

**2nd International Conference on Food, Health and
Agriculture Innovations (ICFHA 2020) Dubai, United Arab
Emirates
5th -9th March 2020**

**SOUVENIR CUM LEAD/ABSTRACTS PROCEEDINGS
BOOK**

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CONFERENCE MESSAGES

MESSAGE

It gives me an immense pleasure to note that United Lightning Vision is organizing 2nd International Conference on Food, Health and Agriculture Innovations 2020 in Dubai, United Arab Emirates from 5th - 9th March 2020.

The present conference involves a number of fields dealing with recent advancements in the field of Food, Health, Agriculture, Biotechnology and Molecular Biology. It is noted that several eminent scientist and clinicians of International repute along with a large number of young scientists and research scholars are taking active part in the conference.

I hope this conference will provide an opportunity for budding scientists to interact with the pioneers and will inculcate a positive exchange of ideas for the development of the emerging field of science.

I extend warm greetings to the organizers and wish them all grand success.

DIRECTOR

(Dr. A. Venkateshwari)

MESSAGE FROM THE PRESIENT ULV

ULV was established in 2018 and registered under pursuant to sub-section 7 Act, 2013 (18 of 2013) and rule 18 (Incorporation rules, 2014) Government of India, Ministry of Corporate Affairs, Central Registration Centre, India. ULV is a professional scientific, educational, and not-for-profit organization created with the goal of developing the credentials of scientists, academics and researchers from all academic and scientific disciplines. United Lightning Vision expects to publish scientific journals, books, professional memberships, seminars, seminars, and world-class programs. ULV currently operates from India, Dubai, Kenya and Bangladesh, Singapore, Sri Lanka, Hong Kong, Malaysia, and Thailand.

United Lightning Vision welcomes you all to the “2 International Conference on Food, the Health, Agriculture & Innovations” to be held during March 5 -9, 2020 in Dubai, United Arab Emirates. This particular conference will hold a unique position for presenting novel and fundamental advances and marching innovations in the areas of Agriculture, Food & Nutrition by facilitating communication among researchers and agricultural practitioners exposed to a wide variety of research areas with a common interest in improving Agriculture related techniques and through innovations. With the presence of highly affiliated personalities, researchers, scientists across the world and focused on sustainable agriculture & food security, this 2 ICFHAI-2020 conference is providing the platform for learning and sharing the new developments in the fields of agriculture, food, and nutrition.

Mr. Akhatar Rasool
(ULV,Hyderabad)

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DIRECTOR
(Dr. A. Venkateshwari)

MESSAGE

Food, Health, Agriculture Innovations – 2020 is one of the many technological developments that touches our lives. It has wide range of applications. I fondly hope that International Conference offers an awesome opportunity to make new contacts in the field of Food, Health, Agriculture Innovations, and to exchange the views of experts during the sessions which will definitely enrich and broaden the outlook on Food, Health, Agriculture Innovations. I wish the 2nd International Conference a grand success and hope that it will come out with updated technological advancements that usher a new era in Food, Health, Agriculture Innovations.

PROF. V. VANITA DAS
PROFESSOR OF ZOOLOGY
OSMANIA UNIVERSITY

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(Invited/Lead Paper)

FOOD TECHNOLOGY FOR FOOD, NUTRITION, HEALTH AND LIVELIHOOD SECURITY

Prof. (Mrs.) Vijaya Khader, Former Dean, ANGRAU, Hyderabad, India

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Food Technology can directly contribute to food security through enhancement of nutrient density establishment of tiny cottage scale for processing industry in rural areas would help to empower a rural woman which contributes livelihood security. Value addition/processing are need of the hour. Post-harvest management will save the food.

Rural employment opportunities should be increased by promoting post-harvest opportunities and value addition, entrepreneurship at the village level and this will increase the net income of the farmers. The promotion of agriculture, small scale rural industry, the rural economy gets a big boost and also corrects the rural- urban imbalance and prevents migration.

Food processing has huge potential to dramatically improve rural livelihoods by raising farm incomes through value addition in agricultural produce. "India is home to a wide-range of raw material suited for the food processing industry because of its diverse agro-climatic conditions. A very small percentage of these are processed into value added products at present. So, the scope, potential and opportunities are huge in this industry. In the 21st century, climate changes, water scarcity, increasing world population, rising food prices, and other socioeconomic impacts are expected to generate a great threat to agriculture and food security worldwide, especially for the poorest people who live in arid and sub arid regions. These impacts present a challenge to scientists and nutritionists to investigate the possibilities of producing, processing, and utilizing other potential food sources to end hunger and poverty. Cereal grains are the most important source of the world's food and have a significant role in the human diet throughout the world. As one of the most important drought-resistant crops, millet is widely grown in the semiarid tropics of Africa and Asia and constitutes a major source of carbohydrates and proteins for people living in these areas. In addition, because of their important contribution to national food security and potential health benefits, millet grain is now receiving increasing interest from food scientists, technologists, and nutritionists.

India is 3rd largest producer of fruits after Brazil and USA and 2nd in vegetables after China. It produces about 65% of world mangoes and bananas, 12% of World's onions. India has a potential production of mushrooms after China. India is center for biodiversity in plants, animals, insects, micro organisms and account for 17% animal, 12% plant and 10% fish generic resources in the world. In spite of these vast natural resources and abundant agricultural produce, India ranks below 10th in the export of food products. Conservative estimates put the processing levels in the fruits and vegetables sector at 2%, meat and poultry at 2%, by way of modern dairies at 14%, bulk meat de-boning of tuna at 21%. The food processing industry has an important role to play in linking the farmers to final consumers in domestic as well as international market. Food processing combined with marketing has the potential to solve the basic problems of agricultural surplus, wastage, rural jobs and better remuneration to the growers. In the next ten years, the food production is expected to be doubled. These produce, if processed and marketed smartly can make India to become a leading food supplier to the world.

Food loss and wastage: One third of the food produced for human consumption is lost or are wasted globally which amount about 1.3 billion per year. In developing nations 40% losses taking place during post harvesting and processing and 25% during pre-harvest process. In Industrial countries more than 40% losses occur at the retail and consumer level. The annual wastage of agriculture produce in India is almost 30% and equivalent to Rs.580 crores due to inadequate storage and processing facilities. The wasted food can feed almost 232 million people. Food losses represents a waste of resource used in production such as land, water, energy and inputs, increasing green gas emission.

Economic growth in India has failed nutrition: India has not met the millennium development goals not as planned for 2015. China, Brazil and Vietnam has reduced child under nutrition by 40% -60%. Reducing malnutrition is not just about health, agriculture and economics but it also accounts for politics, Governance and power.

Several Welfare Programs: National Nutrition Policy (1993); National Nutrition Plan of Action (1995); National Nutrition Mission (2001) not at achieved nutrition goals. Reasons: Nutrition is a poor cousin even in health and agriculture planning and execution, Nutrition improvement is not a stated goal with measurable parameters in National Food Security Mission, National Horticulture Mission and National Rural Health Mission.

The Most important National Nutrition Programs in India : Integrated child Development services program (ICDS), The targeted public distribution system (TPDS), Food for

work ,The National Mid, Day meals program (NMMP) ,Micro nutrient (Iron folate; Vitamin A; Iodized salt) schemes .

Research carried out by Prof. (Mrs.) Vijaya khader on the role of Food Technology on Food, Nutrition, and Health & Livelihood Security is summarized below:

Intervention of various technologies to improve the food & nutritional status of the population proved the following facts: Promotion of malt based small scale food industry not only provides opportunity for rural women to develop entrepreneurship and employment, but also provides food and nutritional security through income generation. Several technologies were developed under NATP like value addition to fish & prawn products, artificial pearl culture, processing of salted fish, which helped the self help group women of Andhra Pradesh, Karnataka, Kerala and Tamil Nadu to improve their economic status. Received two patents & licensed the technology which helped the women to reduce their drudgery and also preserve the fresh fish for a longer time without getting spoiled. Product development can be taken as income generating activity in the rural areas by the illiterate women. Products can be included in supplementary feeding programs in order to improve the nutritional status of the vulnerable groups of the population. The horse gram which is commonly used for cattle feed can be diversified for human consumption with less investment. Mothers as well as Anganwadi workers preferred amylase rich supplementary foods which reduced Grade 3 and grade 4 malnutrition in Pre- school children significantly. The studies revealed that spawn multiplication can be done by women as a co-operative venture and mushroom cultivation can be undertaken at household level as an income-generating activity. Introducing red palm oil is beneficial to overcome vitamin A deficiency. Impact of women's supplementary income on family's nutritional status showed that the supplementary income of women has a positive impact on the socioeconomic status of the family. This impact is particularly felt on the food and nutrient intake of the family contributing towards food & Nutrition security.

ROLE OF GMO'S IN ASSURING FOOD SECURITY AND NUTRITIONAL SECURITY

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ABSTRACT

Food security depends on three pillars namely, (1). Availability of food, (2). Accessibility of food and (3). Adsorption of food. Increased food grain production, especially cereals, through green revolution, paved the way for availability of food grains. The accessibility of food grains is made sure through different government policies, such as public distribution system (PDS). The adsorption of food to all the peoples is ensured through the supply of food grains at low cost. However, the burgeoning problem is how long government can feed the people? Can the world satite the demand for food grains in a sustainable manner. The existing food grain production technologies have proved their mettle in assuring food grain production to the 700 cores of people in earth. The world would become more populous by 2050. The available agriculture land could supply food for about 1000 crores people provided if agriculture is successful. Beyond that population food supply would be a biggest problem, for that the agricultural scientist have to work hard and squeeze the brain to augment the food grain production. Recent studies in molecular biology and biotechnology have resulted in the production of transgenic crop plants. The GM crop\ plants are free from pests and disease, tolerant to adverse abiotic stresses and above all high yielding. The cultivation of GMO crops faces so many ethical and social problems, for the acceptance, by vegetarian, especially. Unfortunately, the per capita availability of food is decreasing due to the population explosion. As nutrition security is the outcome of food security, the scientist ought to increase the food grain production further, for the alleviation of malnutrition people in general, especially the pregnant women and children of less than 5 years old. Profuse thanks to Puratchi Thalaivar MGR the former CM of Tamilnadu, who is unique and harbinger in the formulation and execution of nutritive food to the under privileged family member"s especially the children less than 5 years. The PTMGRNMS is the number one yeomon service to the mankind. Government of India has also implemented various schemes like NREGA for the assured daily wages and hence for the easy absorption

of food. It also formulated various policies to utilize GMO's in Indian Agriculture scenario. At present United States is the number one in the cultivation and utilization of GMO's. About 50-60 per cent of the maize, cultivated in US are of transgenic in nature. Nearly 40-50 per cent of cotton cultivated in USA is the result of Recombinant DNA Technology. It also cultivates transgenic fruit crops as well as vegetables.

