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Current Trends in Biosciences
(SciCon CTBio) - 2017

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- International Conference

BOOK OF ABSTRACTS

Scire Science

August 21 - 23, 2017, Cochin, India

SciCon Series on

CURRENT TRENDS IN BIOSCIENCES

(SciCon CTBio)-2017

BOOK OF ABSTRACTS

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Cochin, India

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The abstracts in this book are synopsis of those presented during the International Conference of SciCon Series on Current Trends in Bioscience (CTBio-2017), at Cochin, India, on August 21-23, 2017, organized by Scire Science.

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PREFACE

There is huge propulsion in the stock pile of research and advancements in bioscience over the past few years. The advancements in science are anchored by apposite communications. SciCon Series by Scire Science organizes conference and workshop series, which enroute the path of researchers, scientiststs, academicians, industrialists and policy makers towards betterment of the society by providing a pertinent platform for sharing the thoughts and research contributions with outstanding interaction opportunities. Presenting research works and understanding the current state of science is highly required for moving ahead to accomplish more achievements in scientific fileds.

International conference on Current Trends in Bioscience (CTBio), has been devised to create a vibrant medium where the candidates are able to delve on the deep roots of bioscience as each session unravels its versatality. Considering the fact that an inspirational discussion can lead to a productive futuristic development, Scire Science witnesses for a panel discussion on the title theme in the conference.

The book contains abstracts of research works by researchers and scientists of various institutions in the field of bioscience.This multidisciplinary global conference thrusts the aeas such as Animal Bioscience, Biochemistry & Biotechnology, Clinical & Biomedical Science, Computational Biology, Ecology and Environmental Science, Energy Bioscience, Food and Nutrition, Industrial Bioscience, Marine and Fisheris Bioscience, Microbial Science, Nanobioscience, Phytopharmacology Science and Plant and Agricultural Sciences. The unfathomable diversity and beauty of Cochin is a perfect choice for venue which will surely amplify the spirit of the gathering

Scire Science has already excelled passionately in creating science communication platforms such as, SciCon series, Summer school, Science project contests, Journal, Newsletter and Books. Scire recognises and honors the proficient researchers and scientists considering their experience and expertise.

Greatly acknowledge the gratefulness to the keynote speakers, authors, session chairpersons and attendees, whose contributions are inestimable. Scire Science expresses heartfelt gratitude to the chair, advisory, project team for their commendable efforts and supports.

SciCon CTBio-2017

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PLENARY LECTURES

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PLENARY LECTURE- 01

Plant intelligence

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Plants are more evolved and diversified than what we have understood so far. The understanding of plant species, sadly, is limited to their identification, classification, anatomy, physiology and biochemistry. When deciphering plants and their life on the above mentioned aspects, the scientists have been more objective and mundanely subjective in their narration. For a common man, students and straight jacketed scientists, plants are nothing more than entities which 'grow'. Our analysis of plant 'sense' in reference to its behavior under a set of environment, is again limited to the role of biochemicals operating around it and the resultant physiology. Similar activity operating in an animal system including humans, are tagged as 'intelligence' and are deciphered in so many ways using adjectives such as behaviour, emotion, higher intelligence etc.

The dictionary meaning of intelligence in animals, including animals, is largely referred to, as 'a problem solving ability'. On the same measure, plants should be considered as highly intelligent biological entities. As plants do not interfere, in our domain of 'living', our interest in plant intelligence is very limited and do not stretch beyond plant sense. Investigations into plant intelligence, though initiated more than one hundred years back with path breaking discoveries by the world renowned botanist, Sir Jagadish Chandra Bose, such investigations did not generate wide spread interest among scientists and to most, such studies, though sporadic, remained non-science and were dismissed all along as non-sensical metaphoric narratives on plants. So much so, even Charles Darwin was criticized as a senile old man, when he floated the 'root brain' theory in support of plant intelligence.

Since a decade, there is an excitement abound with plant scientists, who have, with new tools available, been quite successful in convincing the world or at least a few botanists, the existence of 'intelligence' in plants, as similar with other living organisms, so far as their ability to 'live' in an environment solving all their problems in their own unique and innovative ways. Plants, in the absence of such intelligence mechanisms would not have survived so long, for billions of years, on this earth. This is no more a fundamental research but has a greater practical application in human life as well. The most sought after application as foreseen by me would be in practical Agriculture. Hence, it's time, we also get onto the bandwagon of so called 'Plant neuro-biologists' to decipher deep into the exciting world of 'minds' of plants!

PLENARY LECTURE- 02

Engineering at the nanoscale: a strategy for developing high performance functional biomaterials

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The talk will concentrate on various approaches being used to engineer materials at the nanoscale for various applications in future technologies. In particular, the case of clay, carbon nanostructures (e.g. nanotubes, graphene), metal oxides, bionanomaterials (cellulose, starch and chitin) will be used to highlight the challenges and progress. Several polymer systems will be considered such as rubbers, thermoplastics, thermoetts and their blends for the fabrication of functional polymer nanocomposites. The interfacial activity of nanomaterials incompatibilising binary polymer blends will also be discussed. Various self assembled architectures of hybrid nanostructures can be made using relatively simple processes. Some of these structures offer excellent opportunity to probe novel nanoscale behavior and can impart unusual macroscopic end properties. I will talk about various applications of these materials, taking into account their multifunctional properties. Some of the promising applications of clay, metal oxides, nano cellulose, chitin, carbon nanomaterials and their hybrids will be reviewed. Finally the effect of dewetting up on solvent rinsing on nano scale thin films will also be discussed.

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PLENARY LECTURE- 03

Cancer Stem Cells—Perspectives on Current Status and Future Directions

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Tumor consists of heterogenous populations of cells. The cancer stem cells (CSCs) hypothesis assumes that a tumor is hierarchically organized and not all the cells are equally capable of generating descendant, similarly to normal tissues. Only the cells being able to self-renew and produce a heterogenous tumor cell population are cancer stem cells. CSCs might be derived from normal stem cells, although progenitor cell population is cancer stem cells. Genetic analyses have shaped much of our understanding of cancer. However, it is becoming increasingly clear that cancer cells display features of normal tissue organization, where cancer stem cells (CSCs) can drive tumor growth. Although often considered as mutually exclusive models to describe tumor heterogeneity, and there has been an enormous interest to target cancer stem cells (CSCs) for clinical treatment because these cells are highly tumorigenic and resistant to chemotherapy. Unfortunately, CSCs seems to be quite refractory to available therapeutic strategies due to the action of drug efflux mechanism, a hallmark of cancer stem cells. Combination Chemotherapy therapy and Immunotherapy offer new mechanism of action to target Cancer Stem Cells and it has received significant interest as an alternate therapeutic approach.

PLENARY LECTURE- 04

Future academic strategies for higher education in Horticulture

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In recent days the young generation are opting more towards technical courses like medical, engineering, agriculture/horticulture and allied fields. The meritorious students who could next afford costly medical and engineering fields are looking forward towards life science discipline like Horticulture. Horticulture is of great economic and social importance globally. It is a considerable contributor to global physical and psychological health - through the constant and reliable supply of safe foods and also through the production of ornamental plants, for social activity and to enhance our environment. With a world that is growing in population and also facing enormous environmental and economic changes, the need for experts in all sectors of horticulture will increase not decrease. The real change is a shift in needs, rather than 'no need'. Change is actually bringing about newer and broader opportunities for well qualified, general and also specialized horticulturists. This is apart from the fact that current lower graduate output will create a shortage in the future in all sectors including environmental horticulture, crop growing and the nursery trade. Hence, the following strategy in horticulture tone higher education is required.

Efforts to start new UG/PG programmes in Hort. and food science, MBA in Horticulture, Hort. Engineering and post harvest technology, High tech Horticulture, Bio technology in Hort. etc., Introduction of interdisciplinary teaching programmes – such as organic Horticulture, Food science and technology, sustainable Horticulture etc. similarly to make efforts to establish centre of excellence or school of advanced studies *viz*., crop protection, Hort. Nursery, Natural Resource management, school of crop improvement, seed production etc., Higher professional training in reputed universities both National and International level.

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PLENARY LECTURE 05

Marine Microbes – a potential goldmine for novel bioactive compounds – strategies for discovery and development

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Microorganisms exhibit great diversity in terms of their nutritional and physiological capabilities. This helps them occupy every possible niche on planet earth ranging from tropical to polar regions; from top of mount Everest to great ocean depths. Oceans cover 2/3rd of earth's surface and offer a range of habitats on a vertical and horizontal scale. The special environments offered by the oceans include the hostile black smokers and rift valleys to hugely productive coral reef ecosystems. Unlike the terrestrial environments, the hostile nature of the oceans, make it relatively difficult for the researchers to venture out and explore. Coupled with this the requirement of special logistics such as research vessels and special instrumentation to sample ocean depths make it rather unexplored and hence offers great potential. Emergence of infectious agents in different parts of the world that are often caused by multidrug resistant organisms, warrants the discovery of new antimicrobial agents. In this context the seas around us are often looked up as potential habitats for microorganisms producing novel antibiotic agents/ bioactive compounds. 'Drugs from the sea' is a major research initiative of govt. of India. Though the research in this regard has lead to the discovery of some of the marine microbial bioactive metabolites such as Marinomycin C, Sporolides, Griseorhodin A etc., the unculturable nature of many marine microorganisms pose major challenge to such efforts. New discovery strategies using metagenomic approach and metabolic engineering are paying rich dividends and the search is on with the help of latest technology. Cost effective next generation sequencing (NGS) platforms also help in a big way in the search for novel bioactive molecules from the hidden majority of marine microbes.

Social relevance of the study

Development of novel drugs and bioactive molecules are of utmost importance to societal needs as the frequent episodes of diseases caused by emerging infectious agents that are multi drug resistant pose threat to our existence.

PLENARY LECTURE 06

3D bioprinting: 'Print your own organs'

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3D bioprinting – often referred to as "bioprinting" – is the process that allows scientists to generate and assemble cellular layers to form organic tissues and has the potential to be a 'game-changer', printing human organs on demand, no longer necessitating the need for living or deceased human donation or animal transplantation. While scientist already use 3D printing process to create custom implants and prosthesis in polymeric or metal materials, bioprinting implies the use biocompatible materials, cells and supporting components into complex 3D functional living tissues. Thus the tissues and organs that are created by this technology are considered to be both biological and artificial. Although the technology is not yet at the level required to bioprint an entire organ, 3D bioprinting may have a variety of other mid-term and short-term benefits that also have positive ethical consequences, for example, creating alternatives to animal testing, filling a therapeutic need for minors and avoiding species boundary crossing and developing high-throughput 3D-bioprinted tissue models for research, drug discovery and toxicology.

PLENARY LECTURE 07

When machines become intelligent

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Machine Learning is an attempt to understand how our brain learns and makes intelligent decisions with the hope that we may build silicon based brains in robots that are super intelligent and can work in hazardous environments. Though it has been a distant dream for over four decades, recent advancements in computatng power and data handling capabilities of machines seems to give promising results. While the human brain is still much more complex and efficient than these machines, these models tell us what best we understand about our cognitive capabilities. Today, Google is able understand our questions and provide us with intelligent answers and suggestions that are apparently more compete than what domain experts in the field can provide. Facebook, Amazon and many other companies use machine intelligence for maximizing their customer satisfaction as well as profit. The use of machine intelligence in medicine, environmental studies, genome studies and personalize medical care and self curing nano sized robot implants for continued health monitoring and emergency decision making in critical situations are all emerging fast as reliable solutions to century old challenges. The talk shall highlight some of the recent developments in this area.

Social relevance of the study

The future is going to be different. From macroscopic statistics to microscopic details and intelligent machinesand self learning robotic implants, every mode of life will be revolutionary. The implications are not fully understood and demands lot of research

PLENARY LECTURE- 08

Green coffee with enriched antioxidants as nutraceuticals in food formulations

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Phenolics are pervasive dietary antioxidants. Among these, chlorogenic acids established significant attention for their wide distribution and part of the human diet with prospective biological effects. Green coffee refers to coffee made out of un-roasted coffee beans with an active compound called chlorogenic acid (5–12 g/100 g), in large quantities with potential health benefits for consumers. Current food production trends include not only the protection of food components but also the fabrication of products with pro-health properties through the introduction of antioxidants. Recent studies established that the green coffee consumption exhibited health benefits such as reduced blood pressure, acceleration of metabolism, weight loss, modulation of glucose metabolism in humans etc., India is one of the major coffee producing country and hence can be exploited for Preparation of green coffee and the raw material can be utilized to prepare required products which finds applications in food, beverage, pharmaceutical industry and besides be economically viable. The green coffee conserves were extracted from raw coffee beans, pre-treated, decaffeinated (95± %) and enriched with chlorogenic acid (70± %). The Green coffee extracts exhibited 90 % antioxidant activity. Also, microbial safety and absence of Ochratoxin infers food protection. Standardization and stabilization, nanoencapsulation, formulations using the extracts for functional foods with their quality evaluation and stability will be dwelt. Considering the current health and the life style pattern of the public, preparation of green coffee extract, value added products, and food formulations are developed for incorporation in our daily diet.

Social relevance of the study

The biotechnological approaches for value addition of green coffee and its products would embrace green coffee consumption towards health consciousness among all sectors of the human with user-friendly food products as an instant energy source.

PLENARY LECTURE- 09

Structurally modified metal nano particles for living cell bioimaging application

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Among transition metal oxides, copper oxides are of special interest because of their efficiency in heat transfer application and an industrially important material that can be widely used in numerous applications. In particular, the two main copper oxide phases, cupric (CuO) and cuprous (Cu_2O), are considered among the most important semiconductors with a band gap (Eg) of 1.2 and 2.0 eV, respectively. Cupric oxide (CuO) is a *p*-type semiconductor which has been extensively used in a range of applications such as catalysts, gas sensors, lithium ion electrode materials, and field emission (FE) emitters. In recent years, many efforts have been employed to prepare CuO in nanosize to improve its performance in currently accessible applications. However, to the best of our knowledge, there has been no green synthesis report is available so for to depict the synthesis of CuO nanostructure by using copper metal complex as a precursor. The fluorescent tag attached chemosensors have been extensively used for biological applications; first and foremost in imaging and assays. Among the variety of fluorophores, rhodamine derivatives have attracted many research groups due to the high fluorescence quantum yields, excellent photophysical properties such as long absorption and emission wavelengths, and large absorption coefficients. Herein, we report preparation of fluorescent capped CuO NPs for live cell imaging application.

Social relevance of the study

Based on above spotlights, we designed and synthesized a novel cost effective, low LOD and reversible probe can be an effective tool for heavy metal detection in clinical trials.

PLENARY LECTURE-10

Biorobotics

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Bio-robotics is the use of biological characteristics in living organisms as the knowledge base for developing new robot designs. It also refers to the use of biological specimens as functional robot components. Bio-robotics intersects the fields of cybernetics, bionics, biology, physiology, and genetic engineering. As robots become more sophisticated and embedded in our lives, Human-Robot Interaction & Coordination (HRI&C) has emerged as a sub-discipline that focuses on the behavior and place of robots in society. Progression of medical technology has brought dramatic improvements in surgical outcomes and prognosis. Recently, robotic-assisted minimally invasive surgery has been emphasized for reducing large invasiveness of traditional surgical techniques. It has been applied in the cardiothoracic, abdominal, urologic, and gynecologic fields. Scientists are also exploring the potential for early diagnosis of autism by monitoring sensory-motor development through mechatronic-sensorized toys, such as rattles with force and contact sensors. Biorobotics has revealed new challenges regarding mechanical design, sensor integration, control theory, robustness, adaptability, and so on. These challenges must be overcome if we are to significantly reduce the performance gap that exists between biological and robotic system.

