RNA interference. First CRISPR cut the effected part of DNA sequence with the help of restriction enzymes then fill the gap with the help of polymerase and join them with ligases then further studies will go to check their resistance against viral resistance and may have good production of eggs and meat. Further studies may also possible to resist viral to human beings from chickens.

PP-14

Medicinal properties and health benefits of *Spirulina*

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Spirulina is a biomass of cyanobacteria which is consumed both by humans and animals. The common two species includes *Arthrospira platensis* and *Arthrospira maxima.* These are free floating, cylindrical, filamentous, multicellular trichomes open in left handed helix. *Spirulina* is a rich source of antioxidant as it contains phycocyanin which can fight against inflammatory signalling molecules. It can lower down LDL and triglyceride level. *Spirulina* is also used for the treatment of hypolipidemia and hypoglycemia Studies in rats suggest that *Spirulina* increases the lipase activity and pancreatic secretion of insulin. Nowadays, it is using in the treatment of cancer as it has been found to have anti-cancer properties. *Spirulina* can be an alternative treatment for the symptoms of allergic rhinitis. It is also effective against anemia, because of its high iron content. It helps in improving muscle strength and maintaining blood sugar level. In this context, this study is an effort to summarize various medicinal properties of *Spirulina* and describe beneficial effects of various *Spirulina* based products on human health.

PP-15

Extraction of limonene from citrus peels an evaluation of its antimicrobial activity

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In the current study limonene was extracted from the three citrus rinds by hydro-distillation apparatus. The limonene extracted from the three different sources was in the range of 2-5ml.The insolubility of limonene made its separation possible from the water. The isolated samples were subjected to certain confirmatory tests like analysis of odour, pH, iodine and bromine test. On comparison the test results were found to be in accordance with the pure limonene (97%). The final evaluation of the limonene was done with regard to its susceptibility against certain bacterial (Gram positive and Gram negative) and fungal strains. The anti-microbial activity was evaluated by using the Kirby-Bauer's disk diffusion method. The primary antimicrobial screening of limonene without dilution have shown satisfactory results with a zone of inhibition (mm) comparable to Ampicillin (20mg/ml) and Amphotericin B (20mg/ml). The effect of pure limonene against all strains used was predominant as compared to the isolated samples. The MIC values also showed an expected decrease in the zone of inhibition from 1:2 to 1:8 dilutions. Similarly, as the purity of pure limonene (97%) was reduced the Zone of inhibition was found to be decreased. Hence based on this study, the cost-effective isolation of limonene and other essential oils is quite possible. The samples can be purified to the maximum possible level depending on the sensitivity of the studies like Cancer cell studies.

PP-16

Investigating the patterns of codon and amino acid usage in the genus *Cryptococcus*

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The genus *Cryptococcus*, opportunistic fungal constitute multiple infamous pathogens and non-pathogen species that infect immunosuppressive and immunocompromised individuals. The pathogen species characteristics viz*, C. neoformans* (*VNI, VNII* and *VNB*, all presenting the capsular antigen A) and as *C. neoformans var.grubii (VNIV* presenting the capsule antigen D) and C.*gattii (gattii ca1873, gattii_vgii_ca1014, gattii_vgii_mmrl2647, gattii_vgii_r265, gattii_vgiv_ind107*). In addition, *var. grubii* and *var. neoformans* are worldwide whereas *var gattii* is limited to tropical areas which majorly alter the energy metabolism in humans. These species cause pulmonary Cryptococcus and Cryptococcus meningitis. *C.neoformans* cause HIV-infection that leads to AIDS disease and also cause bone marrow infection though it is not very common and can only be caused in patients who have a CD4 T lymphocytes count below 100cells/µl. During course of evolution these strains have diversify and develop different mechanism of survival due to which some of the species *C. neoformans* and C.*gattii* become pathogenic. In the current studies, intend to analysis the overall codon amino usage pattern of the entire genus in the lieu of pinning down the minute's difference in the expression pattern of pathogenic and non-pathogenic. Further we want to analysis effect of compositional bias and translational selection to analysis the expression pattern of the genus. This would automatically culminate in their suppression of pathogenic potential. Moreover, the current study may even help in combating the resistance genes against different fungicides and pesticides by again manipulating their codon usage patterns.

PP-17

Production of cosmetic products and food supplements by using *Monascus purpureus*

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Monascus purpureus is a filamentous fungi belonging to the class eurotiomycetidae known to produce pigments such as monascin, rubramin, rubrin which have cholesterol lowering effect and reduces vascular complications of diabetes. Other important metabolites produced by *M. purpureus* include monacolins, dimeric acid and citrinin which are known to lower serum cholesterol level, reduce fat levels and inhibit bacteria growth respectively. In this study we have produced red yeast rice using *M. purpureus* MTCC1090 which is a well-known food supplement for lowering serum lipids levels. In addition to this, *Monascus* pigment was extracted with the help of methanol and dried pigment was used as a coloring agent for the preparation of cosmetic products such as blush. Above study emphasizes that *M. purpureus* is an industrially important fungi and can be used effectively for the development of various medicine and cosmetic products.

PP-18

Evaluation of natural bacterial flora on pomegranate surface

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Fresh fruit surface is a home to a large number of microbial flora, which they acquire from the environment in which they are grown. It is important to have a knowledge of surface microbial flora as these can be responsible for the spoilage of the fruit. The knowledge of microbial diversity will help in finding an effective solution in saving the fruits from spoilage. In the present study, microbes associated with the surface of whole pomegranate were identified using 16S rRNA sequencing method. Normal microbial flora associated with the pomegranate surface has not been studied earlier. Our results indicate that the pomegranate surface harbored diverse bacterial communities from different bacterial families. These include bacteria from *Firmicutes*, *Enterobacteriaceae*, *Micrococcaceae*, *Microbacteriaceae*, *Xanthomonadaceae* and *Gammaproteobacteria* family. Major genera associated with the surface were *Acinetobacter, Micrococcus, Pantoea, Microbacterium, Strenotrophomonas, Bacillus, Dermacoccus*, *Staphylococcus, Enterobacter* and *Exiguobacterium*. The *Bacillus* was predominant genus. We also studied the changes in bacterial diversity on treatment with gamma radiation. These microbes were found to be protease, amylase, cellulase and pectinase producers. These were also checked for the presence of genes associated with antibiotic resistance and 78.9% of the tested microorganisms were *bla*TEM positive. Aminoglycoside resistance genes were present in 10% of the tested microbes. This study signifies the role of normal surface flora as a reservoir for antibiotic resistance genes.

PP-19

Immune control of gut microbiota, and the effect of antibiotic on microbial population in reducing obesity

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The loss of beneficial microbes has been proposed to be a causative factor leading to the loss of various homeostatic mechanisms in our body. The Possible causes can include antibiotic use, increased sanitation, and low fiber diet. Obesity, which is more prevalent in developed nations, is attributed to the loss of regulatory immune responses that are correlated with some of the beneficial microbial species. In this review article, we aim to comprehensively study the influence of gut microbiota to constrain lipid metabolism with respect to T-cell mediated regulation and antibiotic. T-cells produce cytokines that activate B-cells to produce immunoglobulin A (Antibody) in the cell that triggers the gut microbiota to act upon substances that are entering the body. If IgA is not produced, the microbiota won't function. Hence, results in weight gain. Also, the use of antibiotic, such as Broad-Spectrum Antibiotic can reduce the diversity of beneficial gut microbiota, and resulting in weight gain. Microbes such as Clostridia have been found to be beneficial and favorably calibrate the immune system. On the other hand, *Desulfovibrio* and other microbes antagonized beneficial microbes. Thus, immune control and antibiotic play a major role in reducing obesity.

PP-20

Isolation and screening of biosurfactant producing bacterial isolates from polluted soil

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Biosurfactants are surface-active agents that are synthesized by microbes such as yeast, bacteria, and fungi. The aim of the present work was to isolate and characterize biosurfactant producing bacteria from the polluted soil samples of different regions of India. Bacteria were isolated by enrichment culture technique and preliminary screening method. Biosurfactant screening was carried out by using surface tension, oil spreading assay, emulsification index assay. Production of biosurfactant was carried out by using an Erlenmeyer flask. This method supplements different carbon sources and is optimized on the basis of temperature and pH parameters. The heavy metal tolerance ability of isolates was analyzed against heavy metals by streaking on heavy metals incorporated agar medium (Zinc sulfate, and Potassium dichromate). Molecular identification of bacterial isolates was carried out by using the 16s rRNA sequencing approach. Molecular identification confirmed that the isolate belongs to *Klebsiella pneumoniae* strain. Our results confirmed that the isolated bacterial strain has the ability to remove heavy metals *In vitro* condition and can be used for *in vivo* application to remove heavy metals.

