

# NATIONAL CONFERENCE

On

## *Plant Sciences: Network in Health and Environment* (PSNHE-2018)

(October 30-31<sup>st</sup>, 2018)

**ABSTRACT BOOK**

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**POST GRADUATE DEPARTMENT OF BOTANY**  
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# POST GRADUATE DEPARTMENT OF BOTANY

## KHALSA COLLEGE AMRITSAR

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## *Preface*



Modern civilization rests on successful and sustained cultivation of plants and wise use of biological and physical resources. Since time immemorial, plants have been collected, traded and bred for new combination of traits. Plants are important in regulating the climatic conditions. As a component of nature, plants are providing solutions to agriculture, health and environment including climate change, food security and as renewable energy sources. “PSNHE-2018” is aimed at providing a platform for adoption and diffusion of research in the upcoming areas of plant sciences. It will disseminate knowledge among researchers, academicians and environmentalists. “PSNHE-2018” will be precursor to understand specific and complete technologies and chart a roadmap for future. The recommendations of the conference will be communicated to the policy makers in the government and other stake holders, with the aim of taking a step forward in finding solutions and new pathways for future potential medicines and climate related issues.

**Kirandeep Kaur Hundal**  
**Coordinator**  
**PSNHE-2018**



# **KHALSA COLLEGE CHARITABLE SOCIETY AMRITSAR**

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## *Message*



It is indeed a great pleasure to know that the Post Graduate Department of Botany is organizing the National Conference on Plant Sciences Network in Health and Environment on October 30-31<sup>st</sup>, 2018 at Khalsa College Amritsar. There is a global concern about environmental exposure and its impact on human health. The Health problems of a country can be properly addressed only through a deep understanding of biology and paying respect to the environment. In the holy Granth ‘Guru Granth Sahib Ji’ it is quoted “**gtD[ r{o{ gkDh fgsk wksk Xofs wjs[..**” where air has been designated as the Guru, water the father and the earth has been accepted as mother. It is interesting to note that the conference is covering all major areas of research in this field. I hope that the discussions by the eminent scientists, researchers and students from renowned institutes will bring the frontier areas of research in plant sciences onto a collaborative platform and a symbiotic relationship can be established among all the researchers from various disciplines. At this Juncture, I express my heartiest welcome to all the participants and wish a very fruitful conference and comfortable stay in the city of Amritsar.

I wish a great success for the National Conference ‘PSNHE-2018’.

**Satyajit Singh Majithia**  
**President**  
**Khalsa College Charitable Society, Amritsar**



# **KHALSA COLLEGE CHARITABLE SOCIETY AMRITSAR**

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## *Message*



Khalsa College Amritsar is always abuzz with a plethora of activities and has become a dynamic venue where brilliant minds from all over the world share their vast reserve of knowledge and skills. On behalf of the management of Khalsa College Amritsar, I invite all the great scientists, academicians, young researchers and students from all over the country to attend the National Conference “Plant Sciences: Network in Health and Environment”. The faculty, students and staff of P.G. Department of Botany have contributed a lot to organize this conference. The scientific community has a major role to play in shaping our future. Science provides us with the signposts of where we are and where we are headed. Education is what we imbibe—from our books, our peers, our teachers and our surroundings. As we move towards our goals, we must always keep in mind that we owe more to the world than it owes us. Each of us can and must do his or her bit to help build a universe that will nurture our future generation. I extend my warm greetings to the organizing committee and all the participants and send my best wishes for the success of the conference.

**Rajinder Mohan Singh Chinna**  
**Honorary Secretary**  
**Khalsa College Charitable Society, Amritsar**



# **KHALSA COLLEGE AMRITSAR**

*(An Autonomous College)*

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## *Message*



I am pleased to welcome you all to the National Conference on “Plant Sciences: Network in Health and Environment (PSNHE-2018)” organized by Post Graduate Department of Botany, Khalsa College Amritsar. I understand that a large number of delegates from eminent institutes are participating in the conference. The conference has been planned with a very befitting theme, which is highly relevant due to the importance of plants to humans. We aim to encourage the exchange of thoughts on interdisciplinary research in fundamental plant sciences. I heartily welcome you all to this unique convergence of talent and experience and extend my warm greetings and felicitations to the organizing committee and all the participants and send my best wishes for the success of the conference.

**Mehal Singh**  
**Principal**  
**Khalsa College Amritsar**

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# **KEYNOTE ADDRESS**

## **Bamboo- Wonder of Nature – Present and Future**

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Bamboos because of their ability to grow faster, low gestation period and multipurpose utilities have endeared themselves to the mankind since ages. It is also true that right from ‘Cradle to Pyre’, the bamboos are rather intimately attached to our lives. In the modern times, there is an ever increasing list of bamboo products and utilities. Because of the multiple uses, these are also known as ‘**green gold**’ of forests. Increasing importance of bamboos can be gauged from the fact that over-million in the world are dependent on bamboos directly or indirectly and goods worth US \$ 10 billions (approx. Rs. 50,000 crores) made out of bamboos are utilized the world over and is expected to reach beyond US\$ 20 billion in the recent times. The domestic market is worth Rs. 2043 crores with a potential growth rate of 15-20% annually. After China, India occupies second place in bamboo production. Around 12 million hectare area is under bamboos which constitutes >13 percent of the total forest cover. Bamboos are truly the most fascinating group of plants offering solutions for rural employment generation, soil and water conservation, mitigation of global warming, and providing raw material for domestic as well as industrial usage. Bamboos are no longer treated as forest timber but as a cash crop and woody grass. The very reason that bamboo cultivation and utilization is being promoted by the Ministry of Agriculture under a National Bamboo Mission through various agencies is testimony to this. Bamboo is a familiar material for the people in the villages who depend largely on bamboos for meeting their basic requirements of food, wood, fuel and fodder. The farmers in the hills maintain bamboo plants mainly for their highly nutritious leaves as fodder for cattle during winter months. Bamboos have over 1500 recorded uses in different areas. In the modern context, bamboo is being increasingly utilized as an engineering material for producing decorative laminates, boards, house hold utility goods, fabric for dress material and waxes having antimicrobial properties, for use in cosmetics. Because of a large diversity in size, colour and thickness of bamboos, these are now preferred material for creating beautiful landscapes. Use of modern methods have enabled extraction of bamboo fabric resistant to UV radiations and having anti-bacterial properties. It is soft with desirable elasticity and generally pesticide free. Moreover, aesthetically pleasing products out of bamboos are liked everywhere. Because of fast growth and high biomass per unit area and time, the bamboos have a great potential for producing liquid and gaseous fuels from biomass which shall help farmers in generating extra income resources at the village levels. Another fact that endears bamboos universally is their almost nil post plantation care once established. There are not many fungal diseases or pests inflicting bamboos and long vegetative cycles add to their commercial values. Industries have a steady demand of bamboos for pulping for paper, sticks in the aggarbattis and even quality fibre for clothes. The latest change in regulations is bound to facilitate growth and promotion of bamboo sector in the Country and helping bridging the gap between the communities living in the remote villages and supplying raw bamboos to the industry at very low prices.

Bamboos excite researchers no end because of some unique features such as an enigmatic flowering behaviour which is species dependent and long flowering cycles, very

fast growth and high biomass production, early maturity, no secondary growth in subsequent years, scope for producing unique hybrids, despite easy propagation by cuttings but no reversion to juvenility unlike in other woody plants and offer innumerable opportunities for employment generation, and environment cleaning in more than one ways. I shall be discussing at length on the importance of bamboos, why and how we should grow these and the biotechnological interventions for future course to the betterment of the mankind.

# **INVITED PRESENTATIONS**

**(IP-01)**

## **28-homobrassinolide Induced Oxidative Stress Tolerance in *Brassica juncea* under Dual Stress of Salt and Temperature**

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28-homobrassinolide (28-HBL) belongs to group of naturally occurring plant steroid hormones named brassinolides (BLs) which have basic four ring structure resemble with cholesterol steroid of animals. Different active forms of BLs are reported to present ubiquitously present in number of plant species which work as signalling molecules to induce different growth and regulation responses in plants including plant tolerance to various stresses. However the underlying mechanism involved in this management in plants by BLs is not well understand. Present investigation explored the role of 28-HBL at different concentrations (0, 10<sup>-6</sup>, 10<sup>-9</sup>, 10<sup>-12</sup> M) to the *Brassica juncea* seedlings subjected to dual stress of salt (180 mM) and temperature (4 °C and 44 °C) taking 25 °C as optimum temperature. Significant reduction in phenotypic expressions of shoot and root length was observed under dual stress of salt and temperature. Supplementation of 28-HBL improved all the phenotypic characters observed in *B. juncea*, but in a very dose dependent manner. Stress markers such as H<sub>2</sub>O<sub>2</sub>, lipid peroxidation, electrolyte leakage enhanced expressively while cell viability was reduced vividly in seedlings exposed to dual stress alone. Exogenous application of 28-HBL showed inhibition in stress marker content thus improved cell viability rate. Activities of SOD, CAT, APOX, GR, DHAR and MDHAR increased in response to 28-HBL. These findings may be useful in the development of dual stress tolerant crops by exogenous application of 28-HBL, an eco-friendly chemical, which may modulate the antioxidant defense system thus improved the redox state of the crop.

**(IP-02)**

## **Antidiabetic and Renoprotective Properties of *Tinospora cordifolia* on Alloxan Induced Diabetic Mice Kidney**

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*Tinospora cordifolia* is a large extensively spreading glabrous, perennial deciduous twiner with succulent stems and papery bark. The effects of methanolic stem extract of this plant on histological alterations in diabetic mice kidney, levels of blood glucose concentration and activity of lactate dehydrogenase enzyme assay was assessed. Mice were given intraperitoneal injection of alloxan monohydrate to a dose of 120 mg/kg body weight and divided into two groups with three mice in each group. First group served as control and were given distilled water. Second group were given *Tinospora* stem extract orally to a dose of 300 mg/kg body weight for a period of 28 days. Blood sugar levels of alloxan + *Tinospora cordifolia* extract treated mice showed decline from 137.33 ± 5.50, to 114.00 ± 8.71 mg/dl from 7-28<sup>th</sup> day. *Tinospora* extract treated mice kidney showed decline in LDH activity from 7 to 28 days stage with values 0.684 ± 0.013 to 0.574 ± 0.017 U/mg protein/min. The histopathological studies of kidneys of diabetic mice revealed degeneration of renal architecture. Alloxanated mice treated with *Tinospora* stem extract revealed reduction in thickening of epithelial walls of renal tubules and cellular infiltration was also lesser as compared to alloxanated mice. The protective effects due to treatment with *Tinospora* extract

strongly indicate the possibility of the extract being able to prevent any leakage of marker enzymes. The mechanism of renoprotective action may be due to presence of phenolic and flavanoidal compounds.

**(IP-03)**

### **Plant Adaptations to Environmental Stress for Sustainability in the Era of Climate Change**

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Global population is escalating at a distressing rate and is anticipated to reach beyond nine billion by the end of 2050. While plant productivity is being seriously constrained by a range of abiotic stresses, feeding the world population under such horrid environment is a major disquiet for all nations. Environmental stresses such as salinity, as drought, heat, cold, nutrient deficiency, toxic metals like aluminum, arsenate, and cadmium in the soil pose major intimidation to agriculture and food security world wide. The productivity loss is elicited by a series of morphological, physiological, biochemical and molecular stress induced changes. Such an adverse situation is in contrast with mounting global food demand and becomes even more testing in developing countries where they cause severe food insecurity and ruthless poverty for large populations predominantly in rural areas. In this scenario, it is urged that such strategies should be adopted which may be used to get maximum crop stand and economic returns from stressful environments. By employing contemporary tools and techniques, strenuous attempts are being made worldwide to understand how plants respond to these stresses. Traditional plant breeding approaches have been marginally successful in improving the tolerances to these stresses. The molecular mechanisms underlying these abiotic stress tolerances in plants are being unraveled with various high throughput sequencing and functional genomics tools in particular to advance the understanding of stress signal perception and transduction of the associated molecular regulatory networks. Therefore marrying the physiological, biochemical and gene regulatory network knowledge will be essential to develop or select for stress tolerant and high yielding food crop cultivars and increase agricultural productivity in the near future.

**(IP-04)**

### **Diversity of Agaric Flora of North West India**

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Agarics are the lamellate fruiting bodies of basidiomycetous fungi which belong to Class *Agaricomycetes* of Phylum Basidiomycota. They are characterised by the presence of a pileus and a clearly differentiated stipe. Three orders viz. *Agaricales*, *Russulales* and *Boletales* have been recognised to represent Agaricoid, Russuloid and Boletoid clades. Taking in account their growing habit and habitat they can be terrestrial, humicolous, foliocolous, lignicolous, coprophilous, termitophilous or may occur in ectomycorrhizal associations with forest trees. North West India being rich in vegetataion having coniferous and angiospermic trees, shrubs, herbs, epiphytes, parasites, climbers etc. provide great oppourtunities for agaric flora to flourish. The altitude of North West India varies between 250-3,300m and have a good monsoon period from June to October. Thus the vegetation, topography and climate of this area is quite favourable for the growth of diverse range of agarics. Commonly met genera in this area are *Agaricus*, *Agrocybe*, *Amanita*, *Bolbitus*,

*Chlorophyllum*, *Clitocybe*, *Coprinus*, *Entoloma*, *Floccularia*, *Gymnopus*, *Gymnopilus*, *Hebeloma*, *Inocybe*, *Lactarius*, *Lentinus*, *Leucoagaricus*, *Marasmius*, *Pholiota*, *Russula* etc. The diversity of agarics differ with different altitude and temperature range. Many of these agarics are both nutritionally and medicinally important and can be domesticated for the evaluation of their different constituents and uses. In the present paper diversity and ethnomycological details of agarics from the North-West India is discussed.

**(IP-05)**

### **Morphogenetic and Phytochemical Diversity of some Medicinal Plants from North West India**

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Constant anthropogenic activities and changing environmental conditions are responsible for changing the vegetation of any area. Plants are constantly subjected to selection through preferable plantations, pollution tolerance and escapism. This process has enhanced the rate of evolution in various genotypes found around us today. There are not only morphological variations among the different plants of same species, these have a genetic basis as well and in some cases there is a marked variation in the phytochemical constitution which may enhance or even decrease the efficacy of the medicines derived from such plants. The present study deals with the cytomorphological status of *Tecomella undulata*, *Abutilon* species and *Ageratum* species from North Western regions of India. The studies present the intraspecific as well as interspecific genetic relationships between the various cyto/morphotypes and species respectively. Species of *Abutilon punjabensis* is described for the first time from the study area and its phylogenetic relationship derived with the other known species. The study also revealed variability in the flavonoid, fatty acid and phenol content and thus the antioxidant potential among the morpho/ cytotypes of *Tecomella* and *Ageratum* and among the species in *Abutilon*.

**(IP-06)**

### **Diversity of Corticioid and Poroid Agaricomycetes in Punjab and Adjoining Areas**

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Corticioid and poroid fungi are characteristic in having unilateral, gymnocarpic hymenium organized in the form of effused, effused-reflexed or pileate basidiocarps. These fungi are important components of the forest ecosystem as they play key role in the recycling of organic carbon by decaying ligno-cellulosic material. Some of the poroid members have long been used in the traditional medicinal system in many Asian countries. As per Mycobank, these fungi have been classified under thirteen orders within class *Agaricomycetes*, sub-phylum *Agaricomycotina* and phylum *Basidiomycota*. Earlier workers have documented only 108 taxa of these fungi from Punjab and adjoining areas of Haryana and Himachal Pradesh. Taking into account the less number of taxa reported and rich diversity of the tree species in the study area, the present investigations were proposed. The present compilation provides an account of 130 Agaricomycetous taxa from the study area based on the exhaustive fungal forays conducted during the years 2012-2016. Of the 130 taxa reported, 6 species i.e. *Antrodiella grandibasidiata*, *A. indica*, *Bondarzewia indica*, *Phlebia*

*brevibasidia*, *Phlebiopsis punjabensis* and *Radulodon acaciae* are new to science. It is pertinent to mention here that in addition to the new species, 32 species are being described for the first time from India along with 66 new records from the study area. As many as ten taxa, growing on living tree species have been evaluated for the histopathological details. A consolidated inventory of all the 172 taxa has also been provided, which will be a useful reference for future workers.

**(IP-07)**

**River Water Quality: A Case Study of Major Environmental Disaster in Beas River on 17 May 2018**

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River is a lifeline of the city and river water quality indicates the habits and culture of its people. Rivers are considered sacred as per Indian traditions, but indiscriminate discharge of industries, municipal corporations including waste dumping deteriorates river water quality on its downstream and affects public use at large. River water quality can be gauged by analyzing parameters viz. (i) pH (ii) dissolved oxygen (iii) biochemical oxygen demand (iv) ammonia (v) conductivity (vi) bacteriological count etc. Based on these water quality parameters, rivers can be classified into categories like A, B or C. The present study is focused on major environmental disaster in river Beas on 17 May, 2018 due to spillage of molasses by sugar mill at Kiri Afgana village of Gurdaspur district. River Beas is originated in Himalayas (Length= 470 km) and enters into Punjab near Hoshiarpur and passes through Gurdaspur and Amritsar and finally merges with Satluj River at Harike Pattan (Tarnan district of Punjab). During this episode, the river color has changed to rust brown and dead fishes were floating in the river. Two water samples were collected from River Beas on 17-18 May, 2018. Also, dead fish was collected from the river bank in Beas and dissected to check the gills and other organs. The water samples were analyzed for pH, colour, conductivity, suspended solids, BOD, COD, Nitrate, UV-absorbing organic matter etc. In conclusion, river water quality was poor [Class C or below] as per criteria proposed by Central Pollution Control Board (CPCB), New Delhi.

**(IP-08)**

**Management of Ambient Air Quality using Ornamental Plants**

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Air quality management involves the determination of the relative contribution of current or future source emissions at receptor sites to ground level pollutant concentrations coupled with implementation of effective management plan to reduce emission level. From the last few decades, urban air pollution has become an inevitable issue for its possible consequences on public health. In order to manage the ambient air quality, there are several methodologies with some specific advantages and constrains. Improvement of ambient air quality involves the basic approaches like emission reduction at source level, conversion of pollutants to a less damaging compounds and sequestration of pollutants. However, in order to manage the air quality, application of ornamental plants may be considered the best alternative approach. Although, it may not be imperative to consider plants as a sole alternative for urban ambient air quality management, but certainly it may useful to manage



air quality for a small confined area, especially in case of indoor air. This paper reviews the possible application of ornamental plants, which may be trees, shrubs or herbs for its possible applications to regulate air quality. Some selective plant species has also been recommended based on its air pollution tolerance index.

**(IP-09)**

### **High Blood Pressure (Hypertension): Symptoms, Causes and Treatments**

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Hypertension (HTN) or high blood pressure, sometimes called arterial hypertension, is a chronic medical condition in which the blood pressure in the arteries is elevated. Blood pressure is summarised by two measurements, systolic and diastolic, which depend on whether the heart muscle is contracting (systole) or relaxed between beats (diastole). This equals the maximum and minimum pressure, respectively. Normal blood pressure at rest is within the range of 100–140 mmHg systolic and 60–90 mmHg diastolic. High blood pressure is said to be present if it is often at or above 140/90 mmHg. Hypertension is classified as either primary (essential) hypertension or secondary hypertension. Hypertension puts strain on the heart, leading to hypertensive heart disease and coronary artery disease if not treated. Hypertension is also a major risk factor for stroke, aneurysms of the arteries (e.g. aortic aneurysm), peripheral arterial disease and is a cause of chronic kidney disease. Dietary and lifestyle changes can improve blood pressure control and decrease the risk of health complications, although drug treatment is still often necessary in people for whom lifestyle changes are not enough or not effective

**(IP-10)**

### **Diversity of Plants: Retrospect, Prospects and Conservation**

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Retrospect means looking back or thinking about past. Prospects means looking forward or thinking about future. Conservation means Preservation. , According to Sect. 2 of ‘the Biological Diversity Act 2002’, the Biodiversity or Biological Diversity is the total variability within all living organisms and the ecological complexes they inhabit. Ecology or “Okologie” (Gk. *oikes*), was coined by Ernest Haeckel- German Zoologist in 1866. He described it as home or a place to live or household. It has been defined as the relation of animal to its organic and inorganic environment. Environment includes the inter-relationships that exist among water, air, land & human beings, other living creatures, plants, micro-organisms and property according to section. 2 (1) (c) of the national green tribunal act, 2010 (no. 19 of 2010)]. Whittaker in 1969 gave 5-kingdom system of classification to describe the different organisms. He divided the organisms on the basis of complexity of cells and organisms, mode of nutrition, source of nutrition and life style. He named the groups as monera, protista, fungi, plantae and animalia. It has been estimated that there are 40,000 species of algae in the world. Out of which 6,500 species are found in India. Among them 5,820 species are found in fresh water and 680 species in marine water. The bryophytes are divided into mosses, hornworts and liverworts. It has been found that there are 15800 *spp.* in world, 2000 *spp.* in India and 751 *spp.* in W. Himalayas of mosses. On the otherhand, the species of hornworts are 270 *spp.* (World), 25 *spp.* (India) and 09 *spp.* (W. Himalayas).

Likewise, liverworts are 8500 *spp.* In (World), 850 *spp.* (India) and 235 *spp.* (W. Himalayas). Pteridophytes are (Gk. *pteron*-feather; *phyton*-plant) 'Ferns' & 'Fern Allies' which have independent sporophyte and gametophyte, roots & cuticle have been developed for the 1<sup>st</sup> time, seedless vascular plants (1<sup>st</sup> Vertebrates of the plant kingdom), fronds show continued apical growth and Circinate vernation (CROZIER FORMATION). There are about 13,000 Species in world and 1,000 species in India. Gymnosperms (Gk. *gymnos*-naked; sperma-seed) have approximately 750 species in the world and 56 species in India. On the contrary, angiosperms (Gk. *angion*-vessel; sperma-seed) have 2,50,000 Species in the world and 17,500 Species in india. All the biological species are under constant threat. What is happening to our clean environment and the biodiversity has to be taken care of. Why this decline is there, because we are traditionally pollution loving nation and poaching the animals and destroying plants not to meet our needs but greed. About 15-20% of 17,500 flowering plants of India are endangered. 365 species are in 'The 2006 IUCN Red List' by the World Conservation Union. Extinction is forever-no technology can bring back the "Extinct species. If the natural habitat is under threat, then the threatened taxa should be introduced in appropriate habitats similar to the natural ones, i.e. in Zoos, Botanical Gardens, Van-Vihars, etc. or we can go in for *in vitro* multiplications, germplasm collections, seed banks, pollen banks, field gene banks, DNA banks, etc., where threatened taxa can be multiplied or stored and then grown in protected areas. There are many remedies like common law, statutory and constitutional. In the end, it is very important to understand that the future is in our hand to think and act logically to save our mother earth's beauty.

# **ORAL PRESENTATIONS**

**(OP-01)**

**Unexplored and Underutilized Plants of Himalayan Cold Arid Region of Ladakh, India**

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Underutilized plants are those plants that have been used from centuries for food, fodder, fiber, oil or medicinal purposes, but have been reduced in importance over time. This is because of unrecognised nutritional value, poor consumer awareness and due to the modernisation of agricultural practices. The cold Himalayan region of Ladakh comes under Jammu and Kashmir State of India. The Ladakh Himalaya which seems barren and devoid of vegetation at first sight is very rich in herbal resources. But the region is devoid of even a single blade of grass in open during the peak winter months. Long before the new vegetables were introduced, Ladakhi people survived on the traditional wild vegetables that grew almost everywhere in the region, that could withstand the harsh abiotic conditions of the region. The wild plants which are used as vegetables have very high nutritional value. There are very large number of wild plants as well as cultivated species which were used from very long time by Amchi (traditional trainers) system of medicine for treatment of various ailments and diseases. *Fagopyrum esculentum*, *F. tataricum*, *Taraxacum officinale*, *Cicer microphyllum*, *Mentha longifolia*, *Urtica hyperborea*, *Rumex patientia*, *Capparis spinosa*, *Nepeta floccose* and *Rheum speciforme* are some of the traditional plants that are used both as food and medicine. Rapid economic development, constructions, modernisation and adoption of new food habits have marginalised these nutritionally rich and medicinally important plants. With the shrinking of the food basket, it is important to conserve these plants to combat malnutrition and hidden hunger that is largely prevalent in our country.

**(OP-02)**

**Utilizing Millets in Chapatti Making for their Nutraceutical Potential**

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Millets are our forgotten grains that have been today labeled as “nutricereals” due to their high nutraceutical potential. Consuming these grains is reported to have benefits like preventing tumor & cardiovascular diseases, lowering cholesterol, and delaying gastric emptying. This study was carried out to utilize different millets like (finger, foxtail, barnyard, kodo, little and proso) to make chapattis as chapatti forms an essential component of the Indian diet. The millet chapattis were found to have higher levels of slowly digestible starch that ranged from 32.75-38.34 g/100g as compared to wheat chapatti (31.29g/100g); which may lead to lowering of glucose absorption consequently maintaining blood glucose level. The rapidly digestible starch was lower for millet chapattis. The resistant starch, which is the starch fraction not absorbed by small intestine was found to be up to 91.4% higher for millet chapattis. Another important characteristic of millet chapattis is the lower glycemic index that ranged between 65.30-71.89 for millet chapatti and 76.31 for wheat chapatti; which is related to the lower insulin response and hence proves its nutraceutical value for diabetic patients. A positive correlation ( $r = 0.88$ ) was observed between the glycemic index and the rapidly digestible starch. Among the millets studied, foxtail showed highest nutraceutical potential followed by kodo, little, barnyard, finger and proso. Hence the utilization of millets in the form of chapatti may serve as an efficient delivery vehicle for the nutraceutical components of millets and serve as an ideal medium for improving the nutritional quality of Indian diets.

**(OP-03)**

**Effect of Pre-Sowing Treatments on Germination Parameters of *Terminalia chebula* Retz. Seeds Collected from Different Sources**

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*Terminalia chebula* Retz. is a forest tree of family Combretaceae. The natural regeneration capacity of this plant is very low. Seeds have a hard seed coat with thick fleshy pulp. So, keeping in view the medicinal importance of this plant, an investigation was conducted to study the effect of five different pre-sowing seed treatments, control (seeds that were kept in open), H<sub>2</sub>SO<sub>4</sub> treatment (50% conc.) for 2 minutes, cold water treatment for 24 hours, boiling water treatment for 15 minutes and cowdung slurry (cowdung + urine) soaking for 48 hours on the seeds collected from 4 different sources viz. Punjab, Haryana, Jammu and Kashmir and Himachal Pradesh to find the best source and pre-sowing seed treatment which enhanced germination. The seeds were sown at different intervals of (just after collection, storage two months and four months). The seed germination percentage, germination capacity and germination energy values were recorded. It was observed that all the pre-sowing seed treatments gave better results as compared to control under all conditions of sowing but the treatment which gave the maximum germination percentage, germination capacity and germination energy was conc. H<sub>2</sub>SO<sub>4</sub> treatment for 2 minutes. The seeds collected from Punjab and Haryana were found to be better for all germination parameters. Hence, all pre-sowing treatments were better than untreated seeds.

**(OP-04)**

**Amelioration of Vitamin A, C and E by Brassinosteroids in *Brassica juncea* L. CV RLC 3 under low Temperature**

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Vitamins are accountable and important for nutritional value of crop along with building up the tolerance power of plant towards any stress. Application of phytohormones, such as brassinosteroids (BRs) is one of the strategies to enhance the production of vitamins under variable environmental conditions. Being plant steroidal hormone, brassinosteroids may have very superior and potential role in growth and development of plant, concurrently it helps in making plant more tolerant to adverse conditions of environment. The present study explored the potential of 24-Epibrassinolide and 28-Homobrassinolide (24-EpiBL; 28-HomoBL; 1 μM, 1 nM and 1 pM) supplementation on the content of vitamin A, C and E during different time periods of seedling growth of *Brassica juncea* L. var. CV RLC 3 under low temperature (5°C). Results suggested that priming treatments of both 24-EpiBL and 28-HomoBL to seeds of *B. juncea* L. enhanced the vitamin content in comparison to untreated control seedlings. These results indicated that BRs increase vitamin content of *B. juncea* L. seedlings. These findings may prove valuable in protecting nutritional value of vegetable crops under temperature harshness by making them tolerant with simple application of eco-friendly chemicals such as BRs. This will also have signature management under abrupt temperature changes of growing environment of the crop.

**(OP-05)**

## **Bioremediation of Paper Mill Effluent by Some White-Rot Fungi**

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The industries discharging highly coloured effluents in the water-bodies include paper and pulp mills, textile mills, bleacheries, dyeing industries, distilleries, tanneries, leather processing units etc. These effluents have strong concentrations of metal ions, phenolic compounds, tannins, organic residues, acid solubilised lignin and a variety of hazardous chemical compounds. Thus raising the toxicity, mutagenicity and chemical oxygen demand (COD) of reservoir in which these are dumped untreated. The pulp and paper industry typically generates large quantities of wastewater which needs to be treated before discharge. The persistent dark brown intense colour in the released industrial effluent from primary wastewater treatment facilities is due to dissolved lignin and other based synthetic, aromatic and chlorinated compounds used in paper making. The holy city of Amritsar is surrounded by cluster of industries in its bye-pass area, hosting four pulp and paper mills generating huge quantity of untreated effluent which makes this water misfit for human consumption. Bioremediation employing ligninolytic white-rot fungi (WRF) and their enzyme system may prove helpful in treating such effluents. The present study has been designed and done using ligninolytic WRF namely *Phanerochaete chrysosporium*, *Phlebia radiata* and *P. floridensis*. These fungi have been tested for their ligninolytic enzyme production on basal medium supplemented with corn-cob, a cheap agro-waste material. An effort has been made to establish relation between ligninolytic enzyme activity and degradation of pulp and paper mill effluent (PPME) by studying decrease in colour intensity of effluent, COD and toxicity/mutagenicity to microbial tester strains. The three of tested fungi decolourised the PPME significantly causing a 96.5 to 97.1% colour loss in variable period of incubations. A maximum of 95% loss in COD of effluent was caused by enzyme extracts obtained from *P. floridensis*. The mutagenicity was also reduced significantly by three of the tested fungi.