PLENARY LECTURE- 11

Molecular therapeutics to dengue virus infection

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Dengue virus (DENV) infection is one of the most important mosquito-borne diseases with clinical symptoms including altered hematology, vascular permeability and organ injuries. Liver is one of the major site of DENV replication where hepatocyte apoptosis contributes via the extrinsic and intrinsic pathway, which finally contributes to liver injury. Phosphorylation of classical mitogen activated protein kinases (MAPKs) including p38 MAPK, c-Jun N-terminal kinase (JNK) and extracellular-signal regulated kinase (ERK) at the post-translational level was reported to be increased during various infections with induced expressions of pro-inflammatory cytokines. We investigated the role of these MAPKs and the efficiency of MAPK inhibitors (SB203580, SP600125 and FR180204) in our established mouse model of DENV infection with liver injury. MAPK inhibitors reversed the hematological parameters, liver transaminases and liver pathology in DENV-infected mice. They also modulated some of the pro-inflammatory cytokines and chemokines in the DENV-infected mice. In DENV-induced apoptotic events, MAPK inhibitors reduced the cleavage of apoptotic caspases including caspase 3, caspase 8 and caspase 9, suggesting their role in the extrinsic and intrinsic pathway of apoptosis. We did not observe any reduction in the DENV number upon treatment with MAPK inhibitors, which suggest their contributory role in host responses. These inhibitors reduced the phosphorylation events of MAPKs and thereby reduced apoptosis in DENV-induced liver injury; this suggest the mechanism by which MAPKs inhibitors prevents liver injury. Our findings pave the possibility of MAPK inhibitors as therapeutics to reduce liver injury during DENV infection, however further functional clinical studies are required.

Social relevance of the study

Our findings suggest the efficacy of mitogen activated protein kinase inhibitors as molecular therapeutics towards DENV-induced liver injury

PLENARY LECTURE- 12

Coconut bio-fuel-a new renewable energy source for sustainable fuel economy

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The fountain of inspiration in bioscience research is always from nature. So the methodological changes happened at cellular, molecular and nano level in biosciences have refined the concept of the subject in developing novel technologies for the well being of the society. This conceptual change has elevated the areas of food, medicine and environmental sciences in the production of value added food products of therapeutic value, natural drugs for diabetes and cancer and eco- friendly bio-fuels for environmental protection. Self sufficiency in energy requirement is a critical factor for the success of any growing economy. It is a paradox that with a rich natural biomass resource that can be converted in to renewable energy, the import trade of the country for petroleum product remains exorbitant. Hence the search for new alternative source for fuel from nature, that is renewable, safe and non- polluting has become a part of innovative research today. Apart from the nutritional and therapeutic properties of coconut oil, its use as a bio-fuel by transesterification of the oil to coconut methyl esters (CME) has opened a new avenue in the field of coconut oil industry. The functional property of CME produced from coconut oil by chemical transesterification was proved in diesel vehicle by test run, directly as biofuel with out any modifications in the engine and in fuel lines. The test run showed the technical specifications torque (Nm) and power (bhp) similar to the efficiency of diesel fuel. The low carbon residue, minimal acidity and the absence of sulphur elements support the fuel energy of CME as an ecofriendly fuel

Social relevance of the study

The production of CME as biofuel was made cost effective compared to fossil fuel through an integrated approach of developing CME from dehusked mature nuts by the effective industrial utilization of the sub-products from shell to glycerol during processing. Thus the data demonstrate a new trend in the field of renewable energy source and in the area of an eco- friendly biofuel production

Abstracts

ORAL PRESENTATIONS

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ABS -01

Histological study on the effect of chemically engineered Titanium dioxide nanoparticles on *Oreochromis niloticus*

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Titanium dioxide (TiO_2) is a wide band gap semiconductor with novel properties suitable for a number of technologically important applications. In this study, the main objective was to analyse the effects of engineered TiO_2-400, TiO_2-800 and TiO_2-Ce doped nanoparticles on the histology of *Oreochromis niloticus*. Nanoparticles of concentration 0.025g/L were added to the experimental group of fishes. After a study period of 14 days, gill, liver and kidney tissues were dissected from both control and experimental groups and examined for histological changes. Microbial analysis such as THB count and fungal growth were also observed before and after the introduction of nanoparticles. Treatment with nanoparticles resulted in several histological changes such as epithelial lifting, hyperplasia, interstitial oedema, epithelial rupture in the gill tissue, hepatocytic vacuolation, necrosis in the liver tissue, reduction in Bowman's space, occlusion of tubule lumen, dilation of glomerular capillaries, cytoplasmic vacuolation and necrosis in the kidney. Microbial analysis showed a marked decrease in the formation of bacterial and fungal colonies after the introduction of nanoparticle. Histopathological alterations like those observed in this study could result in severe physiological problems, ultimately leading to deterioration in health conditions and secondary infection and finally the death of fish. It was also seen that TiO_2 nanoparticles has an effect on the normal microbial fauna of water. Hence, it is unavoidable to take necessary steps for the careful handling of such nanomaterials and control the release of these chemicals into waterbodies.

Social relevance of the study

Presence of TiO_2 definitely affects living systems. Leaching of these NPs into ecosystem leads to bioaccumulation, especially in aquatic organisms. So its necessary to take precautions to avoid careless handling of NPs.

ABS-02

Study on spider diversity and web types of two agro ecosystems in Perumbavoor, Kerala, India

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Invertebrates are the most diverse and abundant animals in most natural ecosystems but their importance is commonly not appreciated. This may be due to fear, lack of public support and ignorance. One among these are the Spiders which belong to the phylum Arthropoda, class Arachnida and Order Aranea. This study aims to analyze the spider diversity and web types in the two agro ecosystems of Perumbavoor region, central Kerala. Spiders were collected from two different habitats-multicrop vegetation and monocrop vegetation during December 2016-May 2017. Specimens were collected once in a week. Opportunistic observations and Pitfall trap method were used for the collection of specimens. The data is analyzed using the software 'Primer 5'**.** A total of 38 species of spiders coming under 30genera belonging to 13 families were sighted from Perumbavoor region. Spider diversity was remarkably high in the multicrop vegetation with 27 species and low in the monocrop vegetation with 16 species. Among the two selected vegetation mixed vegetation showed high diversity (3.042) of spiders due to its heterogeneity. Rubber plantation shows lower diversity (2.629). Also Bray-Curtis similarity index shows least similarity in species between mixed vegetation and monocrop vegetation (28.349). The snares or webs differ greatly in structure among different spiders. Spiders classified into 13 families, 30 genera and 38 species were categorized into 8 principle types of web patterns such as Orb web weavers, Irregular web weavers, Cobweb weavers, Foliage hunters, Ground dwellers, Stalkers, Funnel web weavers and Ambushers. Present study highlights the importance of traditional multi cropping practice in sustaining biodiversity and the role of spiders in the agro ecosystems.

Social relevance of the study

In agro ecosystems spiders regulate the population of insect pests and other macro arthropods. Instead of chemical pesticides, these interesting model organisms can able to use as biological agents for insects control

ABS-03

Comparative assessment of diversity and nesting guild structure of dung beetles-Island versus mainland

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The aim of the present study is to make a comparative assessment of diversity and nesting guild composition of dung beetles across island and mainland regions. This is a pioneer study on the diversity of dung beetles associated with an island from Indian peninsula. Dung beetles were collected by bung baited pitfall traps from Vypin island and Muvattupuzha region during November 2016 to January 2017. Twenty species of dung beetles representing four genera and three tribes were recorded from both the study sites. Of the 20 species reported, *Onthophagus andrewesi* is endemic to Western Ghats. Comparative assessment of dung beetle diversity indicates that Vypin island supported a more speciose dung beetle community than Muvattupuzha region. But when dung beetle species abundance is taken in to consideration, though statistically not significant (P>0.05), mainland supported an abundant dung beetle population. Mean abundance per trap was also very high for Muvattupuzha (5.47) than Vypin island (4.03). Only six species were common to both the habitats. Five species were exclusively to Muvattupuzha region and nine species to Vypin island. Both the study areas differ significantly in nesting guild composition. Though species rich only tunnelers were recorded from Vypin island (100%), but both tunnelers (71.3%) and dwellers (28.7%) were present in Muvattupuzha region. Rollers were absent in both the study regions. High abundance of dung beetles in Muvattupuzha region is attributed to the use of cow dung as organic manure in the agrarian belts of the region. Complete dominance of tunnelers in the Vypin island is attributed to the type of soil present in the island and rapid desiccation of te dung patches present in the study site. Since the soil in the island is sandy loam when compared to the laterite soil in the mainland, tunnelers can easily tunnel through the soil and can separate and isolate large dung portions for their subsequent feeding and breeding. The presence of dwellers in the mainland is attributed to the availability of undisturbed dung pats.

Social relevance of the study

First time information on the diversity of dung beetles from an Island in Kerala.

ABS-04

Effects of chemically engineered $TiO_2$400, TiO_2-P25, TiO_2-La-3, NiO400, TiO_2-CoPc and TiO_2-FePc on *Eudrilus eugeniae*

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The acute toxicological effects of TiO_2, TiO_2 doped and NiO nanoparticles (NPs) in soils is largely unknown. In this work, we determined the 30-d toxicity of nanoparticles using a static test for earthworm. We found the 30-d LC-50 to be 0.5 g/kg. The minimum concentration can cause 99% mortality. However, long lasting contact with these compounds can lead to accumulation in the tissues and to increased toxicity. *Eudrilus euginiae* were maintained in media rich in organic matter and exposed to six kinds of nanoparticles $TiO_2$400, TiO_2-P25, TiO_2-La-3, NiO400, TiO_2-CoPc and TiO_2-FePc over an exposure period of 30 days. The nanoparticles were admixed at the concentration of 0.5mg/kg and 15 test organisms were introduced. The results were compared with Control. The reproducibility index of *Eudrilus euginiae* for 30 days was recorded. The histology of Eudrilus euginiae after 30 days was investigated. The media parameters such as pH, electrical conductivity, Organic carbon, Phosphorous, Potassium and its THB and fungal count were analysed. The reproducibility index has shown significant reduction on exposure to $TiO_2$400, TiO_2-P25 and TiO_2-La-3. Histological studies indicate loss of gut cuticle and gut epithelium integrity and damage in longitudinal and circular muscle. But the Physico-chemical properties of media were better in its P^H, conductivity and organic carbon. But there was no change in the potassium ans phosphorous content. The data suggest that the changes in histological and reproducibility index could indicate the possible deleterious effects over longer-term exposures of NPs based on titanium.

Social relevance of the study

Study shows TiO_2-CoPc have high positive impact on reproductive potential of earthworm. So it can be beneficial for farmers in agricultural purposes. Release of NP causing negative impacts can be controlled.

BB-01

Phenotypic and molecular screening of traditional rice varieties for blast and sheath blight resistance

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Rice Blast and sheath blight are the most devastating diseases causing major yield losses in every year worldwide. India being the center of origin of rice, numerous landraces adopted to overcome these biotic stresses and it had been proved that using resistant rice varieties would be the most effective way to control the diseases. Thirty traditional rice varieties (TRVs) were field screened for both blast and sheath blight resistance. The phenotypic evaluation has been showed that out of 30, none of the TRVs showed resistance to blast disease, whereas only one TRV (Bangara sanna-4) observed as moderately resistant to sheath blight under the uniform nursery. The genetic frequencies of both blast resistance genes and sheath blight resistance QTLs varied from 33.3% to 100%. Out of 30 accessions, the blast resistant genes, *Pizt* and *Pi7t* appeared to be omnipresent and gave positive express. As the second dominant, *Pikm* and *Pita* gene frequencies showed 80% and 63.3% respectively. The molecular marker linked to both *Pi54 and Pi1* genes produced positive bands in ten accessions, while the marker linked to *Pi2* and *Pi9* genes were found to be present in 16 and 14 accessions with genetic frequency of 53.3% and 46.6% respectively. Whereas, the markers linked to sheath blight resistant QTLs, *qSBR-9-1* and *qShB-7.3* were found to be present in all TRVs with genetic frequency of 100%. The QTLs, *qSBR-3-1* and *qSBR-11-3* were known to present in 15 and 17 rice accessions respectively while, a very less number of TRVs were found as positive for *qSBR-11-1 QTL* with genetic frequency of 33.3%. These results are useful in identification and incorporation of functional resistance sources from these germplasms into elite cultivars through marker-assisted selection for improved blast and sheath blight resistance in India and worldwide.

BB-02

Aromatase inhibitor(s):potential clinical use in ER-alpha-positive breast cancer

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Aromatase (CYP19A1) the key enzyme of estrogen biosynthesis, is often deregulated in breast cancer patients. It catalyzes the conversion of androgen to estrogen, thus responsible for production of estrogen in human body. However, it causes over-production of estrogen which eventually leads to proliferation of breast cancer cells. Identification of new small molecule inhibitors targeted against CYP19A1 therefore, facilitates to increase drug sensitivity of cancer cells. In this scenario, the present study aims to identify new molecules which could block or suppress the activity of aromatase enzyme by molecular docking studies using Schrödinger-Maestro v9.3. In this study we used in silico approach by modeling CYP19A1 protein the structure was subjected to protein preparation wizard; to add hydrogen and optimize the protonation states of Thr310 and Ser478 and Asp309 residues. Active site of the CYP19A1 protein was identified using Sitemap tool of Schrödinger package. We further carried out docking studies by means of Glid, with various ligands. Based on Glid score, potential ligands were screened and their interaction with CYP19A1 was identified. The best hits were further screened for Lipinski's rule for drug-likeliness and bioactivity scoring properties. Thus, we report two Rubivivaxin and rhodethrin compounds that have successfully satisfied all in silico parameters, necessitating further in vitro and in vivo studies.

Social relevance of the study

The studies revealed that Troglitazone has relatively lesser binding energy as compared to standard drugs and could be an inhibitor of CYP19A1. Moreover, novel compounds like Rubivivaxin and Rhodethrinhas also had shown lesser binding energy. Consequently, they may be considered as good inhibitors of aromatase enzyme and can likely be promising drug molecules for treatment of breast cancer patients.

BB-03

Molecular analysis of sheath blight QTLs in rice

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Rice is an important food grain and is a staple food for majority of the world's population. To meet increasing global demand and consumption, rice productivity must be enhanced. However, biotic stresses such as diseases have impeded rice cultivation both in the tropics and subtropics. Of them, sheath blight disease of rice is one of the most devastating diseases in rice caused by the pathogenic fungus *Rhizoctonia solani* Kuhn. Its management typically rallied on application of fungicides in combination with cultural practices. Because of its broad host range and polygenic nature of resistance, no complete resistance has been identified in rice germplasms for sheath blight disease. But sheath blight resistance is believed to be controlled by polygenic quantitative trait loci (QTLs). In this study 57 traditional rice varieties (TRVs), six popular and widely cultivated rice varietiesalong with susceptible check (HR 12) were phenotypically screened utilizing the colonized typhabits following SES scale for sheath blight. Except IR 64 which expressed moderate level of resistance to the disease, none could be found to be authentically resistant to this disease. In order to know the presence of QTLs governing sheath blight resistance, molecular evaluation was done with seven QTL linked SSR markers in the same lines. GK-9 (light brown) shown to be possess seven QTLs, followed by seven TRVs with six QTLs. Four TRVs like Mugadsuganda, Neergulabatta, Baba yam and Maikan did not possess even one resistant QTL for sheath blight disease.