PP-21

Evaluation and screening of Chickpea (*Cicer arietinum* L) genotypes for wilt disease tolerance using biochemical, molecular and phenological assessment: A review

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Chickpea is the third most important crop but due to susceptibility to *Fusarium oxysporum* f. sp. ciceris, it suffers 10-90% yield losses depending upon how unfavorable the environmental conditions are for the plant but with increasing knowledge and awareness regarding environment, the use of fertilizers and pesticides is being avoided nowadays. Therefore, the review here focuses on the use of different AMF species like *Glomus hoi, Glomus fasciculatum* and *Rhizobium leguminosorum* for disease control and as biofertilizers on different varieties of the chickpea plant. These fungi alongside maintaining the soil biological and physical properties, helped in reducing the severity of disease in the plant and helped plant in improving the nutrient uptake which is hindered in case of Foc infection. As the plants have the tendency to respond to various biotic and abiotic stresses by up regulating or down regulating some of the genes, the chickpea plant exposed to Foc is studied to find out the biochemical changes in gene expression of a plant after the infection. The infection with the race 5 of Foc showed significant changes in the expression of genes *lox* and *actin* in the root of the plant.

PP-22

Impact of aqueous and ethanol leaf extracts of Jaffna and ODC varieties of *Moringa oleifera* Lam. on pathogenic bacteria

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Jaffna and ODC variety of *Moringa oleifera* Lam., have ample number of benefits. In this study aqueous and ethanol leaf extract of these varieties, inhibited the activity of four pathogenic bacteria (disc-diffusion method) which include; *Bacillus cereus*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and *Escherichia coli*. The extract of both the varieties has shown an impact on the growth of all the bacteria with different zones of inhibitions (mm). Jaffna ethanol leaf extract showed 27.80 ± 0.43; 26.00 ± 0.80; 23.60 ± 0.36; 25.00 ± 0.40, and aqueous leaf extract showed 16.83 ± 0.20; 14.66 ± 0.41; 13.63 ± 0.65; 11.83 ± 0.15 zone of inhibition. Meanwhile ODC ethanol leaf extract showed 20.26 ± 0.30; 20.83 ± 0.20; 18.0 ± 0.40 and aqueous leaf extract showed 13.63 ± 0.35; 13.83 ± 0.41; 8.60 ± 0.45; 8.86 ± 0.85 zone of inhibition against *Bacillus cereus*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and *Escherichia coli* respectively. Therefore, the study reveals that ethanolic leaf of Jaffna variety possess strong antibacterial properties as compared to the ODC variety of *M.oleifera*. Thus, this variety can be explored further as a reliable source of natural bacteriostatic agent.

PP-23

Molecular typing of methicillin resistant *Staphylococcus aureus* (MRSA) isolated from clinical samples of patients from Rajasthan

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Staphylococcus aureus is a potentially pathogenic bacterium that causes a broad spectrum of diseases. *S. aureus* has since developed resistance to penicillin related antibiotics, including methicillin these resistant bacteria are called methicillin-resistant *S. aureus* (MRSA). This study was aimed to determine the prevalence of the mecA gene in clinical isolates of MRSA isolated from the clinical samples which were taken from Dr. B. Lal Clinical Laboratory Pvt. Ltd, Jaipur. Polymerase Chain Reaction (PCR) was thereafter carried out on these isolates to detect the *mec*A gene. The results from our experiments showed that of the 15 samples were tested, 7 samples were positive for mecA gene (46.66%) while 8 samples were negative for the mecA gene. The results show that genes other than the *mec*A gene was much more prevalent in the Jaipur region. It was determinate that MRSA strains were resistant against multiple antibiotics. A significant decrease in Vancomycin susceptibility is particularly notable. The results of this study can lead to the development of novel therapeutic agents capable of controlling or curbing the problem of drug resistance.

PP-24

Use of probiotics to improve fish product and its acceptability among consumers

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The Present Study focuses on the use of Probiotics in fish farming to control disease outbreaks. Traditional methods to combat the problem are antibiotics and Chemotherapeutics, but they are having adverse consequences like drug resistance and bioaccumulation in the system. Alternative to control the use of antibiotics and other drugs is the use of Probiotics. Probiotics have gained popularity as microbial cells which when administered provides positive impact on digestion, microbiota of gastrointestinal tract, make the host disease resistant and improves the quality of environment. Use of Probiotics in fish farming is very cost effective and also maximizes the pond Productivity. Probiotics not only increase the culture production but also increases the consumer's preference. Most of the available probiotics were isolated from terrestrial sources or non-aquatic sources and did not show much effective results. By the concept of Putative probiotics, that is the isolation from the same source shows Optimum results than the ones isolated from terrestrial sources. It may be due to the non-compatibility of Probiotic in the used environment. Further research should be conducted to isolate new bacterial strains from the fish group which can survive in harsh environmental conditions. Organisms surviving in contaminated sites mean they are immunologically strong and gut microflora of vertebrate always directly or indirectly affecting immunity of organism as it is well known that, Probiotic are good gut microflora which supports life by many means.

PP-25

Chemical and biological evaluation of metabolites isolated from potential fish probiotic strains (*Enterococcus faecium* – F1H4, *Enterococcus faecium* – LF3 (1), *Enterococcus gallinarum* – F1H3 and *Enterococcus durans* – S3)

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Probiotics are the beneficial living microorganisms which act as a potential alternative to control diseases in aquaculture and are considered as an effective, non-chemical based and eco-friendly perspective to reduce the use of antibiotics. Moreover, it was demonstrated earlier that multispecies formulations of probiotics are more effective and consistent than their mono-specific counterparts since mixed cultures exerts synergistic probiotic properties. Generally *Enterococci* along with *Lactobacilli* have long history of use in food industry for the production of fermented foods and meat preservation because of two main reasons, first is that they are Lactic acid bacteria and as such produce lactic acid and bacteriocins while second they can survive different compartments of intestinal tract. *Lactobacillus* has received GRAS (Generally Recognized as Safe) status from FAO/WHO (Food and Agriculture Organization/World Health Organization) but *Enterococci* doesn't receive GRAS status yet because they are often positioned as health threatening pathogens. Recent in-vitro studies also reported the antagonistic activity of *Enterococcus* species against common fish pathogen i.e. *Pseudomonas aeruginosa.* Many *in-vivo* studies also indicated the increased immune response as well as better final weight and daily weight gain in fish when they are supplemented with probiotics in feed. The present study aims at the chemical and biological evaluation of metabolites extracted from potential fish probiotic i.e. *Enterococcus species* (F1H3, F1H4, LF3 (1), S3) isolated from the gut of different fish species. Few in-vitro and in-vivo studies have shown the increase in specific growth rate and weight gain as well as decrease in food conversion rate and mortality percentage. Further studies are carried out to extract bacteriocins from different *Enterococcus* strains by chloroform extraction method and purification of these isolates. After purification the molecular weight of these purified bacteriocins will be determined by SDS-PAGE (Sodium dodecyl sulphate – Polyacrylamide gel electrophoresis).

PP-26

Isolation of fish probiotic strain and analysis of metabolites extracted and it's potential against drug resistant bacteria

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Probiotics are live microbial feed additive which have advantageous effect on the host animal by boosting its intestinal microbial balance. They are expanding from last two decades as the outcome of consistently elaborating scientific authentication directing to their favourable effects on human health. The manipulation of probiotics is positive another perspective for predominance of infectious agents and treatments of disease. The need for increased disease resistance, growth of aquatic organisms, and feed efficiency has brought about the use of probiotics in aquaculture practices. The positive probiotic bacteria stimulate the growth, improve the digestion, enhance immune response and upgrade/raise the water quality. Probiotics secrete different metabolities such as bacteriocin, hydrogen peroxide, organic acid which have bactericidal and bacteriostatic activity against closely related species. In this context, during the present study, we have isolated *Lactobacillus* sp. (Probiotic) from the *Channa* fish of Punjab region. After streaking on MRS and BDA, all isolated strains were found to be Gram positive bacilli. Further we have analysed antagonistic activity of these bacteria against fish pathogen *Pseudomonas aeruginosa*. The isolated strains are exhibiting moderate antagonistic activity against fish pathogenic *P. aeruginosa*. Further we will be extracting bacteriocin from isolated antagonistic bacteria and will be studying their mode of action.

PP-27

Novel biosynthesised copper nanoparticles as anti-cancer against hepatocellular carcinoma

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Cancer is a disease affecting the human population in both developing and developed countries. In 2007 the WHO published that in 2005, 7.6 million people died from cancer-related diseases. Chemical chemotherapeutic drugs are effective but show many side effects such as allergic reactions, vomiting, kidney problem and heart diseases which limit its use. The best alternative is plant based anti-cancer drug for the prevention and cure of cancer with greater efficacy. In this study, copper nanoparticles of leaf extract obtained from *Coleus blumei* was synthesised and characterized using UV-visible and FTIR spectroscopy. Further *in vitro* anti-cancer activity of synthesized nanoparticles was studied on Hep-3b and HepG2 cell line using MTT assay. A copper nanoparticle was confirmed by UV-visible spectrophotometer with peak at 581nm and XRD at 2 theta peak. MTT assay has shown high cytotoxicity as these nanoparticles showed 79.53% and 77.28% decrease against HepG2 and Hep-3b cell lines respectively. Therefore, it was found that phyto-based copper nanoparticles can be used to inhibit cancer cell growth effectively without adverse effect on normal cell.