Keywords : Availability, Accessibility, Adsorption, Food security, nutrition Security.

Introduction

Food security is situation that exist when all the people at all times, have physical, social and economic access to sufficient, safe and nutritious food, that meets their dietary needs and food preferences for an active and healthy life (FAO 2002). The population of earth is 686 billion, but of which 125 billion peoples are poor, the poor people earn about 1-2 dollars per play. Ensuring food and nutrition security to all the people of universe is thus a challenge. Green Revolution during 1960-70's increase the food grain production. There were 5-6 fold increase in food grain production during 2018-2019. Many countries in universe have become self dependent on food grain production and infact many countries have become net exporter.

The available cultivable land in universe under the solar system is 38.4 percent(17.235,800 billion ha). The gross irrigated crop area is 11.6 percent(149,000,000 Ha). The ratio of population growth is 22 per cent and the rate of food grain production is 8 per cent. Thus, it indicated that the population growth is geometric and the food grain production is arithmetic. It is reminiscent of Malthusian theory. If it is right, then one should expect a famine in the near future. Agriculture scientists must find a way to augment the food grain production in a sustainable manner. The starvation and hunger index score is more in East African country. To alleviate starvation and hunger the *invivo* as well as *invitro* plant breeders have to find a stable and permanent solution. Recombinant DNA technology is emerging as a potential tool for the production of transgenic crop plants with inbuilt tolerance to biotic and abiotic stresses and above all high yielding. Some of the approaches made through Recombinant DNA Technology to achieve food and nutritional security are discussed below.

ACCOMPLISHMENTS AND ACHIVEMENTS

1) TRANSFER OF „NIF“ GENES INTO CEREALS:

Nitrogen fixing organisms fix about 2.8 times of nitrogen per year. (Grierson and Covey, 1984). Nitrogen fixing bacteria are *Klebsiella pneumonia*, *Azotobacter vinelandii*, *Rhizobium Spp.*, *Rhodospirillum spp.*, *Frankia spp.*, *Rhodopseudomonas spp.*, *Frankia spp.*, *Clostridium spp.*, *Anabena spp.*, *Methanococcus spp.*, and *Azospirillum spp.*, (Johnston, 1989). The host range of N-Fixing bacteria is limited, for example, *R.leguminosarum* infects only peas. It is a plasmid borne trait. (Downie and Johnston, 1988). Thirteen „nod' genes have been identified (Downie, 1991) in *R.leguminosarum* viciae. Many of the *Rhizobium* genes involved in the establishment of nitrogen fixing nodules are located in circular plasmid P^{RL1J1}, of 200kb DNA. It encodes the genetic determinants for nodulation, nitrogen fixation and host-range specificity in peas, with a base sequence encompassing only 45kb DNA. The world's cereal crops such as rice, wheat, maize etc require large amount of nitrogenous fertilizers. They cannot fix atmospheric nitrogen. Nitrogen fixing genes (nif genes) have been isolated from *Rhizobia* and have been successfully incorporated in to a vector. Vector system could be used to transfer the nitrogen fixing ability in to non-leguminous plants.

2) GENETIC ENGINEERING AND MODIFICATION OF EDIBLE OIL COMPOSITION

Voelkav *et al.*, (1992) suggested the modification of seed oil composition by the direct gene insertion. A lauroyl-ACP *specificity* thioesterase was cloned from *Clmbellularia California* and its expression in *Arabidopsis thaliana*, resulted in transformants containing up to 24 per cent of lauric acid in the seed oil. Subsequent transformations of *Brassica napus* produces about 40 per cent lauric acid in the seed oil. The stearic acid content of *Brassica napus* and *B.rapa* seed oils was increased about two percents to as much as 40 per cent by expressing a stearyl-acyl-carrier protein desaturase in the antisenses orientation (Knutzon *et al.* ,1992). Thus, it is possible to enhance the product of a particular enzyme by over- expression of it encoding gene.

3) GENETIC ENGINEERING AND CHANGING FOOD PROTEINS

The decorticated soybean contains 42 per cent protein. Emulsification is the most important and widely used properties of soya protein. Emulsifying activity of soya protein depends upon the soluble protein content. De-amidation of proteins i.e.

Cowpea trypsin inhibitor (C_pT_i) is an anti-metabolic compound against *Heliothis*, *Spodoptera*, *Diabrotia*, *Manduca* and *Tribolium* (Hilder *et al.*, 1987). Transgenic tobacco plants transformed with the disarmed C_pT_i neomycin phosphor transferase expressed the trypsin inhibitor protein (Ryan, 1985), Transgenic tomato, showed a significant reduction in damage to fruit fly and fruit worms (Perlak and Fishhoff, 1993). Transgenic potato plants with „Bt“-genes conferred resistance against Colorado potato beetle. Transgenic cotton plants with synthetic „Bt“ gene viz., „Btk“ conferred resistance against cotton bollworms. Transgenic maize plants with „Btk“ conferred resistance against European corn Borer.

Transgenic tobacco plants resistant to TMV conferring a coat protein gene (CP gene) was achieved (Shan *et al.*, 1985). Zhu *et al.*, (1994) demonstrated about the constitutive co-expression of chitinase and glucanase genes in tobacco plants. These transgenic plants are resistant to fungal diseases. Hein *et al.*, (1993) reported about the expression of stilbenase synthase gene from grapevine resulted in the production of new phytoalexin (resveratrol) in transgenic tobacco plants with enhanced resistance to *Botrytis cinerea*. The expression of a barley a thionin gene significantly enhanced the resistance of transgenic tomato to *Pseudomonas syringae* (Anzai, 1989).

8) GENETIC ENGINEERING FOR ALTERED SEED PROTEIN CONTENT:

Cereals contain 7-26% proteins (prolamines) and pulses contain 25-35 per cent protein (globulin). Cloning and expression of storage protein genes have been achieved.

9) GENETIC ENGINEERING FOR MALE STERILITY (HYBRID BREEDING:

Transgenic tobacco plants with rol C A of *Agrobacterium rhizogenes* plus CaMv 35 S, were sterile. (Schmulling *et al.*, 1988). Transfer of TA-29 RNase gene included male sterility in transgenic tobacco plants (Mariani *et al.*, 1980).

EDIBLE INSECTS AS AN ENGINE FOR IMPROVING LIVELIHOOD - REVIEW

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THE ROLE OF INSECTS

It is estimated that insects form part of the traditional diets of at least two billion people. More than 1 900 species have reportedly been used as food. Insects deliver a host of ecological services that are fundamental to the survival of humankind. They also play an important role as pollinators in plant reproduction, in improving soil fertility through waste bioconversion, and in natural biocontrol for harmful pest species, and they provide a variety of valuable products for humans such as honey and silk and medical applications such as maggot therapy. In addition, insects have assumed their place in human cultures as collection items and ornaments and in movies, visual arts and literature. Globally, the most commonly consumed insects are beetles (Coleoptera) (31 percent), caterpillars (Lepidoptera) (18 percent) and bees, wasps and ants (Hymenoptera) (14 percent). Following these are grasshoppers, locusts and crickets (Orthoptera) (13 percent), cicadas, leafhoppers, planthoppers, scale insects and true bugs (Hemiptera) (10 percent), termites (Isoptera) (3 percent), dragonflies (Odonata) (3 percent), flies (Diptera) (2 percent) and other orders (5 percent).

CULTURE

Entomophagy is heavily influenced by cultural and religious practices, and insects are commonly consumed as a food source in many regions of the world. In most Western countries, however, people view entomophagy with disgust and associate eating insects with primitive behaviour. This attitude has resulted in the neglect of insects in agricultural research. Despite historical references to the use of insects for food, the topic of entomophagy has only very recently started to capture public attention worldwide.

NUTRITION FOR HUMAN CONSUMPTION

Insects are a highly nutritious and healthy food source with high fat, protein, vitamin, fibre and mineral content. The nutritional value of edible insects is highly variable because of the wide range of edible insect species. Even within the same group of species, nutritional value may differ depending on the metamorphic stage of the insect, the habitat in which it lives, and its diet. For example, the composition of unsaturated omega-3 and six fatty acids in mealworms is comparable with that in fish (and higher than in cattle and pigs), and the protein, vitamin and mineral content of mealworms is similar to that in fish and meat.

FARMING SYSTEMS

Most edible insects are harvested in the wild. However, some insect species, such as bees and silkworms, have a long history of domestication because of the value of their products. Insects are also reared in large numbers for the purposes of biological control (e.g. as predators and parasitoids), health (e.g. maggot therapy) and pollination. The concept of farming insects for food is, however, relatively new; an example of rearing insects for human consumption in the tropics is cricket farming in the Lao People's Democratic Republic, Thailand and Vietnam.

In temperate zones, insect farming is performed largely by family-run enterprises that rear insects such as mealworms, crickets and grasshoppers in large quantities, mainly as pets or for zoos. Some of these firms have only recently been able to commercialize insects as food and feed, and the part of their production intended for direct human consumption is still minimal.

A few industrial-scale enterprises are in various stages of start-up for rearing mass quantities of insects such as black soldier flies. They are mainly for consumption as whole insects or to be processed into meal for feed. Critical elements for successful rearing include research on biology, rearing condition control and diet formulas for the farmed insect species. Current production systems are expensive, with many patents pending. A major challenge of such industrial-scale rearing is the development of automation processes to make plants economically competitive with the production of meat (or meat-substitutes like soy) from traditional livestock or farming sources.

INSECTS AS ANIMAL FEED

Recent high demand and consequent high prices for fishmeal/soy, together with increasing aquacultural production, is pushing new research into the development of insect protein for aquaculture and poultry. Insect-based feed products could have a similar market to fishmeal and soy, which are presently the major components used in feed formulae for aquaculture and livestock. Available evidence suggests that insect-based feeds are comparable with fishmeal and soy-based feed formulae. Live and dead insects already have established niche markets, mainly as feed given to pets and at zoos.

PROCESSING

Insects are often consumed whole but can also be processed into granular or paste forms. Extracting proteins, fats, chitin, minerals and vitamins is also possible. At present, such extraction processes are too costly and will need to be further developed to render them profitable and applicable for industrial use in the food and feed sectors.