Social relevance of the study

Till now no resistance source has been identified for sheath blight, So IR 64 which shown moderate resistance reaction can be utilized for future line of breeding works.

BB-04

Rhizoremediation of plastic by *Colocasia esculenta*

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Every year lots of wild animals have been brutally killed only by consuming plastic left overs. Several researches were taken place through out the years to find a relevant ways to get rid of plastic wastes, but none has reached a level close to eliminate it for good. *Colocasia esculenta* commonly known as Taro plant can be used as a tool to fight plastic pollution. Biodegradability of plastic materials in the Colocasia growing region is more than the non-colacasia growing region. The current study focus on the isolation and identification of strains capable of biodegrade plastic from Colocasia growing soil regions. 6 different bacterial strains were isolated, which is capable of degrading plastic from growing in selective media, serial dilution was performed and pour plate it in selective agar plates. Enzymatic screening studies were conducted with these bacterial strains. Degradation efficiency of plastic by these bacterial strains was also studied by incubating in LB broth for 3 month period. The identified strains were then used for molecular studies by DNA isolation and 16S rRNA PCR amplification. The molecular characteristic study was done by sequence analysis and phylogenetic tree construction. A 5 day old Colocasia plant was grown in a selective media for one month, and samples were collected in 5 day interval. The samples were analyzed by UV-vis spectroscopy. Calorimetric determination of samples was further studied for the presence of sugar (DNS method), total protein (Biuret method), phenol (modified Waterhouse method) and various amino acids (Ninhydrin test). The effect of these elements on the growth and activity of the the plastic degrading bacteria were also studied

Social relevance of the study

Rhizoremedial approach can be use as a simple, cheap, safe and efficient method to cure nature from the cleaches of plastic.

CB-01

Anti-diabetic drug development targeting PEPCK

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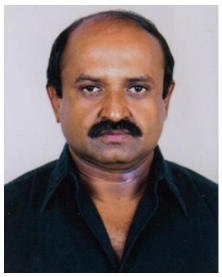
Phosphoenolpyruvate carboxykinase (PEPCK) is the key rate-limiting enzyme in gluconeogenic pathway, which helps to regulate blood glucose homeostasis. Insulin levels of diabetic subjects are insufficient to adequately inhibit PEPCK. Thus, inhibition of PEPCK is a promising new therapeutic approach for treatment of diabetes. With this rationale, there have been efforts to identify the residues in PEPCK that have major but not essential roles in catalysis. Natural compounds or phytochemicals have been used as modulators against diseases including diabetes, by regulating glucose metabolism. In our study computational methods were used to understand role of few essential amino acids (phenylalanine 510, 515, 525) of the enzyme. Molecular dynamics studies in nucleotide bound and unbound enzyme revealed that these residues are essential for enzyme catalysis. Virtual ligand screening of nucleotide derivatives from traditionally used antidiabetic plant derived compounds were performed by HTVS. Few compounds like genistein and tetrahydropalmitine when docked into the PEPCK model, bound to the nucleotide binding site of the enzyme. Further, molecular dynamics study and enzyme kinetics reactions showed that this interaction indeed lowered the rate of enzyme activity. The results indicate that this compound could be a novel PEPCK non-competitve inhibitor which needs to be validated in in vivo hyperglycemic models.

Social relevance of the study

Obtaining novel compounds from the rich biodiversity of North East India through HTVS could give us novel PEPCK inhibitors which can act as alternative to synthetic drugs (against diabetes) after clinical trials.

EBS-01

Evaluation of biomass and lipid content in the isolated algal strains from Western Ghats



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Continued use of petroleum sourced fuels is now widely recognized as unsustainable because of depleting supplies and the contribution of these fuels to the accumulation of carbon dioxide in the environment. Renewable, carbon neutral, transport fuels are necessary for environmental and economic sustainability. Biodiesel derived from oil crops is a potential renewable and carbon neutral alternative to petroleum fuels. Unfortunately, biodiesel from oil crops, waste cooking oil and animal fat cannot realistically satisfy even a small fraction of the existing demand for transport fuels. So microalgae appear to be the only source of renewable biodiesel that is capable of meeting the global demand for transport fuels because of its high photosynthetic efficiency, high growth rate and capability of accumulating lipids in their cells in stress conditions. Oil productivity of many microalgae greatly exceeds the oil productivity of the best producing oil crops. In the present study 10 microalgae strains were isolated and the growth analysis was done by recording the OD data at 600nm. The strains were mass cultivated upto 30 days after which lipid extraction and quantification was done. Among the strains *Desmodesmus subspicatus* (USB11), *Desmodesmus abundans* (GKVK3) and *Scenedesmus sp.* (USB12-3), *Scenedesmus armatus* (USB 10-18) and *Monoraphidium sp*. (HBB3) were found to be the fastest growing species in most of the media and waste water samples. Strains like *Chlorella vulgaris* (USB16), *Desmodesmus subspicatus* (USB11), *Monoraphidium sp*. (HBB3), *Scendesmus armatus* (USB10-18) and *Scenedesmus sp.* (USB12-3) showed high lipid content in the range of 20-40 % of the dry biomass.

Social relevance of the study

Biodiesel from microalgae is the only renewable biofuel that can completely replace petroleum-derived transport fuels without affecting to the supplying of food and other crop products.

EES-01

Process optimization and characterization for enhanced production of chromate reductase from *Bacillus amyloliquefaciens* for bioremediation of hexavalent chromium

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Chromate reductase production by a highly chromate tolerant bacterial isolate CSB 9 has been optimized to a high titer. This bacterium was previously isolated from a chromium contaminated site and identified as *Bacillus amyloliquefaciens* following biochemical and 16S rRNA gene sequencing. Chromate reductase activity of *B. amyloliquefaciens* (CSB 9) was associated with the production of extracellular enzymes. A soluble Cr(VI) reductase from *Bacillus amyloliquefaciens* was extracted and purified to electrophoretical homogeneity through $(NH_4)_2SO_4$ precipitation (60 %), dialysis and gel filtration chromatography (Sepharose CL 6B column) with specific activity of 0.167 U/mg, 6 % yield and 30.36-fold increase in purity. Based on sodium dodecyl sulfate-polyacrylamide gel electrophoresis, the molecular weight of the purified enzyme of interest was estimated to be ~ 116 KDa. The purified enzyme was further subjected to partial characterization which includes the influence of pH, temperature and storage stability. The optimum Cr (VI) reductase activity of purified enzyme for temperature and pH optima was 35 °C and 7.0 respectively on standard analysis condition. Using potassium dichromate as substrate, the enzyme showed maximum activity (*V*max) of 3.5 U/mL with its corresponding K_M value of 27.78 µM.The purified enzyme exhibited higher stability when treated with additives such as metal ions, K^+ (1.3 ± 0.056); surfactant, tween 80 (2.33 ± 0.52); inhibitor, β-mercaptoethanol (0.67 ± 0.15) and organic solvent, glygerol (1.33 ± 0.011).These remarkable qualities found with this enzyme produced by *B. amyloliquefaciens* could make this as an ideal candidate for bioremediation of hexavalent chromium under a wide range of environmental conditions

Social relevance of the study

In the cutting edge of Science and Technology, chromate reductases from chromium resistant bacterium can effectively substitute chemical methods for detoxification of Cr(VI), a widespread environment contaminant in India

EES-02

Diversity analyses of marine and brackish water ammonia oxidizing consortia generated for activating nitrifying bioreactors in recirculating aquaculture systems

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Marine and brackish water ammonia oxidizing bacterial consortia have been developed for the activation of nitrifying bioreactors for deploying in RAS. Both the consortia have been subjected to various diversity analyses using different bioinformatic tools. Random cloning of 16S rRNA gene and functional *amo*A gene has been performed and Amplified Ribosomal DNA Restriction Analysis (ARDRA) has been undertaken for 100 clones to unearth their diversity. Dendrograms on the basis of ARDRA generated 22 clusters from marine and 19 clusters for brackish water ammonia oxidizing bacterial consortia. Profound diversity of clones in the ammonia oxidizing consortia has been exposed by analyzing the phylogenetic diversity of representative clones. They comprised various autotrophic ammonia and nitrite oxidizers like α, β and γ proteobacteria, anaerobic ammonia oxidizers, heterotrophic denitrifiers, Bacteroides and Actinobacteria. Phylogenetic analysis of *amo*A gene based on sequences also revealed the presence of specific ammonia oxidizers. The way of distribution of organisms within the two consortia was determined by means of Geneious software. The diversity indices of both consortia were studied using Mega 5.0, primer 7 and VITCOMIC softwares. Marine ammonia oxidizers exhibited higher mean population diversity, species richness, evenness and thus the Shannon wiener diversity than brackish water counterparts and hence the former is more advised to be used as start up cultures for the activation of nitrifying bioreactors after proper acclimatization to the required salinity

Social relevance of the study

The more diverse marine ammonia oxidizing consortia is the promising startup cultures for the activation of nitrifying bioreactor so as to minimize the deposition of nitrogenous wastes in RAS.

EES-03

The lytic potential of broad spectrum bacteriophages *in vitro* and *in vivo* for biocontrol of *Vibrio harveyi* in aquaculture environment

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In vitro lytic efficacy of *V. harveyi* phages under nutrient rich conditions was assessed on 5 *V. harveyi* strains with 5 respective phages, out of which the highest lytic efficacy was demonstrated by *Vi ha* 19 as it reduced bacterial load significantly without the emergence of resistant forms. Though, *Vi ha* 32 showed more than five log unit reduction in bacterial count (LB 32) within 2 h, beyond then resistant forms emerged. In all the individually treated nutrient rich *in vitro* experiments, 1-5 log reduction in bacterial load resulted with in the first two h. However, further significant reduction could not be seen beyond two h of incubation in any case other than that with *Vi ha* 19, due to the emergence of resistant forms of *Vibrio* mostly subsequent to 2nd h of incubation. *In vivo* biocontrol potential of *Vibrio harveyi* phages was studied in post larvae of *Penaeus monodon* individually and as cocktail. Based on the *in vitro* and *in vivo* experiments conducted in this study, *Vi ha* 19 showed best performance compared to the other phages and phage cocktail based on larval survival without the emergence of bacteriophage insensitive mutants. In this context, *Vi ha* 19 can be recommended to be used as the most ideal candidate for phage therapy for successful management of *Vibrio harveyi* in Aquaculture.

Social relevance of the study

In sustainable aquaculture, application of antibiotics is prohibited to manage vibriosis, including the one caused by *Vibrio harveyi*. In lieu of antibiotics, an eco-friendly alternative method, phage therapy, is recommended here

EES-04

Invertebrate diversity pertaining to sacred grove ecosystems- a case study from central Kerala, India

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Sacred groves are good repositories of biodiversity. Various life forms are being protected on the basis of the unique tradition and culture prevailing in a locality. In the past, sacred groves were very common in Kerala and the quality and extent of such areas were well maintained. A study on Invertebrate Diversity Pertaining to a Sacred Grove Ecosystems was investigated in Santhukad Sacred Grove, near Thodupuzha, Kerala, India for a period of one year from 2015 to 2016. Invertebrates were observed, photographed and few were collected using different methods like pit fall trap method, sweep sampling etc. Opportunistic observation was also made whenever possible. A total of 13 species of macroinvertebrates, 34 species of butterflies, 34 species of orthopterans, 8 species of coleopterans, 26 species of odonates were observed. The study revealed that even though lots of deterioration happened in the quality of biodiversity values pertaining in such crucial areas in the recent past, still such areas possess restoration potentials which are crucial for the longterm environmental heath of the agro ecosystems

Social relevance of the study

Longterm conservation of the biodiversity values pertaining to sacred groves are crucial for the environmental heath of the agro ecosystems prevailing in the midland of Kerala

EES-05

A study on the effect of plywood factory effluents on the water quality of downstreams and nearby wells in Perumbavoor, Kerala, India

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Perumbavoor, in Eranakulam district is a region well known all over Kerala for its plywood industries. Pollution due to these industries is a sensational issue in this region. The effect of plywood factory effluents on the water quality of receiving streams and nearby wells in Perumbavoor was assessed for a period of five months from December to Aril 2017. Samples were collected from streams and wells near randomly selected five different plywood factories in Perumbavoor. In streams, samples were taken from the point of effluent discharge, hundred meters upstream from and hundred meters downstream from the point of effluent discharge. While analyzing the parameters like pH, nitrate, phosphate, TDS, BOD, COD, copper, chromium and formaldehyde it was found that there is a general increase of the concentration of these parameters in downstream as opposed to upstream. The wells near the plywood factories also have high levels of nitrate, TDS, COD and low pH which shows that the effluents has a negative impact on groundwater also. Comparison of these values with BIS guidelines showed that the concentration of these parameters in downstream were higher than the permissible levels except in the cases of copper and chromium. The present study showed that the effluents from the plywood industries have a big impact on the water quality of receiving streams and nearby well

Social relevance of the study

The study will assess the current water quality status of effluent receiving streams and assist plywood industries and authorities in designing appropriate measures to minimize the negative effect of effluents on water bodies

EES-06

A study on the butterfly diversity in Periyar tiger reserve, Kerala, India

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A study on the diversity, abundance, status and habitat preference of butterflies was conducted for a period of 1 year. The sampling was done from 1st to 10th February 2016 at the Vallakadavu and Thekkady Ranges of the Periyar Tiger Reserve, Kerala. It is a biodiversity rich region, sprawled over an area of 925sq.km. The methodology adopted was line transect method and opportunistic observation. The habitats selected were evergreen, semi evergreen, moist deciduous, vayal and riparian habitats. A total of 87 species of butterflies were recorded. They belonged to five families viz, Papilionidae, Pieridae, Nymphalidae, Lycaenidae and Hesperiidae. There are 71 species recorded from Vallakadav Range and 45 from Thekkady Range. Out of these 87 species of butterflies recorded, Papilionidae comprised of 15 species (17%), Pieridae consisted of 13 species (14%) , Lycaenidae comprised of 15 species(17%). Nymphalidae comprised of 36 species (41%) and Hesperiidae with 8 species (9%). Among these butterfly families, Nymphalidae dominated than other families and the least dominant family was Hesperiidae. The sightings include 10 Western Ghats endemic species. Among the different habitats, the maximum diversity was observed in semi evergreen forest with 67 species and 498 individuals. The least diversity observed in vayal habitat with 16 species and 144 individuals.

Social relevance of the study

Among insects, butterflies are ideal subject for ecological studies of landscapes and their value as bio-indicators of biotope quality is being increasingly recognized. The present study indicated that the area is rich in butterfly biodiversity and should be protected

A study on the status and diversity of spiders in Periyar Tiger Reserve, Kerala, India

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Spiders stand as one of the most important components of global diversity and play an important role in balanced, organized functioning of life on earth. The study describes the identification of spider assemblages with respect to the status and diversity in Periyar Tiger Reserve, Kerala, India. Periyar Tiger Reserve is the first Tiger Reserve in Kerala which exists in Western Ghats, one of the biodiversity hot spots of the world which supports diverse habitat types and endemism. A total of 85 species of spiders belonging to 54 genera of 17 families were recorded from this area during ten-day study. This represents 31.74% of the total 63 families so far reported from India. The spider diversity in this Reserve was dominated by family Salticidae with 16 species followed by Araneidae with 15 species. 57 new reports of spiders were noted from the current study. A new report of family Thomisidae comprising six distinct species was recorded. Eleven species were considered endemic to Western Ghats. The present study was an evident for the indication of supporting rich spider diversity in Periyar Tiger Reserve. Diversity of spiders shows certain associations between their population composition and structural complexity of the plant community.