**(OP-06)**

## **Biotechnological Strategies to Combat with a Leaf Spot Disease of *Withania somnifera* (L.) Dunal**

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*Withania somnifera* is a high reputed medicinal plant of family Solanaceae and has been extensively used in African, Indian, and Unani traditional medicinal system. It is well known for its anti-oxidative, anti-aging, anti-arthritic, anti-stress, anti-cancerous, apoptogenic, anti-inflammatory, neuro- and cardio-protective properties. These pharmaceutically important properties are attributed to the presence of a large number of secondary metabolites like alkaloids, flavanol glycosides, polyphenolics, sterols, glyco-withanolides and withanolides. Recently, with the rising market of herbal products, the demand of *W. somnifera* has increased significantly. However, under cultivated conditions, this plant is prone to attack by various pest and pathogens. Among these, the leaf spot diseases incited by *Alternaria alternata* was found to be most prevalent one and lead to 50-60% crop loss in *W. somnifera*. Therefore, there is a strong need to decipher new strategies to combat with this pathogen. Hence, the present study is focused on comparative analysis of disease sensitive and disease resistant cultivars in an attempt to understand the complex relationship of host-pathogen interactions during leaf spot disease in *W. somnifera*. Further, an attempt is also

made to develop a reliable molecular detection system for rigorous quality control against leaf spot pathogen i.e. *A. alternata* in *W. somnifera*.

**(OP-07)**

**Monitoring of some Physicochemical Parameters of Sewage Water from Patiala District**

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Water is an essential component of nature and it plays a very important role in every kind of life. But now-a-days due to industrialization and urbanization, existing water resources are gradually becoming polluted. Sewage water is main source of water pollution. Number of contaminants such as heavy metals, pesticides, dyes, insecticides pharmaceuticals, hormones, fluoride, detergents and other chemical compounds are discharged into water sources from industries and other anthropogenic activities. In many developing countries there are no good facilities of sewage treatment but due to inexpensiveness, they use sewage water for irrigation purposes because sewage water is enriched with many nutrients also. To use sewage water for irrigation there is a need of proper monitoring of physicochemical parameters. Inorganic compounds like sulphates, phosphates, nitrates and nitrites enhance the nutrient quality of sewage water. Common sources of nitrates, sulphates, phosphates and nitrites are animal feed, manure, agricultural fertilizers like pesticide, insecticides, industrial waste waters, sanitary landfills and garbage dumps. These inorganic compounds make sewage water suitable for irrigation if they are present within permissible limit. But if they are above permissible limit, sewage water cannot be used as irrigation purposes because high concentration of these compounds can pollute soil and crops. They accumulate in soil and interfere with the metabolic functioning of crop plants, ultimately destroy crop plants. To avoid destruction of crops, sewage water should be monitored properly and should be treated before using it for irrigation. In this way we can reduce water pollution and can raise our crops by inexpensive method.

**(OP-09)**

**Molecular basis of plant products as therapeutic molecules:  
Finding new leads**

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Human race has always been reliant on plant products for its needs. One of these is their use as medicines which has played crucial role in health care and the dependence is as old as mankind itself. The therapeutic potency of different plant products couldn't be ignored by modern medicinal system. A number of plant products are integral part of modern medicinal system. To name a few: morphine, taxol, quinine, penicillin etc. There are numerous examples available in market where the plant products have been the sole inspiration for the development of successful drugs. A systematic drug discovery process starts with the identification of lead compounds. Over the last two decades the focus for the search of new leads is again shifted on natural products. We possess documented list of well explored formulations in Charaka Samhita. However, the increasing intellect of humans hinders the acceptance of any compound as therapeutic agent without experimental proof. Therefore, there is a need to explore molecular basis of various plant products as therapeutic

molecules. In this presentation molecular mechanism of some existing plant based drugs, potential new drug candidates and associated problems need to be solved will be discussed.

**(OP-10)**

**Development and Characterization of Chlorogenic Acid Loaded Nanocarrier of Atorvastatin for Improved Efficacy**

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Atorvastatin, a BCS class II drug with log P 4.2, is effective in treating dyslipidemia and coronary heart disease. Its poor aqueous solubility (0.1 mg/ml) results in low oral bioavailability of 12%. Nanostructured lipid carriers represent a promising formulation approach for improving *in vivo* performance of lipophilic drugs. In the present study nanostructured lipid carrier (NLC) formulation of the drug was formulated and evaluated. Chlorogenic acid was used as an excipient as it is reported to modulate Pgp efflux transporters activity in addition to its hypocholesterolemic effect. From the results of pharmacokinetic study done in albino Wistar rats a significant increase in the plasma concentrations of NLC formulation as compared to the drug suspension and marketed formulation was observed. Relative bioavailability of NLC formulation was 3.0 and 4.8 times the ATORVA<sup>®</sup> tablet and API suspension, respectively. The results of pharmacodynamic study confirmed that the NLC reduced serum triglycerides and cholesterol to a significantly low level (p50.01) as compared to the ATORVA<sup>®</sup> tablet. From the results it can be concluded that chlorogenic acid loaded NLC can be used as a potential carrier for the bioavailability enhancement of atorvastatin.

**(OP-11)**

***Cyperus rotundus*: A Potential Medicinal Herb**

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Demand of herbal products is growing exponentially throughout the world and various pharmaceutical sectors are currently conducting extensive research on plant materials for their potential medicinal value. Screening of ethnobotanical and pharmaceutical literature available on common weed *Cyperus rotundus* revealed its immense potential as therapeutic agent. *C. rotundus*, commonly known as nutsedge, musta, mutaka, nagarmotha and dila. It belongs to the family Cyperaceae and is the most invasive and noxious weed in the world. It contains flavonoids, tannins, glycosides, furochromones, monoterpenes, sesquiterpenes, alkaloids, saponins, terpenoids, essential oils and many other secondary metabolites. It has its name etched in the Charaka Samhita as an excellent natural remedy for treating digestive disorders, fevers and certain other health conditions. This herb has been an incredible part of Traditional Chinese Medicine, popularly known as a qi-in-blood medicine and has 8<sup>th</sup> rank among 250 potential anti-fertility plants in China. Ayurvedic physicians use the plant powder known as musta or musta moola churna for treating fevers, digestive system disorders, dysmenorrhea and other ailments. Various studies have proved that it has analgesic, antibacterial, anticancer, anticonvulsant, anti-diarrheal, anti-emetic, antihyperglycemic, anti-inflammatory, antimalarial, antimicrobial, antimutagenic, anti-obesity, antioxidant, antipyretic, gastroprotective, hepatoprotective, hypolipidaemic, hypotensive, tranquillizer and



wound healing potential. This weed is listed as an ingredient in number of commercial products like herbal tea, chyanprash, ashokarista, musta powder, Liv-52, etc. The sedge contains an essential oil having characteristic aroma and spicy taste and is used in masculine perfumes. It is also used in aromatherapy products. The present communication highlights the pharmacological effects of *C. rotundus* and efficacy of its chemical constituents.

# **POSTER PRESENTATIONS**

**(P-01)**

## **Unfolding the Functions of Phytochemicals in Regulating Cancer Signaling Pathways**

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Extensive research over the years has shown that nutritional and environmental factors are accountable for human health especially in diseases such as cancer. Cancer being the leading cause of death across the globe, needs to be understood at molecular level such as various signaling pathways that activate or holdback carcinogenesis. In plants formation of phytochemicals takes place via primary and secondary metabolism and these phytochemicals are known to possess various bio-activities such as antioxidant, anti-inflammatory, anti-mutagenic etc. and some of these have the capability to imitate the chemical structure and/or bioactivity of hormones. Research throughout the globe is being focused to identify such phytomolecules which are modulators of oncogenic processes but at the same time are not toxic or are safe. Various cancer regulatory pathways viz. PI3-AKT-mTOR pathway, MAP-kinase pathway, p53 pathway and apoptotic pathways are known to be modulated by medicinal/dietary phytochemicals. These pathways regulate most of the underlying cellular functions such as growth, proliferation, migration, differentiation and programmed cell death. In case of DNA damage, p53 pathway arrests cell cycle. One of the evolutionary conserved pathway, MAP-kinase pathway is known to be deregulated in one third of all human cancers. Mutations found in cancer cells activate mTOR switch of PI3-AKT-mTOR pathway which is known to regulate cell survival and proliferation. Modulations of several signaling pathways highlight the importance of medicinal/dietary plants as promising source of lead anticancer molecules against various types of cancer.

**(P-02)**

## **Phytoremediation: A Green Branch of Bioremediation for Heavy Metal Removal**

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Toxic metal contamination causes major environmental and human health problems. The term “heavy metals” refers to any metallic element that has a relatively high density and is toxic even at low concentration. A heavy metal has density more than 5gm/cm<sup>3</sup>. Some heavy metals are lead, cadmium, mercury, chromium etc. Heavy metal contamination of soil may pose risks to humans and ecosystem through ingestion or contact with contaminated soil, the food chain, drinking of contaminated water, reduction in land usability for agricultural production. These metals enter into the food chain by various edible products. There are two main sources of these contaminants - natural or anthropogenic. From these sources, they enter into the food chain and affect various life forms. The methods employed for the management of heavy metal contaminants include physical, chemical and biological methods. Biological methods have been extensively used for the management of soil and water contaminants. One of such biological method is bioremediation. Bioremediation is the productive utilization of living systems to degrade, detoxify or stabilize toxic environmental contaminants. Its main goal is to degrade the pollutants that are either undetectable or if detectable to concentrations that are safe or acceptable by the regulatory agencies. It uses various strategies to stabilize contaminants like addition of genetically modified organisms, use of indigenous

microorganisms, biostimulation, and phytoremediation. Phytoremediation basically refers to the use of plants and associated soil microbes to reduce the concentration or toxic effects of contaminants in the environment.

**(P-03)**

### **Role of 28-homobrassinolide in Alleviating the Adverse Effects of extreme Temperature and Salt Stress in *Brassica juncea***

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The aim of present study was to explore the ameliorative impact of 28-homobrassinolide on morpho-physiological attributes, stress markers and antioxidant defence system of *Brassica juncea* L. exposed to oxidative stress caused by extreme temperature (4 °C and 44 °C) and NaCl (180 mM) salt. For this, experiments were carried out at the Plant Physiology Laboratory, Department of Botany, Punjabi University, Patiala. Effect of different degrees of temperature (4°C and 44 °C) and NaCl salt (180 mM) on 28-homobrassinolide primed and unprimed seeds of *B. Juncea* L. with different concentrations of 28-homoBL ( $10^{-6}$ ,  $10^{-9}$  and  $10^{-12}$  M) on growth and biochemical aspects was investigated. All concentrations of 28-homoBL used in present study showed different effect on shoot, root length, fresh, dry weights, stress markers and enzymatic antioxidants of *B. juncea* under the influence of temperature stress. 28-homobrassinolide pre-sowing treatment mitigate the detrimental effect of temperature on all aspects of growth, physiology and defence machinery by accumulating sugars, enhancing antioxidant activities from toxic effect of stress and modulating the defence system positively as compared to control. In conclusion, 28-homoBL ameliorated stress marker contents and antioxidant activities of temperature stressed seedlings by reallocation of enzyme functioning and modulating morpho-physiology to mitigate temperature stress.

**(P-04)**

### **Procurement and Production of Perishable Vegetables in Amritsar District of Punjab**

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Vegetables are common in human diet in any part of the world. India is the second largest producer of vegetables in the world, next to China. These are grown in about 6 million hectares forming 3% of the total cropped area. The study is based on multistage stratified random sampling technique from Amritsar district. Three blocks having highest cultivation of vegetables were selected for the study. In all 6 villages, 2 from each selected block were selected randomly for the study. Then 20 percent of the farmers from each size group were selected randomly in the proper proportion from each block. As much as 12 wholesalers, 12 retailers and 6 hawkers were selected for the study to estimate the price spread and marketing efficiency in different marketing channels of winter vegetables. Both simple as well as advanced statistical techniques were used to analyze the collected data. The cost of production was highest in case of chilli while the returns over variable cost were highest in case of brinjal, followed by tomato and chilli. Bitter gourd was less beneficial as compared to other vegetable crops grown in the study area. Marketed surplus as proportion of production

was highest in case of tomato, followed by brinjal, chilli and okra. This becomes more necessary keeping in view the perishable nature of vegetables. Procurement of vegetables on the same day should be made sure.

**(P-05)**

### **Identification of Oil Rich Fraction from *Euphorbia cotinifolia* and its Analysis through Spectral Studies**

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Biodiesel has been receiving attention in recent years to overcome energy crisis. India is rich in biodiversity and known for vast treasure of knowledge about use of plants for various purposes. Many *Euphorbiaceae* species have been proposed as potential biofuel crops. Latex bearing plants particularly *Euphorbia* spp. has received more attention due to high percentage of energy extracts. *Euphorbia cotinifolia* is also one of the potential sources for biodiesel production. In the present paper, an oil rich fraction (ORF) of *Euphorbia cotinifolia* was analyzed to check the relevant hydrocarbon present in the oil sample. ORF was subjected to different spectroscopic techniques like <sup>1</sup>H NMR, <sup>13</sup>C NMR, UV-vis, FTIR and CHN analysis to elucidate the constituents (e.g. hydrocarbons, terpenoids etc.) present in the test sample. <sup>1</sup>H NMR spectra of ORF indicated aliphatic hydrocarbons. <sup>13</sup>C NMR showed 22 signals in ORF of *E. cotinifolia*. FTIR spectroscopy revealed the presence of long chains of aliphatic hydrocarbons and CHN analysis illustrated the optimum carbon hydrogen concentration in ORF of *E. cotinifolia*. Spectroscopic studies have confirmed the presence of aliphatic chains of hydrocarbons, alcohols, fatty acids in ORF of *E. cotinifolia* and also the same has been elucidated in diesel as well as biodiesel. Hexadecane, 10-Heneicosene, Octadecane, phytol diterpenes were confirmed.

**(P-06)**

### **Effect of Essential Oil of *Tagetes minuta* on Root structure of *Cassia occidentalis***

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The objective of the study was to explore the effect of volatile essential oil of *Tagetes minuta*, wild marigold, on root surface of *Cassia occidentalis*, a common wasteland weed. A dose dependent reduction in seed germination and seedling growth was observed in treated seedlings of *C. occidentalis* when grown under lab conditions. Since the inhibitory effect was pronounced on roots of treated seedlings, scanning electron micrographs (SEM) of control and treated seedlings were compared. Number of ultra-structural alterations in surface cells, root hair and root tip were observed in treated seedlings. Variation in the size of root tip may be the result of inhibited cell division at apex and increase in cell size. Distortion of epidermal structures and plasmolysis could be the result of necrosis induced by allelochemicals present in *T. minuta* oil which affected membrane permeability. Taken together, these findings strongly suggested that *T. minuta* oil inhibited *C. occidentalis* by

interfering primarily with root growth. The findings provide a promising and environment friendly method of *C. occidentalis* management.

**(P-07)**

### **Effect of Nitrogen Levels and Cutting Management on Growth and Yield of Dual Purpose Barley (*Hordeum vulgare* L.)**

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The field experiment was conducted at Khalsa College, Amritsar to study On sandy loam soil, low in organic carbon and available N and high in available P and K during the *rabi* season 2015. The experiment was laid out in split plot design with twelve treatment combinations having three cutting treatments viz. cutting at 60 DAS ( $C_1$ ), cutting at 70 DAS ( $C_2$ ) and cutting at 80 DAS ( $C_3$ ) in main plots and four nitrogen level treatments in sub plots including control ( $N_0$ ), 75 kg N ha<sup>-1</sup> ( $N_1$ ), 90 kg N ha<sup>-1</sup> ( $N_2$ ) and 105 kg N ha<sup>-1</sup> ( $N_3$ ) replicated three times. Growth attributes, yield components and grain yield of dual purpose barley were higher in cutting at 60 DAS ( $C_1$ ) than cutting at 70 DAS ( $C_2$ ) and cutting at 80 DAS ( $C_3$ ) cutting treatments.  $C_1$  gave higher grain yield (24.9 q ha<sup>-1</sup>) and straw yield (41.75 q ha<sup>-1</sup>) than the  $C_2$  and  $C_3$  cutting treatment (18.0 q ha<sup>-1</sup> and 10.5 q ha<sup>-1</sup> grain yield and 34.48 q ha<sup>-1</sup> and 24.06 q ha<sup>-1</sup> straw yield respectively). Different nitrogen level treatments had also shown significant effects on growth and yield parameters of dual purpose barley.  $N_3$  gave the maximum grain yield (22.48 q ha<sup>-1</sup>) and straw (40.56 q ha<sup>-1</sup>) yields followed by  $N_2$  (21.08 and 36.05 q ha<sup>-1</sup>) and  $N_1$  (17.98 and 31.90 q ha<sup>-1</sup>) treatments.

**(P-08)**

### **Effect of Integrated Nutrient Management on Growth, Yield and Quality of Malt Barley (*Hordeum vulgare* L.) cv. DWRUB-52**

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Barley (*Hordeum vulgare* L.) is one of the significant cereal crops of the world. According to the latest census, its area and production in India was 0.67 m ha and 1.83 mt, respectively. Nutrient management significantly affects the malt yield, so the present research was conducted to know about the optimum combination of inorganic and organic sources of nutrients for Malt Barley. Further, the issue of rice straw burning may be solved if its chopped and subjected to decomposition by microbes. The present investigation was carried out at Student's research farm, Khalsa College, Amritsar during *rabi* season of 2017-18. The experiment was laid out in randomized block design with eleven treatments comprising of T1 : Control, T2 : 100% Inorganic fertilizers (IF), T3 : 100% Farmyard manure (FYM), T4 : 100% Chopped rice straw (CRS), T5 : 100% CRS + *Trichoderma viride* (TV), T6 : 75% IF + 25% FYM, T7 : 50% IF + 50% FYM, T8 : 75% IF + 25% CRS, T9 : 50% IF + 50% CRS, T10 : 75% IF + 25% CRS + TV, T11 : 50% IF + 50% CRS + TV. The soil of the experimental field was having sandy loam texture with normal pH (8.3) and EC (0.3 dS/m), medium in organic C (0.48), low in available N (184 kg/ha) and medium in available P (20.8 kg/ha) and available K (251.2 kg/ha). Application of 100% IF led to highest ear length (7.92 cm), number of grains per ear (28.3), protein content (10.14 %), grain yield (44.6 q/ha) and straw yield (64.6 q/ha) and it was at par with the treatment 75% IF + 25% FYM. The treatment 100% IF increased grain yield by 110.4% over control. Thus, up to 25% inorganic fertilizers can be substituted by FYM without significantly affecting the yield.

**(P-9)**

## **Microbial Diversity and Their Biofilm Formation Potential in Pipes of Water Distribution System**

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Microbes are ubiquitous in surface as well as in ground water and some of them can make their way into potable water distribution systems. Contaminated soil with human and animal fecal matter, ill-maintained water and sewage pipelines, poor sanitation and personal hygiene are the main factors responsible for the presence of microbial pathogens in the drinking water. The presence of water-borne microbes in the potable drinking water systems determines its quality. Common microbes present in contaminated water are *Shigella*, *Escherichia coli*, *Vibrio cholerae*, *Pseudomonas sp*, *Salmonella sp*, etc. The water-borne pathogens that reside and reproduce in water distribution system causes infection of gastrointestinal tract, urinary tract, skin, and lymph nodes. These pathogens when enter into the water distribution system pipelines they form biofilms. The formation of biofilm is a key component in microbial studies. Biofilm is the sessile aggregation of bacterial cells that adhere to each other on living or non-living surfaces and forms extracellular polymeric substances (EPS). The surface physico-chemical properties of both bacteria and substratum were important for the establishment of bacterial adhesion. Bacteria forming biofilms possesses different growth patterns, responds to specific micro-environmental conditions for the formation of structurally complex mature biofilms. In water distribution systems, adhesion of microbes to the water pipelines initiate biofilm formation which in return reduces the quality of potable water and increases the corrosion of pipes. Biofilms produced by multispecies of bacteria are more resistant to disinfectants such as chlorine dioxide and chlorite than single species. Due to inadequate disinfection strategies and lapses in the chlorination leads to increased resistance of the bacteria that produces biofilms.

**(P-10)**

## **Testing of Infocrop-Wheat Model in Punjab**

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Dynamic simulation modeling of crop growth aims at the simulation of day-to-day assimilation of photosynthetic material based, primarily on the exchange of energy and mass among the various growth processes taking place in a plant. INFOCROP, a generic crop model, simulates the effects of weather, soils, agronomic management (planting, nitrogen, residues and irrigation) and major pests on crop growth, yield, soil carbon, nitrogen and water, and greenhouse gas emissions. The INFOCROP model was validated by comparing the model simulated and actual field data on phenological events (anthesis date and physiological maturity date), growth (maximum LAI) and yield (grain yield) for wheat cultivars. The model gave overestimation as well as underestimation of these events. The anthesis and physiological maturity dates were simulated between -15 to +4 days and -13 to +14 days, respectively of the actual observed dates for wheat cultivars. The maximum LAI was and grain yield were simulated between -23 to +39 % and -17 to +17 % of the actual observed data for wheat cultivars under different environments. However, the model gave very low grain yield for wheat cultivars sown in December month, thereby indicating that the

partitioning of dry matter between grain and straw under late sown conditions needs further scrutiny. The results of this study reveal that the calibrated INFOCROP model can be used for the prediction of wheat growth and yield in the Punjab. Also a well validated model when linked with GIS and remote sensing can be used for yield forecasting at regional level.

**(P-11)**

**Growth and Yield of Wheat (*Triticum aestivum* L.) as Influenced by Different Methods of Sowing and Nitrogen Regimes**

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The field experiment was conducted at Khalsa College, Amritsar to study the Nitrogen management by using LCC under different methods of sowing on growth and yield in wheat (*Triticum aestivum* L.) on sandy loam soil, low in organic carbon and available N and high in available P and K during the *rabi* season 2015. The experiment was laid out in split plot design with twelve treatment combinations having three sowing methods viz. Zero tillage, Flat planting and Bed planting in main plots and four nitrogen management treatments in sub plots including control, Recommended N, LCC<sub>4</sub> and LCC<sub>5</sub> replicated four times. Growth attributes, yield components and grain yield were higher in Bed planting method than Flat planting and Zero tillage methods. Bed planting method gave higher maize grain yield (40.7qha<sup>-1</sup>) and straw yield (50.4qha<sup>-1</sup>) than the Flat planting and Zero tillage methods (36.7qha<sup>-1</sup> and 35.6qha<sup>-1</sup> grain yield and 45.6 qha<sup>-1</sup> and 44.5qha<sup>-1</sup> straw yield). The various nitrogen management treatments had also shown significant effects on growth and yield parameters over control (no nitrogen). LCC<sub>5</sub> gave the maximum wheat grain (43.8qha<sup>-1</sup>) and straw (54.4qha<sup>-1</sup>) yields followed by Recommended N (41.3 and 51.3qha<sup>-1</sup>) and LCC<sub>4</sub> (41 and 51qha<sup>-1</sup>) treatments.

**(P-12)**

**Comparison of Varieties and Nitrogen Management in Maize (*Zea mays* L.)**

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Proper time of Nitrogen (N) application is critical to minimize N loss and increases recover. It is commonly observed that farmer tend to use more nitrogen fertilizer than needed mainly because of its immediate visible impact on plant growth and leaf color. So, in maize also there is need to adjust nitrogen fertilizer application with timing of plant requirement to enhance nitrogen use efficiency because nitrogen requirement of maize plant is not same throughout the growth period. This adjustment should be based on leaf color intensity of crop because it is directly related to leaf chlorophyll content and leaf nitrogen status. This real time nitrogen management may be done by leaf color chart which help in increasing nitrogen use efficiency. Leaf color chart (LCC) is technique for real time nitrogen management which can be used for rapid and reliable monitoring of relative green color of the leaf as an indicator of leaf nitrogen status. The field experiment was conducted at Khalsa College, Amritsar on sandy loam soil, low in organic carbon and available N and high in available P and K during the *rabi* season 2015-16. The experiment was laid out in split plot design with nine treatment combinations having three varieties DKC-9125, P-3396 and PMH-1 in main plots and three nitrogen levels in sub plots including control (N<sub>0</sub>), recommended nitrogen (N<sub>Rec</sub>) and N using leaf color chart (N<sub>LCC</sub>) replicated three times. Variety DKC-9125 and P-3396 produced higher maize grain yield (35.25 and 34.25 q ha<sup>-1</sup>, respectively) and straw yield (81.70 and 80.66 q



ha<sup>-1</sup>, respectively) than variety PMH-1 (grain yield 31.04 q ha<sup>-1</sup> and straw yield 76.85 q ha<sup>-1</sup>). N<sub>Rec</sub> treatment produced the maximum grain yield and straw i.e. 37.71 q ha<sup>-1</sup> and 86.62 q ha<sup>-1</sup> which was at par with N<sub>LCC</sub> (36.41 q ha<sup>-1</sup> grain and 84.56 q ha<sup>-1</sup> straw yield) both treatments were significantly differ from N<sub>0</sub> and had higher nitrogen use efficiency is in N<sub>LCC</sub>.

**(P-13)**

### **Performance of Maize Intercropped with Legumes under Different Plant Spacing**

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Intercropping is growing of two or more crops simultaneously on the same piece of land with an objective of getting greater yield stability, soil protection, and variability in food supply, assurance against crop failure. Intercropping may provide substantial yield advantage over cropping by intensification both time and space. When legume and non-legume species are planted together in an intercropping system, the legume positively affects the nitrogen availability in the system. For sustainability the proper crop stand or proper crop geometry is one of the most important and key factors. The field experiment was conducted at Khalsa College, Amritsar on sandy loam soil, low in organic carbon and available N and high in available P and K during the *rabi* season 2015-16. The experiment was laid out in split plot design with nine treatment combinations having three spacing 60 cm, 75 cm and 90 cm in main plots and two intercropping having cowpea, moong and control (without intercropping) in sub plots replicated three times. The crop sown at 60 cm spacing produced significantly higher grain yield (40 q ha<sup>-1</sup>) but significantly at par with 75 cm spacing having grain yield (38.9 q ha<sup>-1</sup>) and similar trend was observed in straw yield. However, the various intercropping had not shown significant effects on growth and yield parameters. Land equivalent yield were highest in cowpea (1.06) followed by moong (1.02).

**(P-14)**

### **Role of Bamboo in Phytoremediation of Heavy Metals and Environment Cleanup**

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Heavy metal contamination in soil and water caused by mining industries, urbanisation, fertilizers and transportations *etc.* is one of the biggest problems being faced by mankind in 21<sup>st</sup> century as it severely affects the global agriculture and healthcare systems. In India, major heavy metal contaminations are caused by Cr, Pb, Hg, As, Cu *etc.* Reclamation of the heavy metal contaminated soil through natural remediation by plants is a more efficient and effective remedy against the menace of heavy metal toxicity than other approaches. Bamboos, the fast growing arborescent grasses, are a highly suitable plant for phytoremediation because of its worldwide distribution, high biomass production, high accumulation and tolerance to heavy metals. Species of *Phyllostachys*, *Dendrocalamus*, *Bambusa*, *Gigantocloa*, *Thyrostachys*, *Pseudosasa* and *Pleioblastus* are used for phytoremediation of heavy metals in several countries *e.g.* in China *Phyllostachys pubescens* has been reported to absorb a significantly higher amount of Zn and Pb (2329 and 428.82 mg/Kg respectively) from the contaminated soils. But in India very little work has been done regarding phytoremediation using bamboo species. One such report highlights the phytoremediation potential of *Dendrocalamus strictus* which absorbed highest amount of Fe

(27790 mg/kg) and Pb (68 mg/kg) when compared to other trees such as *Albizia lebbeck*, *A. procera* and *Tectona grandis*. However, India possesses the second largest bamboo genetic resource of the world with approximately 136 species growing almost throughout the country and keeping in mind the menace of prevalent soil contamination in the country, bamboo can be used for solving the problem of heavy metal contamination. The present study is thus focused on the potent bamboo species of India which can be used for the controlling such contaminations in soil that will counter not only the soil toxicity but will also decrease the carbon load of environment in a highly efficient manner.