PP-28

Conversion of lignocellulosic waste to ethanol

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Biofuel production from lignocellulosics involves the pre-treatment process, removal of inhibitory compounds, choice of the desirable microbe to carry out fermentation and extraction of the ethanol formed. Most of our population depends on petroleum for fuel which needs to import from other countries and leads to price shock so to overcome these losses non -food lignocellulosic material is a considerable choice having low cost and abundant carbohydrates. Ethanol is a trending topic nowadays as it has about 35% oxygen which decreases NOX emission and has a high carbohydrate content with low cost. Pretreatment of biomass is done to remove the physical and chemical impurities and this also facilitates the entry of the biocatalyst for ethanol production. Pre-treatment is followed by depolymerisation which results in the formation of 5 -6 carbon sugar which is fermented to form ethanol. However at the time of ethanol production many of the inhibitory compounds like phenols are formed which suppress the growth of fermenting microbe and decrease ethanol production but this can be overcome by using a more resistant form or continuous removal of these inhibitory compounds. Ethanol formed is used as a fuel in mixture with gasoline and in this review paper we discuss the production of ethanol from lignocellulosic materials.

PP-29

Screening of hemicellulase producing microorganisms

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Polysaccharides of plant origin are converted into fermentable sugars by the use of microbial enzymes. Production of hemicellulases by certain fungus catalyses the saccharification of sugarcane bagasse. Second generation biofuels can be prepared from agricultural wastes, forestry residues or municipal solid wastes. Hemicellulase is a cocktail of enzymes. Pretreatment is done for separating lignin from lignocellulosic biomass which include biological, chemical, physicochemical treatment followed by saccharification of hemicellulose and fermentation either by solid state or submerged fermentation. Endophytic actinomycetes are selected for production of hemicellulases and closely related enzymes with different enzymatic properties for explication of lignocellulosic biomass. Efficiency and economics of biomass can be improved by optimizing the enzymatic system for hydrolysing hemicellulose. Physical, chemical and structural properties of cellulose and hemicellulose directly influence the generation of cellulose and hemicellulose in filamentous fungi. Thermophilic fungi showed high xylanase production from agro- industrial wastes. Substrate for hemicellulase would be wheat straw, rice husk, sugarcane bagasse, sorghum. The objective is to extract hemicellulase from thermophilic microorganisms and also economically important technologies for industries and also to reduce the cost of these enzymes.

PP-30

Bioprospecting of bioplastic producing microbes

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From the very beginning of the modern era, plastic has been used in every sphere of human life, but now they are causing stern environmental problems because of their non-biodegradable nature. Hence, this article reports the importance of biodegradable plastic or bioplastic which is renewable, produced by microorganisms. A number of aerobic and anaerobic bacteria, such as *Staphylococcus epidermidis, Pseudomonas aeruginosa, Bacillus megaterium, Alcaligenes latus* have been identified and reported as bioplastic producing microorganisms, in form of PHA (polyhydroxyalkanoate), synthesized by PHA synthase gene encoded by phaC. PHAs are macromolecules produced by bacteria to store carbon and energy in intracellular granules, having physical properties similar to plastic, are biodegradable and can be used at the place of non-biodegradable plastic. PHA can further be converted into PHB (polyhydroxybutyrate) by using indigenous microorganisms by scaleup technique for biodegradation of agricultural and industrial waste. Large amount production of PHA can lead to strategic production at commercial scale.

PP-31

Preliminary phytochemical screening and *in vitro* antibacterial activity of *Plumbago indica* (Laal chitrak) root extracts against drug resistant *Escherichia coli* and *Klebsiella pneumonia*

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Plumbago indica (Laal chitrak or Rakta-chitraka; also known as *P. rosea* Linn) is an important medicinal plant that belongs to the Plumbaginaceae family and widely used in traditional medicine systems for curing various ailments and disorders. The present study was conducted to analyze the antibacterial activity of root extracts of the plant obtained by serial extraction (using petroleum ether, chloroform, methanol, and water) by *in vitro* techniques and screen phytochemicals present in the extract by qualitative means. Preliminary phytochemical screening showed the presence of alkaloids, saponin, flavonoids, steroids, tannins, reducing sugars, phenolics, and protein while oil and fat were found to be missing. Determination of antibacterial activity against drug resistant clinical isolates of *Escherichia coli* and *Klebsiella pneumoniae* was carried out using well diffusion method. Among four extracts, aqueous and methanol extracts were found to be active against drug resistance *E. coli* and *K. pneumoniae* while petroleum ether and chloroform extracts were found to be inactive. The minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) of the methanolic and aqueous extracts on both isolates were found to be below 30µg/ml. Owing to this plant antibacterial activity, low minimum inhibitory concentration and its bactericidal activity at low concentration toward the tested isolates, the plant can be recommended as an alternative and candidate for drug development against drug-resistant *E. coli* and *K. pneumoniae*.

PP-32

Insights into the codon usage and amino acid usage pattern in bacterial pore-forming toxins

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Pore forming toxins (PFTs) are an important component of a battery of virulence factors of many pathogenic bacteria. They constitute the largest class of bacterial protein toxins and are present in almost all kingdoms. PFTs supplement the process of pathogenesis by the pathogen through (i) disruption of the host target cell's permeability barrier and (ii) evasion of the host immune response(s). They constitute a unique class of proteins, in that, these are secreted as water-soluble monomeric precursors, which upon interaction with target cell membrane get converted into membrane-bound transmembrane oligomeric channels. PFTs are known to form transmembrane channels in the host target cell plasma membrane, thereby leading to cell death by colloid osmotic lysis or manipulation of the host cellular functions. They are broadly classified into two large categories based on the secondary structural elements involved in the formation of the transmembrane channel, namely, α-PFTs and β-PFTs implying the use of α-helices and β-barrels in the process of pore formation. We employed bioinformatics analysis on gene sequences of members of α- and β- family of pore-forming toxins to investigate the codon usage pattern among pore-forming toxins of prokaryotic origin. The present study sheds light on variations in the pattern of amino acid and relative synonymous codon usage among different PFT genes, preference toward the employment of and restrain from certain dinucleotides, effect of codon substitutions on gene expression and finally the influence of natural selection on the evolution of PFT gene(s).

PP-33

Exploring its immunogenicity and antioxidant potential of protein from *Syzygium cumini and Mangifera indica*

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India is considered to be one of the rich repositories of medicinal and aromatic plants, which are mainly used as starting raw materials for drug manufacturing and perfumery products. Approximately, more than 35 percent of plant species are used for medicinal purposes. In this study, our major objective is to evaluate its immunogenicity and antioxidant potential of protein extracted from leaves of these two medicinal plants i.e. *Syzygium cumini* and *Mangifera indica*. In order to achieve this objective, immunopharmacological studies were conducted and extracted protein from leaves (using Tris HCl and ice cold acetone) and confirming its protein content through Lowry test. In addition, immunogenicity (using standard vaccine i.e. Typhoid vaccine) and antioxidant (using DPPH [1, 1-diphenyl-2-picrylhydrazyl] assay) based studies were evaluated using variable concentration of protein. The results indicate that proteins at higher concentration showed immunogenic effect against typhoid vaccine and also showed antioxidant effect as compared to control. In short, proteins serve as a natural antioxidant and also showed immunogenicity, which may be useful in preventing free radical-induced diseases and also claimed its immunoboosting properties as well. Overall, these studies reveal that protein possesses potential benefits in terms of immunogenicity (against specific protein antigen) and antioxidant effect.

PP-34

Analytical and immunopharmacological studies of flavonoids: *Mangifera indica* and *Syzygium cumini*

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Flavonoids considered them as one of the most diverse group or range of phytonutrients and are reported in all kinds of fruits and vegetables. In phytonutrients, more than 6,000 types of flavonoid components are reported. In view of this, our main objective is to extract the flavonoids from leaves of these medicinal plants i.e. *Mangifera indica* and *Syzygium cumini* and determined analytically (HPLC, FTIR) and also examined its antioxidant (DPPH assay) and antimicrobial potential against gram positive and gram negative bacteria. In this study, qualitative analyses of these two medicinal plants were performed as per standard procedure. In addition, extraction of flavonoids from leaves using methanol and ethyl acetate as solvent system and conducting these studies especially total phenolic content and antioxidant activity [using aluminum chloride colorimetric assay, Folin- Ciocalteu assay and DPPH (1, 1-diphenyl-2-picrylhydrazyl) free radical scavenging assay] along with antimicrobial [agar well diffusion assay] respectively. The results showed that phenolic content of a medicinal plant often correlates with its antioxidant activity and its confirmation through spectrophotometrically (UV-Vis) and FTIR in order to quantify the presence of functional groups. In contrast, these flavonoids showed antimicrobial activity at higher doses as compared to control. Overall, flavonoid from these two medicinal plants especially leaves shows antioxidant activity and antimicrobial activity at higher doses. Conclusively, these flavonoids may provide beneficial effects related to human health care.