FOOD SAFETY AND PRESERVATION

The processing and storage of insects and their products should follow the same health and sanitation regulations as for any other traditional food or feed items in order to ensure food safety. Because of their biological makeup, several issues should be considered, such as microbial safety, toxicity, palatability and the presence of inorganic compounds. Specific health implications should also be considered when insects for feed are reared on waste products such as manure or slaughterhouse waste. Evidence of allergies induced through the ingestion of insects is scarce, but does exist. Some cases have been reported of allergic reactions to arthropods.

LIVELIHOOD IMPROVEMENT

Insect gathering and rearing as minilivestock at the household level or industrial scale can offer important livelihood opportunities for people in both developing and developed countries. In developing countries, some of the poorest members of society, such as women and landless dwellers in urban and rural areas, can easily become involved in the gathering, cultivation, processing and sale of insects. These activities can directly improve their own diets and provide cash income through the

selling of excess production as street foods. Insects can be directly and easily collected from nature or farmed with minimal technical or capital expenditure (i.e. for basic harvesting/rearing equipment). Rearing insects may also require minimal land or market introduction efforts, as insects already form part of some local food cultures. Protein and other nutritional deficiencies are typically more widespread in disadvantaged segments of society and during times of social conflict and natural disaster. Because of their nutritional composition, accessibility, simple rearing techniques and quick growth rates, insects can offer a cheap and efficient opportunity to counter nutritional insecurity by providing emergency food and by improving livelihoods and the quality of traditional diets among vulnerable people.

ECONOMIC DEVELOPMENT

Gathering and farming insects can offer employment and cash income, either at the household level or in larger, industrial-scale operations. In developing countries in Southern and Central Africa and Southeast Asia, where demand for edible insects exists and where it is relatively easy to bring insects to market, the process of insect gathering, rearing and processing into street foods or for sale as chicken and fish feed is easily within reach of small-scale enterprises. With only a few exceptions, international trade in insects for food is insignificant. The trade that does exist to developed countries is often driven by demand from immigrant communities or because of the development of niche markets that sell exotic foods. Border trade in edible insects is significant, mainly in Southeast Asia and Central Africa.

COMMUNICATION

The polarity of views surrounding the practice of entomophagy necessarily requires tailor-made communication approaches for each of the various stakeholders. In the tropics, where entomophagy is well established, media communication strategies should promote edible insects as valuable sources of nutrition to counter the growing westernization of diets. Western societies require tailored media communication strategies and educational programmes that address the disgust factor. Influencing the public at large as well as policymakers and investors in the food and feed sectors by providing validated information on the potential of insects as food and feed sources can help to push insects higher on political, investment and research agendas worldwide.

LEGISLATION

Regulatory frameworks governing food and feed chains have expanded tremendously in the last 20 years; however, regulations governing insects as food and feed sources are still largely absent. For developed countries, the absence of clear legislation and norms guiding the use of insects as food and feed is among the major limiting factors hindering the industrial development of farming insects to supply the food and feed sectors. In developing countries, the use of insects for human or animal food is, in practice, more tolerated than regulated. The feed sector seems to take the lead in pushing for the development of more insect-encompassing norms, while the “novel food” concept seems to be emerging as a leading instrument for setting rules and standards for the use of insects in human foods.

THE WAY FORWARD

Any effort to release the huge potential that insects offer for enhancing food security requires that the following four key bottlenecks and challenges are addressed simultaneously. First, further documentation is needed on the nutritional values of insects in order to more efficiently promote insects as healthy food. Second, the environmental impacts of harvesting and farming insects must be investigated to enable comparison with traditional farming and livestock rearing practices that may be more environmentally damaging. Third, clarification and augmentation of the socio-economic benefits that insect gathering and farming can offer is needed, in particular to enhance the food security of the poorest of society. Finally, a clear and comprehensive legal framework at (inter)national levels is needed to pave the way for more investment, leading to the full development (from the household to the industrial scale) of production and international trade in insect products as food and feed sources.

Effect of CTD on grain yield and membrane stability in bread wheat under the normal and heat stress condition

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ABSTRACT

Relationships among canopy temperature depression with grain yield and membrane thermo stability were conducted by 50 diverse wheat genotypes under the condition of normal and heat stress environment. All the characters namely, grain filling duration; tillers per plant; tillers per meter; spikelet's per spike; seed per spike; thousand grain weight; harvest index and canopy temperature depression expressed significant interaction with environments, indicating that all characters respond to high temperature in different ways in different genotypes. These characters showed positive association with grain yield whereas, days to heading exhibited negative association with grain yield under both normal and heat-stress environment respectively. Under heat-stress environment, days to maturity; plant height and biological yield revealed positive association with grain yield, while cell membrane thermo stability had negative association with grain yield. These traits can be utilized as selection criteria for improving the grain yield in the warmer wheat growing areas for terminal heat-stress.

Key words: bread wheat, canopy temperature depression, correlation coefficient, cell membrane thermo-stability, terminal heat stress.

INTRODUCTION:

Wheat (*Triticum aestivum* L.) is the most widely grown and consumed food crop all over the world and staple food of nearly 35 percent of the world's population and the demand for wheat as estimated to grow faster than any other crop. Abiotic stress, such as drought, temperature, salinity and nutrient imbalance reduce wheat yield in

many environments. Wheat producers are seeking new heat tolerant germplasm suited to these stressed areas.

High temperature during grain growth is a main environmental factor that reduces the grain yield because of the induction of early senescence and acceleration of grain filling activities in wheat due to shortening of grain filling duration and constriction of carbon assimilation (Stone 2001). Grain weight is negatively affected by high temperature, especially those above 34° C, that reduce the duration of grain filling owing to the limited photosynthesis.

Cell Membrane Thermal Stability (CMTS), a measure of electrolyte diffusion resulting from heat-induced cell membrane leakage, has been used to screen and evaluate different wheat genotypes for thermal tolerance (Blum and Ebercon 1981). This method measures the increased electrolyte diffusion resulting from heat induced cell membrane permeability. Electrical conductivity has been used as an index of membrane stability to identify heat-tolerant genotypes in wheat. Study was carried out to investigate the relationship between canopy temperature depression, membrane thermo-stability and other physiological traits with grain yield and yield contributing traits under normal and heat stress environments in wheat and identification of suitable genotypes for higher production and productivity in the target environments.

MATERIALS AND METHODS:

Fifty elite genotypes of bread wheat meant for different agronomic practices like timely-sown irrigated conditions & late-sown irrigated conditions. These lines were genetically diverse, released and pre release wheat material developed by cooperating centers of All India Wheat Coordinated and Barley improvement project.

Sowing was done on 15th November as timely sown and 15th December as late sown, where timely sown conditions was considered as normal environment and late sown conditions as heat-stress environment.

Data were recorded on fourteen morpho- physiological traits as days to heading, days to maturity, grain filling duration, plant height (cm), number of tillers/plant, number of tillers/m, number of spikelet"s/spike, number of seeds/spike, thousand grain weight (g), biological yield (g/plot), harvest index (%), canopy temperature depression, cell membrane thermo stability and grain yield (g/plot) from each plot. The canopy temperature depression (CTD) was measured at anthesis using a portable infrared thermometer (Model AG-42, Tele temp Corporation,

Fullerton, CA) with a view of 2.5°C at late morning to early afternoon in cloudless period. The data for each plot were the mean of 10 readings taken at an angle of 45°C. Membrane thermal stability was estimated using procedures as described by Blum and Ebercon (1981).

RESULT AND DISCUSSION:

All the traits studied showed significant variation in respect of the genotypes. This was apparent from the significant to highly significant values (F-calculated values) under timely sown conditions of 1st year and 2nd year and late sown conditions of the 1st year and 2nd year. The F- calculated values of timely sown conditions of both the year were almost similar as also in late sown conditions. Therefore, mean values of two years each for timely sown conditions and late sown conditions was used for analysis as normal and heat-stress environment. There was also significant differences exist at genotypic level under normal and heat-stress environment. One of the reasons for this may be due to the fact that all the genotypes differ greatly with respect to their parentage for which the material has been chosen very carefully. Therefore, there is a scope for selection. This variability may be because all the genotypes selected in the present experiment were genetically different with more genetic variability for the traits under consideration. This study reveals that the test genotypes behave differently for the studied characters under high temperature.

High tillering is always preferred by wheat growers. In this study tillers per plant and tillers per meter positively correlated with number of spikelets/spike, seeds per spike, harvest index and with grain yield. Number of spikelets per spike positive and significant correlated with seeds per spike; thousand grain weight; harvest index and grain yield, in turn seeds per spike positively correlated with grain yield, while it negatively with thousand grain weight; biological yield and with CMTS. The canopy temperature depression (CTD) and cell membrane thermo stability (CMTS) are strong physiological traits for selecting best genotypes under heat-stress environment and, CTD positively correlation with grain yield, while CMTS negatively with grain yield at genotypic level.

Similar results were also obtained by Gowda *et al.* (2011), Kumari *et al.* (2007) and Reynolds *et al.* (2007). The plant breeders argue that selection for yield component is more efficient than the selection for yield *per se*. So it can be concluded that

significant positive correlation with grain yield could be better with improvement of components under normal and heat-stress environments.

CONCLUSION:

It can be concluded in the investigation that there were eight traits as grain filling duration; tillers per plant, tillers per meter; spikelet's per spike, seed per spike, thousand grain weight, harvest index and canopy temperature depression which have positive association with grain yield and one trait days to heading showed negative association with yield under both normal and heat-stress environment. Under heat-stress environment three traits as, days to maturity, plant height and biological yield showed positive association with grain yield, cell membrane thermo stability showed negative association with grain yield. Therefore, it is clear that canopy temperature depression and cell membrane thermo stability are strong physiological traits can be utilized as selection criteria under terminal heat stress for selecting genotypes with better yield potential.

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A VARIANT (RS13429458) IN THADA (THADA ARMADILLO REPEAT CONTAINING) GENE IS ASSOCIATED WITH AN INCREASED RISK OF PCOS IN SOUTH INDIAN POPULATION.

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ABSTRACT

Background: Polycystic ovarian syndrome (PCOS) is a common endocrine disorder affecting women of reproductive age. Studies have consistently reported a familial clustering hinting at the role of probable genetic susceptibility in the onset of the disease. It is now well established that it is a complex disease with both genetic and environmental interactions. Genome wide association studies (GWAS) identify variants that confer susceptibility to a phenotype in an unbiased manner. There are no published GWAS for PCOS in the Indian ethnicity, therefore this study replicated the variants identified by other GWAS in Indian ethnicity.