**(P-15)**

**Role of Phytochemicals as Anti Cancer Agents: An Overview**

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Cancer, after cardiovascular diseases is regarded as second major cause of mortality and morbidity all over the world. As carcinogenesis is a complex phenomenon involving signaling cascades, cancer demands a proactive strategy for its cure. Over 60% of anti cancer compounds are derived from natural sources including plants, microbes and marine organisms. Due to pleiotropic actions on the target, phytochemicals exhibit suitable candidature for the development of anticancer drugs. Plant derived anti cancer drugs are generally target specific, low cost, safe with minimum side effects. Use of plant sources as anti cancer agents began with Vinca alkaloids in 1950s. Since then a number of phytochemicals and their analogues such as Paclitaxel, Podophyllotoxin, Camptothecin and its derivatives Topotecan and Irinotecan etc have been recognized to possess anti cancer potential. Although a lot of investigations have been made for the advancement in treatment and management of cancer, yet there is still a sufficient room for the improvement and development of more potent, novel bioactive molecules of plant origin. However, emphasis on sustainable use is required and over exploitation of the plant resources should be avoided to conserve biodiversity. Current advances in technology like use of nanoparticles for administration of anti cancer formulations and their controlled sustained release can be also be of immense help. An effort has been made through this paper to review use of plant derived bioactives for their anti cancer potential reported from different parts of the world. Various phytochemicals used as anti cancer agents and their role in treatment and management of various types of cancer has been discussed. This review may be helpful for improvement in plant based anti cancer drugs and to explore novel bioactives with anti cancer activity.

**(PP-16)**

**Vermistabalization of *Dalbergia sisso* Leaves by *Eisenia fetida***

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In campus of Guru Nanak Dev University large amount of organic waste is produced in form of leaf litter which is dumped in open in form of heaps or thrown in pits thus depleting the grandeur of the campus beauty but also adds to air pollution by producing foul smell which attracts mosquitoes and flies. Conversion of this garden litter by action of *Eisenia fetida* into organic manure-vermicompost can help to improve the environment of campus by decreasing the amount of waste and adding beauty of the campus by enhancing growth of plants in the campus itself. In the present study leaf litter of *Dalbergia sisso* was

amended with 25% and 50% cowdung and population buildup (hatching rate, growth rate and rate of reproduction) of *E. fetida* was recorded. 1:1 ratio of leaf litter and cowdung (T<sub>1</sub>) gave maximum number of worms (168) on last day of vermicomposting i.e 105<sup>th</sup> day. An increase was observed in number of worms with passage of time in T<sub>1</sub> while a decrease was observed in T<sub>2</sub> (3:1 ratio). Similar observations were recorded for number of hatchlings and cocoons. So, 1:1 ratio of leaf litter and cowdung is the optimum combination for vermistabilization of *D. sisso* leaves.

**(PP-17)**

**Biofertilizers - Their Role and Constraints in Crop Production**

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With the advent of green revolution, India holds second position in consumption of inorganic fertilizer after China. The annual consumption of fertilizers (N + P<sub>2</sub>O<sub>5</sub> + K<sub>2</sub>O) increased from about 293.8 thousand tonnes (1960-61) to 26,752 thousand tones (2015-16) to obtain higher yield from hybrids and improved varieties of crops. This leads to the reduction in use of organic manures and deteriorate soil health. Due to intensive use of inorganic fertilizers, progressive attempts have been made towards the production of biofertilizers to ensure bio-safety. In this study, effect of biofertilizers viz., *Rhizobium*, *Azospirillum*, *Azotobacter*, Blue Green Algae, phosphate solubilizing bacteria etc., on different crops and their method of application is studied. The data was procured from National Centre of Organic Farming (NCOF) to study the production of bio fertilizers from 2008-2015. Total six states i.e. Dehli, Haryana, Himachal Pradesh, Punjab, Uttar Pradesh, Utrakhand were studied. Uttar Pradesh was reported to produce maximum biofertilizer (19852.05 tonnes) among six states. The present study revealed that biofertilizer has remarkable effect on crop improvement especially, by adding nutrient to soil and found as an alternative in sustainable farming.

**(PP-18)**

**Role of Nutrient Management for Sustainable Agriculture**

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Sustainable agriculture is a way of farming in which we mainly focuses to sustain resources by promoting such farming practices and method that are profitable, environmentally sound and good for communities without compromising future generations' needs. In order to meet growing food needs, farmers are concentrating on heavy use of chemical fertilizers, results in buildup of their residues in the soil due to their lower use efficiency. The developing countries account at present for almost 70 percent of world fertilizer consumption and this share could increase further to over three-quarters of world consumption in 2050. The annual consumption of N+P<sub>2</sub>O<sub>5</sub>+K<sub>2</sub>O increased from about 66 thousand MT in 1951- 52 to 24.482 million MT in 2013-14. To address the current issue, data was collected mainly from Food and Agriculture Organization of the United Nations (FAO) and other agencies. The primary objective was achieved by enlisting adoption of new strategies like use of fertilizers having higher use efficiency, selection of proper cropping pattern, increasing organic inputs use, making farmers aware about soil testing through soil

health card scheme to avoid excess use of fertilizers for optimum food production without affecting soil quality.

**(PP-19)**

### **Crop Residues Management as an Option for Sustainable Soil Health**

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India being an agriculture-dominant country produces more than 500 million tons of crop residues annually. Agricultural activities produce vast amounts of organic residues including straw, unmarketable or culled fruit and vegetables, post-harvest or post-processing wastes, clippings and residues from forestry or pruning operations and animal manure. Total amount of residue generated in India during previous year (2008-09) was 620 Mt out of which 15.9% residue was burnt on farm, whereas in Punjab 50.75 Mt year<sup>-1</sup> crop residue was generated and at the same time 19.62 Mt year<sup>-1</sup> crop residues was burnt. Rice straw contributed 40% of the total residue burnt followed by wheat straw (22%) and sugarcane trash (20%). A large portion of unused crop residues are burnt in the fields primarily to clear the left-over straw and stubbles after the harvest. Burning of crop residues, adversely affects the air quality posing threat to human health, at the same time leads to nutrient loss like N, P, K and S degrade soil properties therefore, deteriorate soil health and cause wastage of residue that is now considered tremendous resource worldwide. Conservation agriculture and recommended management practices (RMPs) like in-situ and ex-situ crop residue management practises collectively are helpful to offset part of the emissions due to unscientific agricultural practices. Hence, new biotechnological applications of crop residues such as for restoration of eroded and degraded soils, ecological restoration and remediation of polluted soils could be used to manage these residues.

**(PP-20)**

### **Scenario of Micronutrients in Agriculture**

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Micronutrients deficiency is widespread problem among developing and in developed countries. Deficiency of micronutrients, especially due to Boron (B), Manganese (Mn), Zinc (Zn), Iron (Fe) and Copper (Cu) leads to fatal diseases, such as osteoporosis, osteomalacia, thyroid deficiency, colorectal cancer and cardiovascular diseases. Micronutrient deficiencies in Indian soils are due to improper nutrient management. The major factors that contribute towards the deficiency of micronutrients in agriculture are increased yield through intensive farming with high yielding crop varieties, fertilizers free from micronutrients as filler material, limited use of organic manures and restricted use of crop residues. Considering all, Micronutrient status of Punjab and their adjoining states, their indicator crops and required fortification in agricultural crops are studied. Boron (B) deficiency (57.8%) was found to be maximum as compared to other nutrients (Mn, Cu, Zn, Fe) in Punjab state. Indicator crops with significant micronutrient deficiencies like khaira disease of rice (Zn), dieback in citrus (Cu), iron chlorosis in paddy nurseries (Fe), grey speck of oats (Mn), pahala blight of sugarcane (Mn), top sickness of tobacco (B) in crop field were studied. To overcome malnutrition problems, it is suggested to adopt improve techniques and systematic research work such as biofortification of field crops.

**(PP-21)**

### **Sulphur Cycling, Retention and Mobility in Soil**

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In soil environment, Sulphur (S) occurs in organic and inorganic forms and is cycled in between these forms via mobilization, immobilization, mineralization, oxidation and reduction processes. Organic sulphur compounds are largely immobile. Inorganic sulphur compounds are comparatively more mobile and sulphate is the most mobile. Adsorption onto clay particles of the soil limits or delays transport of sulphate ions in the soil medium. Non-specifically adsorbed sulphate ions are held only by electrostatic charges in the double diffuse layer, so they are not held as tightly as specifically adsorbed ions that are bonded to metal oxides in the Helmholtz layer. Sulphate adsorption and desorption are controlled predominantly by pH, sulphate concentrations, types of other cations and anions present in the soil solution and the character of the clay colloidal surfaces. Sulphate adsorption is affected by organic matter present in the soil which reduces sulphur losses. Mobilization is strongly affected by temperature given the fact that the different temperature levels affect the activity of different enzymes differently. Greater the mobilization of sulphur, greater will be its availability which ultimately enhances the plant growth.

**(PP-22)**

### **Heavy Metal Polluted Soils: Effects on Plants and Bioremediation Methods**

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Soil polluted with heavy metal has become serious problem due to increase in geologic and anthropogenic activities. Some of these activities include mining and smelting of metals, burning of fossil fuels, use of fertilizers and pesticides in agriculture, production of metals from various industries, sewage sludge, and municipal waste disposal. Heavy metals like arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), mercury (Hg), nickel (Ni), selenium (Se), silver (Ag), zinc (Zn) etc., along with xenobiotics includes synthetic inorganic fertilizers, hydrocarbons, Polyaromatic hydrocarbons, polycyclic biphenyls (PCB) are toxic even at very low concentrations. Many studies have been reported that microbes have the ability to remove contaminants from soils. Considering the increased toxicity, our study objective is to review economic remedial measures. Some of the microorganisms in remediation of heavy metals are *Pseudomonas* spp. (Zn), *Bacillus* spp. (Cu), *Rhizopus arrhizus* spp.(Ag, Hg, Cd, Pb), *Stereum hirsutum* spp.(Cd, Co, Cu, Ni), *Citrobacter* spp. (Cd, Pb), *Chlorella vulgaris* spp.(Ni, Pb, Hg, Zn, Cu), *Aspergillus niger* (Cd, Zn, Ag), *Zooglea* spp.(Cu, Ni) and *Pleurotus ostreatus* (Cd, Cu, Zn) reported as the most reliable technique to degrade these compounds. Further, some species of microorganisms have great potential for degrading xenobiotics are *Rhodococcus* spp.( hydrocarbons, aromatics), *Pseudomonas* spp. (benzene, anthracene, hydrocarbons, PCBs), *Azotobacter* spp.(aromatics, branched hydrocarbons, benzene, cycloparaffins) and *Mycobacterium* spp.(aromatics, hydrocarbons, polycyclic hydrocarbons) studied. Microorganisms ensure a more efficient clean-up of polluted soils which offers a cost effective method for soil remediation.

**(PP-23)**

### **Role of Integrated Nutrient Management in Crop Production**

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Integrated Nutrient Management (INM) is considered as an integral part of sustainable agriculture. INM is, increasingly promoted as a means of improving nutrient use efficiency by enabling plant performance. Continuous use of inorganic fertilizers alone is depleting soil micronutrients, reduction of soil organic matter (SOM) affects water holding capacity (WHC) of soil. To overcome these problems, the objective of this review is to promote INM in modern agricultural practices. Literature studies have revealed its role in providing balanced nutrition to plant and minimize the deterioration of soil, water and ecosystem by reducing nutrient losses to ground and surface water bodies. Nutrient input via INM have shown maximum yield in crop using organic inputs like Poultry manure and Farmyard manure along with chemical fertilizer. It further improves the content of available nitrogen (N), phosphorus (P), SOM and micronutrients content increased significantly as compared with conventional practices. As the whole, it is concluded that INM is an ideal approach for maintenance of crop productivity as well as soil health without compromising crop yields, human health and environment.

**(PP-24)**

### **Soil Quality and Productivity of Basmati Rice (*Oryza sativa*) Influenced by Application of Farmyard Manure and Poultry Manure.**

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The present investigation was conducted at Students' Research Farm, Khalsa College, Amritsar during *kharif* season of 2016. The soil of the experimental field was categorized as sandy loam. The soil tested low in organic carbon and available nitrogen (N) and medium in available phosphorus (P) and high in potassium (K). The soil pH and electrical conductivity values were within the normal range. The experiment comprised of eight treatments *viz.*, T<sub>1</sub>-Control, T<sub>2</sub> -100% N through Farm Yard Manure (FYM), T<sub>3</sub> -125%N through Farm Yard Manure, T<sub>4</sub> -100%N through Poultry Manure (PM), T<sub>5</sub> -125%N through Poultry Manure T<sub>6</sub>-75% N through Farm Yard Manure + 25%N through Poultry Manure T<sub>7</sub> -75% N through Poultry Manure + 25% N through Farm Yard Manure T<sub>8</sub> -50% N through Farm Yard Manure +50% N through Poultry Manure replicated three times. Maximum grain yield (38.86q/ha) was recorded in T<sub>5</sub> and which was significantly higher than control but statistically at par with other treatments. The lowest grain yield (28.15q/ha) was observed in control plot. The organic sources of N had a significant influence on grain yield of basmati rice. Application of FYM and PM produced statistically more organic carbon than control but could not cause any significant changes on EC and pH values. Among all treatments it was observed that PM had higher values of available N and P.

**(PP-25)**

### **Fluoride Induced Alterations in Growth and Biochemical Parameters of *Lemna minor* L.**

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In the present study, fluoride induced oxidative stress in *Lemna minor* was carried out under *in vitro* conditions. The fronds of *Lemna minor* were subjected to various concentrations of fluoride (5, 10, 15, 20, 25 and 50 ppm) for seven days under controlled conditions. Alterations in various growth and biochemical parameters *viz*: photosynthetic pigments (chl a, chl b, total chlorophyll), carotenoid content, carbohydrate protein and MDA content was measured. A significant decrease in photosynthetic pigments (chlorophylls and carotenoids), protein and carbohydrate content was observed, while MDA content increased significantly compared to control. Further, percent decrease in fresh weight and decrease in fresh weight to dry weight ratio was found at higher concentrations of fluoride. Due to tolerance ability of plant under fluoride stressed conditions, *Lemna minor* has gained popularity as a hyperaccumulator for remediating water bodies contaminated with fluoride.

**(PP-26)**

### **Evaluation of Anti-Inflammatory Activity of *Tylophora asthmatica* Leaves Extract**

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*Tylophora asthmatica* is a traditional plant used since ages for the treatment of asthma, inflammation, allergies rheumatism etc. In the present study, leaves of *Tylophora asthmatica* were collected and extracted in methanol, chloroform and petroleum ether using soxhlet apparatus. Phytochemical screening of the extracts was carried out to check the presence of phytochemicals. High performance liquid chromatography (HPLC) was done for the extracts and it was observed that maximum quantity of tylophorine (92%) was present in methanolic extract. Further to investigate the anti-inflammatory activity of the extracts, carrageenan induced paw edema model was used in wistar rats. Hind paw edema was induced by sub plantar injection of carrageenan and paw volume was observed using plethysmograph at different time intervals after treating rats with developed extracts and ibuprofen standard drug. The results indicated that methanolic extract showed significant decrease in paw volume and results were comparable to the rats treated with ibuprofen standard drug. It was concluded that methanolic extract of plant *Tylophora asthmatica* was effective for the treatment of inflammation. Anti-inflammatory activity the extract could be due to the presence of highest quantity of tylophorine in the extract.

**(PP-27)**

### **Di-n-butyl phthalate induced Morphological and Physiological Responses in *Hordeum vulgare* (L.) Under Field Conditions**

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Phthalates are dialkyl or alkyl/aryl esters of 1, 2-benzene dicarboxylic acid and have numerous applications especially as plasticizers. In the last decades, phthalates have got much attention because of their wide applications which leads to their ubiquity in different environments. Phthalates possess physical bonding with polymers which cause their easy release to the environments. Recently, phthalates are reported considerably in agricultural soils and from soils they get a route to enter into edibles or crop plants. From food, animals and humans are exposed to phthalates and have raised the food safety concerns. In animals, phthalates are suspected to induce cancer, endocrine disruption, male reproduction toxicity, mutagenicity, teratogenicity, allergies *etc.* In plants, phthalates are reported to affect the germination, growth, biochemical and antioxidative defense system *etc.* Therefore, the present study is aimed to understand di-n-butyl phthalate (DBP) induced morphological and physiological consequences in a crop plant (i.e. barley) under field conditions for 15 days. The results were statistically analyzed using one and two way ANOVA and significance of data was accessed at  $p \leq 0.05$ . This study revealed that the exposure of DBP significantly affected the morphological and physiological indices of barley.

**(PP-28)**

### **Green Financing: An Emerging Form of Sustainable Development in India**

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Green finance is a phenomenon that integrates the world of finance and business with environmental friendly behavior. It is an arena for many participants, including individual and business consumers, producers, investors, and financial lenders. Green finance is a modern financial pattern for environmental preservation with economic profits, emphasizing “green” and “finance”, two of which are controversial issues. Green finance is a core part of the low carbon green growth, because it connects the financial industry, environmental improvement and economic growth. The objective of this paper is to study the concept green finance and to study the emerging opportunities and challenges of green finance in India. Green Finance is a market-based investment or lending program that factors environmental impact into risk assessment, or utilizing environmental incentives to drive business decisions. Green investing recognizes the value of the environment and its natural capital and also seeks to improve the human well-being and social equity while reducing environmental risks and improving the ecological integrity.



**(PP-29)**

## **Health Benefits of Bamboo Shoot and Potentials of Using it for Development of Functional Foods and Nutraceuticals**

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In recent years, there has been great demand for plant derived products in developing countries. Plants, especially used in traditional medicines can provide biologically active molecules for the development of modified derivatives with enhanced activity and reduced toxicity. Bamboo is gaining increased attention as a medicinal plant because its every part has some therapeutic properties. Bamboo shoot has a long history as a source of both food and medicine. The young shoots are delicious, low in fat and rich in nutrients, antioxidants and bioactive compounds mainly phenols, phytosterols and dietary fiber, which play a potential role in health promotion and providing protection against many chronic and degenerative diseases. Phenolic compounds in bamboos have multiple biological effects such as antioxidation, anti-ageing, antifatigue, antimicrobial and prevention of cardiovascular diseases. Dietary fibres and phytosterols have a beneficial effect on lipid profile and bowel function and reduce total serum cholesterol and low-density lipoprotein cholesterol level. Bamboo shoot is also a good source of vitamins, minerals and amino acids. Arginine and tyrosine are the major amino acids present in bamboo shoots that otherwise is a minor component in common fruits and vegetables. Arginine plays a key role in the synthesis of glycoproteins. Tyrosine is a major precursor of several neurotransmitters and may directly affect processes in the brain including cognitive function. The market of functional food and nutraceutical is growing worldwide as people have become more health conscious. Hence, bamboo shoot as a potential source of nutrients and bioactive compounds holds exciting promises in the field of functional food and nutraceuticals.

**(PP-30)**

## **Potential of Aqueous Plant Extracts for Suppression of *Alternaria solani* Growth**

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Aqueous extracts of four plants *viz.* *Azadirachta indica*, *Putranjiva roxburghii*, *Melia azedarach* and *Tabernaemontana divaricata* were evaluated for suppression of growth of *Alternaria solani* in laboratory conditions. At a concentration of 2%, *Putranjiva roxburghii* significantly suppressed the growth of *Alternaria solani* as analysed using Analysis of variance, Tukey's post-test. On the contrary remaining three extracts promoted the growth more than the negative control. Discovery of a plant with better anti-fungal property than *Azadirachta indica* is a significant out-come of the investigation. *Putranjiva roxburghii* aqueous extract shows potential for management of an early blight of tomato in organic farming and for the isolation of anti-fungal bioactive molecule.

**(PP-31)**

## **Green Banking: A Step towards Environmental Conservation and Sustainability**

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Green banking is a pro-active way of energy conservation and environment protection. It provides effective market based solution for addressing a wide range of environmental problems like climate change, deforestation, issues related to air quality and loss of biodiversity. Banks being the major financier play a vital role in the country's economy and in the sustainable development. For the equitable and sustainable growth of the nation, they are implementing practices and guidelines that make them sustainable in economic, environmental, and social dimensions. But despite these efforts, the adoption of green banking strategies is at start-up mode in India. This paper attempts to understand the concept of digital green banking, its essence, various green banking strategies along with the challenges involved. The paper also throws some light on the laws and guidelines made by the government for environmental conservation and sustainability.

**(PP-32)**

## **Effect of Date of Sowing and Cutting Management on Fodder and Seed Production of Late Sown Berseem (*Trifolium alexandrinum* L.)**

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The present investigation was carried out at the Student's Research Farm, Khalsa College, Amritsar during the Rabi season of 2017-18. The field was laid out in split plot design with fifteen treatments and three replications. Sowing was carried out on different dates viz. D<sub>1</sub>:5 November, D<sub>2</sub>:15 November, D<sub>3</sub>:25 November, D<sub>4</sub>:5 December and D<sub>5</sub>: 15 December and in sub plot treatment contains last cutting dates C<sub>1</sub>:5 April, C<sub>2</sub>: 15 April and C<sub>3</sub>: 25 April. Among the different dates of sowing the treatment D<sub>1</sub> (5 Nov) led to significantly higher average plant height (51.7 cm), total dry matter accumulation (11.1 t/ ha) and total green fodder yield (79.3 t/ha) than all other treatments. However, the highest number of tillers at harvest (5.85), no. of heads/ tiller (3.72), no of seeds / head (45.0) and seed yield (4.69) were obtained in the treatment D<sub>5</sub> (15 Dec) and it was at par with treatment D<sub>4</sub>( 5 Dec). Among different last cutting treatments, the treatment C<sub>3</sub> (25 April) lead to the highest average plant height (46.8 cm), total dry matter accumulation (8.83 t/ ha) and total green fodder yield (69.1 t/ha) and it was significantly higher than other treatments. However, the highest no. of heads/ tiller (3.73), no of seeds / head (42.5) and seed yield (5.08 q/ha) where obtained in the treatment C<sub>1</sub> (5 April) and it was significantly better than other treatments.

**(PP-33)**

## **Response of Malt Barley (*Hordeum vulgare* L.) to Nitrogen and Foliar Application of Potassium**

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A field experiment was conducted to study “Response of malt Barley (*Hordeum vulgare* L.) to nitrogen and foliar application of potassium” during the *Rabi* season of 2017-18. The experiment was laid out in split plot design with 16 treatments comprising of two factors in which main plot contained four levels of Nitrogen i.e. N<sub>0</sub> (control), N<sub>1</sub> (75% recommended N), N<sub>2</sub> (100% recommended N), N<sub>3</sub> (125% recommended N) and sub plot contained K<sub>0</sub> (control), K<sub>1</sub> (1% at ear emergence), K<sub>2</sub> (1% at 50% flowering), K<sub>3</sub> (1% at ear emergence+1% at 50% flowering) with three replications. The growth parameters (plant height, DMA and LAI) increased significantly from N<sub>0</sub> to N<sub>2</sub> but N<sub>2</sub> and N<sub>3</sub> remained at par at all stages of growth. Nitrogen application resulted in significant enhancement in effective tillers (399.32), ear length (9.3cm), grains per year (29.5) and test weight (45.02g) over control and the maximum values of the yield attributes were recorded with 125% recommended N/ha. The maximum grain yield (48.60q/ha) was recorded with application of 125% recommended N which was significantly higher than control and 75% recommended N but at par with 100% recommended N. The quality parameters of barley i.e. protein content and malt yield was improved with application of nitrogen. There was significant variation among foliar applications of potassium with respect to growth except 30, 60 and 90 DAS. The highest grain yield (41.21q/ha) was obtained in K<sub>3</sub> which was significantly higher than K<sub>0</sub> and K<sub>1</sub> but at par with K<sub>2</sub>. The malt recovery and malt yield was increased with potassium. There was no significant effect between Nitrogen and Foliar application of Potassium in all results.

**(PP-34)**

## **Doubled Haploidy Breeding in Vegetable Crops**

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In recent years, the cultivation of F<sub>1</sub> hybrids of vegetable crops became popular worldwide. However, development of these hybrids through traditional inbreeding process is highly time consuming and labour intensive. There are biotechnological tools by which we can develop homozygous parental lines in a short period of time through doubled haploidy. Different techniques now have been used like androgenesis, gynogenesis, parthenogenesis, inducer lines. The plants regenerated through them are haploid and which can be made doubled haploid through chromosome doubling. Androgenesis is one of the most common ways to support the development of valuable doubledhaploid lines. For production of androgenic plants anther culture is more laborious technique requiring manual excision of the anthers and involves the risk of regeneration from somatic tissues and embryo yield from another culture is also lower. Therefore, microspore culture is the preferred method of producing doubled haploid plants. Homozygous lines are of utmost importance in breeding programs. Spontaneous doubling and artificial chromosome doubling induced by colchicine (widely used) or other anti-microtubule agents are the two ways of chromosome doubling. Besides development of inbred lines, doubled haploids have many applications like mutant

induction, production of biotic and abiotic stress resistant plants, construction of genetic linkage maps, genetic analysis of quantitative traits, etc. Forty two cultivars of vegetable crops have been developed through doubled haploid application. The efficiency and effectiveness of using doubled haploid technology in breeding vegetables can be improved by combining it with marker assisted selection and is a potential area of research.

**(PP-35)**

### **Antibacterial Efficacy of Methanol Extract of Some Species of *Asterella*, A Potent Liverwort of Medicinal Use**

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Bryophytes are divided into three classes, Hepaticae (liverworts), Anthocerotae (hornworts) and Musci (mosses). These plants are used traditionally for treating various ailments in several parts of the world. Several species of liverworts like *Marchantia*, *Asterella*, *Dumortiera*, *Targionia*, *Plagiochasma* and *Pellia*, hornworts like *Anthoceros* and mosses (*Barbula*, *Polytrichum*, *Bryum*, *Mnium*, *Physcomitrium*) are used in Northwest Himalayan regions, in several modes for cure of various diseases. *In-vitro* antibacterial efficacy of methanol extract of *Asterella wallichiana* (Lehm.) Grolle and *Asterella angusta* (Steph.) Kachroo, belonging to family Aytoniaceae was tested using agar dilution method on clinical strains of *Escherichia coli*, *Pseudomonas aeruginosa*, *Klebsiella* spp. and two gram positive bacteria; *Bacillus subtilis* and *Staphylococcus aureus*, that is a universally identified, highly resistant gram positive bacteria. Antibacterial activities were observed at concentrations of 12.5, 25.0, 50.0 and 100 µg / ml. Their minimum inhibitory concentrations ranged from 15.5-100 µg/ml. Extract of *Asterella wallichiana* was more active. Antibacterial activities observed with *Asterella angusta* were less pronounced with no detectable activity at extract concentrations of 12.5 and 25.0 µg/ml. *E. coli* appeared to be the most susceptible of the test bacteria while *Staphylococcus aureus* and *Klebsiella* species was least sensitive with *Asterella angusta*.

**(PP-36)**

### **Assessment of Water Quality of Holy Kali Bein in Terms of Water Quality Index (WQI)**

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Water quality monitoring is an area of supreme concern for many developing countries due to the rapid growth in population and urbanization. An attempt has been made to develop water quality index (WQI), using eleven water quality parameters i.e.; pH, DO, COD, BOD, TDS, EC, TA, TH, Chloride, Flouride and Sulphate measured at five different stations along the river Holy Kali Bein in winter season during the year 2017. Holy Kali Bein is one of the main rivulets flowing in Punjab. It is 160 km-long tributary of the river Beas that originates from a spring in the Dhanoa village of tehsil Dasuya in district Hoshiarpur of Punjab, India and then merges at the confluence of the Beas and the Satluj at Harike wetland. It serves as an important source of water for agriculture and helps in flood management. In the year 2000 a clean-up drive was initiated by the famous environmentalist Baba Balbir Singh Seechewal. However, Seechewal's work with the Holy Kali Bein is not yet complete and the rivulet still faces threats of contamination from agricultural runoff, industrial waste and sewage water from various towns and villages. This study was conducted to analyze the

water quality status of the Holy Kali Bein in terms of water quality index (WQI). The WQI scores showed good as well as poor quality of water samples in almost all the five sampling sites along the Holy Kali Bein. The water quality was found to be good at site I while poor quality of water was found at site II-V.

**(PP-37)**

### **Quality Assessment of Guava Fruits as Influenced by Various N Fertilizers**

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The present investigation was carried out to examine the effect of various N fertilizers on quality of guava fruits cv. Sardar in a well maintained Guava Orchard of Khalsa College Amritsar during 2015 – 2016. The experiment was laid out in Randomized Block Design with ten treatments, replicated thrice. Thirty trees of uniform vigour were selected and fertilized with FYM @ 25, 30, 35, & 45 Kg, Urea @ 200, 250 & 350 g, *Azotobactor* @ 35, 45 & 50 g and Vermicompost @ 10, 15 & 22 Kg per tree before the winter crop to find out the optimum dose and combination of these organic and inorganic fertilizers for improving the fruit quality. In different combinations of organic and inorganic fertilizers, the treatment T<sub>9</sub> (FYM @ 35Kg + *Azotobactor* @ 45g + Vermicompost @ 15Kg + urea @ 200g per tree) proved be the most efficacious treatment in enhancing the quality parameters of guava fruits. The fruits with maximum size (8.00 cm x 7.90 cm), weight (196.80 g), total sugars (6.93 %), reducing sugars (2.67 %) and ascorbic acid content (212.55 mg/100g) were yielded from the trees fertilized with FYM @ 35Kg + *Azotobactor* @ 45g + Vermicompost @ 15Kg + urea @ 200g (T<sub>9</sub>). Maximum TSS (12.86 %) was recorded in fruits of the trees treated with FYM @ 25Kg + urea @ 350g (T<sub>1</sub>).