Social relevance of the study

Being an area of varied habitat, top priority must be given to the conservation of its rich diversity. Documenting spider assemblages of the reserve assumes to realize that the Reserve is a very potential habitat for spiders and this also serves as a baseline for the future study of spiders in this protected area. Therefore there is a need for maintenance and management of spider diversity in the Reserve. More long term studies are recommended to catalogue the poorly documented spider fauna of this ecosystem.

EES-08

Preliminary study of herpetofaunal status and diversity in Periyar Tiger Reserve, Kerala

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Herpetofauna represents a highly vulnerable group given their limited dispersal and current situation of population decline. Present study reflects the herpetofaunal diversity and status in Periyar Tiger Reserve, Western Ghats, Kerala, during February 2016. Transect visual encounter survey and opportunistic observation methods were used to estimate species diversity. Forty four herpetofaunal species, which represents about 13.6 % of all known herpetofauna from Kerala, were documented. A total of 23 amphibian species (60.7% Western Ghats endemic) and 21 reptile species (23.8% Western Ghats endemic) were recorded. Overall, 69 individual amphibians and 70 individual reptiles were observed. Two species of amphibians namely, *Rhacophorus maximus* and *Indirana leptodactyla* and four species of reptiles namely, *Lissemys punctata, Gehyra mutilata, Cnemaspis jerdonii* and *Coelognathus helena monticollaris* are first reports from the reserve. Four species of reptiles under IUCN vulnerable conservation status, *Cnemaspis indica, Cnemaspis jerdonii, Coelognathus helena monticollaris* and *Ophiophagus hannah* were identified. Among the amphibians observed, *Raorchestes griet* belonged to IUCN critically endangered status, *Pseudophilautus wynaadensis, Fejervarya nilagirica, Indirana leptodactyla* and *Indirana brachytarsus* to endangered status and *Duttaphrynus parietalis, Micrixalus nudis* and *Indosylvirana aurantica* to vulnerable conservation status. The rich herpetofaunal diversity of Periyar Tiger Reserve could be attributed to the presence of befitting microhabitats and environmental heterogeneity. The present study accentuates the need for extensive studies to estimate the overall diversity and understand the ecology of herpetofauna in this area and nearby areas of the Western Ghats.

Social relevance of the study

The present study highlights the conservation value of Periyar Tiger Reserve and the information obtained can be made useful for implementing biodiversity monitoring activities, and current and future conservation efforts.

EES-09

Fisheries profile in the river Ganga from Haridwar to Patna

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The Ganga has been a major source of capture fisheries in India. The river sustains a diverse flora and fauna including 382 species of fishes. Field survey was conducted during summer and monsoon at six selected stations in a total stretch of about more than 1100 km between Haridwar and Patna. The intensity of fishing and fish diversity is low between Haridwar and Narora where a maximum of 34 species were encountered in September. Bagrids and *Cirrhinus mrigala* constitute the major catch upto Narora. With the convergence of a few small tributaries, the Ganges water gets augmented at Kanpur resulting in the increase in both the diversity (56 species) and abundance (15 times as compared to upper reaches) of fishes in the river. Increase in both diversity (69 speices) and catch (double that of Kanpur) was observed at Allahabad. Further increase in both diversity (106 species) and catch was recorded at Patna. The fish catch was most representative at Patna followed by Allahabad, where important component of the Ganga fishery, the Hilsa and major carp was encountered. The fishermen used traditional nets and gears in all major landing sites of the River Ganga which prove to be ineffective, as more manpower is required to get a poor harvest. It also appeared that lack of trained fishermen in fisheries sector resulted in low catch. The shifting course of the river, pollution, declining water level and fish productivity, fisher`s socio-economic condition, lack of co-operative development for fish culture practice and government`s incentives, and violation of fishery regulation are affecting the Ganges fishery. The paper discusses about Ganga fishery scenario and needs of developmental activities in the above stretch.

Social relevance of the study

Fishermen practice subsistence fishing to derive their livelihood from natural waterbodies like the River Ganga. Fish diversity and catch abundance in waterbodies is important for improving socio-economic condition of fisher.

EES-10

Biosorption of hexavalent chromium by agriculture waste using mutated strain of bacteria

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Biosorption is a cost effective and efficient method for the removal of heavy metals from the contaminated water samples. In the present study the agriculture waste like groundnut oil cake, coconut oil cake and watermelon peels have produced measurable result in the process of removal of chromium in batch process in packed bed columns**.** The gram + ve bacterium was used as an important tool for the adsorption process of chromium. The isolated strain of bacteria from lake of Benguluru was introduced to mutation and was used for biosorption process. The accumulation of chromium as well as its biosorption capacity was investigated in this study. The watermelon biomass showed reduced concentration of chromium upto 12ug/mL in the 2nd elution after 18 hours with a column packaging of 30g, 5mL 24 hours bacterial culture and 10mL polluted water. Groundnut oil cake under the same condition has a reproducibility of 52ug/mL after 3rd elution and coconut oil cake was able to remove upto 23ug/mL. The inherent capacity to adsorb metals due to the presence of functional groups such as -NH2, -COOH, -SH, and -OH on microbial cell walls, which act as binding sites for interaction of metal ions. The influence of different experimental parameters such as pH, effect of initial metal ion concentration and effect of dosage of adsorbent on biosorption was maintained constant.

Social relevance of the study

Chromium toxicity one of the major causes of environmental pollution emanating from tannery effluents. Chromium used in the tanning of hides and skins, as an alloy in the manufacture of stainless steel, in electroplating industry, in textile dyeing and as a biocide in the cooling waters of nuclear power plants, invariably resulting in chromium discharge causing environmental concerns. Chromium levels of Cr(III) and Cr(VI) were high above permissible limits in chrome samples after chrome tanning**.**

FNS-01

Natural energy supplement developed with passion fruit for diabetic patients

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Natural products are a source of new chemical diversity and are the choice of today's world. The sources of natural product are plants, animals and microorganisms. Among them plant products with medicinal property have played a major role in health as energy supplement due to its chemical or secondary metabolite. In this perception the study focused on development of natural energy drink supplement with plant *Passiflora edulis* (passion fruit). Delicious passion fruit is rich in source of antioxidants, minerals, vitamins, fiber and it has brought medicinal properties such as antiinflammatory, antimicrobial, anticancer activity. Rose apples are rich in vitamin C, dietary fiber, vitamin A, calcium, thiamin, niacin, iron, sulfur, and potassium and organic compounds such as jambosine, betulinic acid, and friedelolactone. Passion fruit has exotic, unique flavor aroma and its amazing nutritional and medicinal properties leads to attract its use as natural energy supplement. The objective of this study was to determine quantitative and qualitative analysis of phyto constituencies followed by evaluates the effect of anti-diabetic activity and develop natural energy drink supplement with plant *Passiflora edulis* (passion fruit). Rose apples (*Syzygium jambos*) fruit juice used as flavor ingredient for the natural energy drink. Determine the best combination by optimization of concentrations and examine the quality of taste by sensory evaluation. Result of the present study reveals the presence of wide ranges of phytochemicals and antidiabetic property. The above quality of the fruit juice attracts its demand to use as natural energy drink especially for diabetic patients.

Social relevance of the study

Natural energy supplement drinks especially for diabetic patients with cheaply available passion fruit has anti-diabetic activity. The product gets preferred and safety for public health concern.

FNS-02

Valorisation of green coffee processed spent for value addition

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Green Coffee Beans are rich in phenolic acids and promote various health benefits. Green coffee conserves are extracted using raw green coffee beans using various polar solvents. The process comprises of decaffeination, defatting and aqueous extraction to obtain enriched chorologenic acid conserves (CGA). During this process, green coffee spent is the major residue (80%) generated which represent serious environmental problems in the coffee industry. As these residues are rich in polyphenols like trigonelline, caffeine, theobromine and theophylline, value added products can be developed from the highly rich polyphenolic content of spent. Hence, the spent was evaluated for the proximate analysis and comprised of total ash (1.53%), total fat (0.40%), crude fibre (5.02%), protein (14.22%), carbohydrate by difference (71.6) calorific value (347 Kcal/100g). The chemical properties exhibited total polyphenols of 20% with 1% of CGA and 72% antioxidant activity. Further, various by-products from Green coffee processing namely green coffee oil (10%±5), caffeine (0.5%), polyphenols (20%) are recovered and used for various applications like green coffee oil for aromatherapy, caffeine in pharma and food industry, spent for the production of biodiesel/bioethanol. Thus, sustainable management of the by-products conserving the environment would be value addition for coffee industry.

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FNS-03

Green coffee with enriched probiotics, synergy, stability and survivability

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Probiotics provide a remarkable health benefit which aids in reducing gastrointestinal discomfort, relieves constipation and improves immune health. Green coffee which is rich in antioxidants such as chlorogenic acid helps in weight loss and possesses anti-inflammatory, anti-diabetic, anti-hypertensive properties. In combination with probiotic and green coffee extract (GCE), a value added drink can be formulated. In the present study various probiotics was screened and the suitable probiotics namely *L.casei, L.Plantarum* and *L.fermentum* were selected. The lyoprotectant used for the study are skimmed milk, skimmed milk along with sucrose and lactose. The cell viability of the probiotics with and without GCE was studied by the plate count method to determine the log cfu and the survival factor of the consortia. Both *L.casei, L. plantarum* consortia exhibited good survivability in both the lyoprotectants. The lyophilised cultures were on par with the unlyophilised cultures and exhibited similar survivability. The survival factor of the consortia in both the cryoprotectants ranged between 83-88%. The synergistic activity between probiotics and green coffee extract were evaluated and optimized in the probiotic preparation. Considering the synergy of green coffee and probiotics the extracts will be microencapsulated and utilized as a value added product which helps in various health benefits.

FNS-04

Production and sensory evaluation of muffins fortified with date seed powder

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Date seeds are considered as a waste product of many date processing plants producing pitted dates, date syrup and date confectionary. Date seeds are composed of about 11-18% of Carbohydrate, protein, dietary fiber, fat and ash. In addition, the antioxidant content was found to be comparable with olive oil, which can be as a good source of antioxidant in order to fulfill the consumers demand. Main purpose of this research was to observe the influence of different levels of date seed flour (2%, 4% and 6%) on muffins and its effect on chemical, microbial and sensory characteristics. Substitution of date seed flour does not influence the baking characteristics of the muffin. Fat, carbohydrate and ash content increases with the incorporation of date seed flour, whereas moisture decreases. Muffins fortified with 6% of date seed flour shows overall acceptability and microbial test standard plate count ($3.5x10^3$ cfu/g) and yeast and mould (NIL). Date seed powder which was discarded and used as fodder, can be used to increase the fiber content in bakery product.

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IBS-01

A novel halophilic extracellular lipase with both hydrolytic and synthetic activities

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Fungal lipases are often used as efficient catalysts for numerous industrial applications due to their ability to perform a range of hydrolytic or synthetic activities. However, currently there are few fungi producing extracellular lipases with an ability to catalyze multiple reactions. In this regard, we have undertaken systematic screening and identification of novel extracellular lipase from potential marine fungus with an ability to catalyze both hydrolytic and synthetic activities. Initially, we qualitatively screened 10 isolated strains from sea water using tributyrin agar plate assay method and selected six potential lipase producers (SW1-SW6) which showed clearance halos of more than minimum threshold (3 mm). Further, we quantitatively screened hydrolytic activities of crude lipase produced from these and evaluated their synthetic activities (esterification and transesterification reactions). The results clearly showed that among these potential strains, SW4 produced extracellular lipase exhibited a higher activity as compared to other strains. Importantly, it was found that the novel extracellular lipase produced by SW4 has a good correlation between hydrolytic as well as synthetic activities as compared to other strains; a phenomenon which is highly attractive to numerous industrial applications including biodiesel production. The selected novel SW4 strain was also taxonomically identified. Based on the phylogenic analysis of the nucleotide sequences by comparing with other related fungal sequences, SW4 strain was identified as *Fusarium solani* which was further deposited in NFCCI under accession number 4048 and the nucleotide sequences were also deposited in the GenBank under accession number MF138865.

Social relevance of the study

Industrially, there is a need for enzymes possessing high stability with diversity. Our preliminary findings should further lead to optimization of this fungal lipase production which is a novel enzyme possessing both lipolytic and synthetic activities.

IBS-02

Production of biodegradable plastic by polyhydroxybutyrate (PHB) accumulating bacteria isloated from muncipal solid wastes

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An uncontrolled usage of conventional non-biodegradable plastics over a long period of time has resulted in large-scale accumulation of waste and release of greenhouse gases in the environment, thus giving rise to severe environmental problems. Synthetic plastics are produced from non renewable sources. Their wide range of applications has made them a non replaceable material in our daily life. They are often consumed by ruminants and marine organisms. An alternative to this is the use of bio plastics that are biocompatible, biodegradable and its versatility make these biopolymers materials of ideal choice over synthetic ones. These biopolymers are microbial origin and can be degraded by the same. Biopolymers are granular inclusion bodies within the cytoplasm. The present study aims for the molecular characterization and large scale production of PHB (polyhydroxybutyrate), a biodegradable plastic, from isolates of municipal solid waste using a carbon rich medium. The methodology of this study includes screening study for the isolation of promising PHB producers. The identified strains of potential PHB producers were then used for molecular studies such as DNA isolation and 16S rRNA PCR amplification. The molecular characterization of the potential PHB producers was analyzed. Thus the main aim of this study was to identify microorganisms that are capable of producing and accumulating biopolymers from waste sites, evaluate PHB production in minimal media supplemented with excess carbon sources.

MBS-01

Potential application of LasA protease from *Pseudomonas aeruginosa* MCCB 123 in bacterial DNA extraction

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A potent bacteriolytic extracellular protease producing bacterial isolate from coir retting grounds of Kerala, India was identified as *Pseudomonas aeruginosa* based on phenotypic characteristics and 16S rRNA gene sequence analysis and coded as MCCB 123 (GenBank Accession no. FJ 665510). The enzyme is biocompatible with an IC_{50} of 89.43±3.11µg ml^{-1} on mammalian cell line (HeLa). LasA protease was purified to apparent homogeneity with a molecular mass of 20.5 kDa and was found to have a broad range of lytic action on the Gram-positive and Gram-negative bacterial cell walls and also on bacterial consortium. pH, temperature and incubation time for bacterial cell lysis was optimized and found to be 7.0, 35°C and 30 min respectively with reference to *Staphylococcus aureus* subsp. *aureus*. Its broad-spectrum lytic action on wide variety of bacterial cells can be exploited in bacterial DNA extraction without the addition of detergents and chelating agents. This position the enzyme unique over the existing lytic enzymes reported in DNA extraction. This is the first report of *P. aeruginosa* LasA protease having lytic action on bacterial cell walls other than that of *Staphylococcus aureus* and its application in rapid extraction of DNA from a wide range of bacteria.