Methods: Blood samples, demographic and clinical details were collected from study subjects (n=600) recruited after obtaining written informed consent. Variants (n=15) were identified from from GWA studies performed in other ethnicities and replicated initially in half of the recruited samples (n=300) using MassARRAYiPLEX™. Significant variant identified from the preliminary data were genotyped for association in remainder of the samples (n=300) by PCR and direct sequencing. Insilco analysis for significant variant was performed using software namely CADD, GWAVA, FATHMM-MKL. Chi-square test and Odds ratio was performed to ascertain the significance and strength of association.

Results: The mean age of patients and controls was 24.26±3.22 and 30.19±11.21 years respectively. Of the 15 variants, a variant (rs13429458) in THADA gene was significantly (p=0.0001) associated with PCOS conferring a 3.50 fold enhanced risk of the disease (Odds- 3.50 95% CI – 1.64-7.45). Further, the association of this variant was successfully replicated in an independent cohort and the variant was classified as deleterious by insilico analysis.

ASSOCIATION OF 2794A/G PALB2 POLYMORPHISMS IN THE ETIOLOGY OF OVARIAN CANCER

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ABSTRACT

Background: The partner and localizer of breast cancer 2 (PALB2) has an essential role in BRCA2 mediated DNA double-strand break repair by serving as a bridging molecule and acting as the physical and functional link between BRCA1 and BRCA2 proteins. **The common variants in the PALB2 gene may confer susceptibility to breast and/or ovarian cancer.** Truncating mutations in the PALB2 gene are rare but are thought to be associated with increased risk of developing breast and /or ovarian cancer in different populations. It is now well established that women who carry loss-of-function mutations in the PALB2 gene are at similar cancer risk to those who carry mutations in BRCA2. Thus the present study was designed to investigate the 2794 A/G polymorphism of PALB2 and their association with ovarian cancer risk.

Material &Methods: A total of 150 histopathologically confirmed ovarian cancer patients and 250 healthy age matched controls were considered for the present study. DNA was extracted from the samples collected from all the subjects followed by a standard amplification refractory mutation system (ARMS) PCR was carried out for genotyping of 2794G/Ars45624036 of PALB2 gene and genotyped by agarose gel electrophoresis.

Results: A significant association of 2794G/A (**rs45624036**) polymorphism with OC was observed in co-dominant (OR=4.46; 95%CI=1.97-10.1; p=**0.0002**), dominant (OR=4.60;95%CI 2.05-10.2; p=**0.0001**) and over dominant (OR=4.27; 95%CI 1.89-9.65; p=**0.0003**) inheritance models. On the other hand, at the allelic level, the „A“ allele was found to be strongly associated and conferred **four-fold increased risk** compared to G allele in Ovarian cancer group.

ORAL presentation

Development and Characterization of Omega-3 Fatty Acid Nanoemulsions: Impact of Physicochemical Stability and Bioaccessibility.

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ABSTRACT

Poly unsaturated fatty acids particularly, Docosahexanoic acid (DHA) and Eicosapentanoic acid are the essential nutrients that affect early growth and development as well as the onset of chronic diseases in later life. Supplementation or food fortification strategies to meet the recommended dietary allowances are facing the challenges like stability and bioavailability. In the present study, omega-3 fatty acids are encapsulated in the form of nanoemulsions for improved bioavailability using low energy method. The composition and concentration of oil, water, surfactant and co-surfactants were selected based on a ternary phase diagram. Among seven cooking oils tested, sunflower oil produced stable nanoemulsions and passed through physical stress conditions. Surfactant mix, Omega 3 fatty acids (EPA+DHA) are incorporated in to oil phase and emulsions were prepared by low energy method and their physico-chemical properties have been studied upon storage at 4°C, 25°C and 40°C upto 28 days. Nanoemulsions droplet size was observed to be within the range of 100-200nm, zeta potential (ζ) above -30mV with polydispersity index less than 0.5 after storing for more than 28 days at 4°C, 25°C and 14 days at 40°C. Further, addition of cholecalciferol (vitamin D) enhanced the emulsion stability upto 20 days at 40°C and also improved oxidative stability. The stability of DHA and EPA has been observed to be 87% and 86% at 4°C, 25°C respectively at the end of four weeks and 51% at 40°C after three weeks storage. Bioaccessibility studies using gastrointestinal simulation model showed high availability compared to plain oils with added DHA & EPA. These nanoemulsions can be of use for supportive therapies and food based approaches to improve omega 3 fatty acid nutrition. This is first of its kind which fabricated an efficient nano-vehicle with cooking oils using low energy method for the delivery of omega 3 fattyacids.

Key Words: Fatty acids, cooking oils, nanoemulsions, cholecalciferol, GIT simulation, bioaccessibility

STMS and quantitative trait based genetic and allelic relationship of chickpea

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ABSTRACT

STMS markers and morphological traits were used for leguminous crop chickpea to investigate the genetic relationship and allelic diversity. In this study, we focused on the selection and more efficient utilization of this germplasm in breeding programmes for crop improvement using STMS and morphological markers. 50 STMS markers and 11 quantitative traits were used for exploring the genetic variability and relationship in 35 chickpea accessions. A total of 97 alleles were produced at the 32 polymorphic STMS loci ranged from 2-6 alleles per primer with an average of 3.03 alleles per locus. The PIC value ranged from 0.029 (NCPGR 37) to 0.768 (NCPGR 68) with an average of 0.502. PIC value showed a highly positive correlation ($r = 0.718$) with number of alleles at the STMS loci. In both molecular and morphological based clustering, out of 35 chickpea accessions only one accession ICC-13892 was isolated at the end of clustering. These results indicated that microsatellite markers are highly polymorphic and STMS and morphological markers are adequate for studies of genetic diversity.

Keywords:- Chickpea; STMS; polymorphic information content; allelic diversity; genetic diversity; DNA fingerprinting.

Morphological and Biochemical Assessment of Nine Genotypes of Flax Seed (*Linum usitatissimum* L.) under Salinity Stress

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ABSTRACT

In the era of global climate change agricultural productivity is threatened by array of abiotic stresses with scarcity of irrigation water. Overcoming the deleterious effect of abiotic stressors is most prominent challenge for enhancement of germination, seedling character and physiological analysis. Therefore, the present study was carried out with the aim to evaluate the physiological responses of nine heterosis line of linseed (*Linum usitatissimum* L.). Seed germinated under four level of salinity stress (100 mM, 150 mM, 200 mM, and 250 mM NaCl) to look insight the adaptive mechanisms involved. The germination percentage, root length, shoots length, and seedling vigor index was significantly varied under different treatments of salt stress. Markers of oxidative stress, such as peroxidase (pox), superoxide dismutase (SOD), proline (pro) and malondialdehyde (MDA) might be the central components of adaptive mechanism of plants to maintain cellular ionic homeostasis under salt stress were determined. The outcome of this study emphasized that the gradual increase of NaCl decreased all the morphological characteristics except the oxidative stress markers. We found that all the tested genotype showed differential response in terms of proline and MDA content along with peroxidase and SOD, to counteract and remedied the salt stress through maintenance of cellular osmotic adjustment. Among all the tested genotypes SHA7, followed by SHA8 and SHA9 performed exceeded record of germination and seedling characteristics through osmotic adjustment by the regulation of ionic homeostasis by oxidative stress markers.

Key Words: Linseed, Heterosis, Seed vigour, Antioxidant.

STUDIES ON VARIABILITY FOR YIELSD AND YIELD ATTRIBUTING TRAITS AND YELLOW MOSAIC VIRUS DISEASE RESISTANCE IN F₁ AND F_s POPULATIOIS OF BLACKGRAM [*VIGNA MUNGO* (L.) HEPPER]

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ABSTRACT

Variability in two F₁ and F₂ populations involving Yellow Mosaic Virus (YMV) disease susceptible (ADT 5) and resistance (VBN 6 and VBN 8) parents viz., ADT 5 x VBN 6 and ADT 5 x VBN 8 of blackgram were studied. The high magnitude of GCV was recorded in number of branches per plant, number of clusters per plant, number of pods per plant seed yield per plant, YMV disease score at 45 DAS, YMV disease score at 60 DAS and seed yield per plant in both F₂ populations. High heritability coupled high GA as percent of mean was recorded number of branches per plant, number of pods per plant, YMV disease score at 60 DAS and seed yield per plant in the both the populations. These characters might be controlled by additive gene effects and hence selection will be effective for this character. Skewness negative and Kurtosis revealed that curvy nature was observed for number of yield per plant in both crosses and F₂ populations. Hence, these traits can be improved by direct selection in both populations. Considering the skewness kurtosis for YMV disease resistance, the cross ADT 5 x VBN 6 had curvy nature. Hence selection may be effected in this cross to evolve YMV disease resistant variety in blackgram and also in greengrams.

Keywords: Blackgram, Yellow Mosaic Virus, seed yield per plant, F₁ hybrids and F_s populatios.

COMPARATIVE ANALYSIS OF PHENYLALANINE AND TYROSINE AMMONIUM LYASE ACTIVITIES OF VIOLA SPECIES FROM DIFFERENT KASHMIR REGION

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ABSTRACT

The plant *Viola* species belongs to family *Violaceae* which has been recognized as an important medicinal plant due to its traditional therapeutic role in the treatment of respiratory disorders, Laxative, cancer, tumor and many other pathological conditions. In the present study, the comparative phytochemical parameters mostly Phenylalanine ammonium Lyase (PAL) and Tyrosine Ammonium Lyase (TAL) activity was assessed, with in the *viola* species and along the altitude gradients as these are the key enzymes for the biosynthesis of phenyl-propanoid products and are stimulated under stress conditions. The results revealed a significant amount of variation in terms of its phytochemical activities based on different altitudes ranges and within *Viola* species across Kashmir valley. The variation can be attributed to the difference in the agro-climatic zones inhabited by *Viola canescens*, *Viola biflora* and *Viola odorata*. The maximum PAL and TAL activity was observed in the samples of *Viola canescens* collected from Wangat Conservation Reserve (WCR) at Naranag wildlife area of Ganderbal District, J&K, India, at an altitude of 2850 meters. In conclusion, the present study showed that the *Viola canescens* growing at higher altitude exhibits higher phytochemical or enzyme activity and morphological adaptations to combats the oxidative stress.

Keywords: phytochemical, PAL, TAL, Kashmir, *Viola*.