**(PP-38)**

### **Effect of Integrated Application of Farm Yard Manure (FYM) and Inorganic Fertilizers on Yield and Nutrient Uptake by Basmati Rice**

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The present investigation was conducted at students research farm, Khalsa College, Amritsar during *kharif* season of 2016-17. The soil of the experimental field was categorized as sandy loam. The soil tested low in medium carbon and available nitrogen (N) and medium in available phosphorus (15 kg ha<sup>-1</sup>) and potassium (150 kg ha<sup>-1</sup>). The highest grain yield of rice was obtained with inorganically 100% application of nitrogen (44.3 q ha<sup>-1</sup>) which was significantly higher than 50% application of nitrogen levels and also from application of FYM with 50% application of nitrogen inorganically but at par with treatments in which phosphorus applied. It observed that application of FYM increases organic carbon content by up to 44% over the control treatment whereas highest positive content and uptake of N and P was realized with 100% RDF and combined application of 10 t ha<sup>-1</sup> FYM with 50% RDF of N with P levels as compared to alone 50% RDF inorganic fertilizer. Thus, the use of FYM along with inorganic fertilizers ensures the sustainable crop yields to meet the food requirements of ever increasing population besides maintaining soil health and save part of the money that would have been paid for the greater doses of the chemical fertilizer.

**(PP-39)**

### ***In-Vitro* Effects of Certain Insecticides on Sf9 Insect Cell Line**

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Insects are the most diverse species of animals living on the planet earth. Some insect pests inflict damage to humans, crops and livestock. Moreover, insects are said to be responsible for destroying one fifth of the world's total crop production annually. Tobacco cutworm, *Spodoptera litura* (Lepidoptera: Noctuidae) is a polyphagous crop pest of national status in India and also enjoys a world-wide distribution. A variety of insecticides are used for the control of this pest and have their own mechanism of action. The insight into the mechanism of action and selectivity of these insecticides were gained through *in-vitro* testing on many cell lines. The toxic effects of different insecticides were evaluated *in-vitro* on cultured Sf9 cell line obtained from ovarian cells of *Spodoptera frugiperda*. Cell growth inhibition was measured by MTT, mitochondrial membrane potential and reactive oxygen species assays. The changes were observed after applying the different concentrations of insecticides. Among the various insecticides tested, indoxacarb was found to be highly effective at concentration of 200µg/ml with 76.17 inhibition percentage. Also, 1.44-fold increase in DCF fluorescence was observed in case of indoxacarb as well as a reduction of 77.64% in membrane potential occurred in cells exposed with IC<sub>50</sub>.

**(PP-40)**

### **Termites: Boon or Bane**

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Termites also called as “white ants” are polymorphic eusocial insects, belonging to the order Isoptera considered as a bane to our existence. Out of 2600 species of termites, approx. 300 acts as pest of crops, household wood etc. In India, 200 species and in Punjab alone, 12 species are present. Today termites are considered as pervasive pest in the whole world. As a natural scavenger, it feed on the plant parts (roots), leading to 15-20% damage to economic yield of crop. Apart from that, its other striking damaging effects are reducing water retaining capacity, removal of plant cover, thus promoting soil erosion. It also attacks on storage food products which ultimately is of keen importance to man. Chemical as well non-chemical methods are being adopted to exterminate their population from fields. However, it is being observed that they attain the status of pest when extracted from its natural environment. Alternatively, termites act as soil engineers by building mounds and can act as an immense source of energy in form of poultry or human feed. The scavenging nature of termites is used for decomposition of crop residues, mulches and soil organic matter to soil by lignocelluloses recycling process. Moreover, they improve the soil quality by hoeing, improving aeration, changing soil structure and biologically by recycling the nutrients to the soil. They also help in natural cleansing of the forest bed. Overall, to conclude, we can say that until unless biomass is available naturally or being provided to them manually, the termites can be really great friend of us.

**(PP-41)**

## **Role of Termites in Organic Farming**

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Termites (Order-Isoptera) are the natural soil inhabitants. Under natural conditions, Termites become pest only when they are expelled from their natural habitat. Their beneficial aspects to men are very significant but still hidden for farmers. Termite presence results enormous benefits as they are responsible for decomposition of dry matter in nature, aeration, loosening, natural hoeing of soil etc. A practical example of beneficial role of termites is in organic farming being practiced at Bhagat Puran Singh Organic Farm and Research Centre, Dhirekot, Jandiala Guru, where termites scavenging nature is tricked for above beneficial aspects. They are provided with their required food material; hence they do not attack on crop plants and do a favour for soil, human and Nature. Natural environment of termites is maintained by providing them recycled dry farm residue left on the field after harvesting, waste jute bags, paperboard etc. due to which their interference with men for natural food supply reduces. It has been observed that even in the presence of termites, the overall yield increased approximately by up to 5-7% in the sugarcane field as compared to average yield despite of the fact that since 2006, neither any fertilizers nor any pesticides had been used in these agriculture fields.

**(PP-42)**

## **Fish Diversity Trends and Concerns of Harike Wetland, Punjab, India -A Ramsar Site**

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This paper highlights the trends and concerns of existing fish biodiversity of Harike wetland, situated in Punjab, India. Harike wetland (31°12'N to 75°05'E) is located at the confluence of two major rivers Beas and Sutlej, formed when a barrage was constructed in 1952. It is about 12 km long and 11 km in width and spreads in four districts of Amritsar, Tarn Taran, Ferozpur and Kapurthala covering an area of 8435 hectares. The wetland is having high ecological value as it supports rare, vulnerable and endangered floral and faunal species. It harbors large and diverse fish population which is facing a serious threat due to increased urbanization, industrial processes, agricultural activities, encroachment, siltation, and weed invasion. This ultimately hampers their growth and survival and results in decrease in their number from the maximum reported (61 species; 35 genera in 2009) to minimum of 37 fish species (25 genera) in year 2017. The Indian major carps dominated the entire fishery followed by common carps and catfishes. The reduced numbers of exotic catfish *Clarias gariepinus* at Harike since 2002 emphasize the polluted nature of the wetland further supported by complete absence of exotic fishes like *Hypothalmitis molitrix* and *Ctenopharangdon idella*. Assorted group too is mainly composed of big fishes like *Bagarius bagarius*, *Rita rita* and *Notopterus* especially *N. chitala*. Hence it is concluded that there is an urgent need for the conservation of wetland and despite of such pollution levels, it is still supporting a good number of fish species which needs to be conserved.

**(PP-43)**

### **Functional Efficiency during Seed Germination and Seeding Growth in *Brassica napus* (L.): A Study of Impact of Temperature Stress**

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Seed germination occupies a unique position in plant life. Temperature stress has a strong impact on survival, growth and development of seedlings. The present investigation was carried out to study the impact of temperature stress on morpho-physiological attributes and photosynthetic pigments of *Brassica napus* (L.). Seedlings were exposed to a temperature of 40 °C and 4 °C. It was observed that different degrees of temperatures showed different effect on shoot length, root length and photosynthetic pigments such as chlorophyll a, chlorophyll b, total chlorophyll and total carotenoid content. Low temperature (4 °C) treatment enhanced all aspects of growth and physiology by protecting photosynthetic pigments and modulating the carbon makeup positively as compared to control, whereas high temperature treatment deteriorated all the attributes of growth, physiological and biochemical components as compared to control. The experimental study concluded that low temperature (4°C) was able to increase the freezing tolerance by amelioration of morpho-physiological components, reallocation of nutrients, modulation of photosynthetic machinery to cope up with extreme temperature stress.

**(PP-44)**

### **Integrated Nutrient Management -A Suitable Transition to Organic Farming of Linseed.**

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In the present study two varieties of *Linum usitatissimum* (Linseed) Lc-54 (Lv<sub>1</sub>) and Lc-2063 (Lv<sub>2</sub>) were used to compare and appreciate the role of Integrated Nutrient Management (INM) vis-a vis inorganic applications. Experiment was laid down in polyhouse and under field conditions with 16 treatments in triplicate for both the varieties. Various doses and combinations of vermicompost, vermiwash, inorganic fertilizers were applied. Responses to organic and chemical fertilizers were studied on Lv<sub>1</sub> and Lv<sub>2</sub> and was compared with another treatment of Integrated Nutrient Management (INM) using 50% of vermicompost and 50% of inorganic fertilizer. Germination parameters, growth stages, morpho-physiological growth parameters, oil quantity, Omega-3 fatty acids, Omega -6 fatty acids were obtained from both the varieties were studied. Fatty acid profile was quantified and compared for all the treatments. Lv<sub>1</sub> responded better to 2% vermicompost in terms of oil yields and omega-3 fatty acid production. Lv<sub>1</sub> responded better to inorganic fertilizer as a component of INM suggesting the need to understand the genotypic differences before applying the fertilizer regimes in field conditions. Lv<sub>1</sub> is genotypically better oil yielding variety. Partial replacement of chemical fertilizer in INM yielded 8.8% and 7.3% more oil than chemical fertilizer alone in Lv<sub>1</sub> and Lv<sub>2</sub> respectively. INM proves to be highest yielding treatment for Linseed cultivation. INM can provide high crop yields and overcome the yield concerns of farmers about organic farming.



**(PP-45)**

### **Significance of Medicine Testing on Rat Models**

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The molecular targeted therapies need clinical development. It is a challenging aspect representing new and promising approach to treat various diseases. It involves identification of specific dose that should be biological active. Medicine testing performed on animal models in order to study their effects is of great importance. It is a crucial step that should be carried out before the medicine is out in market for selling. Medicines after being prepared cannot be consumed directly by humans it can be very lethal or toxic or can produce various side effects. These tests help to find the LD 50 value of every medicine and set the safe dose. For such tests, animal models are used that are related to humans in various aspects of body such as rats, mice, guinea pigs, rabbits, monkey etc. Rat is the most ideal animal due to its similarity to humans in various aspects like physiology, behavior, reproductive system, digestive system, nervous system. It is easy to handle and administer dose to rats. Both females and male rats are used for trials of medicine testing. Most preferred varieties are Wistar rat, Long-Evans rat, Sprague Dawley, Battleboro rat, Lewis rat etc. The present paper includes an overview regarding importance of medicine testing on rats for ensuring safety and efficacy of medicines to be released commercially.

**(PP-46)**

### **Role of Oncogenes in Epidemiology of Cancer and Metastasis.**

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According to World Cancer Research Fund, There were an estimated 18 million Cancer cases around the world in 2018. Of these, 9.5 million cases were in men and 8.5 were in women. Lungs and Breast Cancer were most common cancer worldwide contributing 12.3% of total number of cases diagnosed in 2018. In India, Oral Cancer is the most common cancer among men (11.28%) and fifth most common among women (4.3%). Cancer is the term for disease in which cells divide without control and can invade in nearby tissues. Cancer cells can also spread to other parts of body via blood and lymph by the process of metastasis. Cancer is caused due to mutation in genes responsible for normal cells growth, division and differentiation. These genes include p53, RB, Myc, C-Jun, Fos etc. Among all these, about 50% of cancers involved missing or damaged p53 gene due to mutations. Due to mutation in RB gene, the cells ability to growth and divide remains continuous and don't stop during G1 to S phase of cell cycle division. So there in no any check on the stage of cell. It results in tumor initiation as the genes failed to control the cell growth and unable to repair errors in DNA. The present paper includes the overview regarding various genes and pathway involved in tumor initiation and progression.

**(PP-47)**

## **CRISPR- A Powerful Functional Genomic Tool in Crop Improvement**

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CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats) is a family of DNA sequences in bacteria that contains snippets of DNA from viruses that have attacked the bacterium. These snippets are used by the bacterium to detect and destroy DNA from further attacks by similar viruses. CRISPR-Cas9 is a genome editing tool that is creating a buzz in the science world. The simplicity of the CRISPR nuclease, with only three required components (Cas9 along with the crRNA and trRNA) makes this system amenable to adaptation for genome editing. CRISPR has opened new era in biotechnology. It provides simple and efficient access to manipulate virtually any part of the genome of any organism. Large genomic deletions or inversions can be achieved by targeting two widely spaced cleavage sites on the same chromosome. Its potential applications include correcting gene defects, treating and preventing the spread of diseases and improving crops. Gene knockout are the simplest form of targeted modifications and can be used to eliminate genes that negatively affect food quality and divert metabolic flux away from valuable end products. Emergence of CRISPR as a gene editing technique has ability to generate highly specific and efficient mutations in short time span. This technique is highly specific, rapid and cost effective, so can be used as support for the labour and time intensive classical plant breeding. This precise gene editing is applied for functional genomics study, transcriptional regulation, disease and pest resistance and new trait development in model plants as well as cereals, vegetable, fruit crops.

**(PP-48)**

## **Anticancer Compounds from Genus *Pteris* and their Molecular Mechanism of Action**

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Pteridophytes are seedless vascular plants, which are represented by about 305 genera comprising more than 10,000 species all over the world. Although ignored in modern times, they have been known to man for more than 2000 years for their medicinal values and have been successfully used in different systems of medicines. The main chemical constituents in plants of genus *Pteris* include diterpenoids, diterpenoid glycosides, flavonoids, flavonoid glycosides, sesquiterpenoids and volatile oils. Some of these compounds exhibit antitumor, antifungal and antibacterial activities. Entkaurane-2  $\beta$  and 16  $\alpha$ -diol, ent-kaur-16-ene-2  $\beta$ , 15  $\alpha$ -diol, 2*R*,3*R*-pterosin L 3-*O*- $\beta$ -D-glucopyranoside, 4-*O*-benzoyl- $\beta$ -D-xylopyranosyl(1 $\rightarrow$ 2)-7-*O*-benzoyl- $\beta$ -D-glucopyranoside, (2*R*)-pterosin P, ent-11 $\alpha$ -hydroxy-15-oxo-kaur-16-en-19-oic-acid (5*F*) isolated from various species of genus *Pteris* have shown cytotoxicity against different cancer cell lines such as Ehrlich ascites tumour cells, PANC-1 (human pancreatic cancer), NCI-H446 (human small-cell lung cancer) and HL 60 cell line (human leukemia). The molecular mechanism of action of ent-11 $\alpha$ -hydroxy-15-oxo-kaur-16-en-19-oic-acid has been studied in detail. The compound could inhibit the proliferation of A549 cells by arresting the cells in G2 phase and by inducing mitochondrial-mediated apoptosis. It

induced apoptosis of cancer cells by inhibiting NF- $\kappa$ B activation that further decreased Bcl-2 but increased of Bax and Bak expression. MAPK kinases and Akt were also found to be involved in process of apoptosis. Collectively, 5F was effective against several malignant cancers both *in vivo* and *in vitro* with minimal side effects. The present review article is focused on the various chemical compounds that have been derived from genus *Pteris*, in recent years and shown promise as anticancer agents and will also outline their potential mechanism of action.

**(PP-49)**

### **Application of Computers in Biological Research**

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Computers have played a significant and innovatory part in biological research. Creation of databases, organization of data and other laboratory investigations routinely use mainframe as well as personal computers. Application of computers and technology in biology kick started in 1960s with their use in innovative dynamics of cell multiplication and formation of extraordinary three-dimensional images of organelles that were 50,000 times their actual size with the help of electron microscope. A novel collective subdivision of computer technology and biology is called computational biology. This branch has made it possible to create quantum simulations to understand biochemical processes to study how reactions occur on a molecular and atomic level. Biological simulations have been instrumental in designing therapeutic drugs, predictions of protein structure and microscopic exercises like the optimization of the placement of wildlife sanctuaries. Computer programs and mathematical models including statistics have been used in data mining which includes the analysis of data collected by several genome projects. Administrating the large databases of experimental biological data has necessitated advances in computer memory and speeds. The present review summarizes the revolutionary advances being made in the application of computers in the fields of bioscience and medicine.

**(PP-50)**

### **Diversity of Poroid Fungi from Punjab – Family Polyporaceae**

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The poroid members are characteristic in having annual, biennial to perennial, effused–reflexed, sessile and stipitate basidiocarps with gymnocarpic hymenium lining the tubes and supported by sterile tissue. Pilei may be solitary, imbricate or in groups with variable shapes and centric, eccentric to lateral stipe which is usually unbranched. The color of the basidiocarp may vary from whitish, grayish or yellowish to more bright shades of orange, red, brown or blue. Abhymenial surface shows variation from smooth to tuberculate to warted to scurpouse to tomentose to velutinate to villose to hirsute to hispid to irregular. The hymenial surface is usually poroid but in some taxa pores splits on maturity and become irpicoid or dentate. Present paper gives an account of 14 species (*Corioloopsis caperata*, *Diplomitoporus overholtsii*, *Earliella scabrosa*, *Erastia salmonicolor*, *Grammothele fuligo*, *Hexagonia apiaria*, *Lenzites elegans*, *Perenniporia medulla-panis*, *P. meridionalis*, *P. tenuis* var. *tenuis*, *Polyporus grammocephalus*, *Trametes cingulata*, *T. leonina* and *T. pubescens*)

of family *Polyporaceae*. Of these, 3 taxa i.e. *Diplomitoporus overholtsii*, *Erastia salmonicolor* and *Perenniporia meridionalis* are being reported for the first time from India and others highlighted in bold are being reported for the first time from Punjab.

**(PP-51)**

### **CRISPR-Cas9- A Genome Editing Tool**

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Recent advances in genome engineering technologies based on the CRISPR-associated RNA-guided endonuclease Cas9 are enabling the systematic interrogation of mammalian genome function. Genome editing using the Cas9 endonuclease of *Streptococcus pyogenes* has demonstrated unparalleled efficacy and facility for modifying genomes in a wide variety of organisms. CRISPR-Cas9 has been successfully used to generate imprecise insertions and deletions via non-homologous end-joining mechanisms and to create precise mutations by homology-directed repair from donor templates. Key variables are the methods used to deliver the Cas9 endonuclease and the efficiency of the single guide RNAs. Using this system, DNA sequences within the endogenous genome and their functional outputs are now easily edited or modulated in virtually any organism of choice. Cas9-mediated genetic perturbation is simple and scalable, empowering researchers to elucidate the functional organization of the genome at the systems level and establish causal linkages between genetic variations and biological phenotypes. Cas9 is driving innovative applications from basic biology to biotechnology and medicine.

**(PP-52)**

### **Impact of Preharvest Application of Agrochemicals on Yield and Quality of Perlette Grapes**

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The present investigation entitled Impact of preharvest application of agrochemicals on yield and quality of Perlette grapes was conducted in the year 2017-2018 at vineyard of Department of Horticulture, Khalsa College, Amritsar. To improve yield and quality of Perlette grapes preharvest sprays of ascorbic acid, putrescine acid, CaCl<sub>2</sub> and CPPU were given at pea and verasion stage in treatment T<sub>1</sub> to T<sub>12</sub>. Application of CaCl<sub>2</sub> at 0.5 g/l concentration in treatment T<sub>9</sub> advanced apparent maturity by 8 days as compared to control. The maximum berry size (2.49 cm), berry weight (2.71 g), cluster size (283.5 cm), cluster weight (355.98 g) and non-reducing sugars (9.69 %) were recorded in treatment T<sub>12</sub> (CPPU 3 mg/l) respectively. Results also showed that the highest TSS (19.6 °Brix), TSS:acid ratio (38.88), total sugars (20.2 %), reducing sugars (10.56 %) and minimum acidity (0.51%) were recorded under treatment T<sub>9</sub> (CaCl<sub>2</sub> 0.5 g/l) respectively. Hence, CaCl<sub>2</sub> 0.5 g/l and CPPU 3 mg/l application to Perlette grapes improved yield and quality.

**(PP-53)**

### **Study on Jamun Germplasm in Various Regions of Punjab**

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Jamun has higher nutraceutical properties and has been proved as an upcoming fruit crop in country. To harness the genetic variability in the existing seedling population being a cross pollinated fruit crop. The survey of seedling growing as wind breaker at Government Garden, Attari, was evaluated for various physico-chemical attributes during 2016-17. Significantly variation was observed in the tree character i.e. trunk girth, tree height, canopy volume in different genotypes. The highest tree height was measured in GD-19 genotype and minimum in GTB-24 genotype. Maximum fruit weight (14.88 g) was registered in GD-6 genotype and minimum fruit weight (3.94 g) was registered in PS-1 genotype. Wide variability for fruit length (2.10 to 3.58 cm). Fruit breadth (1.52 to 2.75 cm), pulp stone ratio (1.51 in GT-34 genotype) to maximum (7.21) in GD-13 genotype was observed. Maximum TSS/acid ratio is 43.73 in GD-10 genotype, total sugar is( 21.34 %) in PS-1 genotype and reducing sugar is (14.64 %) was recorded in AJWR-14 genotype and minimum TSS/acid ratio is 26.47 in GTB-24 genotype, total sugar is (16.64 %) in GD-3 genotype and reducing sugar is (8.14 %) in GD-10 genotype. Though the fruits of desi were smaller as compared to fruits of ra type but had good eating quality because of high in TSS content. Titratable acidity was found to be at the highest level of (0.87 %) in ALK-18 genotype, while it was found lowest (0.45 %) in GD-3 genotype.

**(PP-54)**

### **Role of Green Banking in Environmental Sustainability**

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The awareness about global warming and its inherent impact on human life is spreading among people. The rise in the environmental issues has brought forward the concept of 'Going Green', in other words taking up eco- friendly initiatives in every field. So change is the need of the hour, the organizations are taking initiatives for 'going green' for sustainable growth in the future. The banks should play a pro-active role considering the emerging ecological aspects as part of their lending process, which would force industries to go for investments leading to Green Management. This paper explores the importance of Green Banking and highlights the much required initiatives to be undertaken by Indian banks towards the same. Adoption of greener banking practices will not only be useful for environment but also benefit in greater operational efficiencies, a lower accountability to manual errors and cost effectiveness in banking activities.

**(PP-55)**

### **Weed Biomass: A Rich Nutrient Source for Compost Preparation**

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The concept of weeds emerged when human beings started growing crops deliberately. In Punjab weeds can be found growing in fallow lands, on canal bunds and in

cultivated land. In present scenario to meet needs of increasing population, use of herbicides is done at very high rate which results in depletion of soil and contamination of underground water. So need of an hour is to find an alternative to chemical fertilizers. Present study deals with an analysis of biomass production and nutrient status (NPK) in three land use systems (canal bunds, fallow land and in cultivated land) at two locations (Ludhiana and Sangrur) and data was recorded throughout year at an interval of one month. In case of land use systems fallow land (Sangrur) was recorded to have maximum Biomass (5863.2 Kg/ha), Nitrogen (98.41(Kg/ha), Phosphorus (21.62 Kg/ha) and Potassium (76.18 Kg/ha) annually. With respect to months maximum weed biomass production (7536.33 kg/ha), Nitrogen (24.63 Kg/ha), Phosphorus (28.83 kg/ha) and Potassium (145.50 Kg/ha) was recorded in July. Poaceae was dominant family in all land use systems while in fallow land (Ludhiana) Asteraceae dominates the system. The paper will highlight composition of weeds in all the land use systems. Thus from present data it is revealed that weeds can be used as compost because biomass production and nutrients status of weeds in different land use systems is quiet high.

**(PP-56)**

**Dye induced gill alterations in a fresh water fish, *Cirrhinus mrigala*  
(Hamilton, 1822)**

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Over the past few decades dye contamination of aquatic systems has attracted the attention of several investigators both in the developed and developing countries of the world. A large quantity of these dyes enters aquatic bodies from time to time because a substantial amount of a dye (10-15% unbound dyes) is lost in the effluent during dyeing processes. In return the aquatic bodies end up being the final destination of a large quantity of wastes from these sectors. Waste waters from dye manufacturing, paper, leather and textile industries bring tons of dyes into the aquifers, most of which are highly toxic to the flora and fauna of the receiving water bodies. Scanning electron microscopic observations were made for the changes in the surface ultra morphology of gills of *Cirrhinus mrigala* on exposure to lethal (0.1, 0.2, 0.4, 0.6 and 0.8 mg/L dye) doses of Basic Violet-1 (an important textile and hair colorant; CI: 42535, Trade name- Methyl Violet-2B). Present study was taken up as insufficient data exist regarding safety of this dye. The dye was observed to be cytotoxic in nature during the acute (96h) exposure to lethal doses. The dye caused reduction or complete loss of microridges, increase in mucous openings and degeneration of gill lamellae and rakers. Therefore time to time monitoring of ultra morphology of tissues will provide us early indicators for the stress of very low levels of pollutants which may later cause mortality of the fish. The study holds importance because fishes are an important link in the food chain of man, respond to toxicants in a manner similar to higher vertebrates.

**(PP-57)**

**Studies on Antioxidant and Antiproliferative Activities from Latex of  
*Calotropis procera* (Aiton) W.T. Aiton**

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*Calotropis procera* is an important medicinal plant of family Apocynaceae. It has been known for Vamana (vomiting) and Virechana (purgation) therapies of Ayurveda. The present study investigates the total phenol content (TPC), total flavonoid content (TFC), antioxidant and antiproliferative properties of *Calotropis procera* latex and its various fractions. Maximum TPC and TFC was observed in ethyl acetate fraction while maximum ferric ion reducing potential and peroxy radical scavenging potential was found in mother latex and methanol fraction respectively. Ethyl acetate fraction showed maximum antiproliferative potential against PC-3 cell line. This study reveals that *Calotropis procera* latex has potent antioxidant activity. Its growth inhibitory activity in PC-3 cancer cell line may be further explored in animal models to get a lead in cancer prevention.

**(PP-58)**

**Heavy Metal Analysis in Soil, Pollen and Honey Samples from Malwa  
Region, Punjab**

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Heavy metals are considered among the most important potentially harmful pollutants and these heavy metals are bioaccumulated by the plants from soil and transferred to our food chain. In present study, the bioaccumulation of heavy metals has been studied soil to pollen and from pollen to soil from two districts (Bathinda and Mansa) of Malwa Region, Punjab. The samples of soil, pollen and honey were collected randomly from above said district and are further analysed for three heavy metals i.e. Nickel (Ni), Lead (Pb) and Selenium (Se) using Microwave Plasma-Atomic Emission Spectrometer (Agilent MPAES-4200). The result showed that Ni, Pb and Se content was found maximum in soil, pollen and honey samples collected from district Bathinda as compare to Mansa. High content of heavy metals in samples collected from district Bathinda might be due to high pollution of industries or use of excess quantity of chemical fertilizers and pesticides. The bioaccumulation factor (BAF) of above said heavy metals was also calculated from soil to pollen and from pollen to honey. The values of BAF from soil to pollen ranged from 0.38-1.05, 0.03-1.10 and 0.00-11.48, whereas, the values of BAF from pollen to honey ranged from 0.56-1.50, 0.33-7.00 and 0.01-0.57, for Ni, Pb and Se respectively. Thus, present study concluded that excess use pesticides and fertilizers in conventional farming system pollutes our soil and these pollutant form soil bioaccumulated by plants and enter in our food chain through different agents. The present study also concludes that honey bee (*Apis mellifera*) can be a good marker for monitoring environmental pollution.

**(PP-59)**

## **Eco-physiological Studies of some Common Selected Plant Species in Xerophytic and Halophytic Environment**

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Leaf chlorophyll content is a good indicator of photosynthesis activity, plant stress, nutritional state and relationships between plants and their environment, and consequently will be of great importance in agricultural field management. The present study focused on the most common plant species which were dominant in the two areas selected i.e Central University of Rajasthan and Sambhar Lake. The most common species like *Argemone mexicana*, *Calotropis procera*, *Prosopis juliflora* and *Tephrosia purpurea* inhibited in Xerophytic and Halophytic environment were selected and then their various Eco-physiological parameter like chlorophyll content, carotenoids content, and Chlorophyll Stability index (CSI) % were compared. The results of different parameters revealed that, chlorophyll (a), chlorophyll (b), total chlorophyll (a+b) and carotenoids content was low in Xerophytes as compare to Halophytes. But the chlorophyll stability index (CSI)% of the Xerophytes taken from CURAJ campus was found to be higher as compared to Halophytes of Sambhar lake for the same four plant species selected. Since Chlorophyll Stability Index (CSI)% is an indicator of the stress tolerance capacity of plants and is a measure of integrity of membrane. The higher value of (CSI) % indicates that decreased Chl content is compensated for by increased (CSI) %. Therefore, the arid climate affects the synthesis of essential pigments of plants.

**(PP-60)**

## **Nrf2/ARE Signaling Pathway as Promising target in Neuroprotection: Role of Glucosinolates**

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Neurodegenerative Diseases (NDDs) are predicted to be the biggest health concern in this “aging era” and the second leading cause of death by 2050. The neurological disorders, such as Parkinson’s disease, Alzheimer’s disease and Huntington’s disease, characterized by progressive and selective loss of neurons, and their recovery being incurable may eventually lead to death. Primarily aging, along with genetic and environmental risk factors, contribute to these late-onset diseases. The anomalies such as cytotoxicity, oxidative stress, mitochondrial dysfunction, aggregation of certain proteins and neuroinflammation have been speculated to be the leading determinants of NDDs. To counteract, Nuclear factor erythroid 2-related factor 2 (Nrf2) a basic leucine zipper transcription factor, regulates the gene expression of Phase II detoxification and antioxidant enzyme through a promoter sequence Antioxidant responsive element (ARE). In an attempt to recognize the competent agents capable of mitigating the pathology of these neurological disorders, the plants’ secondary metabolites known as phytochemicals are potential candidates. A group of promising phytochemicals in terms of neuroprotective effect is constituted by glucosinolates. At present there are no adequate therapies to counteract the onset and the relentless progression of these disorders whose incidences are exponentially growing. The possibility to use ITCs, the safe and cheap compounds, to counteract neurodegeneration by targeting Nrf2/ARE signaling appears as a promising target that absolutely need to be explored.