Social relevance of the study

A unique bacterial DNA extraction method without addition of detergents and chelating agents unlike that of conventional method. First report of LasA protease having lytic action on bacterial cell walls other than that of *Staphylococcus aureus*.

MBS-02

Screening of microbial starter culture to regulate coffee fermentation

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During the coffee processing, fermentation of pulped coffee beans plays major role in imparting aroma, flavour and for the production of quality coffee beans. Studies of the microbial diversity in coffee fruits are needed to select microorganisms for starter cultures specific to dry and wet fermentation processes. These microbial inocula could enhance the organoleptic quality, reduce the processing time. The objectives of this work were to select pectinolytic microorganisms isolated from coffee fermentations and evaluate their performance on coffee pulp culture medium thereby regulating or control the fermentation process by accelerating the demucilisation. Different isolates comprising of bacteria, yeasts few fungi were screened. The potential pre -selected strains were cultured and the cell free culture supernatants of the selected microbes were assayed for Pectin lyase (PL), Polygalacturonase (PG), Pectin esterase (PE) and cellulase activities. Formulation of microbial consortium, based on the pectinase and cellulase activities were carried out. These combinations of microbes were assayed for activities at different time intervals. Based on the performance of microbes individually and in consortium, 4 microbes were selected for the formulation of ultimate consortium to be used on coffee beans. 0.38% of CM 06 (yeast), 0.21% of CM11 (Bacteria) and 0.41% of CM 16 (Bacteria) proved to be the best combination for maximum enzyme production. Maintaining the same inoculum concentration, maximum activities of PG, PL, PE and cellulase were obtained. 27.83 U/ml of PL, 33.87 U/ml of PG, 5.83 U/ml of PE and 31.73 U/ml of cellulase were the maximum activities observed. Optimization of the fermentation with regard to inoculum size, coffee bean volume etc., will be carried out based on standard statistical methods to obtain uniform and quality fermentation with reduction of time.

MBS-03

Enhanced flavour of coffee by acid carboxy peptidase produced by *Aspergillus oryzae*

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Carboxypeptidase is an acid protease enzyme that hydrolyzes the carboxyterminal peptide bond in the polypeptide chain; the product(s) formed by hydrolysis reduce bitter taste besides the free amino acids formed may function in food as pleasant-tasting flavour precursors. Carboxypeptidase from *Aspergillus oryzae* KX 522630 was extracted using wheat bran as substrate by solid state fermentation. The optimization of the biovariables namely moisture, temperature and fermentation duration for efficient protease production was carried out by employing a statistical approach such as Response surface methodology (RSM). The RSM reflected that optimum level of moisture was 30%, temperature was 30°c, fermentation time was 108 hours, and inoculums concentration was 10^6 cfu/ml /g of wheat bran. Model validations indicated 98% agreement between the experimental results and the predicted responses. The enzyme extracted was partially purified, decolorized and pre-treated on green coffee for one h, dried, roasted and ground, brewed and evaluated for organoleptic properties. The acidic carboxy peptidase on wheat bran with optimized parameters yielded 1273±50 nkat/g. The present study signifies impact of carboxy peptidase on coffee and improved sensory quality of coffee beans with pleasant taste profiles with black coffee and also with milk. Thus, the use of flavourzyme *i.e.,* Carboxy peptidases function in coffee contributing pleasant-tasting flavour precursors which could be value addition in the coffee industry.

MBS-04

Remediation of wastewater and biomass production for biodiesel preliminary antiviral prospective of *Tinospora cordifolia* on hsv-1

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Herpes Simplex Virus-1(HSV-1) also known as Oral herpes causes sores or lesions in the gums or near the mouth. The dry stem of *Tinospora cordifolia* was extracted using Methanol and ethyl acetate(80:20). The preliminary photochemical analysis confirmed the presence of saponins, alkaloids, phytosterols and triterpinoids in the crude extract obtained from *T.cordifolia*. Cytotoxicity analysis was carried out using different test concentrations ranging from 1000µg/ml to 62.5µg/ml and the CTC50 was found to be 315.86µg/ml. Virucidal assay ($10TCID_{50}$) was tested and 100µg/ml concentration was found to be effective with a 62.04 % of protection.

MBS-05

Enumeration and characterization of Indole acetic acid producing bacteria from rhizosphere soil in Oman and its effect on plant growth

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Plant growth promoting Rhizobacteria (PGPR) has been used in recent years in agriculture as they are environment friendly and cost-effective. Indole acetic acid (IAA) is a plant hormone produced by most PGPR. IAA is important in plant growth and developmentand an increased input will protect the plants from environment stimuli. IAA is produced by various rhizobacteria mostly as a product of L-Tryptophan dependend pathways. This study was carried out to develop an indigenous consortium to apply to different crops and vegetable gardens that is suited to the arid climate in Oman. A consortium was developed from rhizospheric soil of date palm from college garden. The IAA production of consortia at different temperatures, pH and tryptophan concentrations were tested and the maximum production was at 25°C, pH 9 and 1.5% respectively. Pot assay using germinated seedlings of Mung beans, Green beans and Radish were carried out and significant increase in shoot length, root length, leaf number and chlorophyll content was observed among the inoculated plants. Antibiotic resistance was not observed against any antibiotics tested. Another sample of rhizospheric soil was obtained from potato farm in Al Rustaq, Al-Batinah governorate, two log increases in number of IAA producing bacteria was observed when compared to date palm rhizospheric soil. Among the five isolates, the best IAA producing isolate rtm4 was selected for characterization studies. Antibiotic resistance was not observed against any antibiotics tested. Further studies are being carried out to test whether the organisms can improve salinity and water stress tolerance.

Social relevance of the study

Agriculture engages 37% economically active population in water stressed Oman. This study aims at using indigenous microorganisms that help in boosting crop production and creating entrepreneurial opportunities for the college graduates.

MFB-01

Antitumour activity of the ink extract of Cuttlefish, *Sepia Pharaonis* Ehrenberg

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Cuttlefish and squid form a major marine fishery resource of India and they are exploited mainly for export. The ink sacs form the waste material in squid and cuttlefish processing industry. Attempts are currently being made to isolate bioactive substances from these waste materials for biomedical research. In the present study we report the antitumour property of the ink extract of cuttlefish, *Sepia pharaonis* Ehrenberg. The ink from cuttlefish, *Sepia pharaonis* was first extracted using Tris-HCl and fractionated using ion exchange (fraction C) and gel filtration chromatography (fracion C_1 and C_2). Further analysis showed that the fraction C_2 was an uronic acid rich peptidoglycan (molecular mass 10 KD) and it is made up of five aminoacids. The antitumour activity of peptidoglycan fraction C_2 of the cuttlefish, *Sepia pharaonis* was studied using Dalton's lymphoma ascites (DLA) in BALB/c mice. The results revealed that there was a 70% increase in the life span of DLA bearing mice over the control. The fraction C_2 was studied for its effects on tissue antioxidant enzymes, antioxidants, lipid peroxidation products, serum SGPT, total protein and albumin and neurotransmitters. The results revealed that the drug had no neurotoxicity or hepatotoxicity. These findings suggest the antitumour agent in the cuttlefish ink stimulates the antioxidant defence mechanism in experimental animals thus arresting tumour progression and thus render itself as a potential chemotherapeutic drug for the treatment of cancer.

Social relevance of the study

The ink sacs form the waste material in squid and cuttlefish processing industry. So it results in serious environmental pollution. Here the attempts were made to isolate bioactive substances from these waste materials for biomedical research. So an antitumour drug can be produced from a natural bioactive substance without any environmental pollution, at a cheaper rate.

MFB-02

Bioremediation of aqua culture system using probiotic bacteria

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The universal requirement for water and increasing toll on conventional waste water treatment techniques demands a more environmentally friendly system to tackle this threat. Simultaneously, to improve the yield of shrimp culture and improve its quality is another major upcoming struggle. Adding to this predicament is the increased cost for treatment of waste water and production of the shrimp farming. Scientists and researchers have hence been coming up with various environmental friendly techniques to combat both of these obstacles. Keeping this in mind, one way to elucidate it simultaneously with an added profit is the use of nitrogen fixing bacteria. The sustainability of the ecosystem is determined by the amount of the organic matter settled early at the bottom of the pond before it reaches a detrimental situation wherein the reduced compound starts affecting the aqua culture. Due to the excess amount of organic matter, anaerobic condition sets in the pond and decrease in the levels of dissolved oxygen. The organic matter also contains compounds of nitrogen. The nitrogen fixing bacteria efficiently utilize the available ammonia and nitrite content in the waste water of the shrimp culture which helps in reducing the lethal content of total ammonia nitrogen from the water bodies. These microorganisms when mixed with a solid substrate provide a binding agent to it and also nutrient feed to the shrimp and other fishes in the aqua culture farming.

PAS-01

Path towards genetic diversity analysis and evaluation of blast resistance genes in popular varieties of paddy

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Rice being one of the most important cereal crops holds the second prominent position in global agriculture. With everyday increase in population, adverse climatic changes and new pathogen and pest activities, the rice breeders are facing great challenges to meet the demands. Worldwide rice is affected by most devastating Blast disease caused by *Magnaporthe grisea*. Although chemical control is often found to be successful, this adds to the cost of cultivation and also contaminates the environment. To address this problem the genetic diversity analysis and evaluation of blast resistant genes in rice with the help of SSR molecular markers was conducted. The use of rice genetic resources available at the Rice Research Laboratory can be used to incorporate the genetic variability in rice breeding programme. This will allow new cultivars with broadened genetic basis to create new and useful allelic combination. Development of crosses can be used to broaden the genetic basis of rice and promote the preservation of rare alleles which can be incorporated into elite germplasm. Domestication of crops restricts the crop improvement by limiting the range of valuable traits used in modern plant breeding. The assessment of genetic diversity allows germplasm characterization and conservation. Wild species can improve germplasm but create problems due to reproductive isolation. Rice crop suffers from yield plateau due to narrow genetic base as well. Genetic variability is used in crop improvement program .In this present study 19 advanced breeding lines were selected for diversity analysis among rice varieties.

Social relevance of the study

If rice is resistant to blast disease then yield and productivity levels of rice can be increased and further no pesticides have to be used which prevents environmental damage, soil, water and air pollution.

PAS-02

Genetic diversity studies in bird of paradise (*Strelitzia reginae*) by D^2 analysis of progines as influenced by summer season

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Strelitzia reginae is an evergreen perennial herbaceous plant, it is highly prized as cut flower due to brilliant colour and unusual appearance of the spectacular flower. The D^2 statistic has been employed widely to resolve genetic divergence at inter varietal, subspecies and species levels in classifying problems in plants. In Bird of paradise, based on Mahalanobis's D^2 analysis, genetic divergence studies were conducted in forty progeny lines which were grouped into twelve clusters. The cluster I retained maximum number of progenies (11) followed by Cluster II and III each with 10 progenies respectively and rest of the clusters were of solitary type. The clustering pattern indicated that there was no association between geographical distribution of accessions and genetic divergence. The maximum inter cluster D^2 value was observed between the cluster VII and VIII (15.38) indicating that crosses may be attempted between the progenies of cluster VII (P-27) and cluster VIII (P-1) to obtain new desirable recombinants in Bird of Paradise. Cluster mean analysis indicated that the maximum number of leaves/plant (9.67) and spathe length (26.0) was recorded in cluster VI. The highest mean stem girth (28.33), flower stalk length (62.33), flower stalk girth (6.40) was recorded in cluster VII. The number of flowers/ m^2 (4.67) and vase life (12.67) was observed maximum in cluster IX. Most of these were important flower attributing characters. This indicates that the progenies included in these VI, VII and IX clusters could effectively be used for the crop improvement program for increasing yield.

Social relevance of the study

Beneficial to plant breeders in the process of formulating the bird of paradise, crop improvement programmes and understanding about the nature and degree of genetic divergence available in the germplasm.

PAS-03

Genetic diversity assessment among advanced breeding lines of castor (*Ricinus communis* L.)

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Castor (*Ricinus communis* L.) a non edible oilseed crop belongs to the family *Euphorbiacea*. Castor is cultivated mainly for industrial trade as non edible oil, since it has no food value. Based on the D^2 statistic 51 castor genotypes were grouped into three clusters. Cluster I was the largest with maximum number of genotypes (49). Cluster II and cluster III were solitary cluster with single genotype. Plant height up to primary spike ranked first for 340 times with a maximum contribution of 26.67 per cent to the total divergence followed by number of capsules on primary spike. The inter-cluster distances varied from 31.64 (between clusters I and II) to 40.31 (between clusters I and III). All the other inter-cluster D^2 values were lying between these values. These values suggest that the genotypes from distant clusters exhibit wide diversity. Hence genotypes from divergent clusters should be selected for breeding programme for generating wide spectrum of variability and for selecting superior lines. Cluster I had maximum intracluster distance followed by cluster II. Therefore, it would be desirable to attempt crosses between genotypes belonging to distant clusters for getting highly heterotic crosses. The intracluster D^2 values of any cluster were less than the intercluster D^2 values of any two closely related clusters. Genotypes grouped into the same cluster presumably diverge little from one another. Theoretically, crossing of genotypes belonging to the same cluster is not expected to yield superior hybrids or segregants.

Social relevance of the study

A broad spectrum of variability in segregating generations can be generated by crossing genetically diverse parents. For this, precise information about the extent of parental genetic divergence is crucial. Genetic diversity between populations or genotypes indicates the difference in gene frequencies and any measure of genetic divergence must reflect these differences.

PAS-04

Intercropping of solanaceous vegetables in mulberry- a profitable way to farming community

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Field investigation on "Feasibility of intercropping of solonaceous vegetables in mulberry" was carried out at farmer's field in Bhaktharahalli village, Sidlaghattataluk and Chikkaballapur district of Karanataka state during *Kharif* 2014. Growth and yield of mulberry under solonacious intercropping was studied. Significantly higher growth parameters was recorded in sole mulberry treatment at 60 days after pruning compared to other intercropping treatment combinations with plant height (159.43 cm), number of branches per plant (13.31), number of leaves per plant (121.81), which attributed to the higher leaf yield of 5.81 t ha^{-1} $crop^{-1}$.A higher net return (5, 81,996/- ha^{-1} $crop^{-1}$) was obtained from mulberry and tomato intercropping system and higher cost benefit ratio (3.61) was obtained from mulberry and Brinjal intercropping system respectively.

Social relevance of the study

Present study has a greater impact on utilizing space between the rows of mulberry; the nutrient status of the soil can be enhanced, additional to these there will be higher income to the farmer.

PAS-05

Standardization of softwood grafting techniques in sapota (*Manilkara achras* l.) on invigorated khirni rootstock under polyhouse and shade net conditions

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Propagation studies in sapota with softwood grafting on invigorated khirni root stocks were carried out with use of two length of scions (15 and 10 cm), under two propagation conditions (polyhouse and shade net) and in four different months of grafting (May, June, July and August). The maximum graft success and survival was observed with the use of 10 cm scion (66.25 and 54.58 % respectively), whereas in propagation conditions higher graft success and survival was observed in the grafts under polyhouse (74.58 and 61.25% respectively) and among months of grafting July had shown maximum graft success and survival (80.00 and 70.00 % respectively) followed by May. Growth of the grafted plant was recorded in 30 days intervals up to 120 days and there was increase in the growth parameters like number of leaves, height of the graft and number of sprouts per grafted plant had increased with the increase in days after grafting. In relevance to growth parameters like early sprouting, maximum number of leaves was recorded in grafts when they were made using 10 cm scion, propagated under polyhouse and grafted during the month of July. Maximum number of sprouts per grafted plant was observed in the month of May. The maximum growth in terms of height (above the union) was recorded in grafts made with use of 15 cm scion, propagated under polyhouse and grafted during the month of July.