EFFECT OF SALT (NACL) STRESS ON ANTIOXIDATIVE CHARACTERISTICS, OSMOLYTES AND ABA IN TWO SESAME (*SESAMUM INDICUM* L.) VARIETIES

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ABSTRACT

Salinity is an environmental stress that obstruct normal growth and development of plants by hampers their physiological and cellular functioning. Sesame (*Sesamum indicum* L.) is one of the world's oldest spice and oil seed crop grown mainly for its seeds that contain approximately 50% oil and 25% protein. Antioxidative enzyme activities and foliar contents of proline, glycine betaine and abscisic acid (ABA) along with lipid peroxidation rates and electrolytic leakage were determined in two sesame varieties (TMV-6 and VRI-3) subjected to salt stress of different concentrations (0, 40, 80 and 120mM) as a basal dose and sampling was done in leaves on 30th Days After Treatment (DAT), The activities of antioxidant enzymes which include superoxide dismutase (SOD, EC 1.15.1.1), catalase (CAT, EC 1.11.1.6), glutathione reductase (GR, EC 1.6.4.2), ascorbate peroxidase (APX, EC 1.11.1.11) and peroxidase (POD, EC 1.11.1.7) were significantly high in the salt stressed leaves. Higher antioxidant enzyme activities were observed in the leaf extracts of TMV-6, while the lowest activities were recorded with VRI-3. Lower rates of membrane lipid peroxidation and electrolytic leakage were noticed in the leaves of TMV-6 under salt stress. Quantitative differences were also noticed in foliar proline, glycine betaine and abscisic acid contents between two sesame varieties in response to salt stress. The leaves of TMV-6 accumulated more proline, glycine betaine and abscisic acid under salt stress while lower content in VRI-3. Our data demonstrated that TMV-6 have efficient antioxidative characteristics which could provide better protection against oxidative stress in leaves under salt stressed conditions.

Key words: Abscisic acid, Antioxidative enzymes, Electrolytic leakage, Lipid peroxidation, Osmolytes, Salt stress, *Sesamum indicum*.

INFLUENCE OF SUPER ABSORBENT POLYMER ON GROWTH AND YIELD IN *LYCOPERSICON ESCULENTUM* L. MILL VAR. PUSA RUBY UNDER WATER DEFICIT CONDITION

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ABSTRACT

The presence of water in soil is essential for vegetation which ensures the feeding of plants with nutritive elements, and makes it possible for the plants to obtain a better growth rate. Irrigation water is becoming increasingly limited in India and as per prediction eastern part of Uttar Pradesh is going to face temperature rise and water scarcity in coming future and hence it is important to improve water retention capacity of soil by exploiting the existing available water potential that may ensure better living conditions for plant growth. Super absorbent polymer beside being soil conditioner are among promising aspect to explore for such. An attempt has been made in this investigation to understand the efficiency of super absorbent polymer (Potassium polyacrylate) as a water retainer under pot condition and its effect on growth and yield of tomato crop. For the purpose various growth, yield, physiological, biochemical and soil physical parameters were analyzed at different duration under the influence of different level of SAP (0, 0.50, 0.75, 1.00, 1.25, 1.50 and 1.75g/plant) under water stressed condition. The results of the investigation revealed that potassium polyacrylate can be used as a water retainer in soil with improving in soil quality related to soil plant continuum. Further it showed positive effects on all the growth, yield, physiological, biochemical and soil parameters observed under water deficient environment. In respect of all parameters the treatment T7 (SAP @ 1.75 g/plant) was found superior.

Keywords; super absorbent polymer, water use efficiency, water deficit, tomato, soil, irrigation

MORPHOLOGICAL, BIOCHEMICAL AND MOLECULAR CHARACTERIZATION OF LATHYRUS GERMPLASM

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ABSTRACT

Grasspea (*Lathyrus sativus* L.) $2n=14$, belongs to the genus *Lathyrus* of the family Fabaceae. Being minor pulse crop, grasspea is always neglected by farmers due to high BOAA and low protein content in the local cultivars. We have carried out morphological, biochemical and molecular characterization of *Lathyrus* germplasm by a Randomized Complete Block Design with thirty two genotypes along with two checks in three replications for estimation of heritability, genetic advance, correlation, path analysis, genetic diversity at molecular level and also biochemical analysis. The morphological parameters used for analysis were days to 50% flowering, days to maturity, number of primary branches, plant height, number of pods per plant, number of seeds per pod, pod length(cm), pod width(cm), 100-seed weight(g), grain yield per plant, biological yield (g) and harvest index (%). The biochemical parameters included seed protein content (%) and BOAA content (%) estimation. Based on the mean performance the genotypes LKH L-4 and LKH L-18 were identified as the superior genotypes for yield and yield attributing traits. However, the genotype Sabour local Diyara and LKH L-9 where showed the low BOAA content and high protein content. BOAA Content of the genotypes varied from Sabour local diyara (0.21%) and LKH L-21 (2.6%) with general mean of (1.67%) (Fig.1). Protein content of the genotypes varied from LKH L-11 (15.43%) and Samastipur local (31.79%) with general mean (20.60%) (Fig.2). These genotypes identified as the superior genotype for low BOAA and high protein content. The identified genotypes may be used in the future breeding programme for yield and nutritional improvement in grasspea. Diversity analysis was done using 20 SSR markers to get clear picture of genetic diversity among the genotypes at molecular level. Based on molecular analysis it appears that sufficient diversity was recorded among genotypes. In the investigation, most of the SSR markers used showed polymorphism and detected a total of 21 alleles with an average of 1.91 alleles per locus. Out of 20 SSR primers, 11 were found polymorphic. Therefore the characters contributing maximum to genetic diversity may be given importance during chickpea hybridization program. The results indicated that the genotypes under study are highly diversified and these genotypes may be utilized in further grasspea breeding program aimed to enhance grain yield.

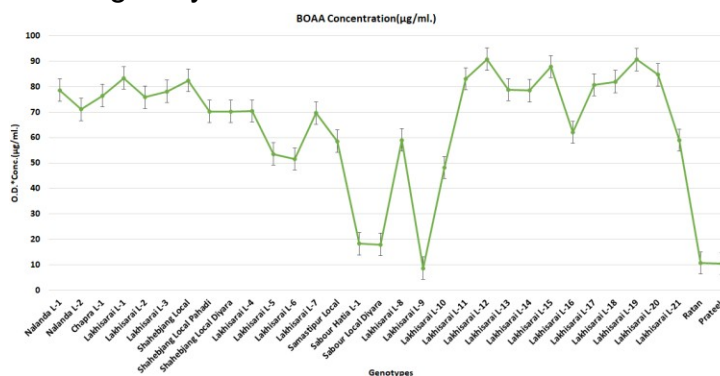


Fig1: BOAA content for different genotypes of grasspea

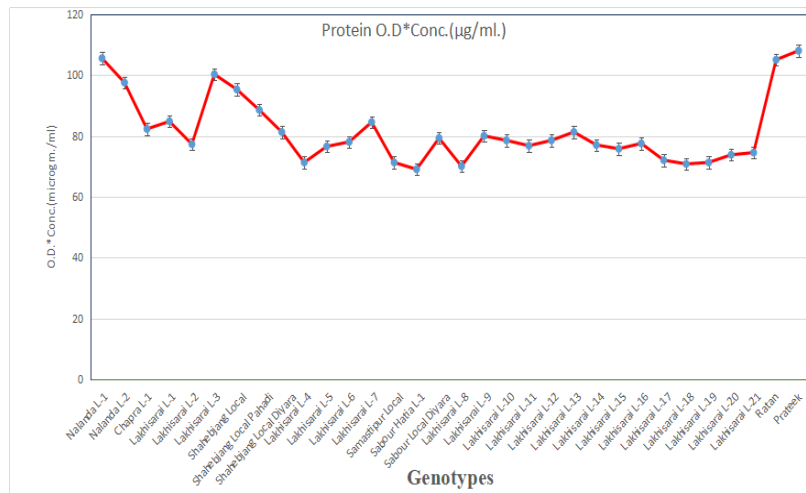


Fig2: Graph of protein content for different Genotypes of lathyrus.



SPECTROSCOPY ANALYSIS AND INVITRO STUDIES OF ALLPLANT PARTS OF CATHARANTHUS ROSEUS

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ABSTRACT

The present research work was to carry out the bioactive compound screening and FT-IR, GC-MS analysis of the whole plant extract (shoot, flower, root) of the *Catharanthus roseus* L. The phytochemicals were extracted from various parts of the plant using different solvents ethyl acetate (ETOAC), dimethyl sulfoxide (DMSO), ethanol (ETOH). These phytochemicals contained Alkaloids, Tannins, Saponins, Flavonoids, Terpenoids, Aromatic acids, Phenolic compounds, Xantho Proteins, Amino acids, Triterpenoids, phlobatannins, Proteins, Carbohydrate, reducing sugar and they were separated using standard methods. Moreover, antimicrobial activities of methanolic separation were determined using various species of bacteria and fungi. Agar well diffusion method was used for the antimicrobial activity, and the zone of the inhibition was analyzed. The analysis of phytochemical screening of extracts indicated the presence of carbohydrates, reducing sugars, proteins, amino acids, steroids flavonoids, terpenoids, saponins, alkaloids, tannins, and phlobatannins. The root extracts highlighted effective antibacterial and antifungal activities compared with shoot and flower extracts against all the tested bacteria and fungi. ETOH extract of the root observed highest antibacterial activity against *Pseudomonas aeruginosa* (18mm), *Staphylococcus aureus* (17 mm), followed by *Escherichia coli* (15mm), *Micrococcus luteus* (13mm), and *Salmonella abony* (11mm) when compared to shoot and flower extracts. *Catharanthus roseus* root extracts highlighted effective antifungal activities compared with shoot and flower extracts against all the tested fungi. ETOH extract of the root observed highest antifungal activity against *Mucor* sp (19.89), followed by *Rhizopus oryzae* (17.17mm), *Aspergillus niger* (16.02), *Candida krusei* (15.98mm) and *Candida albicans*, (14.88mm) as compared to shoot and flower extracts. The evaluation of Preliminary phytochemical screening of extracts indicated the presence of carbohydrates, reducing sugars, proteins, amino acids, steroids flavonoids, terpenoids, saponins, alkaloids, tannins, and phlobatannins. To investigation of FT-IR analysis and antibacterial activities become used agar well diffusion method. FT-IR Vibrational bands confirmed that the fractions of *C. roseus* had lots of biologically active compounds which include H-Bonded Phenols, Alkanes, Carboxylic acid, Carboxylic acid, Flavonoids, Polyphenols, catechins, Aromatics, Aliphatic amines. The phytochemical constituents were analyzed by GC-MS and FTIR methods. The extract showed eight bioactive compounds like Cyclopentanol 1), Butyric acid 2), Glucopyranose 3), Butanoic acid Heptanone 4), 1, 6- Andro- Beta -D-Glucopyranose 5), 2-O- Methyl -D-Manopyranose 6), 4-O-Methylmannose 7). Results of present studies *C. roseus* ETOH extracts shows alkaloids, glycosides, phenolics, tannins and flavonoids. The plant has significant antimicrobial activities. The strong antibacterial and antifungal activities of *C. roseus* indicate alkaloids, flavonoids and phenolic compounds.