**(PP-61)**

## **MAPK Signaling Pathway in Cancer: Role of Phytochemicals**

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The Mitogen activated protein kinases (MAPKs) are fundamental in inflammation and control of various cellular processes such as growth, differentiation, proliferation, migration, apoptosis and numerous physiological processes including innate and adaptive immune responses. The MAPK provide a link in the signal transduction pathway from cytoplasm to the nucleus. It involves main growth factor such as mitogens RAS, RAF, MEK1/2, ERK1/2. During oncogenesis, Ras and Raf are the main growth factors involved in cellular processes and are also known to be prone to frequent mutations. These have been reported to be overexpressed or inactivated in the initial stages of tumorigenesis and its progression. In the field of cancer research focuses on the molecular pathways involved in process of carcinogenesis and designing new drugs, targeting specific pathways like MAPKs, NF- $\kappa$ B, AP-1. The epidemiology studies have revealed the use of nonnutritive and dietary phytochemicals such as phenol, alkaloids, terpenoids, tannin, lycopene in modulating the MAPK modules for cancer preventive and therapeutic strategies. Therefore, the present paper is focused on understanding the mechanisms responsible for alteration in MAPK signaling pathway leading to cancer development, progression and possible treatment outcomes.

**(PP-62)**

## **Adsorption of Pharmaceutical Active Compounds in Wastewater using Ash Derived from Agri-residue & Its Solidification**

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Pharmaceutical compounds are a large group of emerging contaminants (ECs) that are consumed at high quantities all around the world. Recently, many synthetic pharmaceutical compounds such as antibiotics, analgesics, anti-inflammatory, beta-blockers etc. have been detected in various aquatic environments. Worldwide marketing of such compounds is between 1,00000 to 2,00000 tons/year. Therefore, every year a huge amount of antibiotics are introduced into the biosphere. Even at low concentration levels (ng/l), it shows worst effects on human beings and ecosystem. Various methods are being used for separation of pharmaceutically active compounds (PhACs) from aquatic system. Most of the advanced processes (chemical treatments, advanced oxidation techniques etc) are used but these are associated with drawbacks like generation of toxic byproducts, requirement of special equipments and pre/post treatment and high energy demand. In India huge amount of agri-residues are generated, which are being used as fuel in boilers by various industries. This gives rise to large amount of agri-residue ash that can be used as an adsorbent for separation of PhACs. Not much more work done on agri-residue ashes as compared to other adsorbents which discharges into ecosysytem, pollutes it and doesn't undergo reuse. Adsorption is a favourable separation process because of its well-known advantages. This study presents the removal of PhACs which is a big problem nowadays, treated by usingagri-residue ashes as adsorbent. Furthermore, for the safe disposal of exhausted adsorbent, solidification and stabilisation (S/S) technique was used to bind the used adsorbent by using Portland cement as

solidifying agent in different ratios for controlling the leachate adverse effects into the environment.

**(PP-63)**

**Effect of essential oil of *Callistemon viminalis* (Sol. Ex Gaertner) G. Don Leaves on Growth & Germination of *Cassia occidentalis* L.**

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*Callistemon viminalis* belongs to family Myrtaceae under order Myrtales. It is a large family of approximately 155 genera and 3000 species, mostly from the Southern Hemisphere. It is a native of New South Wales, Queensland and has approximately 34 species around the world out of which 10 species are found in India. It contains a wide range of secondary metabolites and essential oils (EO). EO from Leaves was extracted by hydrodistillation using Clevenger apparatus and yielded 0.5% (V/W). The chemical composition of EO was analyzed through GC/MS. Eight compounds, mainly monoterpenes represented 94.97% of oil. Major components included 1, 8-cineole (63.31%),  $\alpha$ -pinene (15.8%) and eucalyptol (12.65%). The effect of oil was further studied on growth of a common wasteland weed *Cassia occidentalis* under laboratory conditions. A dose dependent decrease in germination percentage, radicle and plumule length was observed in treated seedlings. At 20 ( $\mu$ l) concentrations weed was inhibited completely. From this study we concluded that *C. viminalis* essential oil can be used for managing *C. occidentalis* and its possible use as bioherbicide can be explored further.

**(PP-64)**

**Effect of some Botanicals on the Egg Hatching Greater Wax Moth (*Galleria mellonella* Linnaeus)**

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Botanicals being natural products, are safe to non-target animals and human beings and hence, ecofriendly in nature. As they are easily biodegradable, there is no residual and associated resurgence, development of resistance and health hazard problems. Hence, utilization of botanicals for suppressing various pest species has gained greater importance all over the world in recent years. The greater wax moth, *Galleria mellonella* Linnaeus (Lepidoptera: Pyralidae), is a ubiquitous pest of the honeybee, *Apis mellifera* Linnaeus, and *Apis cerana* Fabricius. The greater wax moth larvae burrow into the edge of unsealed cells with pollen, bee brood, and honey through to the midrib of honeybee comb. Burrowing larvae leave behind masses of webs which causes galleriasis and later absconding of colonies. Moreover, it also attacks on the bee combs kept in storage for future use. Honey bees are known to be susceptible to synthetic insecticides. Thus, there is no possibility of using any insecticides against *G. mellonella*. Contrarily botanicals because of their advantageous traits present the best alternate agents in the management of *G. mellonella*. The present investigation was undertaken to study the effectiveness of five different botanicals such as Neem seed extract, Thyme oil, Basil oil, Peppermint oil and Pongamia oil at different concentration on the egg hatching of *G. mellonella* under laboratory conditions. The results revealed that the egg mortality varied significantly when they were treated with above mentioned botanicals at

different concentrations. The 100 percent mortality was achieved with Thyme oil and Pongamia oil followed by Peppermint oil (93.3%), Basil oil (46.4%) and Neem seed extract (6.6%) after 7 days of treatment.

**(PP-65)**

**Efficacy of some Chemicals and Botanicals for the Management of Greater Wax Moth (*Galleria mellonella* L.)**

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Greater wax moth (GWM), *Galleria mellonella* (Lepidoptera: Pyralidae), is considered one of the most important pests of honeybee combs owing to the destructive feeding habit of its larva. The larvae cause economic loss to the beekeeping industry all over the world. The greater wax moth feeds on comb wax and severely damages the wax. Alongwith, it is equally destructive to stored combs because of their feeding and tunneling habits. The larvae of *G. mellonella* eat the wax of the comb and other associated material such as pollen, propolis and dead bees causing enormous damage to bee hives. Both the adults and larvae of GWM have also been earmarked as potential vectors of pathogens (*Paenibacillus* larvae, Israeli acute paralysis virus (IAPV), black queen cell virus (BQCV) etc.). Various methods have been suggested to prevent the attack of this pest. The present experiment was conducted out to check the efficiency of some chemical and botanical pesticides to inhibit egg hatching of *G. mellonella*. Two chemicals i.e. Formic acid and Acetic acid and three botanicals i.e. Cedar oil, Spearmint oil and Neem leaf and seed extract were tested at different concentrations. They were found to be exhibitvarying degree of mortality ofthe eggs of *G. mellonella*. The highest inhibition was recorded in case of chemical i.e. Formic acid (56.65%) and Acetic acid (46.6%). In case of botanicals, the highest in Cedar oil recorded highest efficacy (50.4%) followed by Spearmint oil (36.8%) and Neem leaf and seed extract (16.2%).

**(PP-66)**

**Estimation of Carbon Storage Capacity of some Tree Species of APS University Campus Rewa, M.P**

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Several university campuses having large vegetative areas support excellent plantation of tree cover. These types of forest cover counterbalance carbon emissions through carbon storage and sequestration from urban areas. During the present investigation the tree biomass, carbon sequestration potential of selected tree species of Awadhesh Pratap Singh University, Rewa campus was measured by using non-destructive method. The study found 989 trees of 05 different species with 279, 301, 36, 320, 53 numbers of *Dalbergia sisso*, *Azadirachta indica*, *Mangifera indica*, *Acacia nilotica*, and *Pongmia pinnata* respectively with a total carbon sequestration of 2630.02 tons. Among the 05 different species the maximum carbon sequestration was sequestered by *Dalbergia sisso* (1262.42 tons), and lowest by *Pongmia pinnata* (77.14 tons). To protect the developing world from ill effects of climate change and global warming, the sustainable management of urban trees with the objectives of carbon sequestration is the need of the time.

**(PP-67)**

### **Qualitative Assessment of Phytochemicals, Oxidative DNA Damage Preventive and Antiproliferative Activity of Spice Extracts**

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Free radicals are generated due to the oxidation of biomolecules such as carbohydrates, proteins, lipids, and nucleic acids. Imbalance between oxidants and antioxidants is the major cause of onset of various degenerative diseases. The present study was designed to validate the oxidative DNA damage preventive and antiproliferative activity of traditionally used spices *Coriandrum sativum* (CS), *Cuminum cyminum* (CC), *Piper nigrum* (PN) and their mixture (CPC) in the ratio of 1:1:0.5. Methanol extracts were prepared, concentrated and subjected to qualitative estimation of phytochemical constituents such as tannins, alkaloids, terpenoids, flavonoids etc. DNA nicking and MTT assays were carried out as per standard protocols. The results indicated the presence of tannins, terpenoids and alkaloids in all the extracts. Flavonoids were present only in CC and reducing sugars were found in CC and CS. All the extracts mitigated the damage induced by Fenton's reagent on pBR322 plasmid DNA below 10 µg/ml. GI<sub>50</sub> of 46.16, 34.35, 43.96, 94.54 µg/ml was obtained in PN, CS, CPC and CC in human osteosarcoma MG-63 cell line respectively. Among all the extracts CS showed prominent DNA protective activity as well as inhibited the growth of MG-63 cancer cell line. Results of the MTT assay were further supported by confocal microscopy studies. The present investigation hints at the DNA protective and antiproliferative effects of spice extracts. Appropriate concentration of spices may inhibit DNA damage caused due to hydroxyl radicals and can provide protection against early carcinogenesis.

**(PP-68)**

### **Illuminating Natural Wool with Anti-Microbial Dye Obtained from *Dacryodes macrophylla***

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The dyeing of wool fabric using a natural dye extracted from *Dacryodes macrophylla* has been studied using both conventional as well as ultrasonic dyeing methods. Natural dye has been extracted using water as solvent by Soxhlet extraction method. The extracted color was characterized by spectroscopic studies like IR and UV/Visible. X-ray powder diffraction study was also used and further tested for antimicrobial activity (against *Vibrio cholerae* (MTCC3906), *Salmonella enterica* serotype *typhi* (MTCC733), *Shigella flexneri* (MTCC1457), *Escherichia coli* (MTCC119), *Listeria monocytogenes* (MTCC657) and *Staphylococcus aureus* (MTCC 96). It was observed that the water extract of *D. macrophylla* showed antimicrobial activities against *S. enterica*. The effect of mordants on the dyeing outcome in terms of colour depth as well as fastness properties of the dyeing was investigated. The results of fastness properties of the dyed fabrics were fair to good. Depth of

the shade and fastness properties in case of ultrasonic dyeing was found to be better compared to conventional dyeing.

**(PP-69)**

### **Physicochemical analysis of Textile industry effluent in Kathua, Jammu**

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Our immediate environment is usually affected by various anthropogenic activities, one of such is local and regional pollution. The textile industry is one of the major causes for environmental pollution in Kathua District of Jammu and Kashmir. Textile industry discharge its effluents into the Magar Nala that finally drains into the Ravi river. These effluents are rich in dyes and solids which may be in the form of Total dissolved solids or Total suspended solids. These solids affect the physicochemical parameters of the water body. The quality of any water is defined by its chemical, physical and biological contents. High levels were observed in pH (7.6-9) which exceeds the standard levels of world health organization (WHO). The study revealed that there was an adverse impact on other physicochemical characteristics as a result of directly discharge of untreated effluents from textile industries. This poses a health risk to humans as high pH of water causes alkalosis which may cause nausea, vomiting and muscle twisting.

**(PP-70)**

### **Physio-Chemical Analysis of Ground Water Samples Collected from Surrounding areas of Kanjli Wetland, Punjab (India)**

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India, a megadiversity nation, has large number of wetlands that support enormous and unique habitats with different species. Many of these wetlands with rare biodiversity have been recognized as Ramsar sites with three such wetlands viz., Kanjli, Harike and Ropar in Punjab (India). Despite providing ecological goods and services, wetlands, on account of increasing urbanization, industrialization and various anthropogenic activities are under severe threat. Considering the importance of wetlands, the present study was planned to estimate the physico-chemical characteristics (pH, electrical conductivity, hardness, alkalinity, calcium, magnesium, nitrates, phosphates) and various heavy metals (copper, cobalt, chromium, lead, arsenic, nickel) of ground water samples collected from different villages in vicinity to Kanjli wetland located in Kapurthala district of Punjab (India). Water samples were collected from hand pump (upper level ground water) and submersible (deep level ground water) sources. pH was found to be varying from 6.5 - 8.2. The electrical conductivity was found to be >500  $\mu\text{S}/\text{cm}$  for most of the samples collected from hand pump sources indicating the contamination of water. Nitrate content was also recorded to be above permissible limits in water samples collected from few villages. Contents of chlorides and hardness were found to be much higher in water samples from hand pump sources as compared to submersible sources. These variations can be correlated to the depth of water levels where the leaching of unwanted chemicals, pesticides and many other harmful

ingredients deteriorate the water quality. Chromium and lead were detected in almost all samples. Arsenic was also present in few submersible samples in very low concentration. The present study focuses on contamination of ground water and related health issues.

**(PP-71)**

### **Assessment of Antiproliferative Properties of Pollen Grains of Some Plant Species Collected from Amritsar, Punjab**

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Various genotoxic agents present in nature, food and synthetic drugs cause damage to genetic material ultimately leading to carcinogenicity. Exposure of human beings to such genotoxic agents is unavoidable, exploration of the antigenotoxic/anticancer compounds of natural origin is the new area of research these days. Considering the same, the present study was planned to evaluate the antiproliferative activities of pollen grains of 9 different medicinally important plant species viz., *Bauhinia purpurea*, *Bauhinia variegata*, *Cassia biflora*, *Cassia fistula*, *Cassia glauca*, *Cassia siamea*, *Delonix regia*, *Hibiscus rosa sinensis* and *Melia azadirach* collected from Guru Nanak Dev University, Amritsar following MTT assay. All the samples showed antiproliferative activity against human neuroblastoma cell (IMR - 32). Pollen grains of *Cassia fistula* and *Bauhinia purpurea* showed an antiproliferative activity of 46.25% and 43.51% respectively. The present study indicates the prospective of pollen grains of these plants as potent material to combat with carcinogenicity.

**(PP-72)**

### **Assessment of Genotoxic Effects of Water Samples of Buddha Nullah Using *Allium cepa* and DNA Nicking Assays**

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Buddha Nullah, one of the natural water bodies, flowing through Ludhiana, Punjab (India), was once a stream of sparkling water. In recent years, it has turned into a filthy drain due to continuous disposal of industrial effluents, sewage, dairy and domestic waste. The present study involves the analysis of genotoxic effects of surface water samples collected from 2 different sites, viz., Kitchlu Nagar and Madho Puri of Buddha Nullah using *Allium cepa* root chromosomal aberration assay and plasmid (pBR322) nicking assay. During the present study, the root tips of *Allium cepa* were treated with the collected water samples and slides were prepared using squash method. The root tip cells showed various types of chromosomal aberrations including physiological aberrations (c-mitosis, delayed anaphase, stickiness, laggards, vagrants) and clastogenic aberrations (chromosomal breaks, chromatin bridge and ring chromosomes). It was seen that sticky chromosomes and delayed anaphases dominated among physiological aberrations whereas chromatin bridges dominated among clastogenic aberrations. The total chromosomal aberrations were observed to be 29.86 % and 25.79 % following treatment with water samples from Kitchlu Nagar and Madho Puri, respectively. During plasmid nicking assay, single and double strand breaks were observed in plasmid DNA treated with water samples of both the sites. Occurrence of chromosomal

aberrations and DNA strand breaks in pBR322 plasmid confirmed the genotoxic effects of both water samples. The heavy metal estimation of water samples was also conducted using atomic absorption spectrophotometer which revealed the presence of metals (mg/L) as Co (1.598), Pb (0.533), Cr(0.33), Cd(0.433), Cu(0.006), Ni(0.0265) in Kitchlu Nagar and Co (0.251), Pb(0.387), Cr(0.172), Cd(0.002), Cu(0.006), Zn(1.047), Ni (0.0218) in Madho Puri water samples.

**(PP-73)**

### **Biochemical Alteration in Liver and Kidney of *Labeo rohita* upon Exposure to Basic Violet-1 (BV-1) dye.**

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Aim of the present study was to evaluate the toxic effects of Basic violet-1 (BV-1, CI No. 42535), a widely used azo dye in dyeing and textile industries, on antioxidant enzymes of *Labeo rohita*. Fish were exposed for 96 h to 0, 0.2 (LC<sub>20</sub>), 0.4 (LC<sub>40</sub>), 0.6 (LC<sub>60</sub>), 0.8 (LC<sub>80</sub>) and 1 (LC<sub>100</sub>) mg/l of BV-1. Antioxidant enzymes such as lactate dehydrogenase (LDH), alkaline phosphatase (AKP) and acid phosphatase (AcP) were estimated in liver and kidney of the fish as markers for the stress of BV-1. After 96 h exposure, prolongation of the stress was explored during a period of 30 days (recovery period) and activity of enzymes was determined at 15 day intervals. Besides an impact on antioxidant enzymes, altered behavioral changes were observed such as loss of balance, erratic swimming and severe mucus secretion. Significant dose dependent increase over control in the activity of AcP while a significant decrease over control in LDH and AKP activity was observed in all the tissues after 96 h exposure as well as recovery period. AcP was maximally affected enzyme and kidney was observed to be the most sensitive tissue to the stress of the test dye. The results indicate toxic effects of the dye on *L. rohita* as indicated by the altered enzymatic profile in the exposed fish and the effect prolonged till the end of recovery period. So, AcP in kidney can be considered as best biomarker to determine toxicity of even very low doses of BV-1 in fish.

**(PP-74)**

### **PGPRs and BRs Assisted Detoxification of Chlorpyrifos in *Brassica juncea* L.**

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Pesticide usage is inevitable part of our environment as they are extensively used in agriculture, health sectors, household etc. Nowadays, organophosphate pesticides are commercially favoured type of pesticides and extensively used worldwide. However, their application causes toxicity to plants by generating oxidative stress, leading to decrease in quality and yield of plants. Various physical and biochemical mechanisms are present for degradation of these pesticides. Microbial degradation is considered as one of the effective option for removal of these pesticides from environment. Brassinosteroids (BRs) are well known to have abiotic stress protective role in plants as well as to increase the yield of plants.

They are also considered as effective phytohormone in providing defence to plants in various stresses. The present study was designed to observe the plant growth, biomass as well as defensive role of 24-epibrassinolide (24-EBL) along with *Pseudomonas aeruginosa* under Chlorpyrifos (CP) toxicity in 60 day old *Brassica juncea* plants. Various reactive oxygen species generated during the stress condition were analysed spectrophotometrically. It was observed that inoculation of *Pseudomonas aeruginosa* along with seed priming treatment of 24-EBL significantly enhances the antioxidative defence system of plant, plant growth as well as yield of plant.

**(PP-75)**

**Jasmonic Acid Induced Immunity by Modulating Antioxidative Defense System in Tomato Plants under Pb Stress.**

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Lead (Pb) is one of the major heavy metal of antiquity and has gained considerable importance as a potent environmental pollutant. Pb phytotoxicity leads to inhibition of enzyme activities, disturbed mineral nutrition, water imbalance, and change in hormonal status and alteration in membrane permeability. It can cause oxidative damage by stimulating the production of free radicals and reactive oxygen species which lead to oxidative stress. Jasmonic acid (JA) a naturally occurring phytohormone, may trigger signaling pathways leading to increased resistance to abiotic stress conditions. The present work was conducted to study the effect of Jasmonic acid (0.01, 1 and 100 nM) on morphological parameters, antioxidative enzymes and oxidative stress on 15-days old seedlings of tomato subjected to different concentrations of Pb metal (0.25, 0.50 and 0.75 mM). Findings of present study showed that Pb treatment reduced root and shoot lengths. Treatment of 0.75 mM Pb enhanced MDA, superoxide ( $O_2^{\cdot-}$ ) and  $H_2O_2$  contents as compared to the untreated seedlings. JA (100 nM) showed improvement in growth parameters and reduction in the levels of MDA,  $O_2^{\cdot-}$ , and  $H_2O_2$  in Pb treated seedlings. JA (100 nM) mitigated the oxidative damage by decreasing the expression of *respiratory burst oxidase* and elevated the expression of *CAT*, *POD*, *GST*, *GR* and *PPO* in Pb-exposed seedlings. The biochemical and molecular analyses demonstrated that JA plays a crucial role in plant defense responses against Pb toxicity.

**(PP-76)**

**Role of Earthworms in Assisted Phytoremediation of Heavy Metals**

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With increased industrial pollution and enhanced agricultural chemical material, heavy metal pollution becomes more common in soil environment. The soil has been traditionally been the site for disposal for most of heavy metal pollution which needs to be treated. Treatment of polluted soil is best done by using plants by process known as Phytoremediation. Heavy metal pollution imposes health hazards on human and animal population. It is well known that earthworm's activity can increase soil nutrients, improve soil structure biomass. Many metal tolerant earthworms like *Eisenia fetida*, *Lumbricus rubella*, *Pherentima sp.* are the most commonly used for remediation of heavy metal contaminated soils. Earthworms express both direct and indirect effects on Phytoremediation



which includes stimulation of microbial activity, soil mixing and aeration, improvement of water retention capacity whereas direct effects include the ingestion of pollutants with soil minerals and partial degradation of organic pollutants in their intestinal tract increasing bioavailability of heavy metals in soil. Plants growing in soils contain earthworms showed better translocation of nutrients from root to shoot than soils without earthworms. Consequently better growth and increase in the phytoremediation efficiency of plants could be achieved by enhanced earthworm activity in soil contaminated by heavy metals.

**(PP-77)**

### **Medicinal Plants: Traditions of Past and Drugs of Future**

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Plants play valuable role in all forms of life since antiquity and are of important basic needs viz. shelter, flavours, food, clothing, fragrances etc. Internationally renowned and knowledgeable traditional medicine systems such as Ayurvedic, Unani and Chinese are all based upon plants. 75% of world population depend upon plants especially underdeveloped and developing countries for primary healthcare because of cost effectiveness, cultural acceptability and better compatibility with the human system. However, the most developed countries (Germany and France) have started using herbal extracts as prescription drugs. The medicinal plant based drug discovery provides solutions for various ailments such as cancer, HIV/AIDS, malaria, Alzheimer's and other cardiovascular diseases. Various plant products are recommended along with chemo/radiotherapy by health professionals as they reduce the ill effects of radiations. The plants possess these properties because of the presence of various classes of phytochemicals and other biologically active constituents. The herbal medicines are highly lucrative in the international market.

**(PP-78)**

### **Cytomorphological Evaluation of Some Polypetalous Plants from Uttarkashi District (Uttarakhand)**

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The present study have been conducted in 25 species of dicots belonging to series polypetalae collected from different localities of Uttarkashi district of Uttarakhand (Northwest Himalayas) falling in different altitudinal range of 1100-3800m to investigate chromosome counts and detailed meiotic behavior. The meiotic chromosome count for *Astragalus sanjappae* (n=8) and *Myricaria elegans* (n=12) were the first ever chromosomal records at world level. Present meiotic count of  $2n=84$  in *Potentilla argyrophylla* added a new 12x cytotype for the species. Out of total studied species, 4 species showed abnormal meiotic behavior in terms of cytomixis, chromatin bridges and late disjunction of bivalents. Cytomixis has been observed in *Silene vulgaris*. Chromatin bridge formation due to late disjunction of bivalent has been observed in *Impatiens sulcata*. These abnormalities consequently caused pollen sterility. Keeping this in view and importance of cytomorphological studies, an attempt has been made to explore the cytomorphological diversity in some plants from the district. Furthermore, the flora here is under considerable pressure due to increasing human settlements, increasing entry of tourists/pilgrims, transport vehicles, degradation of forests due to construction of roads and highways and developmental

activities. Because of ongoing threats to floral diversity, it becomes essential to assess the morphogenetic diversity before it gets too late.

**(PP-79)**

### **Role of *Amanita caesarea* Mushroom in Pharmaceutical Industries**

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*Amanita caesarea* has become attractive as a functional food and as a source of drugs. The Genus *Amanita* possess about 600 species which include some toxic as well as some edible species and in India, approximately 100 species have been reported. The mushroom was first described by Giovanni Antonio Scopoli in 1772. It is native to Southern Europe, particularly in the hills of northern Italy and North Africa. It is becoming more important in our diet due to its nutritional value. The protein present in this contains all the nine essential amino acids required by our body. The medicinal and nutritional value of the mushroom has a wide range of application in food and pharmaceutical industries. There extracts are also used for the possible treatment of a number of diseases worldwide. The mushroom has significant amount of nutrients like proteins, carbohydrates and reducing sugar along with good amount of phenol, ascorbic acid and flavonoids. The studies have indicated that mushroom have cardiovascular, anticancer, antiviral, antibacterial, antiparasitic and glyceric regulatory activities. These properties of *Amanita caesarea* have supported its implementation in drug discovery and pharmaceutical industries.

**(PP-80)**

### **CRISPR: A New Approach for Plant Genome Improvement**

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Genome editing technologies like induced mutagenesis, DNA recombinanase-mediated gene replacement, ZFN and TALEN systems have played a great role in biological research. However, recently the clustered regularly interspaced short palindromic repeat (CRISPR)-associated protein9 (Cas9) genome which is adapted from the adaptive immune system of bacterium *Streptococcus pyogenes* has revolutionized genome editing with ease as it provides simple and efficient approach for targeted repression or activation of gene expression and has made genome engineering technology feasible for application in agriculture also. Conventional breeding depends on existing natural genetic variation, therefore, extensive back-crossing programs are essential for introgression of the selected traits into an elite background. New alleles can be introduced by random mutagenesis, but it is very time consuming as it requires large scale screening of to identify mutants with desirable properties. Genome editing can accelerate plant breeding by allowing the introduction of precise and predictable modifications directly in an elite background, and the CRISPR/Cas9 system is particularly beneficial because multiple traits can be modified simultaneously. Various plant-specific CRISPR/Cas9 vector systems have been developed for efficient editing of plant genomes which include gene knockout, genomic deletion, disruption of *cis*-regulatory elements, gene knockin and suppression of virus infection and can be utilized for genetic improvement of important traits in crops, like disease resistance, nutrient usage, and adaption to stresses. CRISPR/Cas9 is thus a promising tool for genome modification in plants and is expected to screen transgenic plants for gene editing events by PCR/Restriction digestion or sequencing.

**(PP-81)**

## **Isolation and Characterization of Nitrilase Producing Bacterial Community from Thermal Springs of Himachal Pradesh**

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Nitrile degrading bacteria play an important role in biodegradation of toxic nitriles. The importance of thermostable biomolecules in the field of biotechnology has led to an upsurge of research into organisms from thermophilic sites. In India, North western Himalayas have an many hot water springs which are known to harbor abundant thermophilic bacterial strains. The present study was carried out with the aim of isolating mandelonitrile degrading isolates from hot water springs of Manikaran and Kheerganga located in Kullu District of Himachal Pradesh. Extensive screening by indicator plate dye method resulted in obtaining five pure cultures of thermophilic bacteria exhibiting appreciable nitrilase activity. These were subjected to biochemical characterization and it was observed that all bacteria were gram positive rods. Further, identification was done on the basis of 16s rRNA sequencing. Extensive screening by indicator plate assay method resulted in obtaining nitrile degrading thermophiles. Identification of these thermophilic isolates was done on the basis of biochemical tests and 16s rRNA gene sequencing and were designated as *Geobacillus icigianus*, *Geobacillus stearothermophilus*, *Bacillus licheniformis*, *Lysinibacillus macroides* and *Bacillus pumilus*. Two isolates namely *Geobacillus stearothermophilus* MAC1 and *Geobacillus icigianus* MAC VI have been deposited at IMTEC and assigned accession numbers MTCC 12615 and 12616 respectively. Phylogenetic tree showed the distant relationship of the bacterial isolates. It was observed that all the isolates were capable of degrading nitriles when grown in presence of inducer and can represent suitable candidates for bioremediation of mandelonitrile.

**(PP-82)**

## **Overexpression of HER2 in Retinoblastoma as possible therapeutic Target: Role of Erucin**

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Retinoblastoma (Rb) is a rare and aggressive childhood disease of the developing retina, behaved as intraocular malignancy in infancy and is diagnosed in the first few years of life. Retinoblastoma if not treated on time has the ability to metastasize to the central nervous system. Currently, it is found that chemoreduction and adjuvant therapy has replaced external beam radiotherapy as primary treatment for intraocular retinoblastoma. The five components of the Rb pathway include transcription factors (E2F), d-type cyclins, cyclin dependent kinases (Cdk4/6) acts as tumor cell proliferation, while cyclin dependent kinase inhibitors (p16Ink4a, p18Ink4c, p27k1p1) and the RB-family proteins acts as growth suppressing signals. The brief mechanism of retinoblastoma disease include phosphorylated Rb1 stimulates the growth signals (E2F), results in transcription of genes. All the components of RB-pathway are rational targets in cancer therapy. Deregulated E2F transcription factor causes defects in the RB pathway, which stimulates gene expression to promote G1/S transition and apoptosis. Human epidermal growth factor receptor 2 (HER2) is a transmembrane protein that is encoded by the HER2 proto-oncogene (also known as neu or c-erb B-2), mapped on chromosome 17q21. Its overexpression is mainly associated with breast

cancer but it has also been described in other malignancies. Recently, it has been claimed that a truncated version of this protein is expressed in RB, responsive to directed therapies in vitro. Recent research focusses on developing small-molecule cyclin-dependent kinase inhibitors as therapeutic agents. Genetic and epigenetic mutations in cancer cells including, the deletion/silencing of the p16Ink4a, the amplification of the cyclin D1 focus, and the biallelic mutation of the RB1. In the case of extraocular retinoblastoma, survival rate is still low. The potential targets for molecular therapy include the use of erucin as inhibitor of HER2, cdk4/6 along with cell cycle analysis in retinoblastoma cells.