PP-35

Alleviation of heavy metal-induced toxicity in *Psoralia corylifolia* by exogenous application of PGR

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Plants often face the various environmental challenges caused by biotic and abiotic aspects, which are ultimately affecting their growth and development. Among these stresses, heavy metal toxicity has become a major focus in recent times because of the increased environmental pollution. 24-Epibrassinolide (EBL), a universally occurring phytohormone provides resistance against various abiotic stresses and shows potential to quench heavy metal stress from plants by making them tolerant to various metals. *Psoralea corylifolia* belonging to the family Fabaceae, is a rare medicinal plant which is widely used in Ayurvedic medicines. Present experiment was conducted to study the effect of 24-EBL on plant growth (root length, shoot length, germination percentage), antioxidants (GSH, Ascorbic acid), antioxidative enzymes (CAT, SOD, APOX, DHAR, MDHAR, MDA), osmolytes (proline, glycine betaine) and protein content in 20 days old seedling of *Psoralea corylifolia* under the stress caused by different concentrations of mercury (0.1mM, 0.25mM and 0.5mM). Reduction in the growth (root length, shoot length, and percent germination) and decrease in protein content was observed in Hg treated seedlings. But the level of antioxidants, osmolytes and antioxidative enzymes activity were found to be increased under Hg stress. Treatment of 24-EBL was effective to combat the Hg stress from the plant. Overall, it was concluded that treatment with Hg metal showed toxic effects in *Psoralea corylifolia* plant, but the exogenous application of 24-EBL was proved beneficial for enhancing the vegetative growth, antioxidants and antioxidative enzymes activity of the plant.

PP-36

Prevalence of *Escherichia coli* in milk samples and their antibiotic sensitivity pattern

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India is the largest producer of milk in the world however unhygienic practices followed during milk production, storage and transportation makes it highly prone to microbial contamination. Some of the prominent microbial contaminants of milk include *Escherichia coli*, *Salmonella typhimurium*, *Campylobacter jejuni*, *Clostridium perfringens*, *Bacillus cereus* etc. Among them *E. coli* is one of the most prevalent contaminants of the milk and if consumed with milk may cause haemorrhagic diarrhoea to the consumers. Therefore it's important to periodically check the microbial quality of milk. In this context the aim of this study was to identify the prevalence of *E. coli* in milk samples studying their antibiotic sensitivity pattern. During this study 106 milk sample were collected from different areas of Jalandhar and subjected to selective isolation of *E. coli* on Eosin Methylene Blue agar, The isolates were characterised by Gram's staining, motility test and a variety of biochemical tests including catalase, indole, methyl red, voges-proskauer, citrate utilization, triple sugar iron and urease test. Following this *E. coli* isolates were subjected to antibiotics sensitivity test by disc diffusion method. During this study, a total 45 *E. coli* samples were confirmed microscopically and biochemically while among them 8 isolates were found to exhibit resistance towards ceftazidime, while 3 isolates were found to be resistance against the cefixime and ceftazidime, and at least one isolate was found to be resistance against doxycycline, norfloxacin, cefixime, ceftazidime, kanamycin, cotrimoxadole and imipenem. Above finding emphasizes the periodic analysis of food samples for the presence of microorganisms and their sensitivity pattern for controlling any future outbreak.

PP-37

Detection and characterization of siderophores from intestinal and extra-intestinal *E. coli*

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Microorganisms infecting tissues and organs compete with the infected host for limited iron molecules in vivo. Microorganisms adopt a unique mechanism for sequestration and transport of bound iron by producing iron-chelating molecules called siderophores. Siderophores thus help colonization of microbes in iron-deficient sites of the host, hence acting as an important virulence factor. In the present era of emergence of multiple drug resistant microorganisms, siderophores are also seen promising carriers of antimicrobials to target sites inside microbial cells. In the present study siderophores of pathogenic *E. coli*; the most common infectious agent in developing countries which can cause diarrhea, urinary tract infection, HUS, HC, neonatal meningitis and septicemia; were detected and chemically characterized. Siderophore type expressed by intestinal and extra-intestinal E. coli isolates from different parts of the country was detected. The study was initiated with 783 isolates received at National Salmonella and Escherichia Centre from different parts of the country. A total of 534 confirmed E. coli isolates were tested for the expression of siderphore and its type. Siderophore expression was observed as one of the important virulence markers of intestinal as well as extra-intestinal clinical E. coli isolates as 41.5% of the isolates were found to be producing siderophore as screened on CAS agar. On chemical characterization 12.5% isolates were found to produce catechol type siderophore and 35.4% of the isolates were found to produce hydroxamate type siderophore. A difference in siderophore type expression by intestinal and extra-intestinal pathogenic E. coli was observed. Isolates from different parts of the country and in different seasons were found to express siderophores. A difference in frequency of siderphore expression was observed among isolates from different geographical regions and different seasons.

PP-38

Role of jasmonic acid (JA) in the growth and development of plants against biotic stress

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Plant growth and crop yield is strongly altered by different stress conditions in the form of various biotic and abiotic factors. Biotic stresses are confronted by the plants in the form of their morphological, biochemical and molecular mechanisms. Adaptation is necessary for the plants to survive in the continuously varying climatic circumstances and plants are always under the risk of infectious agents attack like viruses, microbes, fungus and various other microorganisms. Among these, fungal stress affects the water transport, leaf area of the plant and hence caused reduction in rate of photosynthesis. Plant response to overcome the fungus stress is oxidative exposure, which results in release of reactive oxygen species (ROS), primarily superoxide and hydrogen peroxide. To counteract this oxidative stress, plants take the benefit of plant growth regulators like abscisic acid (ABA), ethylene and jasmonic acid (JA) which plays a vital function in influencing various phases of plant growth. JA is a naturally occurring growth regulator which can influence several developmental processes in plants and is known to enhance the defence mechanism of plants against fungal stress. JA helps in improving the level of photosynthetic pigments, osmolytes and antioxidant defence system in plants under biotic stresses. As even under fungal stress conditions, plants showed improved growth, osmolyte content and also activated antioxidative defence system, which is boosted up by the exogenous application of JA.

PP-39

Isolation, purification, and characterization of indigenous white rot fungi from decayed wood

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White-rot fungi, belonging to basidiomycetous species is a potent producer of laccase enzyme which has gained more interest in the agricultural sector for bioremediation purposes, pulp and paper industry, textile industry, etc. Fifty different samples of fruiting bodies of white-rot fungi were isolated from rotten woods from areas of Jalandhar city and were cultured on wheat bran agar by tissue culture technique. Among them, 8 isolates were subcultured by periodic transference to fresh wheat bran agar on the basis of their mycelium formation and microscopy by lactophenol cotton blue staining, for purification. The 8 isolates were also screened preliminary for laccase enzyme production by plate assay method of which only one sample was found to be a potent laccase producer. An 18s rRNA analysis was done for molecular characterization of the isolate which has shown the isolate to be phylogenetically associated with *Coprinopsis cinerea strain BAFC cult 4361* by around 99%. The study was beneficial to isolate an efficient laccase producing starin from the environment which could have an application in various fields of applied microbiology.

PP-40

Isolation and characterization of chitinases from microbial sources

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Chitin is an important polysaccharide having utility of resource where it is used in industries for processing of waste products and production of various food products. Fungi carry chitin in its cell wall proving it to be an excellent source for extraction of chitin and chitinase, whereas in some cases it can be isolated from plant as well. The current research is focused at isolation of chitin from various fungal strains where *Aspergillus niger* was found as one of the best source of chitin extraction. This was achieved by 10 fold serial dilution of soil samples in 7 test tubes and then it was grown in potato dextrose agar. Sub culturing was observed in sabouraud dextrose agar. The morphology was observed by lactophenol cotton blue. The chitinase activity was observed by growing these strains on chitin agar media which was prepared by adding 5 gram chitin in 1000 ml solution. The identification was done on the basis of red zone of circulars and isolation was done by basic centrifugation and salt treatment. The isolated chitin was further purified by treatment of ammonium phosphate and centrifugation where the supernatant was purified by phosphate buffer in the final step. Later chitinase activity was analyzed by preparation of various samples including varied concentrations of salt and substrate and standard curve was obtained by DNS method. The increasing concentration of enzyme showed the increasing absorbance which was further used to calculate the activity of enzyme. Protein interference observed in the enzymatic activity gives further research for exploration purposes.