FUNCTIONAL CHARACTERIZATION OF A SALT INDUCIBLE MULTIDRUG AND TOXIC COMPOUND EXTRUSION (MATE) FAMILY GENE FROM CHICKPEA**¹Nimmy, M.S, ²Vinod Kumar,**¹National Institute for Plant Biotechnology New Delhi, ²Bihar Agricultural University Sabour**ABSTRACT**

Chickpea (*Cicer arietinum* L.) is a major pulse crop of India and contributes to a major share of the world's chickpea area (70%) and production. As a crop of arid and semi-arid regions, chickpea productivity often suffers from biotic as well as abiotic stresses. Among the abiotic stresses that hamper the growth and development of the plant, salinity is very much important factor with negative influence on growth and productivity. Salinity adversely affects chickpea germination, vegetative growth and especially reproductive processes. Identification of salt stress inducible candidate genes in chickpea will help breeding efforts aiming to enhance its productivity. It is essential to identify, clone and characterize those genes employing genomics assisted methods. The present investigation is an attempt to identify salt inducible genes in chickpea by expression analysis and the genes identified and characterized may serve as promising candidates for salt tolerance in chickpea. Genes that are induced in response to salt stress are thought to play major role in conferring stress tolerance. The identification of salt inducible genes can greatly facilitate the development of improved chickpea cultivars with enhanced salt tolerance using breeding and/or biotechnological approaches. Salt responsive genes belonging to MATE efflux proteins reportedly play a significant role imparting salt tolerance to plants. We have identified and characterized a salt inducible MATE gene in chickpea. The expression pattern of these genes was validated by quantitative reverse transcription polymerase chain reaction (Fig.1). Analysis of ~ 2 kb upstream promoter sequence of the gene *in silico* revealed the presence of stress responsive cis acting regulatory elements such as ABRE, ARE, heat shock element (HSE), and defense and stress-responsive element (TC-rich repeats) confirming the stress responsive nature of the gene. The genes identified in this study may serve as promising candidates for further elucidation of the salt tolerance mechanism in plants. The results convincingly demonstrate the salt inducible response of the gene and characterization of the genes and its promoter contribute to a better knowledge of the salt stress response in chickpea. Also can be further exploited in development of salt tolerant varieties of chickpea

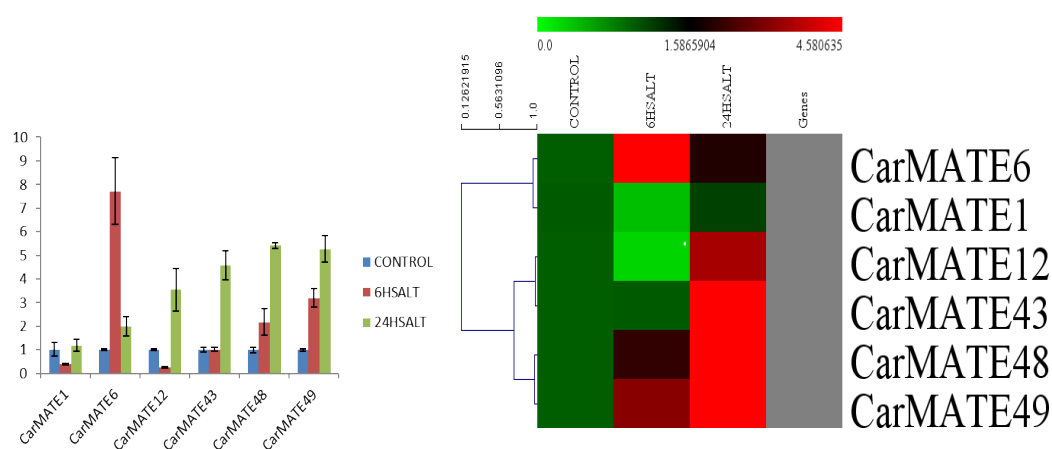


Figure 1: Expression level of 6 representative CarMATE genes in RNA isolated from salt treated tolerant chickpea cultivar . Real time qRT-PCR result showing upregulation of gene expression under salt stress . Also the hierarchially clusterd heatmap represents the gene expression.

VARIATIONS IN GROWTH PARAMETERS OF CHERRY TOMATO (*Solanum lycopersicum* var. *Cerasiforme*) GROWN IN FLYASH AMENDED SOIL CONDITIONS

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ABSTRACT

A pot experiment was carried out in green shade, at Forest Nursery & Research Centre, of Department of Environment Science & NRM, College of Forestry, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, during Rabi season 2017-2019. The investigation was conducted to assess the effect of different concentrations of flyash and inorganic fertilizers on the growth and yield characteristics of Pusa Cherry Tomato (*Solanum lycopersicum* var. *Cerasiforme*). The different levels of flyash viz 10%, 20%, 30%, 40% and 50% and inorganic fertilizer levels viz 25%, 50% and 75% was used as a different treatments with the soil. Results showed that 40% of flyash exhibited significant effect at 90 DAS on plant height (190.88 cm), average number of leaves (37.33), average number of branches (7.67) and total yield per plant (346 gm). It was also found that the combinatorial effect of flyash (40%) with inorganic fertilizer (75% RDF) exhibited significant shoot fresh weight (871.80 gm), shoot dry weight (63.57 gm), root fresh weight (8.20 gm) and root dry weight (1.53 gm), when compared to control. The results suggested that fly ash can be used as a soil amendment to solve the problem of fly ash disposal.

ISOLATION, IDENTIFICATION AND STUDY OF ANTIMICROBIAL PROPERTY OF POTENTIALLY PROBIOTIC BACTERIA FROM DAIRY PRODUCTS OF LUCKNOW REGION

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ABSTRACT

Probiotics are defined as "live microorganisms which when administered in adequate amounts confer a health benefit on the host". The objective of this study was to isolate, identify and characterize some lactic acid bacterial strains from fermented dairy products including yoghurt, cheese, buttermilk and curd, as potential probiotics with antimicrobial activity against some test strains (*Escherichia coli*, *Pseudomonas sp.*, *Klebsiella sp.* and *Streptococcus sp.*). The ability of probiotics to withstand the normal acidic conditions of the gastric juices and the bactericidal activity of the bile salt as well the production of lactic acid that inhibits the growth of the microorganisms, allow them to be established in the intestinal tract. The isolated probiotic strains were tested for the bile tolerance, salt tolerance, acid tolerance and arginine hydrolysis. Results showed that all isolates were able to grow at low pH (2-6) and they were tolerant against NaCl (2%, 4%, 6%) and bile salt concentration (0.2%, 0.4%, 0.6%). The isolated probiotics hydrolysed arginine. The probiotic strains were capable of growth at different temperature i.e 10 °C and 45 °C and ferment different types of carbohydrates such as glucose, sucrose and lactose. Finally, antimicrobial activities of the isolated *Lactobacillus* strains were performed against four test organism including *Escherichia coli*, *Pseudomonas sp.*, *Klebsiella sp.* and *Streptococcus sp.* by agar well diffusion method. The probiotic strains showed antimicrobial activity against the four test organisms. The capability of probiotics incorporated in yoghurt, cheese, buttermilk and curd to inhibit the growth or even kill certain pathogens confirm the health benefits one derives from the consumption of these products.

Key words: probiotics, fermented milk, antimicrobial activity

AN OVERVIEW ON MICROPROPAGATION OF GENUS *ALLIUM* WITH SPECIAL EMPHASIS ON *A.CEPA* AND *A. SATIVUM*

Aanisia zahoor

ABSTRACT

The genus *Allium*, includes hundreds of medicinal plant species, serves human beings in both therapeutic and culinary purposes and has attained its position amid the vast and most essential representative genus of Alliaceae family. *Allium* species are mostly known by their rich content in sulfur compounds but they also contain flavonols, steroidal saponins, fructans, antioxidant enzymes etc. The present review article focuses on the use of biotechnology for *in vitro* culture, cryopreservation and genetic transformation of the *Allium* species with special emphasis on *Allium cepa* and *Allium sativum* which are among the top ranked species of genus *Allium* and are cultivated throughout the world. *In vitro* regeneration using different explant and plant growth regulator combination with different sterilization strategies have been reported in the literature. Tissue culture technology is potent for accelerated growth, multiplication and production of pathogen free healthy plants of *Allium* and has opened wide areas of research for biodiversity conservation. Several well established micropropagation protocols for *Allium* have been standardized during last few years. Highly efficient systems for genetic transformation and cryopreservation of the genus are the requirement of near future.

Keywords: *Allium*, snow mountain garlic, micropropagation

Ethylene improves antioxidant production and nitrogen-assimilation to prevent inhibitory effects of copper stress on photosynthesis in mustard (*Brassica juncea* L.)

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ABSTRACT

Ethylene is an important gaseous signalling molecule that participates in many developmental and physiological processes, including defence responses against toxic metals in plants. The role of ethylene in copper (Cu)-induced toxic effects on photosynthesis was examined in mustard (*Brassica juncea* L.) plants. Exposure of plants to 100 mg Cu significantly enhanced oxidative stress (H_2O_2 content and lipid peroxidation) and impaired plant growth and photosynthesis, chlorophyll fluorescence and reduced chlorophyll content and stomatal conductance. However, the exogenous application of 200 μ l ethephon (a source ethylene) reversed the effects of Cu through its stimulation of ROS-scavenging compounds (superoxide dismutase, ascorbate peroxidase, glutathione reductase and reduced glutathione). Exogenous ethylene significantly increased plant growth, photosynthesis and chlorophyll content and diminished the accumulation of reactive oxygen species (H_2O_2) and TBARS content. Application of ethylene together with nitrogen (N) showed better responses than ethylene alone. The protective effect of ethylene was achieved through enhanced production of reduced glutathione (GSH), proline. This study concludes that ethylene counteracts Cu toxicity in *B. juncea* strongly by regulating N-assimilation and antioxidant production.