**(PP-83)**

### **Variability in Gene Content of Solanaceous Plastomes**

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The chloroplast genome of green plants is exceptionally conserved in gene content and organization, providing sufficient resources for taxonomy and evolutionary studies. The nucleotide sequences of large number of plastid genomes have been sequenced. The present work was planned to study available chloroplast genomes of solanaceous plants with special reference to their gene content. Gene information was obtained from 'Gene database' to describe different genes in chloroplast genome of a particular species. Coordinates of individual genes were compared. Gene for trnP-GGG (tRNA- Proline) was reported only in *Datura stramonium*. Gene infA was mentioned as pseudo gene in Genbank files for all species except *Solanum bulbocastanum* where it was mentioned as protein coding. For *Atropa belladonna* and *D. stramonium*, this gene was not at all reported, so the sequence of infA extracted from genbank file of *S. bulbocastanum* was used to perform blast using plastomes of *A. belladonna* and *D. stramonium*. Blast revealed similar sequence with coordinates corresponding to those observed for *S. bulbocastanum*. SprA gene was also not reported for *A. belladonna*, *Capsicum annuum*, *D. stramonium*, *Nicotiana tabacum*, *N. undulata* and *S. bulbocastanum*. Blast revealed similar sequences in these species with coordinates corresponding to that observed for *N. sylvestris*. Gene trnH was only reported to be trnH coding gene in *C. annuum*. In all other species, this region was reported to be part of ycf2 (considered as hypothetical chloroplast open reading frame) as in *C. annuum* also.

**(PP-84)**

### **Plastic Degradation through Earthworm**

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Polycarbonate (PC) is a group of thermoplastic polymers which contain carbonate groups in their chemical structures. It is a non-recyclable and an extremely recalcitrant plastic used in manufacture of compact disc (CDs), digital versatile disc (DVDs), automotive components, baby bottles, water bottles, screwdriver handles, eyeglass lenses etc. Annually, large amounts of polycarbonates are discarded worldwide. However, due to the presence of toxic Bisphenol A (BPA) which is a known endocrine disruptor causing infertility, heart disease, cancer etc. So, many manufacturers have stopped using PC for applications related to human intake. PC in landfills is definitely an environmental nightmare. Although there are methods being employed to recycle, dispose off and degrade through thermal degradation

like incineration. These methods turns out to be very less effective having high maintenance cost and even affects to humans by releasing harmful gases. Finding an eco-friendly and cost-effective become the need of the hour. Many scientific reports suggested that plastic can also be degraded by the use of microbial and enzymatic degradation. In this regard, a trial experiment was done to observe whether the earthworm can survive and degrade on any PC waste (w). PC waste generated during grinding, polishing of eye lens was obtained from an optical shop and mixed with cattle dung in different ratios (W: CD = 0:100, 25:75, 50:50, 75:25 and 100:0) and fed to the earthworm. To our contrast it was found that the earthworms were able to survive till 90 days and were degrading the mixed waste except in (100:0) ratio. Thus, this shows that through the process of vermicomposting (using earthworm) PC can be easily degraded.

**(PP-85)**

### **An Account of Chromosome Number and Detailed Meiotic Course in some Members of Apiaceae from Kinnaur District (Himachal Pradesh)**

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Present study prevail exact chromosome number and detailed meiotic course in seven species of family Apiaceae from the Kinnaur district of Himachal Pradesh (India) which is known for its cold dry climatic conditions. Presently the chromosome count for genus *Eriocyclus caespitosus* (n=11) and species *Seseli sibiricum* (n=11) has been recorded for the first ever worldwide. Alongwith new chromosome records, the phenomenon of cytotoxicity coupled with various meiotic irregularities have also been detected in *Heracleum candicans* (n=11) which resulted in abnormal microsporogenesis and low pollen fertility. In this species, cytotoxicity involving inter PMC transfer of chromatin material was observed at all the stages of meiosis-I and meiosis-II in 26.53% cases where it leads to the formation of PMCs with pycnotic material, hypo- and hyperploids PMCs, chromatin stickiness and occurrence of laggards at A-I. These laggards failed to get included at poles during anaphases/telophases and constituted micronuclei during sporad formation. Consequently sterile male gametes are recorded.

**(PP-86)**

### **Growth and Yield of Potato (*Solanum tuberosum* L.) as Influenced by Green Manure and Biofertilizers under Different Levels of Inorganic Nitrogen.**

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Potato has emerged as fourth most important food crop in India after rice, wheat and maize. India produced 49.34 MT potato from 2.17 Mha area with an average annual yield of 22.73 t/ha. Nitrogen is an most essential plant nutrient and maintaining an adequate supply of nitrogen in the root zone of potato without leaching is important for optimal production of marketable quality tubers. Residues of chemical fertilizers in potato and their associated health and environmental hazards have been reported. In view of this, there are some alternative eco-friendly sources of nutrition for plants such as legume green manures, biofertilizers etc. The field experiment was conducted at the Students' Research Farm, Khalsa College, Amritsar during autumn season of 2017-18 to study the effect of green manure and biofertilizers under different levels of inorganic nitrogen on yield and quality of processing

potato (*Solanum tuberosum* L.). The experiment was laid out in Split plot design with 16 treatments having four green manure and biofertilizers, viz. control (GM<sub>0</sub>B<sub>0</sub>), biofertilizers (B<sub>1</sub>), green manure (GM<sub>1</sub>), green manure + biofertilizers (GM<sub>1</sub>B<sub>1</sub>) as main plot treatments and four levels of inorganic nitrogen, viz. 0 (N<sub>0</sub>), 93.75 (N<sub>1</sub>), 140.62 kg/ha (N<sub>2</sub>), 187.5 kg N/ha (N<sub>3</sub>), respectively as sub plot treatments with three replications. Among green manure and biofertilizers, the maximum growth and yield attributes were observed in green manure + biofertilizers while minimum were associated with control. Moreover, per cent increase in total yield was 23.6, 14.5 and 4.6 in green manure + biofertilizers, green manure, biofertilizers over control treatment, respectively. In case of different nitrogen levels, 187.5 kg N/ha (N<sub>3</sub>) resulted in significant enhancement in plant height, leaf area index, haulm dry matter, tuber bulking rate, number of tubers per plant (6.83), average weight of tuber (43.76g), total tuber yield (217.7 q/ha) and processable tuber yield (135.4 q/ha) over no nitrogen application which was at par with 140.62 kg N/ha (N<sub>2</sub>) nitrogen level.

**(PP-87)**

### **Naringin as a Toxicity Mitigating Agent**

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Naringin is a group of flavonoids which is widely distributed in plant foods. In its pure form, it is present in the form of yellow powder. It is mainly extracted from grapefruit and some other related citrus species. Naringin has been reported to show a broad spectrum of therapeutic and pharmacological properties including anti-inflammatory, free radical-scavenging, lipid-lowering, antioxidant, anti-fibrotic, anti-osteoporotic and anti-obese. Studies report naringin to be anti-nephrotoxic as it can mitigate hyperammonemia. It has also been found to significantly increase ( $p < 0.05$ ) myocardial mitochondrial enzymes (I-IV) activity. Naringin was found to attenuate acetaminophen (APAP) and arsenic-induced hepatic and renal toxicities. Treatment with naringin (40 and 80 mg/kg) was reported to substantially and dose-dependently ( $p < 0.01$  and  $p < 0.001$ ) restore and alter level of kidney and liver functions by down-regulation of elevated oxido-nitrosative stress. It also ameliorated the cardiac toxicity against doxorubicin and arsenic. Many other studies also present naringin as a strong antitoxic agent. It is recommended that every person should plan a scheduled dietary intake of citrus fruits to improve their health status.

**(PP-88)**

### **Effects of Air Contaminants on Human Health: An Overview**

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Environmental pollution on account of anthropogenic activities like industrial, domestic, agricultural practices, unsystematic urbanization, municipal incinerations and motor vehicles has been witnessed over the globe for past few decades which has resulted in release of diverse carcinogens in air, water, soil, sediments and vegetation. Although the problems related to pollution existed in the developed and developing countries for centuries, it started becoming significant following the industrial revolution in the 19<sup>th</sup> century. Rapid growth in cities, accumulating number of vehicles, increasing population with demands in aggravating consumption patterns, increased energy consumption, unplanned residential, industrial and economic development have led to a higher rate of increase of pollution in

urban areas. Apart from the urban activities, use of pesticides sprays, burning of crop residues and release of gases from domestic fossil fuels as well as open burning of wastes also are responsible for increase in air pollution. Among different types of pollution, air pollution has been recognized as a serious concern because various pollutants present in air can cause respiratory diseases like asthma and bronchitis as well as cardiovascular abnormalities leading to death. Accumulation of toxic compounds including heavy metals, inorganic fertilizers, pesticides, volatile compounds and polycyclic aromatic hydrocarbons in air is a serious matter of concern because these contaminants have potency to induce direct deleterious effects to human gene pool. U. S. Environmental Protection Agency (EPA) has promulgated primary and secondary national ambient air quality standards (NAAQS) for six criteria pollutants viz., SO<sub>x</sub>, NO<sub>x</sub>, CO, O<sub>3</sub>, PM<sub>10</sub> and Pb. Although regulations concerning evaluation of contaminated environmental segments, especially air, are mainly depended on physico-chemical characterization, the studies concerning the health issues are equally important. The present study focuses on the various diseases caused by air contaminants.

**(PP-89)**

**Assessment of Efficacy of Leaf Extracts of *Ocimum sanctum* Linn.  
(Lamiaceae) Against Myiasis causing Larvae of *Sarcophagaru ficornis*  
Fabricius (Diptera: Sarcophagidae)**

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Myiasis, the infestation of live vertebrate animals with dipteran larvae, is a common parasitic problem among livestock animals in tropical and sub-tropical regions of the world. Dipteran larvae, commonly known as 'maggots' use the tissue of living hosts as a food source for their growth and development. Maggot infestations in neglected wounds of dairy animals interfere with the animal's physiological function leading to massive economic losses to dairy farmers across the globe. *Sarcophagaru ficornis* (Diptera: Sarcophagidae) is one of the predominating fly species responsible for causing myiasis among domestic animals in the tropical regions. The control of myiasis is largely dependent on the use of chemical agents like ivermectin and macrocyclic lactones whose residues generally contaminate the dairy products like milk and meat resulting into serious health hazards among humans. Moreover, the increasing concern of pesticide accumulation in the environment has prompted researches to develop safer alternatives to the synthetic chemical compounds. Plant-derived materials being biodegradable have been currently evaluated as an alternate remedy in controlling pests of medical and veterinary importance. The present study evaluated the efficacy of crude leaf extracts of *Ocimum sanctum* against the larvae of *Sarcophagaru ficornis* by using dipping and thin film technique. The results indicated that the extracts exhibited significant larval mortalities and developmental anomalies in both the techniques. It was concluded that the extracts of *O. sanctum* can effectively be used in bio-safe management of myiatic infestations among domestic animals caused by the larvae of *S. ruficornis*.

**(PP-90)**

### **Ultra Structural Studies on the Scales of Fish *Bengana dero* (Hamilton-Buchanan) from Ropar Wetland**

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Wetlands are unique aquatic ecosystem and support valuable biodiversity and some are even endemic to them. These include birds, reptiles, phytoplankton, zooplankton and a huge variety of fishes. Fishes are considered as highly diverse group among aquatic animals that exhibit deep phenotypic changes during development. Thus identification of fishes has become an important aspect to differentiate and categorize them up to species level. Highly economically valuable fish have been procured from Ropar Wetland for the studies. Fish scales are considered as a taxonomic tool for the identification & differentiation of the fishes. Scales from four different regions i.e. dorsal region, pectoral region, lateral line region and caudal region are taken and cleaned under tap water and then cleaned in 1% solution of KOH to remove excess mucous from the scale. Cycloid scales are observed. Ultra structure of scales is studied under Scanning Electron Microscope and Light Microscope. Scale has a focus, circuli, annual rings, radii, lepidonts present on circuli and chromatophores. With the studies of these structures scales are also useful to find out the phylogenetic relationship among species. Ultrastructure of scales is also very helpful in finding the age and growth of fishes.

**(PP-91)**

### **Parabens and Oxybenzones as Inhibitors of Plant Growth**

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Paraben and oxybenzone are being widely in cosmetics used as preservative and UV filter respectively. Parabens are also used in foodstuffs and pharmaceutical drugs. Both these ingredients are present in hand and body lotions including sunscreens. When washed into the water bodies they act as environmental contaminants. To assess the detrimental effects of these contaminants, *Allium cepa* root tips were exposed to a dose of 1g/50 ml of various brands of hand lotions and sunscreens for 24 hrs. The chemicals of lotions and sunscreens were found to hinder mitosis or in some cases reduce the mitotic index in *Allium cepa* root tip cells. These changes in cells are indicators of growth inhibition potential of paraben and oxybenzone suggesting a need for further studies on plants.

**(PP-92)**

### **Assessment of Chromosomal Aberration on Exposure to Commercial Turmeric Powder using *Allium cepa* Root Assay**

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Turmeric, a yellow coloured spice derived from the rhizome of the plant *Curcuma longa* has been studied extensively because of its therapeutic effects of Curcumin, the phytochemical imparting the yellow to orange-yellow colour to it. It is estimated that 2–5% of turmeric is curcumin which is insoluble in water. Although the anti-mutagenic, anti-carcinogenic, and anti-genotoxic potential of turmeric (curcumin) has been extensively



studied and well documented on the animal model there are few documents regarding its effects on plant growth. The present study was designed to investigate the effect of turmeric on mitotic activity (clastogenicity) on a plant model, *Allium cepa*. Samples of different commercial brands of turmeric were collected and *Allium cepa* root tips were exposed to a dose of 5gm/50ml of water for 24hr each. The mitotic activity (mitotic index and chromosomal aberrations) were recorded. Exposure to certain brands of turmeric induced clastogenic aberrations and disturbances like chromosome break, multipolar anaphase, extended interphase and telophase, dislocation of the spindle, stickiness in chromosomes, spindle disturbance, prolonged prophase, abnormal kinetics and physiological aberrations in shape and size of cells in *Allium cepa* meristem root tip cells. Clastogenicity in *Allium cepa* root tip may be induced by components of turmeric other than curcumin as it is insoluble in water and the variation in quality of different commercial turmeric samples.

**(PP-93)**

### ***Allium cepa* and *Vigna radiata* as Sensitive Models to Assess Toxicological Properties of Chloropyrifos**

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Pesticides are group of chemical substances which are widely used to enhance crop production. Chloropyrifos is an organophosphate pesticide which is commonly used to kill a variety of pests. It is present in the form of colourless crystals and is reactive with strong acids and amines. It is known for its deleterious effects on nervous system. Being an organophosphate, it blocks the enzyme acetylcholinesterase that affects neurotransmission. These pesticides could be persistent in soil and water leading to heavy environmental pollution. *Allium cepa* root test is an important test to quantify the impact of pesticides including chloropyrifos via morphological or anatomical parameters. *Vigna radiata* has also been used in different studies to evaluate toxicity of chloropyrifos. The present study emphasizes on evaluation of toxic effects of Chloropyrifos using *Allium cepa* and *Vigna radiata* as sensitive plant models.

**(PP-94)**

### **Edible Parasol Mushroom- Rich Source of Nutritional Credentials**

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In nature, fungi are mostly involved in biogeochemical transformation of metalloids, metallic elements and other related chemical elements obtained from soil and plant biomass in which mycelium develops. Parasol mushroom is considered to be one of the most distinctive members of the family, Agaricaceae and is mostly saprophytic. However, evidences have stated that no mushroom should be eaten in its raw form inspite of a common opinion from some practitioners and on its suitability as raw (uncooked) food. This is because the biological properties of all the proteins present in the mushrooms are not sufficiently known. A good example is toxic agaritin present in *Agaricus* mushrooms disappear during cooking. It is a basidiomycetes fungus which is having a large prominent fruiting body that resembles a parasol. The mushroom was first reported by an Italian Naturalist Giovanni Antonio Scopoli in 1772. The cap part of Parasol mushroom has to be cooked before eaten but its stipes are inedible. It is highly valued mushroom having nutritional, sensory and medical properties along with their mineral nutrient composition. The mushroom contains

protein, vitamins, zinc, iron, polysaccharides, copper, fibre, fatty acids and acids. It was also found to possess antioxidant, anti-inflammatory and anticancer activities. Hence, the mushroom was found to be a rich source of various nutritional and nutraceuticals components which are helpful in promoting human health.

**(PP-95)**

### **Formulation of Nanoemulsion against Neurodegenerative Disease**

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Nanotechnology which encompasses the production and application of physical, chemical and biological systems at submicron level as well as the integration of resulting nanostructures into larger systems, has been extensively explored for the treatment of central nervous system (CNS) disorders. Mefenamic acid, a BCS Class-II NSAID drug has been reported to be effective in the treatment of neurodegenerative disease like Alzheimer's disease. It has been reported to improve learning and memory impairment in an  $A\beta_{1-42}$ -infused Alzheimer's disease rat model. However, no formulation of the drug has been developed till date for the treatment of Alzheimer's disease. In the present study we have aimed to formulate clove oil stabilized nanoemulsion of mefenamic acid, with a potential to provide excellent drug efficacy, transport to brain and longer duration of action due to its nano size and intranasal route. The nanoemulsion was prepared by using aqueous titration method. Solubility and miscibility studies were performed. Based on the results of solubility and miscibility studies conducted, clove oil, solutol HS15 and Tween 20 were selected as oil phase, surfactant and cosurfactant respectively. The optimized formulation when evaluated was found to be optically transparent, homogeneous, having a optimal viscosity of  $19.42 \pm 1.48$  cps, refractive index of  $1.508 \pm 0.187$  with pH  $5.48 \pm 0.721$  suitable for nasal administration. Based on the above preliminary results, it was concluded that the clove oil stabilized nanoemulsion of mefenamic acid was successfully formulated.

**(PP-96)**

### **Cytotoxic and Apoptotic Efficacy of Hexane Fraction of *Cassia fistula* L. Fruits on Human Cervix Carcinoma (HeLa) Cell Line**

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*Cassia fistula* L. (Fabaceae) is a highly admirable medicinal plant distributed widely in the tropical and sub-tropical regions. In the present study, cytotoxic and apoptosis inducing potential of hexane fraction of *C. fistula* fruits (CaFH) was investigated towards Human cervical cancer (HeLa) cell line. The cytotoxicity of CaFH fraction was evaluated against three cancer cell lines HeLa (cervix), IMR-32 (brain), PC-3 (prostate) and normal cell line CHO by MTT assay. The screening of results indicated high levels of antiproliferative activities in HeLa cells as compared to other cell lines. The induction of apoptosis was investigated by Hoechst 33342 staining, scanning electron microscopy, cell cycle analysis, mitochondrial membrane potential staining and intracellular reactive oxygen species in Human cervical cancer (HeLa) cell line. The results obtained revealed that the CaFH fraction have showed significant reduction in cell viability towards HeLa cancer cells with the  $GI_{50}$  of  $97.69 \mu\text{g/ml}$  in comparison to other cell lines IMR-32 followed by PC-3 with the  $GI_{50}$  value

of 143.06 and 160.2  $\mu\text{g/ml}$  respectively. The apoptosis inducing potential was demonstrated by nuclear condensation and fragmentation, cell shrinkage, membrane blebbing and formation of apoptotic bodies, elevated intracellular ROS level, reduced mitochondrial membrane potential and cell cycle arrest at sub-G<sub>1</sub> phase. Our data suggests that the CaFH fraction can be a promising candidate for chemopreventive/chemotherapeutic studies.

**(PP-97)**

### **Management of Diabetes Mellitus using Natural Products**

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Diabetes mellitus (DM) occurs throughout the world, but is more common in developed countries. WHO (World Health Organization) has estimated that DM is the eighth leading cause of death. DM is a metabolic disorder which is characterized by increased blood glucose level (hyperglycemia). It occurs because pancreas fails to produce enough insulin or the cells of the body do not respond properly to the insulin production. Commercially produced drugs are largely derived from plants and form the mainstream of today's modern medicine. Active phytochemicals from many plants have been isolated and studied for their anti-diabetic activity. Iridoid glycosides, glycans, quinquefolans A, B and C, spirostanol glycoside PO-2,  $\beta$ -Eudesmol and mangiferin-7-O- $\beta$ -d-glucoside have been isolated from *Rehmannia glutinosa*, *Trichosanthes kirilowii* Maxim., *Panax quinquefolium*, *Polygonatum officinale*, *Atractylodes lancea* and *Anemarrhena asphodeloides* Bunge. respectively. Mostly these compounds act directly on pancreas and stimulate insulin production and glucose uptake or act directly in tissue like muscle, liver etc. These compounds also favour the activities like glycolysis, glycconeogenesis and other pathways. Plant products have fewer side effects and they have promising hypoglycemic potential. Multicenter large-scale clinical trials need to be taken up to evaluate the safety and effectiveness of natural products and their interaction with conventional drugs when administered simultaneously. These plants provide clues for further development of new and better oral drugs for diabetes. Present review is focused on collection and compilation of data regarding plants with anti-diabetic action and their possible mechanism of action in *in vivo* models.

**(PP-98)**

### **Wastewater Treatment by using Water Hyacinth**

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In recent years, groundwater quality is deteriorating day by day due to rapid urbanization and industrial growth. Developing cost effective and environment friendly technologies for the remediation of soil and wastewater polluted with toxic substances is a topic of global interest. Millions of deaths are caused every year due to drinking of polluted water. Diarrheal diseases like cholera and other harmful illnesses such as Guinea worm disease, typhoid, and dysentery have been linked to water contamination. Phytoremediation is one of the biological treatment methods using plants based systems and microbiological process to eliminate contaminants in nature. *Eichhornia crassipes* (water hyacinth) is a perennial free floating aquatic plant and has high tolerance to pollution and heavy metals (Cd, Pb, Cu, Zn and Ni) and nutrient absorption capacities. The root structure of water hyacinth provides a suitable environment for aerobic bacteria to remove various impurities present in water. Studies have shown that about 1 million L/day of domestic sewage could be treated

over an area of 1 ha through water hyacinth with a reduction of 89% and 71% in biological oxygen demand and chemical oxygen demand respectively. Water hyacinth is considered to be an ideal candidate for use in the rhizofiltration of toxic trace elements from a variety of water bodies. The present review will report noteworthy bioremediation case studies using water hyacinth and significant results reported during the last ten years.

**(PP-99)**

### **Potential of Plant Molecular Pharming for Production of Biologically Active Mammalian Proteins**

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Plant molecular pharming is a new branch of plant biotechnology, where plants are engineered to produce recombinant pharmaceuticals and biologically active mammalian proteins in large quantities. It has emerged as niche technology for the manufacture of pharmaceutical products indicated for chronic and infectious diseases. Plant molecular pharming has effectively been used for the production of various pharmaceutical vaccines, antibodies and dietary supplements that have been commercialized for the treatment of human diseases. These products are exemplified by: CaroRx antibody, Hepatitis B Virus surface antigen Vaccine and Lactoferrin. The practice of molecular pharming will intensify as the technology and protocols become more standardized, optimized and efficient through implementation of high-quality manufacturing practices. The technique holds promise for production of inexpensive drugs for regional markets. An added advantage for using plants is that they are able to carry out the majority of post-translational modifications mandatory for biological activity and suitable pharmacokinetics of recombinant therapeutic proteins. In this review, we will explore the areas where molecular pharming can make the greatest impact, including the production of pharmaceuticals that have novel structures or that cannot be produced efficiently in microbes or mammalian cells because they are insoluble or toxic. Data would be collected on novel plant derived pharmaceuticals at various stages of clinical development or commercialization.

**(PP-100)**

### **Investigation on Male Meiosis and Microsporogenesis in *Pupalia lappacea* Juss. from Western Himalayas**

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*Pupalia lappacea* Juss. (Family Amaranthaceae) commonly known as *creeping cock's comb*, is widely distributed in tropical and subtropical regions of Asia and Africa and introduced in Australia. In India, the species is found in the hedges of fields and waste places at the altitudinal ranges of 500-1,400m. The plant has great medicinal value and traditionally used in the treatment of leprosy, bone fractures, rat bites, dog bites and yoke galls. Aerial parts of the plant exhibit antioxidant and anticancer activities. The present investigation deals with the meiotic analysis of four populations of *Pupalia lappacea* Juss. from different regions of district Kangra of state Himachal Pradesh. All the populations uniformly revealed chromosome count of  $2n=50$ . Out of four populations, three populations i.e. Indora (500m), Jawali (540m) and Jaisinghpur (500m) exhibited the normal meiotic behavior with high pollen fertility. The plants of Damtal (500m) population showed abnormal male meiosis and characterized by presence of laggards, extra chromatin material chromosome stickiness. This

is the first report of cytomixis in the species. Microsporogenesis was also erratic with the formation of tetrads with micronuclei, polyads and polyads with micronuclei. Consequent to these meiotic abnormalities and abnormal microsporogenesis, the pollen fertility was reduced and pollen grains of variable sizes were produced.

**(PP-101)**

### **Diversity of Genus *Marasmius* from Punjab**

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Genus *Marasmius* Fr. belongs to family *Marasmiaceae* and order *Agaricales*. It is characterized by small and marescent carpophores and is a wide spread saprotrophic genus. It is represented by 500 species known world over. It is a tropical genus known for its litter binding and degrading potential and occurs generally on leaf litter, twigs, branches and dead logs of wood. It is divided into eleven sections viz. *Androsacei*, *Fusicytides*, *Scotophysini*, *Epiphylli*, *Pararotulae*, *Hygrometrici*, *Marasmius*, *Neosessiles*, *Alliacei*, *Globulares*, *Sicci*. Present paper includes four species falling under section *Sicci*. This section is a major section and is represented by cental and non- institious stipe. Four species viz. *Marasmius bambusinus*, *M. dennisii*, *M. rubricosus* and *M. hematocephalous* supported with field photographs and taxonomic details has been presented in the paper.

**(PP-102)**

### **Green Entrepreneurship: A Case Study of ITC Ltd.**

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Development that does not compromise the ability of future generations to meet their needs and also meet the needs of present generations is referred to as sustainable development. Sustainable business is referred to as that business which has minimum negative impact on planet i.e. environment, people i.e. society and prosperity i.e. economic issues. Sustainability mantra is reduce, recycle and reuse. "Corporate sustainability is a business approach that creates long term consumer and employee value by creating a "green" strategy aimed toward natural environment and taking into consideration every dimension of low a business operates."

**(PP-103)**

### **Effects of Long-Term Organic and Conventional Farming on Soil Physico-Chemical Properties**

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Seven organic and conventional fields were selected where organic and conventional farming was practiced for more than ten years. Soil samples were collected from both organically and conventionally managed fields. The study revealed that there were no significant differences between organic and conventional management for particle size distribution and particle density. However, soil samples from the organically managed fields exhibited lower values of pH, electrical conductivity, bulk density and higher porosity than

the conventionally managed fields. Also organic fields had significantly higher available N, P and K as compared on conventional fields.

**(PP-104)**

### **Evaluation of Sulphur Status and its Importance in Agriculture**

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Sulphur occurs mainly, in two forms *viz.*, organic and an inorganic via mineralization, mobilization, oxidation and reduction processes in soil. These series of processes taking place is termed as sulphur cycling. The affinity of different cations to bond with sulphate ion also affects its adsorption onto the soil surface. More the retention or adsorption of the sulphate ions on the colloidal surfaces less will be its availability to the plants. Objective of present review study is to highlight its present status, deficiency of sulphur in agricultural soils and availability to crops. Study revealed that sulphur deficiency varies state wise from as low as 10% to as high as 50%. The deficiency range of sulphur in soils of Punjab lies within 20-40%. This might be due to increase use of sulphur free fertilizers like urea, Diammonium Phosphate (DAP), Muriate of Potash (MOP), Calcium ammonium nitrate (CAN). Adsorption, retention of sulphur onto the soil colloids rendering it unavailable to plants such as onion, garlic and the oilseed crops, namely mustard, groundnut, sunflower, etc. that requires sulphur as an essential nutrient for their growth. The deficiency of sulphur has reported to chlorosis of younger leaves followed by stunted plant growth. Studies suggested the use of bio-fertilizer, Symbion-S, Sulphate-containing fertilizers such as ammonium sulphate, single super phosphate, potassium sulphate, gypsum, etc. can be used to ensure the optimum supply of sulphur to the plants to achieve sustainable crop productivity.