PP-41

Development of effective methods for the determination of different types of adulteration in milk and milk products

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Milk serves as a vital source of nourishment for people of all age groups. It is a rich source of nutrients and minerals required for the normal growth and maintenance of our body. India remains the leading milk-producing country in the world. Many livestock animals like cows, buffaloes and wild oxen are bred for their ability to produce milk, which is used to produce other milk products like curd, cheese, yogurt, etc. With an increase in the human population, urbanization, and consumption of dairy products milk adulteration is now a social concern in our country and across the globe. Many merchants and milkmen deliberately adulterate milk to earn the profit. Milk adulterants can lead to serious health hazards which can lead to fatal diseases. There are various qualitative and quantitative methods to detect milk adulteration. Some of these are biochemical tests performed in laboratories by specialized biochemists, whereas test kits are also commercially available in the market which is used to detect adulteration in the milk samples, but these are not cost-effective as the industries usually collect milk in bulk quantity from different locations. There is a need to develop a cost-effective and easy method that can be performed on the spot. The current study is aimed to develop quick, easy and sensitive strategies for the detection of milk adulteration. A strip for the detection of urea, turmeric paper strip for the detection of boric acid was prepared. This strategy is quick and effective for the detection of milk adulteration.

PP-42

Phylogenetic insights into the diversity of Human Papilloma Virus (HPV) and its impact on cervical cancer

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Human papillomavirus (HPV) is a double enveloped DNA virus that causes cervical cancer or cervical intraepithelial neoplasia, as the virus is associated with the expression of viral oncogenic proteins that are capable of inactivating tumour suppressor genes P_{53} and P_{Rb} in the host genome. Viral infections constitute 15-20% of human cancers and among them sexually transmitted HPV infections are common and asymptomatic and a total of 98.7% of all cervical cancers are HPV positive. The lifetime risk of an incident with HPV infection is 80% and cervical cancer is the 4th most cancer among the women globally. HPV variants play a vital role in the risk modelling based on their risk or lethality they are categorised into low risk (6, 11, 40, 42, 43, 44, 53, 54, 61, 72, 73, 81), moderate risk (45, 33, 58, 51, 52) that cause genital warts and high risk isoforms showing (16, 18, 31, 45, 33, 35, 39, 51, 52, 56, 58, 66, 70) cause cervical cancer. In the present study, we showing the diversification and lethality among E6 and E7 Oncoproteins with low, moderate and risk HPV motifs by performing multiple sequence alignment to draw the phylogenetic analysis and their interactions between host genome HPV to check for amino acid clustering/motif identification the variants among the isoforms. The study may be useful for understanding the interactions between the variants and would decipher the therapeutic intervention and cervical cancer.

PP-43

Diatom-derived silica as drug carrier system

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Diatoms are single-cell photosynthetic microalgae, which serve as a potential replacement for mesoporous materials as suitable drug carriers for developing cost-effective systems for medicinal products. A large surface of 100 m2/g for unheated, fresh diatom shells, micro-and nano-porosity structures and bio-degradability of amorphous silica form a promising bio-material for medicinal products. The silica cell wall has features like optical characteristics, mechanical strength, structural and chemical characteristics, and could resolve problems related to conventional drug delivery which, due to poor bioavailability or drug instability, cannot be effectively implemented as conventional drug formulations. By integrating ferromagnetic elements into the frustules and then using a magnet, the drug-loaded diatoms can be directed to the release site. They can be easily designed to control the release of drugs through pores of nano size. This review paper focuses on the potential use of diatom-derived silica as a drug carrier system. Porous silica diatomic capsules are ideal micro-scale devices for the design and implementation of a variety of complex medical procedures such as cell repair, surveillance and drug delivery.

PP-44

Fungi mediated synthesis of ZnO nanoparticles and their antimicrobial activity

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The irrational use of antimicrobials have led to the emergence of drug resistance in microorganisms, hence, new ways are being looked upon in order to control this ever increasing burden of microbial diseases. In this respect, a fungal endophyte (*Aspergillus flavus*) (isolated from bark of *Punica granatum*) was utilized for carrying out biogenic synthesis of Zinc Oxide nanoparticles. The nanoparticles were characterized via Ultra Violet Visible (UV-Vis) spectroscopy, fourier transform infra-red (FT-IR) spectroscopy, Diffraction Light Scattering (DLS), Zeta Potential, X-Ray Diffraction (XRD) and Scanning Electron Microscope along with Energy Dispersive Spectroscopy (SEM-EDS). The antimicrobial activity of particles were checked both against bacteria and yeast as *Staphylococcus aureus* MTCC 96, *Bacillus cereus* MTCC 6629, *Pseudomonas aeruginosa* MTCC 4673, *Acinetobacter iwoffii* MTCC 8288 and *Candida albicans* ATCC 10231. The nanoparticles showed considerable activity against both Gram positive isolates and yeast as compared to the Gram negative. Thus, these nanoparticles can be sought out to put a check on the drug resistant microbes.

PP-45

Effect of biopriming on Fusarium wilt disease caused by *Fusarium oxysporoum* in *Cicer arietinum*

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Fusarium wilt caused by *Fusarium oxysporoum f.sp. Ciceris* is one of the highly destructive diseases that causes upto 90% yield losses currently continuous use of synthetic fungicide *against Fusarium oxysporoum f.sp. Ciceris* will lead to severe pollution on the environment as well as development of by *Fusarium oxysporoumf. sp. Ciceris* resistant strain. In this study two species of chickpea (Desi and Kabuli) were inoculated with different dose of biopriming agents i.e. *Trichoderma, Pseudomonas*, mycorrhiza and microbes consortium to reduce severity of wilt disease. A considerable variation among the species was observed for the diseases. In present study desi types inoculated with pseudomonas is susceptible to wilting. However, mycorrhiza inoculated the same types showed resistant to wilting. Moreover, in kabuli types treated with consortium microbes showed susceptible to wilting. Wilting percentage significantly varied between treatments. This screening will further help to utilize the elite genotypes in crop improvement programme.

PP-46

Corona virus as an efficient vector for gene transfer in treating different diseases and gene alterations

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Corona virus came from the Latin word "Corona" which means crown or halo. CoV (Corona virus) is a large family of viruses that cause common cold and even severe respiratory syndrome and, in some cases, lead to death. Corona virus belongs to the family of coronaviruses with a single stranded RNA genome. Corona virus is zoonotic and contains spike (S), envelope (E), membrane (M) and nucleocapsid (N) proteins. The size of the genome ranges from 26 to 32 kilo base pairs, one of the largest for the RNA virus. In this review paper, we are discussing various techniques that can be used to treat an infected person with coronavirus. Corona virus can be used as a vector for vaccine development before its harmful genes (genes 3, 5b, 6 and 7 encodes S, E, M and N respectively) are removed which result in attenuated viruses; secondly, its trophism can be modified by manipulating its spike proteins or, thirdly, by expressing heterologous genes by inserting transcriptional signals into the genome. As clinical trials are taking place in our country as they spread very quickly and vaccine preparation is needed to save people's lives. SARS (Severe Acute Respiratory Syndrome) broke out 18 years ago and SARS-CoV was discovered in bats as a host (natural reservoir) and had a potential to infect humans, and now COVID-19 is present and has been identified as a cause of acute respiratory syndrome epidemic in humans in Wuhan, China in 2019 and has seen 2,050 laboratory-confirmed cases and 1,400 people are killed as reported in recent cases. 50,000 people are affected and reach the US and India too. We therefore propose that we can treat infected patients easily by modifying the genome of the virus by using CRISPR Cas9 technology, gene therapy and by modifying the harmful genes in the viral genome.

PP-47

Receptor mediated Nipah Virus glycoproteins: A new approach in targeting membrane receptors to increase gene transfer rates of different viral vectors

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Receptor-targeted lentiviral vector (LV) approach may revolutionize the transfer of genetic material to the host organism for gene therapy. LVs conjugated with the receptor-specific Nipah virus, which has a special membrane protein called glycoprotein, which recognizes the cell surface receptor in the host organism, can reduce the distance between the cell and the vector to a considerable extent by less than 100Å distance. Important cell receptors have been targeted, such as EpCAM, CD20, and CD8, and their role has also been described. Nipah virus (NiV) is a zoonotic pathogen of the Paramyxoviridae family that has a history of causing mild to severe respiratory and neurological diseases in both humans and animals. The important and noticeable result of the research was that the use of the NiV-LVs association of both of them, when targeted at Her2/neu, was approximately 100-fold higher gene transfer activity seen when certain receptors located in the proximal regions of the membrane were observed compared to when the vectors bind to the receptors in the membrane-distal epitope. It was also seen that receptor size also plays a key role in the transfer of genetic material, such as the reduction of receptor size in the case of glutamate receptor subunit 4 (GluA4), which enhanced the cell to take more genetic material. Due to lentiviral ability to infect non-dividing cells, it may be better suited for gene transfer of germlines. The data analyzed also indicated that two viruses can be used in conjugation to help with the high transfer rate of genetic material in the host organism. Therefore, it is known that Nipah virus membrane protein glycoproteins are best suited for the transfer of specific genes to specific cell type additions and their cell surface protein or receptors should be targeted to achieve high-rate of gene transfer.