Keywords: Antioxidant metabolism; Copper; Ethylene; N- assimilation; Photosynthesis; Lipid peroxidation

Antioxidant and Nutritional properties of some traditional underutilized leafy vegetable or weeds consumed by a local tribe of Jharkhand, India.

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ABSTRACT

In present study, 26 species of local underutilized leafy vegetables commonly consumed by tribals of Jharkhand were identified through market survey and local villages of three district of state. Leafy vegetables sold in markets, *Amaranthus viridis*(Gandhari) was found highest in quantity followed by *Centella asiatica* (Beng), *Hygrophila polysperma* (Muchari), *Polygonum plebeium* (Chemti) , *Marselia minuta* (Chatta saag), *Crotalaria juncea* (Sanai phool) etc. Besides these , there are also few other leafy vegetables which are not found in local markets but rural people collect them for their surroundings and consume them , few of these are *Oxalis corniculata* (Netho), *Ficus geniculata* (Putkal), *Colocassia esculata* (Kachu patta), *Hibiscus sabdariffa* (Kudrum phool, patta), *Portulaca oleracea* (Golgola). The leafy vegetables were found to be rich in many nutrients. The antioxidant found maximum in *Colocassia esculata*. The ascorbic acid content found maximum in *Amaranthus viridis* . The maximum tannin content was recorded in *Ficus geniculata*. The maximum total mineral content was observed in *Colocassia esculenta*.

Keywords: Underutilized , Leafy vegetables , Jharkhand, Antioxidant , Nutritional.

Potential therapeutic value of the entomopathogenic caterpillar fungus *Cordyceps militaris*

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ABSTRACT

Edible mushrooms had long been used for medicinal and food purposes since decades. Modulates many functions of human body and consequently participates in the maintenance of state of good health, necessary to reduce the risk of many diseases. Modern pharmacological research confirms large parts of traditional knowledge regarding the medicinal effects of mushrooms due to their bioactive compounds, besides being used as functional foods. *Cordyceps* is a highly valued fungus in this regard which thrives in the cold, grassy, alpine meadows on the mountainous Himalayan plateau. Because of the difficulties involved in harvesting, it has been expensively priced. Despite its cost and rarity, the unprecedented medicinal applications of *Cordyceps* have made it a highly valued staple component of the Traditional Chinese Medicine in China. *Cordyceps militaris* is a parasitic fungus on Lepidoptera larvae. *C. militaris* is being used for the general promotion of health and longevity. The anti-inflammatory and immune-promoting effects described can potentially facilitate the treatments of other diseases such as arthritis, cancer, tumour and many other diseases also enhances physical stamina. Its medicinal properties are due to variety of therapeutically important constituents including cordycepin (3deoxyadenosine), ergosterol, and glycoprotein, polysaccharides, as a composition which has a very potent anti-cancer, antioxidant and anti-inflammatory activities. Since this fungi is edible and thus can be a food additive or supplement will play a key role in the prevention and cure of various ailments caused by metabolic disorder/ infections. The usage of natural/herbal medicines over the synthetic ones has seen an upward trend in the recent past. *Cordyceps* being an ancient medicinal mushroom used as a crude drug for the welfare of mankind in old civilization is now a matter of great concern because of its unexplored potentials and promoting its cultivation strategies for commercialization and ethno-pharmacological use of this wonderful herb.

Keywords: *Cordyceps militaris*, Traditional Chinese Medicine, Parasitic fungus.

An overview on micropropagation of genus *Allium* with special emphasis on *A. cepa* and *A. sativum*

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ABSTRACT

The genus *Allium*, includes hundreds of medicinal plant species, serves human beings in both therapeutic and culinary purposes and has attained its position amid the vast and most essential representative genus of Alliaceae family. *Allium* species are mostly known by their rich content in sulfur compounds but they also contain flavonols, steroidal saponins, fructans, antioxidant enzymes etc. The present review article focuses on the use of biotechnology for in vitro culture, cryopreservation and genetic transformation of the *Allium* species with special emphasis on *Allium cepa* and *Allium sativum* which are among the top ranked species of genus *Allium* and are cultivated throughout the world. In vitro regeneration using different explant and plant growth regulator combination with different sterilization strategies have been reported in the literature. Tissue culture technology is potent for accelerated growth, multiplication and production of pathogen free healthy plants of *Allium* and has opened wide areas of research for biodiversity conservation. Several well established micropropagation protocols for *Allium* has been standardized during last few years. Highly efficient systems for genetic transformation and cryopreservation of the genus are the requirement of near future.

Improved production of secondary metabolites by silver nanoparticle elicitation in callus cultures of *Lavatera cashmeriana*: an endemic plant of Kashmir Himalaya

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ABSTRACT

Lavatera cashmeriana Cambess is an endemic and endangered plant of Kashmir Himalaya with an extensive range of medicinal importance. Traditionally it is used as mild laxative, anti-inflammatory, analgesic and also used to cure skin irritation in pregnant ladies. There is deficiency of research efforts on its proliferation and production of medicinally important secondary metabolites under field and in vitro conditions. In this study 24hr treatment of different concentrations (2.5mg-l, 5mg-l, 7.5mg-l, 10.0mg-l, 12.5mg-l) of silver nanoparticles in combination with plant growth hormones BAP(2.0mg-l), 2,4-D(1.0mg-l) and NAA(1.0mg-l) were tested for enhancement of secondary metabolite production. Among the different concentration AgNP(7.5mg-l) along with plant growth regulators showed maximum increase in production of bioactive compounds: phenols (17.24mg-g), alkaloids (9.23mg-g) flavonoids(27.65mg-g) as compared to the control. However the higher concentrations from (10.0mg-l) of AgNP proved lethal to the callus.

Keywords: *Lavatera cashmiriana*, nanoparticles, in vitro cultures, secondary metabolites, growth hormones.

Evaluation of plant growth promoting rhizobacteria for their potential and their role in biocontrol against bacterial wilt of tomato (*Lycopersicon esculentum* Mill.)

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ABSTRACT

Bacterial wilt of tomato cause plant death and significant yield loss, triggered by soil-born pathogen *Ralstonia solanacearum* (Smith), has turned out into a serious issue for tomato. Plant growth promoting rhizobacteria (PGPRs) have been reported to be potential biological agents for disease control in crops as PGPRs elicit induced systematic resistance to bacterial and fungal diseases. Among these PGPRs, the strains of *Bacillus* and *Pseudomonas* on broad spectrum are highly effective. To investigate potential outcomes to control bacterial wilt, 250 isolates of rhizobacteria were screened against *R. solanacearum*. In-vitro screening confirmed the strains PR25 and 3NAA8 showed the maximum inhibitory potential for the disease. Tomato seedlings and rhizosphere soil were treated with the antagonists and their effects were studied under in-situ conditions. The study revealed that PR25 (*Enterobacter*) and 3NAA8 (*Bacillus*) strains significantly reduced disease incidence and improved vegetative growth of tomato plants. respectively. Strain 3NAA8 was found to be the most regulatory strain in disease suppression and also growth promotion resulting in 76% fresh weight increase compared to control. The study revealed that PR25 and 3NAA8 strains are promising strains.

Keywords: Rhizobacteria; Biological control; PGPR; Bacterial wilt; *Ralstonia solanacearum*

Development and Characterization of Omega-3 Fatty Acid Nanoemulsions: Impact of Physicochemical Stability and Bioaccessibility.

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ABSTRACT

Poly unsaturated fatty acids particularly, Docosahexanoic acid (DHA) and Eicosapentanoic acid are the essential nutrients that affect early growth and development as well as the onset of chronic diseases in later life. Supplementation or food fortification strategies to meet the recommended dietary allowances are facing the challenges like stability and bioavailability. In the present study, omega-3 fatty acids are encapsulated in the form of nanoemulsions for improved bioavailability using low energy method. The composition and concentration of oil, water, surfactant and co-surfactants were selected based on a ternary phase diagram. Among seven cooking oils tested, sunflower oil produced stable nanoemulsions and passed through physical stress conditions. Surfactant mix, Omega 3 fatty acids (EPA+DHA) are incorporated in to oil phase and emulsions were prepared by low energy method and their physico-chemical properties have been studied upon storage at 4°C, 25°C and 40°C upto 28 days. Nanoemulsions droplet size was observed to be within the range of 100-200nm, zeta potential (ζ) above -30mV with polydispersity index less than 0.5 after storing for more than 28 days at 4°C, 25°C and 14 days at 40°C. Further, addition of cholecalciferol (vitamin D) enhanced the emulsion stability upto 20 days at 40°C and also improved oxidative stability. The stability of DHA and EPA has been observed to be 87% and 86% at 4°C, 25°C respectively at the end of four weeks and 51% at 40°C after three weeks storage. Bioaccessibility studies using gastrointestinal simulation model showed high availability compared to plain oils with added DHA & EPA. These nanoemulsions can be of use for supportive therapies and food-based approaches to improve omega 3 fatty acid nutrition. This is first of its kind which fabricated an efficient nano-vehicle with cooking oils using low energy method for the delivery of omega 3 fatty acids.

Key Words: Fatty acids, cooking oils, nanoemulsions, cholecalciferol, GIT simulation, bio accessibility

Effects of Horticulture Gardening on Human Health: An Incentive of Investment for Self Help Groups

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ABSTRACT

There is increasing evidence that horticulture nurtures substantial human health benefits. Studies reported a wide range of health outcomes, such as reductions in anxiety, depression, and body mass index (BMI), as well as increases in life satisfaction, quality of life, and sense of community. The present study studied the impact of horticulture on human health. The present study used the data of the different reports to substantiate the analysis. The estimates showed a significant positive effect of gardening and fruit consumption on health outcomes. The present study has provided robust evidence for the positive impact of cultivation and fruit consumption on human health. A regular dosage of gardening can improve public health.

Keywords: horticulture, gardening, health, consumption

Genetic divergence analysis in lentil (*lense culinaris* Medik.) genotypes under late sown condition in Bihar

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In the present investigation, an experiment was conducted to study the genetic variability, direct and indirect inter-relationship, and to assess genetic diversity in the lentil accessions for yield and its attributes under late sown condition. The present investigation was carried out at pulse research farm, Model Bhatti, Bihar Agricultural University, Sabour (Bhagalpur), Bihar during Rabi 2018-19 with 36 indigenous and exotic genotypes of lentil procured IIPR, Kanpur, U.P., NBPGR, New Delhi, G.B.P.U.A. & T., Pantnagar, Uttarakhand, ICARDA, Lebanon and Local collection of south Bihar region. Significant treatment differences were expressed for all the characters under study except number of primary branches per plant, number of pods per cluster and number of seeds per pod under late sown condition. High heritability (%) along with high genetic advance as % of mean was documented for number of secondary branches per plant, number of pods per plant, number of filled pods per plant, 100 seed weight, grain yield per plant and biological yield per plant, indicating that these characters are advocated by additive gene and directional selection for these traits would be more rewarding. The correlation analysis revealed that grain yield per plant showed highly significant and positive association with number of pods per plant, number of filled pods per plant, 100 seed weight, grain yield per plant, biological yield per plant and harvest index had positive and highly significant association with grain yield per plant under late sown condition.