**(PP-105)**

### **An Eco-Friendly Approach Towards Control of Myiasis Causing Larvae of *Chrysomya bezziana* (Diptera: Calliphoridae) using Crude Extracts of *Azadirachta indica* (Meliaceae)**

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Myiasis is a parasitic infestation of tissues and organs of live human and other vertebrates by dipteran larvae. The Old World Screwworm fly - *Chrysomya bezziana* is known worldwide in the tropical regions for causing myiasis among man and domestic animals, thereby leading to health hazards and severe economic losses to the dairy farmers. A large number of synthetic products are being used these days to control myiasis. These non-biodegradable produces lead to pollution thereby disturbing the delicate ecological balance. Synthetic agents like Ivermectin used to treat myiasis, have been reported to cause contamination of milk and meat products. The residues of drug which enter the food chain and result in serious side effects among humans. These problems highlight the challenges in control and treatment of myiasis, without harming humans and their environment. Plant derived materials being biodegradable; have been increasingly evaluated these days in controlling the insects of medical and veterinary importance as an alternative to the synthetic agents. In the present study, an attempt was made to develop an eco-friendly approach towards control of myiasis causing larvae using crude extracts of the plant, *Azadirachta indica*. The dried leaves of the plant were extracted with four different solvents *viz.* petroleum ether, chloroform, ethyl acetate and methanol and were evaluated against the third

instar larvae of *C. bezziana*. The results showed that all the extracts had toxic effect on the larvae. Highest mortalities were recorded in methanol extract followed by chloroform, petroleum ether and ethyl acetate extracts with LC<sub>50</sub> values 1.07g/100ml, 1.7g/100ml, 3.39g/100ml and 4.9g/100ml respectively. It was concluded that the crude extracts of *A. indica* can be effectively used in controlling the larvae of *C. bezziana*.

**(PP-106)**

**Efficiency of Different Natural Plant Product in the Management of the Greater Wax Moth *Galleria mellonella***

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The greater wax moth *Galleria mellonella* (Lepidoptera, Pyralidae) is one of the most devastating and serious pest of the honey bee colonies which causes severe economic losses to the beekeeping industry. The major damage is due to its feeding behaviour and tunneling habits. The larvae eat the wax comb and other associated material like honey, pollen, propolis, dead bees and pupal cases of the bees. The greater wax moth is present throughout the world and causes serious damage in the temperate, tropical and subtropical beekeeping regions. In India 60-70 per cent infestation was reported in the last few decades. The susceptible colonies of *Galleria mellonella* cause deprivation of food and various diseases (American Foul Brood). The present study was conducted to check the insecticidal activity of the natural plant products like , Neem (*Azadirachta indica*), Tulsi (*Ocimum tenuiflorum*), *Pongamia pinnata*, Mint (*Mentha arvensis*), *Cinnamon verum*, Clove (*Syzguim aromaticum*) against different larval instar of the greater wax moth at different concentration 0.20, 0.40, 0.60, 0.80 and 1.00 per cent. The results revealed that larval mean mortality of wax moth varied significantly with different natural plant products. Highest larval mortality in the case of Neem i.e. ranging from 79.44±0.63 % to 94.42±1.72 % followed by Tulsi 67.18±1.15 % to 73.34±0.79 %, Mint 62.94±3.63 % to 71.25±4.33 %, *Cinnamon* 62.07±2.25 % to 64.93±3.55 %, Clove 52.94±3.01 % to 55.53±5.39 % and *Pongamia* 34.96±1.99 % to 53.35±0.75 % at different concentrations. Out of these six tested natural plant products, Neem performed better under laboratories conditions. The present study also indicates that the natural plant products show insecticidal properties against the greater wax moth. Since these treatments seem to be safer for pollinators, environment and humans.

**(PP-107)**

**Putative Ectomycorrhizal Agarics Associated with *Cedrus deodara* in the Kashmir Himalaya**

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The present research was undertaken to document the putative ectomycorrhizal diversity of agarics associated with *Cedrus deodara* in the Kashmir Himalaya. The extensive and exhaustive field surveys carried out in the Kashmir Himalaya at different sites resulted in the collection and identification of six putative ECM agaric taxa. The present investigation reflects that the dominant trees of *Cedrus deodara* in the Kashmir Himalaya harbour diverse ectomycorrhizal species. The following agaric taxa viz. *Cortinarius sinapicolor*, *Lacatrius deterrinus*, *Russula xeremplina*, *R. lepida*, *R. brevipes* and *R. badia* associated with *Cedrus deodara* have been morpho-anatomically described in the present paper.

**(PP-108)**

## **Mushrooms for a Cleaner Earth**

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Mycoremediation is an emerging biotechnique that involves the use of fungi to sequester or degrade wide variety of intractable and persistent environmental pollutants. The process generally involves biodegradation, bioconversion or biosorption of the toxic contaminants present in soil and water. Fungus is nature's most vigorous agent for decomposition of organic matter. Mushrooms (white-rot and brown-rot fungi) act as molecular disassemblers that break down recalcitrant, long chained toxins into less toxic simpler compounds and still be used as a vendible product for human consumption. Certain species of mushrooms viz. *Pleurotus*, *Lenticula*, *Agaricus* can also absorb radioactivity and hyperaccumulate heavy metals, making them a suitable candidates for *in-situ* remediation of heavily contaminated nuclear power plant and industrial sites. However, in such cases of biosorption and hyperaccumulation, the mycelium absorbs the toxic pollutant making it unfit for consumption. These contaminated mushrooms are then carefully disposed off. Enzymatic machinery, shorter life span and higher accumulation potential makes mushroom an economically sound alternative for extraction, transportation and storage of toxic waste that restores the earth's ecosystems. Mycoremediation through mushroom cultivation will thus mitigate two of the world's major problems, waste accumulation and production of proteinaceous food source.

**(PP-109)**

## ***Hermetia illucens* - A Promising Source of Animal Feed and Bioactive Substances**

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Insect biotechnology holds an extraordinary potential for sustainable production of nutrient packed palatable animal feed and important bioactive substances. This process is well illustrated by the larvae of black soldier fly, *Hermetia illucens*. The insect larvae can survive under harsh environmental conditions and is resistant to bacterial infections, making it suitable to rear on different organic waste such as manure, kitchen waste, fecal sludge and food waste, converting it into valuable larval biomass. This insect larval biomass can directly be used as animal feed or may require further processing to optimize it for pigs, cattle, fishes and poultry birds. The larval feed is rich in essential amino acids, proteins and lipids making it a suitable replacement for soy and fish meal commonly used to feed animals. Besides, these larval mass cultures produce valuable bioactive compounds such as enzymes, chitosan and antimicrobial peptides which could potentially be used not only for animal but also for human welfare. The ever growing demand for proteins and lipids put a constraint on agricultural land and insect mass culture offers an alternative sustainable means to help overcome the situation.



**(PP-110)**

### **Micropropagation of *Ocimum sanctum* from Nodal Segments**

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A protocol for *in vitro* propagation of *Ocimum sanctum* L. from nodal segments was developed on Murashige and Skoog's (MS) medium fortified with different plant growth regulators like benzyl adenine (BA), kinetin (KN), N<sup>6</sup>-(2-isopentyl)adenine (2-iP) and gibberellic acid (GA<sub>3</sub>). Maximum shoot induction was achieved on MS medium supplemented with BA (0.5 mg/l) + 2-iP (1.5 mg/l). At this combination of PGRs 4.4±0.18 shoots were generated per explant with an average height of 3.84 ± 0.13 cm, after 30 days of culture. For faster multiplication, the shoots were transferred to fresh MS medium with BA (0.5 mg/l) + GA<sub>3</sub> (0.5 mg/l) + 2iP (0.5-6 mg/l). The rooting of *in vitro* raised shoots was achieved by transferring them on MS medium supplemented with different auxins. All tested auxins stimulated root induction of *in vitro* raised shoots of *O. sanctum*. Micropropagated plantlets were successfully established in soil after hardening on sterilized sand and garden soil mixture.

**(PP-111)**

### **Influence of Organic Manures and Biofertilizers on Soil Physico-Chemical and Biological Properties in Guava Orchard**

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The study was conducted in the experimental orchard of Department of Fruit Science, Punjab Agricultural University, Ludhiana, Punjab, India during 2017-18 on five year old guava (*Psidium guajava* L.) trees cv. 'Allahabad Safeda' to investigate the effect of organic manures and biofertilizers on nutrient availability, physico-chemical and biological properties of soil. Combined application of organic manures and biofertilizers (Vermicompost (30 kg/ Plant) + *Azospirillum* @ 250 g/tree + PSB @250 g/tree) resulted in significantly maximum soil EC (0.39 dsm<sup>-1</sup>), organic carbon (0.49 %), N (195.47 kg/ha), P (29.86 kg/ha), K (286.21 kg/ha), Zn (3.3ppm), Fe (30.48 ppm), Mn (9.70 ppm), Cu (9.29 ppm) and reducing the pH (7.93) of the soil. The mean microbial biomass pool in terms of *Azotobacter*, *Azospirillum*, Phosphorous solubilising bacteria (PSB), Bacteria and Fungi increased by (32.5 x 10<sup>4</sup>), (34.7 x 10<sup>4</sup>), (26.32 x 10<sup>3</sup>), (82.68 x 10<sup>7</sup>) and (22.90 x 10<sup>3</sup>) respectively over the control in T<sub>4</sub> treatment. Thus the combination of Vermicompost (30 kg/ Plant) + *Azospirillum* @ 250 g/tree + PSB @250 g/tree (T<sub>4</sub>) improved the soil nutrients availability, physico-chemical and biological properties of soil.

**(PP-112)**

### **Influence of Organic Manures and Biofertilizers on the Vegetative Growth, Fruit Quality and Leaf Nutrient Status in Guava Orchard**

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Department of Fruit Science, PAU Ludhiana

The study was conducted in the experimental orchard of Department of Fruit Science, Punjab Agricultural University, Ludhiana, Punjab, India during 2017-18 on five year old guava (*Psidium guajava* L.) trees cv. 'Allahabad Safeda' to investigate the effect of organic manures and biofertilizers on the vegetative growth, fruit quality and leaf nutrient availability

of guava. The treatments consisted of application of Vermicompost, *Azotobacter*, *Azospirillum*, Phosphorous Solubilising Bacteria (PSB) and Farm yard manure (FYM) in different doses and combinations along with a control in which only inorganic fertilizers were applied. Combined application of Vermicompost (30 kg/ Plant) + *Azospirillum* @ 250 g/tree + PSB @250 g/tree (T<sub>4</sub>) resulted in maximum plant height, canopy spread, trunk girth, fruit weight, TSS, total sugars and vitamin C. Maximum leaf P and K content was recorded in treatment consisting of Vermicompost (30 kg/ Plant) + *Azospirillum* @ 150 g/tree + PSB @150 g/tree (T<sub>3</sub>) but maximum leaf N content was recorded under FYM (30 kg/ Plant) + *Azospirillum* @ 250 g/tree + PSB @250 g/tree (T<sub>8</sub>). Maximum dehydrogenase activity was observed in 90 DAF as compared to other intervals. Use of biofertilizers with organic manures was found as a good approach for production of quality guava fruits.

**(PP-113)**

***In vitro* Studies on the Production of Heavy Metal Tolerant Plants –  
An Overview**

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Soil contamination with heavy metals has become an important global issue in the recent past. Although the primary source of heavy metals in any component of environment is mainly from the natural activities, the increased day to day anthropogenic activities like urbanization, industrialization and modern agricultural practices have further accumulated these pollutants in different ecosystems. As the exposure to various pollutants is unavoidable, the increase in their concentration in environment leads to detrimental effects. Heavy metals, in particular, have harmful impacts on human health upon entering human system via food chain, inhalation or dermal contact. Many strategies have been adopted worldwide to combat the heavy metal pollution. Remediation techniques using plants, microbes or chemical interactions have come up as a boon to overcome the environmental pollution. Conceivably, phytoremediation has become the foremost tool in this field while other techniques include phytoextraction (method to reduce heavy metal levels in the soil), phytostabilization (method to reduce mobilization and thereby, minimizing bioavailability of heavy metals) and phytovolatilisation (conversion of heavy metals into volatile forms to release them into the atmosphere after uptake). *In vitro* protocols are also being developed to raise heavy metal tolerant plants as they use minimal space and time. Plant tissue culture is a powerful tool that gives the possibility to grow millions of plantlets under controlled conditions, and to get physiological information about the behaviour of the plant cells under stress conditions. The present study deals with the compilation of literature on use of plant tissue culture techniques for raising heavy metal tolerant plants.

**(PP-114)**

**The Use of Plant-Based Technology in the Bioremediation of Heavy Metals  
from Contaminated Soils**

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Over the past century, environmental pollution has been on the rise due to increased human activities. The unsafe agricultural practices and enormous growth of industrialization has led to elevated levels of anthropogenic chemicals into the environment. Amongst the

various pollutants, heavy metals and metalloids have significantly contributed to widespread soil contamination. Different physical, chemical and biological processes have been used for efficient remediation of polluted soil. The use of traditional physicochemical treatments of soil has led to the development of new technologies for remediation. Phytoremediation involves the use of plants to bioremediate pollutants from the contaminated soils. Plants which are hyperaccumulators such as *Brassica juncea*, *Salvinia molesta*, *Pteris vittata*, *Helianthus annuus*, *Medicago sativa*, *Bacopa moneri*, *Lemna minor* etc. can take up heavy metals from soil and water offer a possibility to clean up the polluted sites. This plant-mediated technology is emerging as an efficient and environmental friendly treatment technique and could be used as an *in situ*, non-invasive and aesthetic solution. It is economical, easy to manipulate and can be engaged in high-risk contamination regions by planting particular species for preventive measures. The present review will particularly look into the mobility, bioavailability, plant response, metals compartmentalization and the involvement of metals in physiological pathways of plants.

**(PP-115)**

### **Role of Genetic Engineering in Chronic Wound Healing: A Review**

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Chronic wounds are defined as wounds that fail to proceed through the normal phases of wound healing. Chronic wounds seem to be detained in one or more of the phases of wound healing. Wound healing is a complex process and has been a subject of intense research for a long time. There are 50 million patients suffering from chronic wounds and that affect the patient and community economically and socially. The cost of general wound care is estimated to be \$25 billion annually in the U.S. The conventional methods to heal the chronic wounds were to correct the dysfunctioning by controlling extracellular elements. The present work is embodied to summarize the different technologies to enhance the chronic wound healing by genetic modification to wound beds. The cutaneous transduction/transfection methods include viral modalities and non-viral modalities. Similarly, number of emerging technologies were also explored that focused on the exciting capabilities of wound diagnostics such as pyrosequencing as well as site-specific nuclease editing tools such as CRISPR-Cas9 used to both transiently and permanently genetically modify resident wound bed cells. Additionally, new non-viral transfection methods (conjugated nanoparticles, multi-electrode arrays, and microfabricated needles and nanowires) are more effective and safe transgene delivery to skin but also represent significant advances broadly to tissue regeneration research.

**(PP-116)**

### **Impact of Bioaerosols on Human Health**

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Bioaerosols are airborne particles *viz.* bacteria, fungi, viruses, and pollen grains present in the atmosphere which are released from terrestrial and aquatic ecosystems. The particle size of bioaerosol ranges from 0.001 nm to 100 µm. The impact of bioaerosol on living organisms depends upon their size, concentration, physio-chemical properties etc. The

plants, soil, water, and animals (including humans) are sources of bioaerosols, and they are ubiquitous in most of the environmental components. Bioaerosols adversely affect human health which include infectious diseases, acute toxicity, allergies, cancer, SARS (Severe Acute Respiratory Syndrome) and also can raise a threat of bioterrorism. The most common bacterial airborne diseases are pulmonary tuberculosis, Diphtheria; fungal diseases include Aspergillosis, Coccidioidomycosis and viral disease is influenza. The survival rate of bioaerosol depends upon the biotic and abiotic factors such as climatic conditions viz. temperature, light, relative humidity etc. Each bioaerosol has its own aeromicrobiological pathway through which it is launched, transported/dispersed in air and deposited on the target.

**(PP-117)**

### **An Overview of Invasive Alien Flora of India**

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Invasive alien species (IAS), second biggest threat to biodiversity are the species which become established in natural or seminatural ecosystem and threaten the native species and their habitat. These are characterized by rapid reproduction and growth, high dispersal ability, phenotypic plasticity and ability to survive in wide range of environmental conditions. The species get introduced via shipments of food, movement of biological materials and humans, and damage caused to the biodiversity is enormous and often irreversible. Invasive species belong to all taxonomic groups including plants, animals, fungi, micro-organisms and profoundly perturb environments, homogenizing flora and fauna owing to biodiversity loss. They have ecological and economic consequences imposing high costs to agriculture, forestry and aquatic ecosystems. Approximately 1% of Indian flora is under invasion by alien plant species and includes a total of 173 species in 117 genera under 44 families with predominance of Asteraceae family. The most serious invasive species include *Alternanthera philoxeroides*, *Cassia uniflora*, *Lantana camara* etc. Stringent steps for early detection and their eradication are required to prevent global environmental changes and biodiversity loss.

**(PP-118)**

### **Dendrochronology: A Tool to Assess the Past Environmental Changes**

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Dendrochronology is a valuable tool for reconstruction of past climate and long term responses of trees forming annual rings in response to their environment. In addition to providing high precision dates for known disturbances, evidences from tree-rings can help to identify the previously unknown events and can be used to study the synchronicity of abrupt environmental changes. Three methodological steps are common to most dendrochronological studies: Collection and preparation of samples; Cross-dating and measurement; and Chronology building. Tree rings are acting as history books and they can predict the past climatic changes, tree growth and vegetative dynamics, and the rise and fall of civilizations. Measuring stable isotopes in annual rings would be helpful in understanding variations in atmospheric circulation patterns which are connected to terrestrial ecosystem processes. Linking dendrochronology with other methods (e.g., remote sensing, plant physiology, palaeoclimatic reconstructions and modelling) is a valuable approach to draw comprehensive scientific conclusions across temporal and spatial scales. Scientific understanding and International collaborations are needed to extend further research in the tropics.

**(PP-119)**

### **8-hydroxy-2deoxy Guanosine level in Hypercholesterolemia**

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Hypercholesterolemia is a condition influenced by dietary intake, lifestyle patterns and genetic factors. It is characterized by acute increased levels of total cholesterol in the serum and also of low density lipoprotein cholesterol (LDL-C). Other features of the disease include deposition of xanthomas in tendons of arms, legs, thighs and in the blood vessels causing susceptibility to cardiovascular diseases. The high levels of LDL-C may trigger oxidative stress which is defined as imbalance between the oxidative forces and antioxidant systems resulting in the accumulation of byproducts of oxidative respiration, called Reactive Oxygen Species (ROS) which can cause damage to the cellular macromolecules including DNA. In the present day, the 8-hydroxy-2deoxy Guanosine which is an oxidizing agent, its levels were determined in a case-control study. Stored serum samples were earlier collected under informed consent after approval of the study by the Institute and Ethics Committee. The patients (n=25, 20-40 years) were contacted from local hospitals and age, sex and socio-economic status matched healthy controls (n=25, 20-40 years) from general population. The patients were on medication for years and comprised of both males and females. The levels of 8-hydroxy-2deoxy Guanosine were determined using spectrophotometric methods and standard kits (ELISA kit). The results on statistical analysis revealed that the 8-hydroxy-2deoxy Guanosine levels are significantly higher (0.000) in patients ( $55.84 \pm 1.187$ ) as compared to the controls ( $30.86 \pm 1.148$ ). The observations reveal that oxidative stress in patients persists despite medication and further management is required.

**(PP-120)**

### **Plant Dietary Supplement Intake and Microsomal Epoxide Hydrolase 1 [EPHX1] Gene polymorphism in Healthy Male**

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Plant derived nutritional supplements are natural antioxidants and can delay age-related changes and susceptibility to inflammatory disease by reducing oxidative stress. The metabolic genotypes and genetic variants of various detoxifying enzymes can however differentially affect levels of oxidative stress if their activity is altered. This can affect the health status. In present study, genotyping of a genetic variant of EPHX (rs2234922) was carried out on some healthy male participants (n=103) with regular intake of nutriline (Amway nutrients) and those (n=104) not taking any supplements. Whole Genomic DNA isolated from blood samples collected earlier from the general population under informed consent were processed for PCR-RFLP analysis after Ethical approval from the institutional Ethics concern. The standard methodology as available in literature was used. The amplified DNA products were subjected to restriction digestion and genotyping (2% gel electrophoresis) revealed the presence of the wild type allele (295bp) in all the 207 samples. Studies on a larger sample can be useful for providing genotypic fraction of the EPHX1 variant.

**(PP-121)**

### **Nanofertilizers: A Smart Targeted Delivery system**

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Nanotechnology has offered a revolutionary breakthrough in the field of plant science and agriculture. Large-scale production of nanoparticles of physiologically important metals can enhance nutrient use efficiency besides reducing environmental pollution. Due to great sorption capacity, high surface area, controlled release kinetics at the targeted site and ability to penetrate seeds or root tissue make nanoparticles a suitable candidate for formulation of agrochemicals. Nanoagrochemicals, particularly nanofertilizers, are primarily designed to enhance bioavailability, increase solubility and controlled target biodistribution of the active principle mineral element in response to environmental and biological triggers. Besides, nanoparticles also protect the applied active ingredient against premature degradation, leaching and volatilization, resulting in reduced application of the chemical. Tremendous increase in the world population over the past decade has burdened the agriculture sector to increase crop productivity to meet the growing food demand. Chemical fertilizers are double-edged swords that on one hand increase crop production but on the other cause an irreparable damage to soil ecology leading to reduced soil fertility. Nanotechnological interventions can thus provide for sustainable production, precision farming and ground breaking inventions in the field of agriculture.

**(PP-122)**

### **Assessment of Carbon Sequestration Potential of Selected Tree species at Central University of Rajasthan**

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Due to increased developmental and transportation activities, the concentration of green house gases is increasing day by day especially, CO<sub>2</sub> and leading to increased atmospheric temperature. The increasing carbon emission is of major concern that has been well addressed in Kyoto Protocol. Trees, Shrubs, Soil and Sea water play an important role in absorbing atmospheric carbon dioxide. In the present study problem of the statement was to determine the carbon sequestration potential of the trees in the University which is a semi arid region and 5 species in 61-90cm girth class. For the quantitative analysis of vegetation, random sampling method was used for sampling the above ground vegetation. For the collection of data, 25 plots of 20m×20m size were laid randomly in the selected five various sites, 5 plots in each site and 20 species were found in 10-30cm girth class, 13 species in 31-60cm girth class The non –destructive method has been followed to determine carbon storage. The maximum carbon sequestration potential in *Melia azadirachta* (0.707ton) followed by *Azadirachta indica* (0.483ton), *Caccia fistula* (0.261ton), *Bauhinia variegata* (0.218 ton) and minimum carbon sequestered by *Ricinus communis* (0.004ton).

**(PP-123)**

## **Application and Side Effects of Food Preservatives: A Review**

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Preservatives are the natural or synthetic chemicals that are added to the products such as foods, pharmaceuticals, paints, cosmetics, biological samples etc. to prevent decomposition by microbial growth, nutritional losses and enzymatic or chemical changes. Preservatives have been used since prehistoric times. In the late 19th century the traditional oils, salts, paints, were used as preservatives but was not widespread until the 20th century. However, with the beginning of 20<sup>th</sup> century, the bulk of chemically synthesized preservatives were flourished into the food industry. The preservation of foods has evolved greatly over the centuries and has been instrumental in increasing food security. The exploitation of food preservatives varies greatly depending on the country. Many developing countries do not have strong regulatory bodies to control the food additives and hence have to face the harmful levels of preservatives in foods. As the world population is increasing at an alarming rate, which has put a great pressure on the food resources. In order to congregate the increased demand of food supply it has become essential to find new food sources as well as to preserve the available food stock for long period without its spoilage. Various methods have been evolved for the storage of food which involves the usage of many chemical substances as food preservatives or antimicrobial agents. Food preservatives could be the natural or synthetic chemicals that are added to the products such as foods, pharmaceuticals, paints, cosmetics, biological samples. There are forty five certified substances by the European Union that are used as preservatives. Although some of these substances are harmless when used according to their authorized amount. But the use of preservatives above the permissible limits can cause number of ill health effects like skin rashes, itching, breathing difficulty, sneezing and gastrointestinal disturbances. The present work is a synoptical review on food additives used as preservatives (antimicrobial agents) authorized in the European Union, considering its characteristics, uses and side effects.

**(PP-124)**

## **Potential of Phytochemicals as Epigenetic Modulators**

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DNA harbors genetic information and its native structure should be preserved in order to maintain the normal cellular function. Cells have unique and specific pathways to sense DNA damage. Eukaryotic cells maintain genome stability by the collective and coordinated efforts of a web of cellular activities such as replication, repair and cell cycle progression. The DNA damage response signaling pathway is the main regulator of this network. Eukaryotic DNA is bound by alkaline histone proteins which package the DNA molecule into nucleosome and organize it into chromatin. Acetylation of lysine residues within the N-terminal tail protruding from the histone core is involved in gene regulation. It is an epigenetic modification brought about by Histone Acetyl Transferases (HATs) and Histone Deacetylases (HDACs). HDAC acetylated chromatin is inactive whereas HAT acetylation make it active. HDAC and HAT activities have been described to be connected with signal transduction, cell growth and death and pathogenesis of various diseases. Many dietary compounds such as curcumin, epigallocatechin-3-gallate, Genistein, indole-3-carbinol, phenylisothiocyanate, resveratrol have been involved in regulation of HDAC and HAT. Health benefits of these compounds have been

attributed to epigenetic mechanisms. The present review will be focused on epigenetic mechanisms and genomic instability; HDACs involved in DNA damage response and implications and potential of phytochemicals in altering histone acetylation.

**(PP-125)**

### **Association of Honeybee Diet with Hypopharyngeal Gland Activity**

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Hypopharyngeal glands (HPG) or brood food glands in the head of worker honeybees produce proteinic secretion (royal jelly) for feeding larvae and queens as well as discrimination among different castes. The activity of HPG is influenced by physiological status of the honeybee being the most developed in the nursing period. Moreover, the overall development of hives and growth of HPG is affected by the quality of food accumulated by the worker bees. The morphological and physiological changes in the HPG of worker bee are essential for the production of royal jelly. An association of different dietary constituents *viz.* bee bread, pollen+sugar, Nectapol, yeast+glutin+sugar powder, honey, honey+soybean extract, honey+pollen, traditional substitute, sucrose solution *etc* with the activity of hypopharyngeal gland has been studied. A positive association between the pollen consumption and head weight of worker bee and HPG diameter and synthesis of protein during nursing period of worker honeybee has been documented. Also, on starvation, HPG is characterized by disappearance of secretory granules, vacuoles and size reduction of gland acini and cells. It may be concluded that, developmental stages of worker honeybee and initial HPG development is influenced by worker bee dietary constituents.

**(PP-126)**

### **Assessment of Various Biochemical Components in Different Genotypes of Tomato (*Solanum lycopersicum* L.) Acting as Health Promoters**

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Tomato is one of the widely consumed vegetables in the world, in both fresh and processed form. It is considered highly nutritious because of its high carotene content (in the form of  $\beta$ -carotene), high lycopene content and as good source of vitamins. Lycopene and carotene are potent antioxidants and seem to be responsible for the natural cancer-fighting properties. Being a rich source of vitamin A and C, it is well known for its antioxidant activity. Tomatoes are also found to be a rich in glycoalkaloid tomatine and have shown desirable pharmacological properties including anti-bacterial, anti-fungal, anti-viral and anti-cholesterolemic activity. In our study, ten different carotene rich genotypes of tomato (PCRT-2, PCRT-4, PCRT-8, PCRT-10, PCRT-12, PCRT-15, PCRT-18, PCRT-20, PCRT-22, PCRT-23), ten different lycopene rich genotypes of tomato (PLRT-2, PLRT-4, PLRT-8, PLRT-10, PLRT-12, PLRT-15, PLRT-18, PLRT-20, PLRT-22, PLRT-23) and two standard check varieties i.e. Punjab Ratta and Punjab Sona Cherry were screened for different biochemical components *viz.*  $\beta$ -carotene, lycopene, vitamin C, vitamin A, tomatine and total antioxidant capacity. The fruits were harvested at marketable stage and size and further biochemical analysis for above traits were done. The relationship among these components was also evaluated. The analysis of variance showed that all the genotypes were significantly



different for all the genotypes. The results obtained are pre-requisite in formulation of an effective breeding program. The tomato improvement work is aimed at releasing new cultivars with high health promoting components, high yield and better quality.

**(PP-127)**

### **Some Mushrooms Act as a Potential Source of Nutraceuticals**

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Mushrooms are highly nutritive low caloric food with good quality of proteins, minerals and vitamins. It is generally considered to be a rich source of various nutraceuticals products. Nutraceuticals products are derived from food sources which possess extra health benefits in addition with some basic nutritional value found in food. The word nutraceuticals is a combination of two words 'nutrition' and 'pharmaceutical' and was first coined by Stephen L defelice who was founder and chairman of the foundation of innovation medicine in 1989. Nutraceuticals market has also showed a steady average of 9.6% per annum increase in growth. Mushroom is an excellent source of folic acid that is a blood building vitamin helpful in preventing anemia. Many species of mushroom such as *Clithocybe cliatreta*, *Poria cocos*, *Mycenae sp.*, and *Centinus edoder* contain different bioactive compounds helpful in providing health benefits. *Clithocybe* contain cyathiformine which have antimicrobial and *Poria cocos* contain landstane for phospholitave A2 bioactivity. Mushroom has comprehensive activities like antioxidant, anti-diabetic, cardiovascular and anti microbial. It has low range fat, starch and high fiber content so it is considered to be an ideal food for obese person and for diabetics to prevent hypoglycemia.