PP-48

Effect of biopriming on the growth and yield attributes of mustard (*Brassica juncea)*

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Bio-fertilizers are ecologically and a renewable source of plant nutrients, which may replace the costing of chemical fertilizers effectively. Biofertilizers, biologically not only activate the soil but also restore the fertility of soil naturally. Field experiments were conducted during Rabi season in the year 2018-2019 at Lovely Professional University, Jalandhar, Punjab, India. The mustard (*Brassica juncea*) variety PVR-357 was grown in sandy loam soil having pH of 7.8. The experiments were carried out in a randomized block design with three replications. The effects of *Azotobacter chroococcum* (N-Fixing), *Pseudomonas striata*, phosphorus solubilizing bacteria (PSB), Consortium along with recommended dose of fertilizer (RDF) were inspected. A total of sixteen experiments each having different treatment combinations were conducted. Seed inoculation with Azotobacter+PSB along with 50% RDF were significantly increased the plant height, number of branches, dry matter, leaf area per plant, no. of siliqua per plant, no. of seeds siliqua per plant and test weight. Seed and straw yield ha^{-1} with 75% RDF+Azotobacter+Consortium, was significantly increased as compared to other treatments. The treatment combinations resulted in a significantly higher yield than the 50%RDF only. The increase in seed yield with application of 50%RDF+Azotobacter+PSB, was found to be less and that at 75%RDF+Azotobacter+consortium combination was more as compared to the RDF only. Hence, with 25% saving in RDF (i.e. in combination with 75%RDF+Azotobacter+ consortium), more yield of mustard can be achieved rather than using 50% RDF alone. The present study will be helpful in the development of effective biofertilizers combination for crop production.

PP-49

Chemical mutagenesis for enhanced production of ligninolytic enzymes by white rot fungus

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Ligninolytic enzymes (laccases, manganese peroxidase, lignin peroxidase) are majorly produced by different types of bacteria and fungi found in nature of white white rot fungi like *Pleurotus sp., Trametes sp., Cyathus sp.* etc. deserves special mention. Wild type strains are unable to fulfil industrial needs as they produce insufficient amounts of ligninolytic enzymes, so there is need to find cost-effective methods and cheap substrates for high production of ligninolytic enzymes. This review focuses on chemical mutagenesis of white rot fungus, using various concentrations of different mutagens like, Ethyl methane sulphonate (EMS), Ethidium Bromide, Colchicine etc. which could be used to enhance the production of ligninolytic enzymes by solid substrate fermentation by utilization of agro-industrial wastes. Chemical mutagens have the ability to alter the genetic sequence but have been reported to exhibit 50% chances to alleviate the inherent potential of these microbes. White rot fungi *Trametes versicolor has been* reported to show enhancement in ligninolytic enzyme production by 3 folds with 100µg/mL of Ethyl methane sulfonate (EMS). Similarly, the treatment of *Cyathus bulleri* by EtBr with 1.5 µg/ml concentration has also been reported to improve the laccase production where wild type producing 4.4 IU/mL and after treatment started producing 18.8 IU/mL which accounts to 4 folds increase in enzyme production. Hence, chemical mutagenesis of such strains could be an alternative to unveil the hidden potential of the white rot fungi to meet the demand of various industries.

PP-50

Pleurotus sp., a well-known white rot fungus for production of laccase

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Pleurotus is a genus of gilled basidiomycetes, also known as oyster mushroom, most of which are white-rot fungi having ability to grow on hardwood trees and possessing the capability of laccase production. It is found in both tropical and temperate climates all over the world. The genus is the most exploitable xylotrophic fungi being a low-cost industrial tool because of their high adaptability, with no special growth condition requirement, besides possessing the ability to show resistance towards various diseases and pests. They have shown the ability to degrade lignin through laccase production thus are reported to be useful in degrading agro-waste at industrial level. The degradation of lignin is very difficult as it is resistant to many enzymes because of the large structure consisting of three monolignol units, all of which are methylated to various degrees. The enzyme to degrade lignin is the ligninolytic enzymes including heme-peroxidases and copper-based laccases. Through various optimization processes, by different studies the highest laccase enzyme activity in *Pleurotus ostreatus* was determined to be 32,450 IU/gfs (5g fermented substrate) by solid state-fermentation. Laccases are blue copper oxidases capable enough to decolorize up to 80% of different dyes showing aromatic compound degradation. The enzyme can also be used in gold nano-particle synthesis, bioremediation of aqueous environments polluted by endocrine disruptors, for denim bleaching in the textile industry, pulp delignification, in the fabrication of biosensors and biofuel cells showing its strong potential in industrial applications.

PP-51

Effectiveness of bioremediation for the removal of toxic heavy metals using microorganisms

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Bioremediation is an effective technique used to convert toxic heavy metal ions into less harmful compounds, using resistant microorganisms for cleaning the soil and water bodies with heavy metal contamination. Such contaminants are released as a result of indiscriminate use of the natural resources for human purposes which altered the geochemical cycles and biochemical balance of the ecosystem affecting the human health and aquatic biota. This study will focus on the efficient, eco-friendly and cost-effective method for the remediation of inorganic metals like Pb, Cr, Cd, and Hg that are released into the environment and the safeguard measures by using recent advances in bioremediation using microbes linked to heavy metal degradation. It will emphasize the use of bioremediation as a prospective technique in an ecosystem due to their nature of non-biodegradability that could be toxic to microorganisms, a specific technique for the efficient removal of contaminants to be achieved using different mechanism by identifying the microbes that are resistant to heavy metal ions. However, this review will focus on the use of bacteria, fungi, algae and other microbes that show a synergic and bio-sorption capacity effect for removal of heavy metals ions in an environment.

PP-52

Bioactive peptides: Emerging tool to fight cancer

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Bioactive peptides are chemical functional substances which are linked by covalent bond and are formed by amino acid residues. The essential requirement of food derived bioactive peptide increases day by day due its important property, for example high affinity, efficiency specificity which play vital role in human health by promoting digestive, endocrine, cardiovascular, immune system. They are also known as future biological active regulators which help to reduce the chances of oxidation and microbial degradation in food stuff. The biological active substance having different considerable activities which includes antiproliferative, antioxidant, antimicrotubular, these activities are identified from the marine animal sources, specifically algae and cyanobacteria, which act as a secondary metabolite. Milk also contains a rich amount of soluble and insoluble protein that is whey and casein protein. Alcalase potato protein hydrolysate (APPH) and germinated soya bean protein are bioceutical and play role in anti-obesity as well as anti-diabetes. The different presumed biological activities found in glutellin which carry at least 21 peptides with~53% of the nut storage protein. These activities are anti-hypertensives, antioxidants, immunomodulators, antimicrobial, anti-thrombotic, anti-cancer, hypocholesterolemic, anti-obesity and protease inhibitors that inhibits the cell cycle progression in cancer cells. These peptides have many advantages over synthetic drugs. There is a need to establish favourable conditions to develop bioactive peptides for human welfare in terms of treating many diseases as well as food beverages.

PP-53

Single Cell Protein: Good option for global protein challenge and waste management

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Increase in human population, results death due to starvation, civil war, protein malnutrition and related diseases in many countries of the world. So this emphasizes on a serious remedy for such problems. Agriculture sector alone cannot meet the huge demands of protein required in the whole world. Single cell protein (SCP) production, therefore, can be treated as a very effective technology to combat this global challenge of protein shortage. Microbes like bacteria, yeast, fungi, algae etc. have been used as sources of SCP for many years. SCP not only produces protein, but can also be very useful technology for waste management by converting agricultural wastes to food and feed for man and animal. Biotransformation of different forms of agricultural wastes material into useful material like SCP at the same time has the potential to resolve the food protein deficiency in the world by making an cost effective product as food and animal feed, by minimizing toxic metals up to significant extent by using these agricultural wastes as substrates for the synthesis of products having good nutritive value.

PP-54

Physical mutagen: An agent for the enhancement of laccase production by white rot fungus

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White rot fungi is known to produce various types of ligninolytic enzymes like laccase, manganese peroxidase and lignin peroxidase which can be utilized in mycoremediation processes of various environmental pollutants. Laccase, a multicopper oxidase is majorly distributed in higher plants and fungi. Laccase holds potential applications in paper, food, textile, cosmetic industry, etc. Laccases can likewise be utilized for bioremediation and biodegradation of xenobiotic substances. The point of concern is, the amount of enzyme produced by wild strains of such fungi is inadequate with respect to the modern needs, resulting in the emergence of strain improvement methodologies. Mutagenesis has picked up the enthusiasm of researchers as an effective tool for such a process. This study has focused on different types of methods of physical mutagenesis by means of UV, X ray, laser lamps etc, which possess the potential to enhance the laccase production by such wild strains of fungi. UV irradiation of *Coriolopsis gallica* TCK at an intensity of 30 watt was found to be an efficient dosage for three times increase production of enzyme from 14.50 U/ml to 49.08 U/ml depicting physical mutagenesis can be a potential strategy of strain improvement to fulfil the industrial needs.