Social relevance of the study

In South India khirni rootstocks have to be bought from Northern India for sapota propagation and due to the failure of grafts rootstocks are being wasted, hence this study helps in reutilization of this invigorated rootstock for further propagation among the nurserymen

PAS-06

Effect of pre-harvest sprays of silicon and calcium salts on yield, quality and physico-chemical characteristics of mango *cv.* Mallika

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Mango being highly heterozygous and cross pollinated crop, this has resulted in enormous variations in the yield and quality. With an aim to overcome this problem an experiment was carried out on pre-harvest sprays of silicon and calcium salts on yield and physico-chemical characteristics of mango cv. Mallika at KRC, College of Horticulture, Arabhavi in RBD with three replications. Where the pre-harvest treatments *viz.,* control, calcium salts and silicon of different concentrations were used on cv. Mallika mango trees. All the calcium salts and silicon treatments gave higher yield when compared with control. The calcium salts treatment had favourable effect on quality and physico-chemical characteristics of mango. Calcium chloride (0.2%) gave highest maximum yield (216 kg/tree). Fruits treated with calcium nitrate (0.2 %) resulted in maximum TSS (23.01 ^{0}B), Total sugars (19.04%) and Non-reducing sugars (16.70%). Fruits treated with silicon (2ml/lit) had prolonged storage (14.80 days) with lower cumulative Physiological loss in weight (21.17%) over control. Similarly, the highest yield (8.94 t/ha) was recorded in the treatment with foliar spray of silica at 4ml per litre. However, physiological loss in weight was comparatively more in control mango samples throughout the storage period

Social relevance of the study

For better yield and enhanced shelf life, pre-harvest sprays with secondary nutrient element like calcium is essential for plant growth. Silicon is considered as an important beneficial element, helps in growth and development of plant, improves the cell wall. Silicic acid is not much mobile element in plants. Therefore a continued supply of this element would be required particularly for healthy and productive development of plant

PAS-07

Acalolepta nivosa White, 1858 (Coleoptera: Cerambycidae) as a new pest of Jackfruit (*Artocarpus heterophyllus* Lam.)

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Jack fruit is a tropical edible fruit tree that comprises of about 50 species, extensively seen in the Western Ghats of Kerala. Among them *A. heterophyllus* is most valued for its edible fruits and much valued timber. Though several insects were found infecting jackfruit, their influence on the yield and growth potential was not seriously considered, mostly due to the fact that they grows naturally with least human intervention. Regular roving surveys were carried out under ICAR-AICRP on Fruits under homesteads in Kerala from 2014 to 2016 to record bio-ecology, host preferences, damage potential and prevalence of cerambycid beetles as pests which are known to be more destructive in grub and adult stages. The cerambycid beetles that were collected using portable light traps in the vicinity of jack fruit trees were identified as *Acaloleptanivosa* White, 1858. The adult beetles were seen from March to November. Aak plant(*Calotropisgigantea*; Family: Apocynaceae), Roxburgh's Kydia (*Kydiacalycina*; Family: Malvaceae) and Madagascar Jasmine (*Stephanotis floribunda*; Family:Apocynaceae) are recorded as hosts of the pest. Host range studies conducted in insect cages revealed that *Calotropisgiganteaand Kydiacalycina* were preferred by both grubs and adults, whereas only adult beetles showed a marked preference to jackfruit shoots and leaves. The beetles fed extensively on the bark of the shoots and leaves of medium maturity. Green bark portions leaving the inner woody portion were fed upon by feeding from the bottom of the shoot and progressing toward the tip. After few days the shoots started wilting along with yellowing of leaves, due to destruction of conducting tissues. The life cycle of the beetle was 7-10 days of egg period, four months of larval period and 24-28 days of pupal period in *Calotropisgigantea*. The adult beetles lived for 1.5 to 2 months. It is notable that these beetles have turned to jackfruit for their nutritional requirement in the adult stage as bark feeders and defoliators thus causing death of growing shoots and branches.

Social relevance of the study

Present study provides additional knowledge of host plants, its feeding habits and in helping to fill the gaps with respect to the biology of grubs and adult insects as an emerging or new pest of jackfruit.

PAS-08

Mutagenic studies of phosphate solubilizing organism and its effect on growth of soyabean

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Soybean (*Glycine max*), commonly known as soja-bean belongs to family Fabaceae. The seeds of the plant are edible. Soybean has many bioactive compounds that is known to improve human health. The present work is done to increase the growth efficiency in soybean plant and to increase its phytochemical activity. Soybean is rich in protein and dietary fiber which helps in digesting the food and helps to lose weight. The concentration proteins and phytochemical compounds were evaluated. Phenols and flavonoids were a greater source in soybean and it helps to reduce cholesterol. The best phosphate solubilizing microbe was isolated from the collected soil sample. *Bacillus subtilis* was found to be the best phosphate solubilizing microbe. The organism was then mutated to find any genetic variability. As a result the amplified bands had no much genetic variability and a uniform band structure was observed. However, on mutating the organism the activity of catalase and peroxidase enzymes increases and that of superoxide dismutase enzyme was decreased. Phenols and flavonoids have an increasing concentration with mutated samples.

Social relevance of the study

The study helps to increase the growth efficiency and phytochemical activity which helps in the reducing the cholesterol content by mutagenesis.

PAS-09

Plant growth-promoting bacterial diversity in Jhum agro-ecosystems at different jhumcycles of Mizoram, India

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Shifting cultivation a prominent agricultural practices, locally known as Jhum, which involves clearing of forest vegetation followed by cropping for consecutive two seasons and then allowing the forest to re-establish naturally in the fallow period at different durations (cycles) in the hilly areas of Northeast, India. In recent years, the shortening jhum cycle resulted in poor soil health and environmental degradation. Studies on jhum agroecosystem has been limited to only soil loss due to erosion and plant diversity (above ground) with very negligible attention towards below ground microbial diversity. In this study, we have determined the diversity of rhizosphere bacteria of three crops such as rice, maize and arahar grown in adjacent fields of 5, 10 and 20 years jhum cycles at tacchip village, Mizoram. India. Four samples from rhizosphere niches viz. Bulk soil (BS), loosely adhered soil (LAS), strongly adhered soil (SAS) and root interior (RI) were analyzed by culture independent approach (PCR-DGGE and Next Generation Sequencing). More than 100 different types of bacteria grown on selective media were obtained by various culture dependent approaches using different selection media. SAS showed a decline in bacterial population with increase in the age of Jhum cycle especially in rice cultivated fields. The results suggested that the bacterial community in BS and LAS was not distinctly different in the evaluated crops, whereas their diversity in the SAS and RI were different. Our results indicate a higher level of dependence of crops on rhizobacteria, grown in short Jhum cycle field and therefore, application of zone specific bacterial biofertilizer to crops grown in short Jhum cycle is beneficial.

Social relevance of the study

This study will encourage different community of North-east India to practice jhum cultivation in a shorter fallow period. Along with the increase in yield.

PAS-10

Somatic embryogenesis induced from cultured leaf tissues of *Coffea arabica* L. cv Catimor hybrid.

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Coffee belongs to genus *Coffea* with over 100 species of which only two species, *Coffea arabica* L (Arabica) and *Coffea canephora* Pierre ex A. Froehner (Robusta) are commercially cultivated. Traditionally coffee is propagated through seeds. The seed progeny is amenable to change due to the process of recombination during meiosis. Tissue culture is a promising method for large scale multiplication of elite plants. The present study aimed at standardizing the tissue culture protocol for mass multiplication of an elite hybrid plant from catimor crosses (S.4814 6/8). Leaf explants were collected from 17 years old matured plant from experimental plot of CCRI during April 2016. The explants were disinfected and inoculated in MS medium supplemented with Kinetin (4mg/L) and 2,4-D (1mg/L) for callus induction. After four weeks of incubation in callusing media, the dark brown, medium to large calli were obtained and transferred into MS medium with Kinetin (4mg/L), IAA (0.1mg/L) and 2,4-D (0.5mg/L) for induction of somatic embryos. After seven months in the medium, brown nodular and friable calli were obtained. These friable calli were sub-cultured in six different somatic embryo induction media consisting of MS media supplemented with 2,4-D, IAA, KN, BAP at two concentrations and phloroglucinol at three different concentrations (10, 20 and 30 mg/L). Among the various combinations tested, MS medium with 0.1 mg/L of 2,4-D; 0.5 mg/L of IAA, 2.0 mg/L of BAP and 1.0 mg/L of Kinetin supplemented with 10 mg/L of phloroglucinol induced somatic embryogenesis in high frequency. The somatic embryos were then transferred to half strength MS media and placed under light for embryo germination. The study resulted in successful induction of somatic embryogenesis within a period of eight months. The results of the study are discussed in detail.

Social relevance of the study

The availability of a standardized protocol of large scale multiplication of elite plants in Arabica coffee is the need of the hour for the scientific coffee community. Induction of somatic embryos during process of tissue culture is a major step in development of TC plants. The study details the standardized protocol for large scale multiplication of *Coffea arabica* elite hybrid plant of Columbian catimor cross S.4814 6/8 in a short time of eight months highlighting the successful induction of somatic embryos.

PAS-11

Screening of transferability of rice molecular markers in Sorghum

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Development of microsatellite markers is extremely expensive and time and labour consuming because of the prior requirement of sequence information for design of locus specific primers. Therefore, use of molecular markers developed for one species could be very valuable for related species. The transferability of SSR markers from related families is an alternative approach to bypass the cost developing species specific markers as well as the complexity of the work. In the present investigation, five genotypes each from two crops (rice and sorghum) were evaluated. Upon PCR amplification the alleles were separated on Agarose Gel Electrophoresis system. Initial polymorphism detection was conducted using twenty primer pairs distributed on rice chromosomes. It was observed that nine rice primers amplified in sorghum. This studied showed that rate of transferability of rice primers among sorghum genotypes have 45.0 %. Hence, screening existing markers through transferability test from closely related species or family is resource conscious.

Social relevance of the study

This is the first study on transferability of rice SSR markers on sorghum for saving cost and time. Rice SSR markers can be a valuable marker source for those plant species for which little molecular marker information is available.

PAS-12

Response of gamma rays and Ethyl methane sulphonate (EMS) on seedling characters of gladiolus cultivar Ethyl cav cole.

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The experiment was conducted at Department of Horticulture, University of Agricultural sciences, Dharwad (Karnataka), during the year 2010-13. Gladiolus the queen of the bulbous ornamentals is the leading geophyte grown worldwide for cut flower trade and garden displays. The use of physical and chemical mutagens or combination of both increase variability in agronomic traits in crops. In the present investigations corms of Gladiolus (*Gladiolus hybridus* L.) cultivar Ethyl cav cole was subjected to gamma rays at 10, 20 and 30 Gy doses treated at BARC Mumbai and chemical mutagen Ethyl methane sulphonate (EMS) at 0.25, 0.50 and 0.75% concentrations in laboratory in order to study the nature and amount of variation induced by gamma rays and EMS singly. The seedling observations were recorded 45 days after planting. The results obtained revealed that radiation treatment and chemical treated materials adversely affected on seedling survival per cent (90 and 88 %), days taken for germination of the corms (17 and 18 days), seedling height (40.3 and 41.6 cm), no of leaver per seed ling (4.2 and 4.4) and leaf length (27.6 and 29.2 cm) and width (1.5 and 1.8 cm) at higher concentrations there was injuries to most of the seedling characters. Minimum days were required for germination at lower doses of gamma rays as well as EMS. The percent germination was significantly affected by the treatments and doses, with the increase in concentrations, the germination decreased. Plants treated at 10 Gy gamma rays and 0.25% EMS recorded on par with the untreated control plants in all variables studied.

Social relevance of the study

The present study helpful in the response of the gladiolus to different physical and chemical mutagens at different concentrations.

PAS-13

Identification of best culture medium for microalgae production

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In recent decades, microalgae have acquired attention from pharmaceuticals to bio fuels. The unicellular marine microalga is one of the most common live feed used in the field of aquaculture. The high cost of the culture medium which supports an optimal growth of the algae is still one of the main problems related to the large scale culture and also not all the culture media support microalgae to grow vigorously. Hence, in this study, an attempt was made to identify a simple and best medium for microalgae which were isolated from southern part of Karnataka region. A total twenty different microalgae samples were isolated from soil and water sample resources and these were subjected to grow in three different media such as BG11, TAP and BBM for identifying their growth condition. Selected culture media on different days of incubation was studied for biomass production and biomass feedstock has reviewed great interest to be used as an alternative and renewable source of energy. All the twenty isolates showed varied growth pattern and dry biomass content in different culture media. However the growth and dry biomass content of microalgae was optimum in all the three media. But in case of BBM media the growth and dry biomass content was found to be significantly more but biomass harvesting is late when it compare with TAP media. The optimized growth medium will be used for biomass production for biofuel application and the results of the present study suggest that BBM media is one of the excellent substitutes that can be used for the cultivation of microalgae.

Social relevance of the study

Present study aims in the identification of the suitable and best culture media for microalgae production and found that BBM media is one of the excellent substitutes that can be used for the cultivation of microalgae.

PAS-14

High yielding cowpea variety DC-15

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Cowpea is one of the important pulse crop widely grown in Palakkad district. The cowpea variety DC-15, which was evaluated over three years (2011-IVT, 2012-AVT-1 and 2013-AVT-2) at Regional Agricultural Research Station, Pattambi as a part of All India Co-ordinated Research Programme on Arid Legumes could yield 1063, 1642 and 1284 kg/ha as grain yield respectively where the local check variety Kanakamony (PTB-1) could yield 825, 862 and 716 kg/ha respectively. Both the varieties mature in 70 days. Frontline demonstrations conducted at eight different places of Palakkad district during 2016, showed that the cow pea variety DC-15 could yield on an average of 1800 kg/ha whereas, the check variety Kanakamony (PTB-1) could yield on an average of 1138 kg/ha. The performance of DC-15 was 43 per cent over the check variety Kanakamony (PTB-1). The variety is highly suitable for rabi cultivation. During the early stages, the pods can be used for vegetable purpose. The quality parameters like crude protein and fat of DC-15 could record 24.08 per cent and 3.53 per cent respectively where as the local check Kanakamony could record 22.5 per cent and 2.66 per cent respectively.