**(PP-128)**

### **A Review on Co-relational Studies between Urban Heat Island Effect and Air Quality using Geospatial Technologies**

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The higher temperature of urban areas in contrast to surrounding rural areas gives rise to the 'urban heat island' (UHI) phenomenon. The urban characteristics such as reduced vegetation, low albedo, higher building density and hence, low sky-view factor contributes to the increased urban temperature. Moreover, the excessive warming accompanied with anthropogenic emissions in urban areas alters the chemical composition of urban air. The noticeable increase in energy consumption occurs to overcome the excessive warming in cities due to the UHI effect; that ultimately leads to higher energy production thus degrading the air quality by certain gaseous emissions. The mitigation measures of UHI effect such as the increase in urban vegetation and albedo of urban buildings can lower down energy consumption of cities thereby improving quality of urban air. The urban vegetation also influences air circulations and thus heat exchanges that causes dissipation of the trapped urban heat and pollutants into the atmosphere. Numerous studies have been documented regarding investigation of correlation between air quality and the UHI effect that states the adverse impacts of UHI effect on air quality. Several models such as WRF-Chem, land use regression models have been coupled with urban canopy models to estimate the effect of UHI on air quality. The use of geospatial technologies is one of important perspective of these studies as the advancements in spatial and temporal resolution of satellite data at low price

have significantly influenced their use in monitoring UHI patterns, spatial distribution of air pollutants etc. There is an urgent need to monitor UHI effect and associated adverse impacts on air quality for sustainable environment.

**(PP-129)**

### **Applications of Molecular Farming in Plants: A Review**

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Molecular farming is a biotechnological program that includes genetic modifications of plants to produce recombinant proteins and chemicals for commercial and pharmaceutical purposes. Advantages offered by molecular farming for the plants include low cost of cultivation, high biomass, easy scale up capacity, low capital costs. Molecular farming represents a novel source of molecular medicines such as plasma proteins, enzymes, growth factors, vaccines and recombinant antibodies. Industrial proteins are also synthesised in transgenic maize. Plants used for biopharmaceutical production includes *Arabidopsis thaliana*, tobacco, lettuce, alfalfa, maize, rice, potato. An antithrombin protein *Hirudin* which is originally produced in salivary glands of *Hirudo medicinalis* produced in plants by employing molecular farming. The gene coding for hirudin protein is fused with oleosin gene of *Arabidopsis* and the fusion gene construct is introduced into *Brassica napus*. Further the oleosin-hirudin protein is purified. Another example is the production of spider silk proteins in potato. Therefore molecular farming allows rapid progress from genetic engineering to crop production and new cash crops producing recombinant proteins which are already being exploited. Keeping all the applications of molecular farming in mind the present review has been designed to summarize the various reports on it.

**(PP-130)**

### **Microsomal Epoxide Hydrolase 1 (EPHX1) Gene Polymorphism in Healthy Adult Females as a function of Plant Dietary Supplements**

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Intake of plant dietary supplements (antioxidants) can mitigate free radicals and Reactive Oxygen Species (ROS) produced endogeneously or from exogenous sources and thereby results in decrease in oxidative stress. However the genetic constitution of an individual can modulate the effect of antioxidants. One of the enzymes, the microsomal epoxide hydrolase (EPHX1), is a biotransformation conserved enzyme which converts epoxides to trans-dihydrotriols which can be conjugated and excreted from the body and thereby reduce oxidative stress. Genetic polymorphism of the EPHX1 can alter the biotransformation capacity of the enzyme and affect oxidative stress. In the present study, EPHX1 polymorphism (rs2234922) in healthy females (n=193, 18-40y) taking (n=97) and not taking (n=96) dietary supplements (NUTRILITE Multivitamin and Multimineral Tablets) was carried out after ethical approval from the Institutional Ethical Committee. Blood samples collected earlier under informed consent were used to isolate whole genomic DNA. Genotyping of EPHX1 (rs2234922, A>G) polymorphism was performed by PCR-RFLP analysis using the F 5'-ACATCCACTTCATCCACCGT-3' and R 5'-ATGCCTCTGAGAAGCCAT-3' primers. The products were analysed after 2% agarose gel electrophoresis and a 295 bp product (wild type) was obtained. All samples revealed the wild type allele on genotyping and showed no differences in the genotypes of those taking and not taking dietary

supplements. A larger sample size may be more insightful for studying genetic polymorphism of the EPHX1 (rs22349222) gene.

**(PP-131)**

### **Structural Characterization of Some Genes of *Brassica juncea* L. Using *in Silico* Bioinformatics Tools**

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*Brassica juncea* L. is an important oil seed crop and also used as green leafy vegetable and the present study was designed to analyze the uncharacterized genes of *Brassica juncea* for secondary structure predications and 3D modeling by using various bioinformatics tools. Pyre 2 tool was used for the secondary structure predictions and it was observed that in all the genes maximum values of alpha helix followed by TM helix, disordered and beta strand were found for the uncharacterized genes. I-TASSER web server was used to predict possible three-dimensional models for conserved domains of some uncharacterized genes of *Brassica juncea*. The built models were validated by 3D verify, PROCHECK and ERRAT server. Out of the eight genes studied only three genes, i.e., A0A023VW24, A0A023VX39 and A9LLE8 have qualified against recommended score for a high quality model and found to be sufficiently robust for future studies such as docking and simulation. This is the first and the baseline study in the uncharacterized genes of *B. juncea*.

**(PP-132)**

### **Perspectives of Bamboo as Nutraceuticals**

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Bamboo, the tall arborescent grass which comes under the family Poaceae is gaining wide attention as a nutraceutical. Use of bamboo as medicine has a long history particularly in Asia. In ancient Indian literature like “Bhavprakash nighantu”, it is mentioned that bamboo cures leprosy, wounds, swellings and prevents cold. It is recorded in Chinese medicinal books that the shoots improve digestion, and prevent cardiovascular diseases and cancer. Bamboo has all the nutrient and bioactive compounds that are needed for good health and disease prevention. Several species like *Dendrocalamus latiflora*, *Phyllostachys bambusoides*, *P nigra*, *P pubescens*, *Bambusa kingiana*, *B balcooa*, *B arundinaceae*, *Sasa borealis* etc. have been proven to contain anti microbial, anti-carcinogenic, anti-oxidants and anti-diabetic properties. It is termed as a “heart protective vegetable” due to its higher content of potassium. The antioxidants in leaves are certified as a novel kind of natural antioxidant and it is used as herbal tea that is beneficial to health. The natural antioxidants derived from bamboo leaves have been proposed as replacement for synthetic antioxidants like butylated hydroxyanisole, butylated hydroxytoluene and propyl gallate. Bamboo shoots, the soft edible portion of the plant, are a very good source of health enhancing phytochemicals like phenols, phytosterols, natural anti-oxidants, vitamins, minerals, dietary fibres and are relatively low in fat content. These components have multiple biological effects like prevention from cardiovascular diseases, cancer, diabetes and other properties like anti-ageing, anti-inflammatory, anti-fatigue and anti-microbial. The medicinal value of bamboo mentioned in ancient literatures is being scientifically authenticated thereby revealing the enormous potential of this wonder grass as a nutraceutical.

**(PP-133)**

### **Role of Nitisinone Derived from *Callistemon citrinus* Treatment of Tyrosinemia – A Rare Inborn Metabolic Error**

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Tyrosinemia is a rare inborn error of catabolism of biologically important amino acid tyrosine, in which body cannot adequately break down the tyrosine, which results into the hypertyrosinemia. In Central Europe, the prevalence is 1:125,000, although much higher incidence rates are observed in other regions such as Turkey, Quebec, and India. Tyrosinemia results from gene defects in phenylalanine and tyrosine catabolic pathway and inherited as an autosomal-recessive trait and is, thus, more common in populations with a high degree of consanguinity. The epidemiologically observed inhibition of growth of plants and weeds under the bottlebrush plant (*Callistemon citrinus*) lead to the discovery of chemically active substance leptospermone. Leptospermone belongs to the triketone family and inhibits chloroplast development due to a lack of plastoquinone secondary to hepatic 4-hydroxyphenylpyruvate dioxygenase (HPPD) inhibition; thus, it served as a blueprint for the synthesis of nitisinone. **Orfadin®** (Nitisinone) is first FDA-approved drug for treatment of Hereditary Tyrosinemia. Nitisinone based drug prevents liver ailments, renal tubular dysfunction and neurological defects by restricting the accumulation of toxic by-products in liver and kidneys. Nitisinone also act as very promising agent in the treatment of alkaptonuria and tumors through the active tyrosine metabolic pathway.

**(PP-134)**

### **Plant Metabolomics: a Rapid Tool for Biochemical and Functional Characterization**

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Plants produce a large array of specialized metabolites (natural products) that not only are essential for growth and development, but also play important roles in adaptation to the variable stressful environments. Also, many plant metabolites are essential nutrient elements for humans and serve as natural drugs. Generally, these metabolites are classified into primary and secondary metabolites. The former are indispensable for the growth and development of a plant, while the latter are not essential but are crucial for a plant to survive under stress conditions by maintaining a delicate balance with the environment. In addition, primary metabolites are highly conserved in their structures and abundances while those of secondary metabolites differ widely across plant kingdoms. The diversity of plant metabolites and the likely complicated regulatory mechanism highlight the necessity to explore the underlying biochemical nature. In the post-genomics era, metabolomics - defined as the analysis of the total population of metabolites in a given sample, cell or tissue - and the integration of the data in the context of functional genomics, is attractive for analysis of global metabolic changes in plant development and responds to different environmental stresses. Metabolomic analysis greatly accelerates processes in deciphering the function of an individual gene in a metabolic pathway, building metabolic networks, identifying metabolic regulators, and more importantly establishing causal relations between metabolic pathways and biologic functions in plants.

**(PP-135)**

### **Potential of Herbals in Combating Pancreatic Cancer**

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Pancreatic cancer is the fourth most common cancer with high malignant rate and occurrence throughout the world. It was found that due to the high rate of asymptomatic development, invasion and malignant pancreatic cancer is highly lethal. In most of the patients the cancer is mostly detected at its advanced stage. The pancreatic cancer patients have poor survival rate which is less than 5%. Several evidences have revealed the limited success of chemotherapy or radiotherapy in treating pancreatic cancer. However, studies have found that the use of alternative medicines, including natural products/herbal medicines is helpful as an exciting adjunctive therapy. We are summarizing recent advances of natural products/herbal medicines to treat pancreatic cancer in preclinical and clinical trials. Some of the most common treatment modalities that have been studied for pancreatic cancer include curcumin, naltrexone, genistein and traditional herbs. Certain epidemiological studies have demonstrated that herbs which are used in traditional medicine by Middle Eastern countries considered to be the most safe and cost-effective strategy to combat the occurrence of pancreatic cancer. Researchers have also found that thymoquinone, an extract from the *nigella sativa* seed oil, blocked the growth of pancreatic cancer cell and also killed cells by enhancing programmed cell death.

**(PP-136)**

### **Phytochemical Analysis and Antioxidant Potential of Methanolic Extract of *Cassia absus***

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*Cassia absus* is a medicinal plant useful for the treatment of various ailments and diseases. The seeds of the plant have a bitter taste, diuretic, cathartic and useful in the liver, kidney and eye diseases since ancient times, and therefore, rightly called Chakshu (eye, in the Sanskrit language). In the present study, antioxidant potential of the methanolic extract of *Cassia absus* seeds (CMS) was investigated using various in vitro antioxidant assays viz. DPPH, chelating power and superoxide anion radical scavenging assay. The preliminary phytochemical analysis of CMS indicated the presence of phenolics and flavonoids. In the DPPH, chelating power and superoxide anion radical scavenging the CMS extract exhibited the inhibitory percentage of 90%, 66% and 80% respectively at the highest tested dose of 200µg/ml. It was observed that the extract showed maximum quenching effect in the DPPH radical scavenging assay as compared to the other assays. The results obtained have revealed that the antioxidant activity of the *C. absus* seeds might be attributed to the presence of phenolic phytochemicals in it.

**(PP-137)**

### **Antiproliferative and Apoptosis Inducing Activity of *Cassia absus* Methanol Extract against Human Osteosarcoma Cells**

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*Cassia absus* L. belongs to the family Fabaceae and commonly known as Chasku in the Indian medicinal system. Traditionally, it is used in the treatment of asthma, bronchitis, conjunctivitis, cough, hepatic diseases, renal, leucoderma, constipation, hemorrhoids, headache, ulcer, blood purifier and wound healing. In the present study, antiproliferative and apoptosis inducing activity of *C. absus* methanol extract (CAM) was investigated against human osteosarcoma (MG-63) cell line. The antiproliferative activity of CAM was assessed in MG-63 cells using MTT assay. The apoptogenic effect of the extract was evaluated by Hoechst 33342 staining, mitochondrial membrane potential staining, cell cycle analysis and intracellular reactive oxygen species assays. The data obtained revealed that the CAM exhibited significant cytotoxic activity with the GI<sub>50</sub> of 122.9 µg/ml in MG-63 cell line. The induction of apoptosis was revealed by condensation and fragmentation of nucleus and formation of apoptotic bodies, reduction in the level of mitochondrial membrane potential, elevation in the level of intracellular ROS and accumulation of cell population at the sub-G<sub>1</sub> phase in a dose-dependent manner. Our data proved that the *C. absus* could be a potential plant to explore in cancer chemoprevention.

**(PP-138)**

### **Wheatgrass: A Potential Anticancer “Green Blood”**

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The traditional herbal medicines which have been used from ancient days in India are generally known to be free of any deleterious effects. They are inexpensive and effective. Wheatgrass is the young grass of common wheat plant (*Triticum aestivum* L., family Poaceae) and it is also known as “green blood” because of its high chlorophyll content, i.e., 70% of its chemical composition. Moreover, it has structural similarity with haemoglobin and thus results in high oxygen supply to all the tissues. Wheatgrass is a commonly found herb in India, contains enzymes like protease, cytochrome, amylase, lipase, transhydrogenase and superoxide dismutase (SOD). Besides these enzymes, it also contains all the essential amino acids especially alanine, aspartic acid, glutamic acid, arginine and serine, which are helpful in providing good amount of protein in body which builds and repair tissues. Wheat grass therapy is recommended for patients suffering from chronic diseases like Asthma, Atherosclerosis, Parkinson’s disease, Joint pains, TB, Constipation, Hypertension, Diabetes, Bronchitis, Insomnia, Eczema, Sterility, Haemorrhage, Obesity and Flatulence. Nowadays wheatgrass is widely used an alternative medicine approach of anticancer therapy, due to its high antioxidant content chlorophyll, laetrile and SOD which converts dangerous reactive oxygen species (ROS) into hydrogen peroxides and an oxygen molecule. Chlorophyll, like other tetra-pyrroles, has the ability to induce mammalian phase 2 proteins that protect cells against oxidants and electrophiles. Plant hormone abscisic acid (ABA) is another anticancer constituent of wheatgrass that neutralizes the effect of the hormone chorionic gonadotropin and like compounds produced by the cancer cells. Apart from these, it also has the ability to inhibit oxidative DNA damage. Further studies are needed to be explored to unwind the mechanistic studies and other beneficial potentials of wheatgrass.

**(PP-139)**

## **Stevioside Protects Against Rhabdomyolysis-induced Acute Kidney Injury in Rats**

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The present study investigated role of stevioside against rhabdomyolysis-induced acute kidney injury (AKI) in rats. Rhabdomyolysis refers to intense skeletal muscle damage which further causes AKI. Glycerol (50% w/v, 8 ml/kg) was injected intramuscularly in rats to induce rhabdomyolysis. After 24 hours, AKI was assessed by measuring serum creatinine, creatinine clearance, urea, potassium level, fractional excretion of sodium and microproteinuria. Oxidative stress in renal tissues was assessed by measuring thiobarbituric acid reactive substances, superoxide anion generation and reduced glutathione level. In addition, serum lactate dehydrogenase and creatine kinase levels were assayed to quantify glycerol-induced muscle damage in rats. Haematoxylin & eosin and periodic acid Schiff staining was done to assess histological changes in renal tissues. Moreover, renal expression of apoptotic markers (bcl2, bax) was demonstrated by immunohistochemistry. Stevioside (10, 25 and 50 mg/kg) was given to rats three days prior to glycerol administration. Rhabdomyolysis-induced AKI was demonstrated by marked changes in serum and urine parameters along with significant increase in oxidative stress markers and histological changes in renal tissues. Immunohistology of kidney tissues revealed apoptosis in glycerol-treated rats. Administration of stevioside demonstrated significant correction of renal parameters along with profound anti-oxidant and anti-apoptotic effect. Moreover, administration of stevioside attenuated muscle-injury in rats as demonstrated by reduction in serum lactate dehydrogenase and creatine kinase levels. Hence, it is concluded that stevioside attenuated rhabdomyolysis-induced AKI attributing to its anti-oxidant and anti-apoptotic properties.

**(PP-140)**

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

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

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

**(PP-141)**

### **Recent Advances in Solar Energy: A Theoretical Framework**

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The present study is an endeavour to examine antecedents and consequences of using solar energy products. It will primarily deal with the literature framework of factors affecting customer's awareness, perception and outlook towards solar roof tops in houses, corporate offices and educational and other institutions. The role of government and other non government organizations in promoting this green technology has also been studied. This study offers new and innovative ideas for spreading awareness about advantages of shifting to solar energy amongst the masses so that the movement is not random or erratic, but extensive and all pervasive. It will give insight into selecting appropriate strategies for reaching the common public by understanding their attitude to ensure that the efforts of the government in this direction are not futile.

**(PP-142)**

### **Effect of Chilling Stress on Morpho-Physiological and Biochemical Characteristic of Seedling Growth in *Cicer arietinum* (L.)**

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Low temperature is one of the abiotic stresses that affect the survival, growth and reproduction of crop plants. The present investigation was carried out to study the influence of chilling stress of 0°C and 4°C for 24hr and 48hr on germination potential, radicle length, plumule length and moisture content of seedlings after different intervals of time in *Cicer arietinum*. The level of various biochemical reserves of seedlings was also studied. All the above morphological, physiological and biochemical parameters were significantly influenced by the various chilling stress treatments as compared to control. The increase was due to cellular and metabolic changes that occurred during cold acclimation.

**(PP-143)**

### **A Study on Chemical Analysis and Clastogenic Effects of Three Synthetic Food Dyes**

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Mutagenicity and genotoxicity of synthetic food dye viz., bright green, chocolate brown and raspberry red were estimated using Ames and *Allium sativum* root chromosomal aberration assay (A/SRCAA), respectively. During Ames test, all food dyes were found to be



mutagenic in TA100 and non mutagenic in TA98 tester strains of *Salmonella typhimurium*. In AISRCAA, raspeberry red dye induced maximum genotoxicity in terms of physiological aberrations (vagrants, c-mitosis, stickiness, delayed anaphase, abnormal anaphase and abnormal metaphase) whereas bright green food dyes in terms of clastogenic aberrations (chromatin bridges, chromosomal breaks and chromatin rings). Chemical analysis of the food dyes was done using ultra high performance liquid chromatography (UHPLC) and Mass spectroscopy (MS). UHPLC studies have shown presence of tartrazine, sunset yellow, brilliant blue and erythrosine food colorants, whereas MS confirmed the presence of brilliant blue, sunset yellow and tartrazine. During elemental analysis of three synthetic food dyes, Scanning Electron Microscope-Energy Dispersive X-ray (SEM-EDX) exhibited the presence of various elements including Cu, Fe and Mn while Atomic Absorption Spectroscopy (AAS) has shown presence of Fe, Cu, Co, Mn, Pb and Zn.

**(PP-144)**

### **Molecular Markers in Plant Genetics Research**

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Recent developments in molecular biology have opened the possibility of employing various types of molecular tools to identify and use genomic variation improvement of various organisms. The evolution of the improvement in the field of agronomy is fundamental for its adaptation to the new exigencies that the current world context raises. With the development of molecular marker technology in the 1980s, the fate of plant breeding has changed. During the last few decades, the use of molecular markers, revealing polymorphism at the DNA level, has been playing an increasing part in plant biotechnology and their genetic studies. Molecular marker is a gene or DNA sequence with a known location on chromosome and is associated with a particular gene or trait. Use of molecular tools and transgenic crops will allow us to meet the food needs in a sustained manner with limited availability of resources. In the review we will discuss about the biochemical and molecular markers and their applications in plant genetics research.

**(PP-145)**

### **Phytoremediation of Heavy Metals: Concepts and Techniques**

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Heavy metals like lead, arsenic, chromium, zinc, cadmium, copper and mercury are contaminating our soil and even underground water. These pollutants are directly or indirectly causing significant damage to the environment and human health as a result of their mobilities and solubilities. The selection of most appropriate soil and sediment remediation method depends on the site characteristics, concentration, types of pollutants to be removed and the end use of contaminated medium. Cheaper and effective technologies are needed to protect the precious natural resources and biological lives. The main techniques involved are *bioleaching* and *phytoremediation*. Bioleaching involves use of *Thiobacillus* sp. bacteria which can reduce sulphur compounds under aerobic and acidic conditions at temperature between 15° and 55°C whereas phytoremediation involve use of different plants like

*Chenopodium*, *Utrica* and *Alyssum* that can take up and accumulate toxic metals in their leaves where they can be disposed off easily. With the recent advancement in biotechnology, the capabilities of hyperaccumulators may be greatly enhanced through specific metal gene identification and its transfer in certain species, which play a significant role in the extraction of heavy metals from the polluted soils.

**YOUNG BOTANIST AWARD**  
**PRESENTATIONS**

**(YB-01)**

## **Metal Resistant PGPRs Reduced Cd Uptake and Toxicity in *Lycopersicon esculentum* by Improving Growth, Photosynthetic Pigments and Expression of Metal Transporter Genes**

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Plant growth promoting rhizobacteria (PGPRs) play an essential role in rhizosphere by forming symbiotic associations and promote plant growth by synthesis of various metabolites and phytohormones. They are very effective in immobilization of heavy metals and further reduce their translocation in plants via precipitation, complex formation and adsorption. The present study was therefore designed to understand the role of *Pseudomonas aeruginosa* and *Burkholderia gladioli* in mitigation of Cd stress (0.4mM) in 10-days old *L. esculentum* seedlings. The effect of these microbial strains was studied upon growth characteristics and photosynthetic pigments of *L. esculentum* seedlings. Moreover, metal tolerance index, metal uptake and the contents of metal chelating compounds (protein bound and non-protein bound thiols, total thiols) were also assessed. The gene expression profiling of different metal transporters was conducted in order to investigate the quantitative analysis. The results of present study revealed that 0.4mM Cd generated toxicity in seedlings in terms of reduced growth (root length, shoot length, fresh weight and dry weight) and photosynthetic pigments (chlorophyll, carotenoids and xanthophylls). Further, the metal uptake was also enhanced in Cd- treated seedlings along with levels of protein and non-protein bound thiols in Cd- treated seedlings. It was observed that inoculation of *P. aeruginosa* and *B. gladioli* reduced the toxicity symptoms from *L. esculentum* seedlings by improving growth parameters as well as stimulating the levels of photosynthetic pigments and protein bound and non-protein bound thiols. Gene expression studies suggested enhanced expression in the metal transporter genes which were further declined in the microbe supplemented seedlings. Therefore, micro-organisms poses growth promoting traits that enable them to reduce metal toxicity in plants.

**(YB-02)**

## **Antiproliferative and Apoptotic Inducing Effects of *Illicium verum* against Human Osteosarcoma**

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Osteosarcoma is the most common primary bone cancer affecting children and adolescents worldwide. Despite an incidence of three cases per million annually, it accounts for an inordinate amount of morbidity and mortality. Hence, there is a substantial need for new therapies to combat cancer. Plants are reservoirs for novel chemical entities and provide a promising line for research on cancer. So, considering the significant potential of many natural products as anticancer agents, the present investigation was undertaken to explore the anticancer potential of *Illicium verum* Hook.,(Schisandraceae) commonly known as “Badian” or “Star anise”. It is used as a spice in Indian culinary and has been recommended for the treatment of ailments viz. stomach ache, vomiting, skin inflammation, insomnia, and

rheumatic pain. Isolation and fractionation of its fruits yielded various extracts/fractions. The antiproliferative activity of hexane fraction (Anise-Hex) was measured by MTT assay. Anise-hex fraction effectively reduced the growth of MG-63 cells in a time and dose dependent fashion with GI<sub>50</sub> value 41.88 µg/ml in MTT assay. Mechanistic studies revealed that Anise-hex fraction reduced the number and size of colonies in clonogenic assay as compared to control. SEM and Confocal microscopy studies showed nuclear condensation, fragmentation, formation of apoptotic bodies pointing towards its apoptogenic inducing ability. Flow cytometry showed a decrease in mitochondrial membrane potential and an elevated level of ROS. HRMS revealed the presence of compounds namely, Trans-anethole, p-coumaric acid, Crotonic acid, Saphulenol and Anisatin. The results of the present study suggest that *I. verum* possess significant antiproliferative and apoptosis inducing activity which can be further exploited for its chemotherapeutic and nutraceutical use.

**(YB-03)**

**Evaluation of the Antioxidant and Antiproliferative Activities of *Onosma bracteatum* Wall**

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Carcinoma is a group of diseases which has a major health issue worldwide. It occurs due to uncontrolled proliferation of cells caused by mutation in genes or alteration in metabolic pathways. Brain and CNS cancer constitute ~ 3% of the cancer cases worldwide and are more frequent among men than women. For cancer chemoprevention various agents such as natural, synthetic or biologicals are used for the treatment of cancer. In the present study, we aimed to explore the antioxidant and antiproliferative of six fractions viz. ethanol (ObEth), hexane (ObHex), chloroform (ObCl), ethyl acetate (ObEa), n-butanol (ObBu) and aqueous (ObAq) fractions of *Onosma bracteatum* Wall. leaves. *O. bracteatum* is a medicinal plant of family *Boraginaceae* and used for the treatment of rheumatism, syphilis, leprosy, relieving excessive thirst, restlessness and functional palpitation of the heart. Antioxidant activity of *O. bracteatum* was evaluated using DPPH radical scavenging, Ferric ion reducing power and Molybdate ion reduction assay. Antiproliferative activity was assessed against neuroblastoma IMR32 cancer cells. It was found that among all the fractions, ObEa fraction showed maximum DPPH and ferric ion scavenging activity with an IC<sub>50</sub> value of 90.07 and 674.5 µg/ml respectively. In Molybdate ion reduction assay, ObEa fraction exhibited 83.33% of ascorbic acid equivalent (AEE)/100 mg of fraction. ObEa was found to be rich in phenolics and flavonoids with TPC and TFC value of 163.59 mg of GAE/g of fraction and 139.39 mg of RE /g of fraction respectively. The ObEa fraction exhibited potent antiproliferative activity with GI<sub>50</sub> of 71.47 µg/ml in neuroblastoma IMR32 cancer cells. The current study revealed that the potential of *O. bracteatum* phytochemicals against neuroblastoma which need to be further investigated.

**(YB-04)**

**Mechanisms Involved in Alcohol Induced Hepatotoxicity**

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Alcohol induced hepatotoxicity is fatal disease caused by chronic consumption of alcohol. It is a world's 3rd largest disease not only a risk factor but also responsible for

numerous social issues such as domestic violence, child neglect and abuse (WHO). According to British medical journal, death rates are hiked due to liver diseases predominantly via alcohol induced hepatotoxicity and it is ranked as 5<sup>th</sup> largest cause of death annually among adults (British Liver Trust survey, 2017). In a survey, 11.5% of total drinkers with excess alcohol consumption, men are highly indulged as compared to females with four to one ratio (WHO). Ethanol can induce hepatotoxicity by producing excess free radicals leading to oxidative stress and lipid peroxidation. This results in generation of several immunological responses by activation of kupffer cells present in liver hepatocytes. Immune responses induce cell death in hepatocytes via affecting mitochondrial membrane potential and hepatic redox balance due to metabolism of ethanol by alcohol dehydrogenase resulting in fatty liver followed by cirrhosis. Liver transplantation is the only option in case of acute or chronic alcohol induced liver failure and there is no medicine available as such for alcoholism (Times of India, 2017). Present paper includes possible mechanism involved in alcohol induced liver toxicity along with its main consequences.

**(YB-05)**

### **New Era in Cancer Therapy: Use of Natural Compounds in Chemoprevention and Chemotherapeutics**

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Cancer, a multifactorial deadly disease wipes out approximately 7.5 million life's from planet every year. The multifactorial nature of this disease cause different types of cancer in different parts of body even in different types of cells in same organ. Now a day, many drugs are going through late phase clinical trials and will be ready to come in the market. Most of these drugs are synthetic which may cause resistance with time. Moreover, these drugs are targeted to a specific type of cancer of specific organ. To compensate these problems, and to target much of cancer types, scientists now faced towards natural isolated compounds. The safe use of these compounds over synthetic one is important aspect for researchers to move on. Another important point for this move is to use natural compounds from our food chain. The epidemiological studies help researchers to choose such plants. While exploring the chemopreventive and chemotherapeutic potential of these compounds, many of them shows more activity than synthetic one at even lower doses. These compounds exhibit molecular properties such as inhibition of phase I enzymes, stimulation of phase II enzymes, cell cycle arrest, hindrance in microtubule dynamics, suppression of telomerase activity, epigenetic modifications along with other activities on signaling pathways. The list of natural compounds showing these properties are growing logarithmically with time after the discovery of vinblastine and taxol. The world needs novel natural compounds targeting most of the cancer pathways for common cancer types.