PP-55

Production and application of ligninolytic enzyme for environmental sustainability

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Ligninolytic enzymes have a wide range of application ranging from delignification of lignocellulosic materials, recalcitrant organic pollutant removal, treatment of wastewater, decolorization of dyes, treatment of soil to bio-pulping and bioleaching in paper industries, enzymatic polymerization in polymer industries and etc. Above all, environmental problems are a zone in which these enzymes deserve special mention. Fungi, especially basidiomycetes species, are presently an important group of organisms which are popularly explored now-a-days as a rich ligninolytic enzyme source. Myco-bioremediation, with the basidiomycetes species could thereby be a promising technology because of their enzyme system for the degradation of a wide range of environmentally toxic compounds. These extracellular ligninolytic enzymes, include laccase, manganese peroxidase, and lignin peroxidase which acts on the hazardous compounds, inclusive of the insoluble ones, as a source of nutrient and converts them to simpler fragmented forms. If economy is taken into consideration the cost of the culture medium can be a significant fraction of the enzyme cost if an expensive substrate is used for the production. On the other hand, sugarcane bagasse, coconut coir, peanut shell, soybean bran, which are agro-wastes are cheap, sustainable, complex source of nutrients which are negligible in cost in comparison to the ultimate enzyme cost as well as if not in use contributes as an environmental pollutant. Thus, they possess the full potential to be chosen as a substrate that can influence enzyme productivity which ultimately would be quite economic with respect to the total enzyme cost. White-rot fungi produce these enzymes in abundance and this potential of white-rot fungi can be harnessed to the treatment of such agro-industrial waste which ultimately would enable the efficient degradation of recalcitrant compounds under an in vivo condition by the maintenance of the sustainability of the processes involved.

PP-56

Secondary metabolites in pathogenesis

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Microorganisms generally use small molecules known as secondary metabolites as signal indicators to control their gene expression. It is believed that microbes use these indicators or signals to get a competitive benefit over their competitor pathogens. Natural compounds from microbes are significant small compounds that play major functions in different biological activities like growth, locomotion, nutrient requirement, stress behavior, biofilm synthesis, defense etc. This is believed, pathogenic microbes use such compounds to control their virulent properties and their existence during infections. Here are a few examples of secondary metabolites, homoserine lactones (HL), modified oligopeptides, aromatic alcohols, indole-3-acetic acid (IAA) etc. These informational systems may provide new strategies for making antimicrobial compounds/drugs. In microbial interactions they use different molecules with particular functions, like real time analysis of the environment, communication with neighboring microbes or hosts and providing the virulence.

PP-57

Application of wheat bran and rice husk for ligninolytic enzyme production by white rot fungi

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Agricultural wastes such as wheat bran and rice husk are an excellent provider of nutrient sources such as carbon and nitrogen. They are present in ample quantity and are economic and an outstanding substrate for enzyme production. They are typically composed of cellulose, hemicellulose, and lignin. As lignin holds a recalcitrant structure, not easily degradable in nature it leads to the generation of unwanted waste that ultimately leads to stubble burning and contributes towards pollution. Experimentally it has been proven that these agricultural residues can act as good substrate for ligninolytic enzyme production, thereby, can efficiently be used by microbial sources. White rot fungi, belonging to the basidiomycetes group, being an eukaryotic system has been studied for many years. *Pleurotus spp*., an abundantly studied white rot fungi, has been reported to show ability to use up such lignocellulosic wastes to produce extracellular laccase at a quantity of 200U/mL when grown on wheat bran and 156U/mL on rice husk. Thus, depicting that these lignocellulosic wastes can be used for industrially important enzyme production like laccase, which is having the potential to degrade even carcinogenic compounds but may show variation with respect to strains for utilization of each type of substrate.

PP-58

Lignocellulosic waste: A promising substrate for enzyme production by *Coprinus* species, a white rot fungus

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The lignocellulosic waste like sugarcane baggase, rice husk, wheat bran, barley bran, corn cob, saw dust, groundnut shell refers to plant dry matter, non-starchy fibrous, waste materials representing to be a primary source of cellulose, hemicellulose and lignin. *coprinus* species belongs to basidiomycetes class having the ability to degrade the complex lignocellulosic substances by the production of laccase, manganese peroxidase, lignin peroxidase, carbomethylcellulase (CMCase). Studies have shown that the extent of degradation of such substrates by the microorganisms, the type and production of enzymes vary from one lignocellulosic waste to other. In rice husk, *coprinus* species provide a higher amount of manganese peroxidase (3.83-5.10 U/mL) on 15th day, whereas in sugarcane baggase the yield of laccase is higher (151.6 U/L). *Coprinius* species can produce CMCase (33.92 U/L) and laccase (112.4 U/L) in wheat straw. Due to its higher yield for laccase enzyme, this species is used to study laccase production capacity of fungi. This enzyme has importance in removal of harmful and carcinogenic substances from soil by acting as a bioremediating agent. Laccase has the ability to detoxify environmental pollutants, also have importance in industries of textile, pharmaceuticals, cosmetics, bioremediation. Thus, such types of enzymes can be produced by the utilization of agro-industrial waste as an economic means for their production.

PP-59

Growth promotion of Wheat var. HD2687 and Maize var. PSCL4642 seedlings under salinity condition by using Plant growth promoting bacterial isolated from *Bougainvillea glabra* rhizosphere

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Wheat and maize crops provide a nutritionally-rich diet that contributes to man's food security. Their growth, however, is reduced under a stressed abiotic environment like salinity. Plant microbiome are connected with each plant tissue and develops the holobiont in association with the plant. Plants actively manage the configuration of their related bacterial population and its function. Such microbes provide a broad range of benefits and advantages to the plants. The objective of our research was to examine the growth development of Wheat HD 2687 and Maize PSCL-4642 cultivars under a saline environment at the seedling stage with after inoculation of salt-tolerant PGPR bacterial isolate BoGl123 purified from *Bougainvillea* glabra rhizosphere. The number of seed germination with/without bacterial inoculation is tested at 50, 100, 150, and 200 mM concentrations of NaCl with both crops. In contrast to controls with 50 mM NaCl concentrations, BoGl123 isolate provided higher radicle length in maize (34 mm) as well as in wheat (26.8 mm). At 100 mM NaCl, however, the radical length of wheat and maize seedlings decreased respectively to 212 mm and 140 mm. Inoculation of plants with BoGl123 isolate enhanced plumule length of seedlings in contrast to controls at different NaCl concentrations. In comparison with control, BoGl123 improved the plumule length of wheat to 38.2, 18.0, and 6 mm at 50, 100, and 150 mM NaCl concentration, respectively. Present study results have supported the idea that PGPRs could help increase the tolerance against saline stress in wheat and maize seedling stage.

PP-60

Stability of White Rot Fungi after physical mutagenesis

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White-rot fungi produces various types of ligninolytic enzymes that possess the capability of transforming or degrading a broad range of xenobiotic compounds, phenolic groups, secondary aliphatic polyalcohols etc. Mutagenesis is a process which could be used to obtain a strain which would possess a capacity to produce a larger quantity of required enzyme by the wild strain but in such a study strain stability is an important point of concern. White rot fungi, as an organism of choice for mutagenesis for enhance production of ligninolytic enzymes are now-a-days experimented. Along with their enzyme productivity, survival percentage and the optimum range of applied physical mutagenic agent are important parameters to be taken into consideration. Experimentation on *Pleurotos ostreatus* by ultraviolet radiation was used as a physical mutagenesis for enhancement of laccase production. The mutant strain obtained after mutagenesis was named as UV-6 with higher laccase activity with laccase activity around 135U/L, which was 77% higher than that of the non-mutagenised strain. UV irradiation subjected to *Phanerochaete chrysosporium* strain for 30 secs of exposure has exhibited a stability rate of around 54.4%. The other physical mutagen that can also be employed is X-rays. X-rays on white rot fungal strain *Pycnoporus cinnabarinus* has also shown an enhanced laccase production after an exposure for a maximum of 8 secs. Beyond 8 secs there was decrease in production along with decrease in survival rate and stability. Thus, strain stability holds an important parameter to be checked along with an enhanced production of the desired enzyme after mutagenesis.