Social relevance of the study

The cowpea variety can be used for rabi cultivation after the harvest of first crop of rice. The pods at early stage can be used as vegetable. The variety could record 43 per cent higher grain yield over the local check variety Kanakamony

PAS-15

Influence of foliar application of micronutrients on yield and quality of Aonla (*Emblica officinalis* Gaertn.) cv. Neelam (NA-7)

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Aonla (*Emblica officinalis* Gaertn.) has become a most preferred fruit for ayurvedic preparations is facing the problem of reduced yield and quality due to many reasons including heavy incidence of fruit drop and nutrient deficiency under arid and subtropical regions. To exploit the possibility of reducing the incidence of fruit drop and enhancing the fruit yield through foliar application of micronutrients in aonla cultivar NA-7. The study revealed that the foliar spray of micronutrient combination of 0.5 % $ZnSO_4$ + 0.5 % $FeSO_4$ + 0.25 % Borax; significantly reduced the incidence of fruit drop (45.60 % as against 79.63 % in control). The said combination of micronutrients was also associated with highest fruit weight (43.69 g), fruit length (3.78 cm), fruit diameter (4.93 cm), pulp weight (43.03 g) and pulp to seed ratio (22.03) and yield (24.96 kg/plant). The yield was almost double as compared to control in the said combination of micronutrients as result of reduction in fruit drop percentage.The quality parameters were not influenced much by micronutrient spray, although the combination of 0.5 % $ZnSO_4$ + 0.5 % $FeSO_4$ recorded higher (486.88 mg/100 g) vitamin C and combination of 0.5 % $ZnSO_4$ + 0.5 % $FeSO_4$ + 0.25 % Borax recorded higher total sugar (4.94 %) as compared to control. Hence, the micronutrient combination of 0.5 % $ZnSO_4$ + 0.5 % $FeSO_4$ + 0.25 % Borax holds immense potential as a foliar spray in arresting fruit drop and doubling up the yield and improving quality in aonla.

Social relevance of the study

Aonla is an arid fruit crop which needs micro nutrient supplementation to tackle the physiological problems while cultivating. In this context the research mainly focused on rectifying these problems by different micronutrients.

PAS-16

Effect of fusarium wilt on the phenolic content of carnation (*Dianthus Caryophyllus* L.) genotypes

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A study was conducted at the division of Floriculture and Medicinal crops, Indian Institute of Horticultural Sciences, Bangalore to investigate the changes in phenolic compound levels among carnation genotypes infected by fusarium wilt. Two resistant (Gioele, Praga) and two susceptible (Dark Dona, Malaga) carnation genotypes were studied for their respective phenolic compound levels after they were infected by *Fusarium* Wilt, caused by *Fusarium Oxysporum* F. Sp. *Dianthi*. Among the resistant and susceptible carnation genotypes assessed for their phenolic compound levels, the resistant genotypes Gioele and Praga recorded higher levels of Vanillic Acid (28.68 and 121.73 µg/100 G), Syringic Acid (0.12 and 0.40 µg/100 G), Ferulic Acid (39886.39 and 24142.57 µg/100 G), Gallic Acid (8.29 and 6.29 µg/100 G), *P*-Coumaric Acid (1056.47 and 2418.61 µg/100 G), *O*-Coumaric Acid (74.58 and 125.70 µg/100 G), 2,4- Dihyroxy Benzoic acid (9.60 and 6.40 µg/100 G), Protocatechuic acid (34.94 and 36.94 µg/100 G), *P*-Hydroxy Benzoic Acid (3.98 and 2.90 µg/100 G) and Salicylic acid (204.03 and 774.10 µg/100 G) when compared to the susceptible genotypes. the outcomes of the study clearly indicate the role of phenolic compounds in resistance against *Fusarium Oxysporum* F. Sp. *Dianthi*, and also will serve as an alternate method in identifying resistant carnation genotypes

Social relevance of the study

Development of fusarium wilt resistant carnation.

PAS-17

Changes in flavonoid content of carnation genotypes after fusarium wilt incidence

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An experiment was conducted at the Division of Floriculture and Medicinal Crops, Indian Institute of Horticultural Sciences, Bangalore to assess the changes in the levels of flavonoid compounds in two resistant (Gioele, Praga) and susceptible (Dark Dona, Malaga) carnation genotypes after the incidence of *fusarium* wilt caused by *Fusarium oxysporum* f. sp. *dianthi*. The flavonoid compounds were quantified using LC-MS. The resistant genotype Gioele recorded higher levels of quercetin (41.00 µg/100 g), apigenin (74.09 µg/100 g), neringenin (112.05 µg/100 g), epicatechin (115.71 µg/100 g) and epigallocatechin (7.93 µg/100 g) on the other hand the resistant genotype Praga recorded higher levels of Luteolin (82.70 µg/100 g), Myricetin (76.84 µg/100 g) and Kaempferol (0.18 µg/100 g) compared to the susceptible genotypes Dark Dona and Malaga. The outcome of the experiment clearly underlines the role of flavonoids in resistance against fusarium wilt of carnation and would help identify carnation genotypes resistant to fusarium wilt based on flavonoid levels.

Social relevance of the study

Development of fusarium wilt resistant carnation.

PPS-01

Evaluation, molecular characterization and applications of phytoconstituents from medicinally important plants

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Screening and molecular characterization of bioactive compounds from medicinal plants is an essential step in drug discovery. This has lead to the development of potential compounds possessing antimicrobial, antioxidant and anticancer properties. Antimicrobial compounds help to fight against various infectious diseases caused by pathogenic microbes. An antioxidant can trap the free radicals thereby reducing the risk of chronic diseases. Anticancer compounds can inhibit the growth of cancer cell as cancer is resulting in mortality worldwide. The present study was designed to evaluate phytoconstituents (alkaloids, phenols, flavonoids, sterols etc.) qualitatively and quantitatively from leaves of various medicinal plants namely, *Bryophyllum pinnatum, Centella asiatica* Linn, *Sauropus androgynous, Tinospora cordifolia, Withania somnifera* (Linn.) Dunal, *Phyllanthus amarus* and *Plumbuago zeylanica.* The extraction of desired chemical components from the plant is a crucial step and was carried out by soxhalet using methanol. The antioxidant potential was assessed by biochemical methods and most of the plants demonstrated to posses this attribute. Antimicrobial activity was evaluate by agar well diffusion method and several plants showed the inhibition zone against many pathogenic microbes like *Escherichia coli, Bacillus subtilis, Micrococcus leutus, Streptococcus aureus* etc. The extracts are been tested for anticancer properties on cell lines and has shown positive results. The molecular characterization of phytochemicals was carried out by High performance liquid chromatography (HPLC), Fourier-transform infrared spectroscopy (FTIR) and Proton-Nuclear magnetic resonance spectroscopy (H-NMR) which elucidated the structural aspects. Hence, the present investigation reveals the bioactive compounds possessing medicinal properties.

Social relevance of the study

The present study reveals the potential phytochemicals which could be boon for the treatment of many human health problems.

PPS-02

Estimation of flavonoids, phenols and antioxidant capacity of *Spilanthes ghoshinis*

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Spilanthesghoshinis is a medicinal, folklore plant used for variety of ailment across the country. The present work was carried to evaluate the secondary metabolite like flavonoid and phenol. Antioxidant capacity was calculated using DPPH and SOD assay. The present result showed that *Spilanthes ghoshinis* have 1.00 flavonoid, 7.5 phenols, while the DPPH assay showed 1.86% SOD with 0.76% of inhibition. This study can provide a better insight for the ayurvedic system of medicine.

PPS-03

Resazurin based microtitre assay and comparison of DLA and EAC cell lines in *Amaranthus Viridis* L. (Kuppacheera).

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Amaranthus viridis L. a medicinal plant belonging to family Amaranthaceae, is used for bactericidal activity to kill infectious diseases and has reported to be antioxidant and anticancer though it contain glycosides, phenols and flavonoids. The study conducted to evaluate the anticancer ability using the cell lines and antimicrobial activity using Resazurin dye. The leaf extract were made by extraction using different solvent based on polarity. Antimicrobial activity using Resazurin based microtitre assay and MIC were determined, anticancer study conducted in DLA and EAC cell lines. The result showed that MIC value against showing antimicrobial activity for ethanol and methanol extract (1.25-0.625mg/ml). DLA cell line showed good percentage than EAC cell line. *Amaranthus viridis* L. extract showed antibacterial and antifungal activity against human pathogenic strains and has got anticancer property.

Social relevance of the study:

The work basically provides a vegetable drug that can act as a antioxidant and anticancer molecule. From the antimicrobial studies, this selected plant has got property to inhibit microbes that are pathogenic to humans. From the LCMS analysis and activity prediction software (PASS), pharmaceutical industry can get aware regarding the bio-molecules and their specific biological activity

PPS-04

A comparison of *in vitro* pharmacological properties in *Syzygium Aqueum*, Alston

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Underutilized plant species are defined by their unexploited economic potential, making them an appropriate focus for commercialization. A number of underutilized fruits are adequately rich in antioxidants and phytochemicals besides necessary nutritional components such as vitamins, minerals, and dietary fibre. Hence, more emphasis is being given to some of the underutilized fruit crops due to their high nutraceutical values. The purpose of the study was to compare the pharmacological activity and their relationship with tannin content in *Syzygium aqueum,* Alston. Antioxidant capacity was evaluated using diphenyl-2picryl hydrazyl DPPH) and tannin content was measured by UV visible spectrophotometer. Our findings revealed that the underutilized fruit plants have the potential to be the sources of natural antioxidant and nutraceutical compounds.

PPS-05

Development of phyto drug loaded nanoparticle incorporated hydrogel nanocomposite and their antimicrobial activity

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Polymer nanocomposites represent an important stake in scientific research and offer a combination of properties with respect to single components. The present work deals with nanocomposite hydrogels obtained from alginate, a biobased polymer, which is employed as a biocompatible matrix for the encapsulation of silver nanoparticles (AgNPs). Alginate nanocomposite hydrogels were obtained through crosslinking with calcium chloride ($CaCl_2$). The effect of the encapsulation of AgNPs within alginate hydrogels on their porous structure and the AgNP dispersion was evaluated through scanning electron microscopy.The release studies of phytodrug was done for a 24 hour interval. Finally, nanocomposite alginate hydrogels were found to be effective against various bacteria and fungi. Therefore, the present work proposes a nanocomposite alginate hydrogel as an antimicrobial topical applicant in dermatological field.

Abstracts

POSTER PRESENTATIONS

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PP-01

In vitro multiplication and germplasm conservation of *Ruta chalepensis* and assessment of genetic stability using molecular markers

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Ruta chalepensis L. an evergreen shrub belongs to the citrus family, commonly known as 'fringed rue' frequently utilized in herbal therapy and the plant is used as a promoter of menstruation, treatment for hypertension, a topical treatment for earaches and headaches, and an external treatment in the form of a skin antiseptic and insect repellent. An efficient method was developed and standardized for rapid *in vitro* multiplication of this multipurpose medicinal plant via enhanced axillary bud proliferation from nodal explants collected from a healthy field grown plant. Different plant growth regulators, media types and pH of the media was investigated to achieve the maximum shoot multiplication. The highest frequency of shoot regeneration (96.3 ± 2.02) and maximum average number (40.4 ± 1.45) of shoots were observed on MS medium (pH 5.8) supplemented with a combination of 5.0 μM BA and 1.0 μM NAA. For rooting individual isolated microshoots were transferred on ½MS (half-strength) supplemented with IAA, IBA or NAA and maximum rhizogenesis were achieved on ½MS medium containing 0.5 μMIBA. Regenerated plantlets with well-developed shoot and roots system were successfully hardened off and established in pots containing garden soil with a 90% survival rate. Genetic stability of in vitro regenerated plantlets was evaluated and compared with the mother plant using directed amplification of minisatellite-region (DAMD) and inter simple sequence repeat (ISSR) marker. No differences were detected in DAMD and ISSR profiles among the regenerated plants and the donor plant, demonstrating their genetic constancy and clonal fidelity.

Social relevance of the study

The method will contribute to *in vitro* regeneration of *R. chalepensis* and will help to develop a strategy for mass propagation and germplasm conservation and could also be useful in reducing the existing pressure of pharmaceutical industries on wild stock of this multipurpose medicinal plant.

PP-02

Genetic transformation and siRNA mediated aphid resistance in tomato plants

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In the present study, we explored the concept of RNA interference to silence *Acetylcholinesterase 1* gene of *M. persicae* (*MpAche 1*) and develop aphid resistance transgenic tomato plants. Three plasmid constructs; T-449 contains a single *Ache 1* fragment in forward orientation, T-452 contains two *Ache 1* fragment in reverse and forward orientations, respectively, flanking the plasmid intron and T-455 contains a single inverted *Ache 1* fragment only were develop and successfully transformed into *Solanum lycopersicum* L. cv Jamila. Success of agrobacterium mediated genetic transformation in tomato plants were confirmed by PCR and northern blotting experiments and small interfering RNAs (siRNA) were detected in transgenic plants. Transformation efficiency against varying constructs were also assessed and the highest transformation frequency were recorded in plant transform with construct T-452. To investigate the effect of transformed construct on *Ache 1*, aphids were fed on different transgenic plants and a differential expression in *Ache 1* gene of aphids was obtained with different constructs. The overall results obtained suggest the successful transformation of siRNA in tomato plants, and the aphid gene (*Ache 1*) was down regulated after feeding on transgenic plants. Further, aphid challenge assay was conducted to investigate the plant-mediated silencing of target gene (*Ache 1*) inhibiting the fecundity of *M. persicae*. Data obtained in tomato plants transformed with vector T-452 (double hair loop) exhibited significant reduction of aphid population by 34.2%.

Social relevance of the study

The principal outcome of the present work strongly suggest that siRNA mediated silencing might be an effective way for genetic transformation to develop disease resistance tomato cultivars which may prove useful for farmers.

PP-03

Synthesis and evaluation of a bioink for three dimensional bioprinting of liver construct

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Recent advancements in three dimensional (3D) printing technologies have paved a new way for fabrication of functional tissue constructs. 3D Bioprinting, an additive biofabrication technology creates tissue constructs by layer-by-layer positioning of cells, biomaterials and biochemicals in precise geometry. An appropriate biomaterial will serve as the bioink for bioprinting 3D tissue construct that maintains the viability and functions of cells. In this study, a modified form of gelatin, Gelatin Methacryloyl (GelMA) was synthesized and evaluated for its use as bioink for *in vitro* liver tissue construct. Physico-chemical characterization included analyzing cross-linking efficiency, mass-swelling ratio and compressive modulus of hydrogel. The *in vitro* biological evaluation included cytotoxicity analysis by direct contact and elusion test method using L-929 fibroblasts cells. The hydrogel was non cytotoxic and cells maintained high levels of metabolic activity when incubated with hydrogel extract. The suitability of hydrogel as a bioink was evaluated by encapsulation of hepatocytes (HepG2) followed by analysis of viability and liver specific functions. The results confirmed that GelMA can be a base material to be used as bioink. Encapsulated hepatocytes were viable and functional with expression of albumin and urea synthesis over a period of 7 days in the culture.

Social relevance of the study

3-D bioprinted liver tissue constructs will be used as hepatotoxicity systems for screening drugs.

PP-04

Efficacy of extracellular chromate reductase from *Bacillus* sp. for detoxification of hexavalent chromium

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Residual chromate deposits present in the chromite mine soil of Odisha, India is considered as major environmental pollutant. Hexavalent chromium [Cr(VI)] being extremely toxic, causes mutagenic, teratogenic and carcinogenic effects in biological system. Chromate reductase activity of a highly resistance *Bacillus* sp. isolated from chromite mine soil of Odisha (India) was associated mainly with the contribution of extracellular enzyme production. Enzymatic Cr(VI) reduction is an effective method for detoxification of Cr(VI) in polluted sites of mining area. The present study highlights on enhanced production of extracellular Cr(VI) reductase from *Bacillus* sp. using optimum physico-chemical conditions. The production of chromate reductase was enhanced to a significant level of 54.85 % under optimized set of conditions. There was a decrease in incubation time from 24 h (late log phase) under unoptimized condition to 16 h under optimized set of conditions. Further one step purification was performed and the purity of chromate reductase was checked by SDS-PAGE. Thus, the enhanced production and efficacy of extracellular chromate reductase by *Bacillus* sp. is a promising result for detoxification of Cr(VI) under wide range of environmental conditions.