PP-61

Strain Stability for efficient laccase production on mutagenesis

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Laccases are the lignolytic enzymes being produced by higher plants, fungi and some bacterial groups naturally. Laccases use molecular oxygen to oxidise various aromatic and non-aromatic compounds and can be used for bioremediation of toxic compounds. Main requirement for bioremediation by such enzymes is to get a stable strain with high production of enzymes. Wild strains fail to achieve so as naturally they produce insufficient amounts of enzymes. Strain improvement by traditional mutagenesis (random screening) is one of the strategies to get a mutated strain with desired characters. Industrial strain improvement can lead to increased productivity but strain stability plays an important role in this process. The point of discussion is to focus on the factors affecting stability of mutated strain and its importance. Strain stability helps to ensure that any gains in production persists in mutated strain and no loss of any desired character will be there after successive generations or under conditions like extensive growth for biomass production etc. Stabilised strain guarantees the quality of laccase produced. As the previous studies have shown that *Shiraia sp*. GZS1 strain was mutated using ultraviolet irradiation. It was highly stable and active in broader pH range, higher optimal catalytic temperature, more active under alkaline conditions. A newly isolated laccase-producing strain *Shiraia sp*. GZS1 and a genetically stable mutant GZ11K2 had 1.82 times laccase activity compared with that of the wild strain.The mutant GZ11K2 with higher laccase productivity and enhanced enzyme properties can be used in biotechnological and industrial applications.

PP-62

Plastic-degrading bacteria in greater wax moth larva (*Galleria mellonella* L.)

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Plastics are considered one of the hazards for the environment because of their non-biodegradable property. The chemical composition of plastic is mainly long hydrocarbon chains of ethene (polyethene), and polypropyplene is the important plastic type generally found in wastes. Among the several attempts made by scientists to overcome and reduce this environmental problem, the development and use of eco-friendly biodegradable plastics is one receiving much attention in recent years. It involves decomposition or breakdown of organic materials into smaller compounds including CO_2 and H_2O through microbial action. However, the degradation process is slow and the manufacturing process of biodegradable plastics is costly and non-economical. Therefore, it has become essential to find an alternative way for a more efficient and economical method of plastic degradation by natural means. Recently, a great discovery was reported about the presence of bacterial strain(s) in the larval gut of greater wax moth (*Galleria mellonella*), which has the capacity to digest plastics within a week. The plastic digesting ability of the gut bacteria has been described as the result of one probable enzyme, laccase-like multi copper oxidase (LMCOs) synthesis. Wax moth larva is a natural predator in honeybee hives feeding on beeswax and propolis, and causing damage in combs by making galleries. Beeswax has a similar chemical composition with that of polythene and hence laboratory experiments have shown that wax moth larvae have the ability to feed and digest plastics when they are kept under starved conditions. Concerted attempts are still underway in order to identify and isolate the bacterial enzyme responsible for this polythene digestion. The isolation and artificial synthesis of this particular enzyme will be highly profitable since it is the fastest known method of plastic degradation when compared to other known methods. In future, it is envisaged that this bacterial enzyme will be able to resolve the biggest problem of plastic pollution which our planet is facing today.

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Characterization of plant growth promoting rhizobacteria isolated from jeevamrit for enhanced production of turmeric

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Agriculture is an essential component to maintain the human health but due to sudden increase in population the demand has increased and to meet the requirement the use of chemical fertilizer has also increase. The continuous use of chemical fertilizer and pesticides degrade the quality and fertility of soil and also reduce the yield. The organic inputs such as jeevamrit consists abundance of beneficial microorganisms that promote the plant growth and yield. Jeevamrit is prepared by aerobic fermentation of cow's dung, urine, gram flour, organic soil and jaggery which showed greater load of microorganisms such as bacteria, fungi and yeast. By keeping in view the above points the isolation and characterization of plant growth promoting bacteria from jeevamrit was done and their effect on plant growth promotion of turmeric was studied. From jeevamrit 64 bacterial isolates were isolated and screened for various plant growth promoting activities. Out of 64 only 48 bacterial isolates were chosen on the basis of plant growth promoting activities such as P-solubilization, Nitrogen fixer, Siderophore production, HCN production, IAA production and Antifungal activity. From the selected bacterial isolates 67.78% were P- solubilizers, 60.37% were Nitrogen fixer, 62.37% were Siderophore producer, 34.29% HCN producer, 45.88% IAA producer and 78.22% show antagonism against *Pythium graminicolum* and 74.81% show antagonism against *Collectotrichum capsici*. Hence these bacterial isolates can be used for environment friendly sustainable agriculture systems and act as alternative to harmful chemicals.

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Diversity analysis of resident bacterial population associated with tomato rhizosphere inoculated with PGPR

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Microbial diversity is the principal unexplored domain of life under intensive investigations. The massive arrays of microbial activities are of considerable importance to the biosphere and human economics. This postulates stout reason for understanding their diversity, conservation and hence exploitation. Amid different vegetable crops, Tomato (*Solanum lycopersicum* L.) is the second most significant cultivated vegetable crop grown world-wide in tropical and subtropical regions. Since decreasing the use of fertilizers in agriculture has become mandatory, especially on vegetable crops, the potentiality of PGPR (Plant Growth Promoting Rhizobacteria) is steadily increasing as it offers an attractive way to replace the use of agro-chemicals. There are numerous microbial communities that can benefit the tomato plant. On the basis of broad range of PGPR and biocontrol activities, eight efficient bacterial isolates S16, N23, N24, N26, N29, N30, N39 and N43 were selected that possessed significantly higher P-solubilization (225.00 µg/l), IAA production (82.00 µg/l), siderophore production (125.23 % SU) and *in vitro* antibiosis (62.5 %) against major fungal pathogens of tomato. These efficient isolates were further selected for identification up to species level by molecular technique based on 16S rDNA partial sequence analysis. The BLASTn search of the obtained sequences revealed the presence of bacteria belonging to genus *Acinetobacter calcoaceticus, Pseudomonas* sp., *Pseudomonas aeruginosa, Serratia marcescens, Enterobacter* sp. and *Bacillus* sp. showing 100 % and 99 % similarity with their already reported isolates of NCBI database in the NCBI GenBank database.

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Phosphate solubilization by bacterial isolates from cauliflower rhizosphere soils

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Many agricultural soils contain a high amount of phosphorus in insoluble form which is not available to crops. Its availability to plants can be improved by the application of phosphate solubilizing bacteria (PSB) as bioinoculants. This study aimed to isolate and determine the potential of native PSB from the rhizosphere soils of cauliflower grown at district Hamirpur of Himachal Pradesh. Out of a total of 275 morphologically distinct bacterial isolates obtained, 64 were found to be phosphate-solubilizers. These bacterial isolates showed variations in their ability to solubilize tricalcium phosphate (TCP) qualitatively and quantitatively. They were also screened for additional plant growth promoting traits. All the phosphate solubilizing bacterial isolates exhibited the ability to fix atmospheric nitrogen whereas they differed in their ability to produce indole acetic acid (IAA), hydrogen cyanide, siderophore, ammonia, amylase and protease. Maximum IAA production was recorded to be 37.70µg/ml among the phosphate solubilizing bacteria. Four isolates of bacteria from cauliflower rhizosphere soil which efficiently solubilized TCP (392.88 to 454.55µg/ml in liquid medium) were identified by 16S ribosomal RNA technique. All the four isolates belonged to genus *Pseudomonas* (*Pseudomonas baetica* strain BAL11, *Pseudomonas fluorescens* strain NER32, *Pseudomonas* sp. strain NAD11 and *Pseudomonas* sp. strain MUN6). These phosphate solubilizing bacterial strains offer the potential to be used as bioinoculants in sustainable production of cauliflower under low hill conditions of Himachal Pradesh and reduce the utilization of agrochemicals.

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Congenital Adrenal Hyperplasia

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Congenital adrenal hyperplasia (CAH) is an autosomal recessive disorder which involves deficiency of an enzyme produced by adrenal glands, involved in the synthesis of cortisol, aldosterone, which results in affecting normal growth and development. The most common type of CAH affects approximately 1:10,000 to 1:15,000 people in the U.S and Europe. The statistical data of India is undetailed and varies with different types of CAH. Major symptoms in infants embrace ambiguous genitalia in girls and an enlarged penis in boys. Although, primary symptoms such as vomiting, alteration in blood pressure, headache are visible during the initial stage of the disease, may deceive the physician leading to its false diagnosis at an early stage and can eventually lead to severe complications and even death. Inadequate data & knowledge, illiteracy, backwardness, unavailability of hospital infrastructure and proper medical guidance are among other reasons which render this rare genetic disorder undiagnosed and untreated. Treatment of CAH includes monitored hormone replacement therapy alongside lifetime medication and reconstructive surgery. In children, replacement of missing cortisol with oral hydrocortisone is a popular option while in grownup children Dexamethasone or Prednisone can be used. Although these treatments are not very effective, long-term management, continuous monitoring, and strict follow-up of suggested treatment enhance the effectiveness of ministration. This study is designed to draw the interest of doctors & researchers and to create awareness among the people for a safe and effective remedy for CAH can be inferred.

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