Social relevance of the study

In the modern era of Biotechnology, the detoxification of Cr(VI), a widespread environmental contaminant by enzymatic Cr(VI) reduction is a technological advancement to tackle the pressing issues of environmental pollution.

PP-05

Remediation of wastewater and biomass production for biodiesel using a thermotolerant fast growing microalga *Chlorella sorokiniana*-I

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Many diverse anthropogenic activities lead to waste materials both solid and liquid, which is disposed off usually in water bodies such as rivers and lakes; polluting them. Phycoremediation is the process of removing pollutant from aqua-waste using algae. This practice is not only safe for the environment but also can be used for recovery of bioresources. The photosynthetic microalgal biomass is a potential feedstock for producing the biodiesel due to their enormous ability to rapidly divide and accumulate lipids while removing nutrient from wastewater. We have screened a fast growing oleaginous microalga from the sewage fed Neela-Hauz Lake, New Delhi. The strain identity was discerned using the 16S and 18S rDNA and named as *Chlorella sorokiniana*-I (ICGEB) based on the DNA sequence homology with *C. sorokiniana* species. The growth kinetics of *C. sorokiniana*-I was evaluated using different parameters such as dry cell weight, total lipid content and FAME. The indigenous *C. sorokiniana*-I has efficiently removed total Nitrogen 77%, total Phosphorous 81%, Iron 67%, Calcium 42%, and reduced the COD, BOD and alkalinity by 48%, 47%, 15%, respectively of the wastewater. It thrives well at continuous temperatures of 37ºC and 40ºC and accumulated about 52% higher lipid and two fold higher FAME using wastewater when compared to commercial medium (TAP), which makes the thermotolerant *C. sorokiniana*-I amenable for producing the biodiesel feedstock while remediating the wastewater.

PP-06

Stress related gene responses and behavioral changes in *Caenorhabditis elegans* exposed to organophosphorous pesticide quinalphos

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Quinalphos, an organothiophosphate compound is being widely used in Indian agricultural fields than others but relatively little is known regarding its toxicological effects at whole animal levels. The potential harmful effects of long term use of pesticides on human and environmental health should be evaluated for the safe use of these chemicals, since they are neurotoxic. Based on advantages of *Caenorhabditis elegans* as an animal model for toxicological studies, we have aimed in this study to evaluate the stress related gene responses and changes in behaviors at whole animal levels using *C. elegans*. For this, young adult worms were exposed to the LC_{50} value of quinalphos (1.0 µg/ml/h) and the expression pattern of totally eight different genes of stress responses was examined. Among them, the expressions of five genes (daf-2, daf-16, age-1, glod-4 and egl-30) were up-regulated, whereas three genes responsible for neuronal pathway (*unc-47, unc-13* and *utx-1*) got down-regulated in the worms treated with sub-lethal concentration of quinalphos. Furthermore, quinalphos exposure showed increased expression of GFP fluorescence in *daf-16:* GFP reporter constructs than untreated *daf-16*::GFP worms. Behaviorally, adult worms showed reduced motility during quinalphos exposure and also showed reduced feeding activity. The physiological meaning of up- or down-regulated expression of stress response genes by pesticide exposure thus provide indication of the toxic mode of action from the levels of a single gene to that of the whole organism.

Social relevance of the study

Numerous pesticides are in common use for agricultural, veterinary, household, and landscaping applications, it exert adverse effects on both target and non-target species. Many pesticides function by affecting the nervous system. At sufficiently high concentrations, these chemicals produce paralysis and subsequent necrosis and death. This study investigated the neurotoxic effects of acute poisonings of quinalphos at genetic levels in a whole animal using nematodes with the exposure at sub-lethal concentrations for a given number of hours. The changes observed such as modifications in behavior, growth, reproduction, and phenotype after the exposure of pesticide are validated in terms of gene expression levels.

PP-07

Ferulic acid esterase from Lactic acid bacteria isolated from milk and milk products for producing ferulic acid

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Ferulic acid is a phenylpropenoid compound, most abundant, ubiquitous hydroxycinnamic acid derived from phytochemical phenolic compounds, and widely distributed throughout the plant kingdom. It is a renewable resource for the biocatalytic or chemical conversion to other useful aromatic chemicals from agricultural by-products in nature. Ferulic acid is a potent antioxidant, which neutralizes free radicals that causes oxidative damage of cell membranes and DNA. Lactic acid bacteria (LAB) produce ferulic acid esterase (FAE), which hydrolyzes the phytophenolic compounds into respective alcohols and phenolic acids like ferulic acid. In this study, a direct plate assay was performed for screening LAB with FAE activity by culturing in MRS medium containing ethyl ferulate as a sole carbon source. A total of four isolates belongs to three different genera of bacteria were isolated from the milk and milk products and the isolates were identified as *B.subtilis, Lactobacillus plantarum, L. delbrueckeii* and *Weissella confusa* by classical biochemical tests following 16s rDNA analysis. Our own search of *Weissella confusa* genome has identified three putative Esterase/Lipase proteins namely type B-carboxylesterase (CE), Esterase/Lipase-1 (EL-1) and Esterase/Lipase-2 (EL-2) Bioproject/PRJEA78999). Gene specific primers were synthesized to PCR amplifies all three genes, but the amplification was observed only for Esterase/Lipase gene (EL-2) with the size of 894 bps. The EL-2 amplicon was cloned in pTZ57R vector and sequence verified for further subcloning in expression vectors.

Social relevance of the study

Probiotics, as natural supplements, are generally considered safe, but can also be tested for set-out safety parameters. A number of studies have investigated bacterial strains for a range of conditions, including infections, allergies and metabolic disorders. Promising research focuses on the microbial secretion and production of beneficial biologically active enzymes and proteins. The primary goal of this study was to identify novel enzyme capable of the conversion of ethyl ferulate to ferulic acid.

PP-08

Combinations are more important than total number of disease resistance genes

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Rice blast caused by *Magnaporthe oryzae* is the most devastating disease of rice and causes a serious threat to world food security. Therefore in this study, the distribution and effectiveness of 20 R genes in thirty advanced breeding lines and popular released varieties of Karnataka were investigated based on pathogenicity assays and molecular markers. The results showed that some of the advanced breeding lines and popular released varieties exhibited some degree of resistance with the blast score of 0 to 3 (standard evaluation system scale for rice blast, 1996) and most of the varieties were observed to harbor more than seven R genes and the number of R genes harbored in varieties were significantly negatively correlated with resistant frequency in the selected varieties. Two blast resistant genes like *Pizt* and *Pi7t* were demonstrated to be specifically distributed in all the genomes of rice varieties. By analyzing the relationship between R genes and resistant frequency of rice varieties at phenotypic level, the R genes like *Pi1, Pi2, Pi9, Pi54, Pi20, Pi40* and *Pita* were found to show the main effects against *M. oryzae*. Combinations of genes such as *Pi1+Pi9+54, Pi2+Pi9+Pi54, Pi1+Pi2+Pi54, Pi2+Pi40+Pi54, Pi1+Pi40+Pi20* and *Pi54* alone or else combined with *Pita* gene confer effective resistance against *M. oryzae*. The above results provide good theoretical support for the rational utilization of combinations of major R genes in developing rice cultivars with broad-spectrum resistance.

Social relevance of the study

This study would help to originate strategies for improving rice blast resistance through marker-assisted breeding in rice growing regions.

PP-09

Physico-chemical and biological studies of vermicompost prepared by admixing sodium polyacrylate from used diapers using epigeic earthworm *Eudrilus eugeniae*

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Diapers are the 3rd largest single product in the waste stream. Landfill sites do not provide the conditions necessary for diapers to decompose but are in effect "mummified" and retain their original weight, volume and form. This present study deals with the possibilities for the utilization of absorbent, Sodium polyacrylate (SPA) from used disposable diapers with compost. The experiment was under-taken to assess the changes in the Physio-chemical and biological properties of compost admixed with 5%, 15% and 100% SPA.Earthworms play an important role in the decomposition of organic matter.*Eudrilus eugeniae* which is highly efficient worm in vermicomposting is used in this work. Changes in the compost, includes about 21.5% decline in pH after 120 days of compost.Moisture, electric conductivity, bulk density, water holding capacity, phosphorous and potassium, after the decomposition process increased, whereas the organic carbon got reduced towards the end of composting. There was about 54% decrease in the quantity of compost recovery within 120 days and proliferation rate was high in 15%SPA. This indicates that vermibiotechnology is an effective method to dispose diaper waste without causing any negative environmental impacts. From the results, it can be suggested that, the compost admixed with maximum of 15% SPA can be used as a fertilizer as it improves the quality of organic matter effectively.

Social relevance of the study

Disposable diapers with human waste do not degrade in landfills results in pollution. Vermicomposting, an ecobiotechnological process that transform waste in to stabilized compost is used here successfully.

PP-10

Application of immunodiagnostic assays in detection of paramphistomosis in domestic ruminants

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Paramphistomosis is one of the most pathogenic diseases in the domestic livestock which is infected during post monsoon due to presence of snail's variety. Paramphistomosis is caused by massive infection of small intestine and is characterized by sporadic epizootics of acute parasitic gastroenteritis with high morbidity and mortality in livestock. The research work conducted under DST sponsored project on paramphistomosis revealed the rate of infection with 4.62% in domestic ruminants after eggs screening by sedimentation test. The highest incidence was found in buffaloes followed by sheep, cattle and goats in Punjab. The oral inoculation of infective stage was given to experimental sheep for the emergence of disease and recording prepatency through conventional and immunodiagnostic tests. The eggs of *P. epiclitum* was identified in the faecal samples of experimental sheep after 135 days post infection which confirm the establishment of experimental infection in sheep. The somatic and E/S antigen was prepared from flukes collected from various slaughter houses and infected sera samples were collected from sheep orally infected with *P. epiclitum* metacercariae at respective dose of 4000 to 5000 metacercariae per animal. DID, CIEP and counter current immunoelectrophoretic studies using anti-*P. epiclitum* rabbit hyper immune sera showed strong reactivity in forms of precipitin bands and arc, while experimentally infected sheep sera also reacted sharply with somatic antigen of *P. epiclitum* and *G. crumenifer* and formed single precipitin are suggestive of the presence of diagnostic moieties in the antigen. However SDS-PAGE profile revealed various polypeptide bands along with some predominant bands. Further western blot studies using serum samples of rabbit recognized clusters of polypeptides, while experimentally infected sheep sera (10 weeks PI) recognized the specific polypeptide band. Significance of antigenic moieties in detection of prepatent *P. epiclitum* infection in ruminants has been discussed. Systematic application of immune diagnosis and identification of major protective antigen can detect early infection and minimize the incidence of paramphistomosis in domestic livestock.

Social relevance of the study

Paramphistomosis epidemiology and serodiagnostic findings provide early detection and diagnosis, management formulation and immunological control of the disease prevalent in endemic areas and livestock industry.

PP-11

Application of date palm (*Phoenix dactylifera* L.) syrup and its influence in food industries to enrich food products

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Today's world is struggling to meet the needs of a healthy lifestyle, where malnutrition, diabetes mellitus and intestinal disorder are common. Date palm (*Phoenix dactylifera* L.) is one of the oldest and popular foods of the middle east which is rich in B complex vitamins B1, B2, nicotinic acid and vitamin A. It also contains high content of aspartic acid, proline, glycine, histidine, valine, leucine and arginine. The main purpose of this study is to introduce date palm syrup (DPS) to modern food industries to increase nutrition in their baked goods, fermented products and beverages. DPS can be obtained by minced date flesh incorporated with water at a rate of 1:2 at 70ºC for 30 minutes. DPS is rich in polyphenols which shows anti-microbial activity against *S.aureus* and *E.coli*. It is also rich in tannins, flavonoids, flavonols and potent antioxidant. Bioactive component of DPS are bacteriostatic. It has low glycemic index and does not result in glucose excursion when consumed in a healthy balanced diet. DPS gives the most optimal result, since it is unrefined it maintains all the vitamins, minerals and fiber content. Food industries can use DPS to increase medicinal, therapeutic and nutritive value of different food products.

PP-12

Aquaspirillum magetotactum: the magnetic microbe

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Microbes are the organisms which are most abundantly found on our planet and are ubiquitous in almost every environment. The variations and the adaptability of these microbes are wondrous and exciting to research upon. Among these organisms one of the more recently found bacterial species has a very unique property: biomagnetism. The name proposed for this new species is *Aquaspirillium magnetotacticum* which reflects the remarkable magnetic responsiveness of the organism. Few relevant characteristics of the microbe are that it is aerophilic, chemoheterotrophic, magnetotactum fresh water spirillum.

PP-13

Bioplastics: plastics go green

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Plastics, due to their economic properties and extreme versatility, are the material of choice in many industrial and commercial applications. Most traditional plastics are produced using petroleum. However, the problem of disposal of plastics remains a widespread concern. The recent trends in the preservation of the environment have created many innovations in bio degradation of plastic products. Bioplastic is one such innovation which uses renewable resources such as sugar, starch, vegetable oils or cellulose in production. Polylactic acid (PLA) is the most important bioplastic in the market whose degradation requires special industrial conditions that are not normally available in landfills. Bioplastics based on cellulose acetate serve as a better alternative. The common plasticizers are substituted by specific esters which will decompose the plastic within just a few years as compared to normal plastics that take hundreds of years to degrade. Bioplastics depending on the sources for manufacture are either biobased or fossil based. Fossil based degrades easily but results into toxic products whereas bio-based take a long time. If the production chain is streamlined and progress can be made on the use of cellulosic plant material to produce bioplastics, then we could see a significant reduction in the environmental impact of plastic materials. The market for bioplastics is growing slowly but steadily so there's a good chance we'll see serious improvements in the next decade.

PP-14

Collagen sponge: A novel support to cardiac stem cells

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Stem cell therapy, while a new age miracle treatment system to many ailments, still faces numerous challenges in implementation. One such problem of using stem cells to restore damaged cardiac tissue is the dynamic nature of the heart that causes the injected Stem cells to usually die or wash away before it can regenerate the tissue. Some recent research shows that Porous Collagen Sponges, the Aquatic parazoan organisms have the potential to support stem cell culture to grow into cardiac tissue. The Unique structure of the organism that has no specific tissue makes it easy to manipulate and separate in seeded stem cell producing wondrous results.

PP-15

Bioluminescence: A pollution detector

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The most insidious poisons are the ones we cannot see. Pollution in the waterways can be invisible and deadly. The most important need is finding the pollution before it can do damage to our largest cities. The solution is to use the bioluminescence microbes to help detect poison in water. Tests are done on soil samples collected from water ways because the sediment is not mobile like water flow yet holds the pollution inside of itself. Bioluminescence is the phenomenon of emission of light from a living organism. It is a type of chemical luminescence reaction catalysed by enzymes. The reaction involves the oxygen oxidation of organic molecule called the Luciferin. The study aims to isolate the gene responsible for the production of this molecule can be transmuted to other 'non-bioluminescent' bacteria to induce bioluminescence into the organism. Bacteria growing in lead polluted environment can be isolated and used. The isolated bacterium is introduced with a primer for Luciferin gene. The mutated bacterium can be used to determine the presence of Lead in the sample.

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