Path analysis displayed that biological yield per plant had maximum and positive direct effect on grain yield per plant followed by harvest index and number of filled pods per plant. On the basis of Mahalanobis D^2 statistics, five clusters were designed for late sown condition displaying cluster II with maximum number of genotypes (18) followed by cluster I (11), cluster III (5) and lastly, cluster IV and V was monogenotypic. Owing to the results of inter-cluster distance and mean performance of clusters for different traits, the genotypes Pusa Vaibhav and IPL-406 under late sown environment are expected to trigger the desirable segregants for yield and its determinants. 100 seed weight chased by number of pods per plant and number of secondary branches per plant under late sown condition.

Key words: *Lens culinaris*; Genetic divergence; D^2 statistics, Path analysis

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ABSTRACT

Ultrasonic is a science of sound waves above the limit of human audibility (> 16 kHz). By tuning frequency, ultrasound can be utilized in many industrial applications including food. Ultrasound techniques are relatively cheap, simple and energy saving, and thus became an emerging technology for probing and modifying food products. There are basically two types of transducers used for generation of ultrasound i.e. piezoelectric and magneto-strictive. Piezoelectric transducers are the most commonly used in commercial scale applications due to their scalability i.e., the maximum power per single transducer is generally higher than magneto-strictive transducers.

Based on frequency range, the applications of ultrasound in food processing, analysis and quality control can be divided into low power and high power. Low power (low energy, low intensity) ultrasound (LPU) has frequencies higher than 100 kHz at intensities below 1 W/cm², which can be utilized for non-invasive analysis and monitoring of various food materials during processing and storage to ensure high quality and safety. Application of LPU is based on velocity, attenuation and acoustic impedance. Pulse–echo and continuous wave ultrasound are two major techniques that are used in most ultrasound sensors. The applications of low-intensity ultrasonics are encountered in all food industries mainly vegetables, dairy, and meat. When travelling through a medium, the ultrasound waves change their characteristics and the analysis of this change allows assessment of properties of the medium. Different properties of foods have been addressed in the past and have mostly been linked to texture (maturity, ripeness in cheese, melons, avocados etc.), composition, or even sensory characteristics. Defect detection such as cracks in cheese or hollow hearts in potatoes has also been addressed.

High Power Ultrasound (HPU) has frequency less than 100 kHz at intensity more than 1W/cm². It works on the principle of cavitation and acoustic streaming. High power ultrasound has become an efficient tool for large scale applications, such as emulsification, homogenization, extraction, freezing, thawing, filtration, and low temperature pasteurization, drying etc. HPU enhances the rate of several processes and quality of products.

Keywords: frequency, ultrasound, power, quality, analysis.

CHALLENGES IN HORTICULTURAL SCIENCE

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ABSTRACT

Horticulture plays a pivotal role in the food and livelihood security of India. Though horticultural crops occupy only 8.5% of arable land, they contribute 24.5% of the GDP in agriculture. Plantation crops (tea, coffee and rubber) occupying 0.95% of cropped area have stake of 15.1% of the total export earnings. Economists view that commercialization of agriculture and promotion of agri- business in India is correlated to the progress in the plantation and horticulture sectors. The organized supply of a wide range of reasonably priced horticultural crops in most developed countries has led to a marked gratification about the need for ongoing R&D programmes in horticulture. Consequently, many governments world-wide have scaled back funding for food production and unfortunately, most research- driven universities have now disbanded horticulture/horticultural science departments and combined them into plant science/Agriculture departments with a very strong focus on the molecular sciences. On the contrary, the basic necessity for research on horticultural crops has not decreased, rather the challenges have increased in complexity given the existing consumer demands for affordability, safety and continuity of supply; increasing needs to achieve sustainable practices; and the requirements to deal with challenges originating from a more uneven climate, the loss of productive soils through urban intrusion, and the loss of low-cost labour. Hence, specific priorities, as given below need to be identified for horticultural research to meet such challenges. With ever increasing public consciousness, the promotion of healthy habit benefits through the eating of various fresh and dried fruits and vegetables as well as their juices, dried products and extracts many of which have extensive on-label claims is on the rise. However many such claims have not in fact been clinically confirmed and regulators are increasingly requiring label claims to either be substantiated or removed. Obviously, to correctly determine the presumed health benefits in many fruits and vegetables would be an interesting area of endeavor where there is a union of horticultural science with nutritional and medical research. Further, owing to increased consumer interest towards the eating of fresh rather than frozen produce, another challenge for horticultural science is to improve methods for short- term storage so that best quality is retained rather than to focus on longer-term storage for prolonged marketing.

Key words: Dried products, Fresh fruits and vegetables, Frozen produce and Sustainable practices.

3D Food Printing: An Advanced Technology for Food Customization

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ABSTRACT

The modern era of food revolution is demanding a nutritious product with better mouthfeel and appearance. The concept of three dimensional (3D) printed food came out as a potential solution to bring customization of food. 3D food printing is a fusion of engineering and art of designing food. The basic of 3D printing is a digitally advanced robotic process to develop a customized product by joining layers upon layers. 3D printing provides a broad array of completely personalized food that precisely fit the needs, taste and dietary pattern of people from different ages, sexes, occupations, and health lifestyles by adjusting the composition, density or structure to the preferences and needs of the user. About 15%–25% of the aging population suffers from swallowing difficulties, and this creates an increasing market need for mass customization of food. 3D food printing is a potential solution to overcome drawbacks of current food customization techniques, such as lower production efficiency and high manufacturing cost.

Keywords: food, engineering, art, efficiency, cost

Study of mean performance, genetic variability, heritability, genetic advance and character association in tomato (*Solanum lycopersicum* L.) genotypes

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ABSTRACT

A field experiment was conducted to study genetic variability, heritability and genetic advance to investigate yield and quality traits in thirteen tomato (*Solanum lycopersicum* L.) genotypes. The experiment was laid out during 2017-2018 in Randomized Block Design (RBD) with three replications at the Main Experiment Station, Department of Horticulture, Sikkim University, Gangtok. Considerable amount of variability was noticed for the twelve quantitative characters as indicated by the analysis of variance. Promising genotypes having high fruit yield are ST-102 (681.32g) and ST-92 (657.86g) and ascorbic acid was high in ST-102 (34.62mg) and ST-82 (27.36mg). Analysis of coefficient of variation revealed that, the magnitude of phenotypic coefficient of variation was slightly higher than the genotypic coefficient of variation for all the traits. Moderate to high GCV and PCV, high heritability with high genetic advance observed for most of the yield attributing characters. High estimate of GCV and PCV was recorded for total phenol content (56.60% and 56.93% respectively). High heritability was noticed for characters like total phenol content (99%), total soluble solids (95%), ascorbic acid (93%), average fruit weight (91%) and fruit yield per plant (90%). Genetic advance as a percent of mean was recorded very high for total phenol content (115.96%). Path coefficient analysis revealed that average fruit weight and fruits per plant had the highest positive direct effect on fruit yield at both the genotypic and phenotypic levels. Hence, it would be rewarding to lay stress on these characters for yield improvement.

Keywords: Variability, heritability, genetic advance, replication, GCV, PCV, RBD, coefficient of variation, genotypic, phenotypic, path analysis, tomato genotype.

PINK OYSTER MUSHROOM (*Pleurotus djamor*): A POTENT ANTI-OXIDANT AND HYPOGLYCEMIC AGENT

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Abstract

Pink oyster mushroom is second abundant edible mushrooms around the globe and owing to its medicinal, nutritional properties and less fat content is well accepted. Preserving mushroom in dried form conserves flavour, reduces post-harvest losses, easier transport and also dehydrated mushrooms serve as valuable ingredients in a variety of food formulations. Thus, the present research was carried out to study the physico-chemical properties, nutritional composition, anti-oxidant activity and hypoglycemic effect of dried pink oyster mushroom (*Pleurotus djamor*) powder. In the present investigation the yield of dried mushroom powder was 8.54%, oil absorption capacity was 3.34 ml/g and swelling index was 0.33. The 100 g dried pink oyster mushroom powder had 5.52 g moisture, 21.73 g crude protein, 1.91 g crude fat, 5.47 g total ash, 21.42 g crude fibre and 43.81 g total carbohydrate whereas energy content was 280 kcal. Qualitative detection of phyto-constituents revealed that tannins, flavonoids, terpenoids, cardiac glycoside and saponins were present in mushroom sample. Further, free radical scavenging activity of the dried mushroom powder was 6.22%. Similarly, hypoglycemic test revealed that highest glucose consumption by hepatocytes was in 2.0 ml mushroom extract at 100 mg% glucose exposure followed by 200 and 150 mg% exposures. Owing to its medicinal and nutritional properties, pink oyster mushroom (*Pleurotus djamor*) powder can be used in formulation of various value added products which can help alleviating the protein calorie malnutrition and also for lowering the risk of metabolic diseases like diabetes mellitus.

Keywords: Pink oyster mushroom, protein, hypoglycemic-agent, anti-oxidant, *Pleurotus djamor*

Plasma sterilization: A non-thermal process

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ABSTRACT

Food safety is a major growing concern in the food sector. Food-borne pathogens and spoilage microorganisms are one of the challenges in the food industry as it can cause public health risks and economic impact. There are a lot of sterilization method to eliminate these microorganisms. Some of these methods rely on lethal heat treatment such as steam pasteurization, autoclaving, ohmic heating, etc. Thermal technologies have side-effects on nutritional sensory and functional properties of treated food. In contrast to the thermal technologies plasma sterilization is a promising method for destroying microorganisms. Plasma is a neutral ionized gas containing charged particles, free electrons, ions, and the neutral reactive species such as atoms and molecules. When such electric field is subjected to the ionized gas, charged particles are accelerated resulting collisions with the atoms and molecules.as the result of collisions new charged particles (ions, electrons and free radicals), chemical reaction with sample surface and creation of photons in the UV range and the effect of heavy UV radiation and collision ions shows a strong effect on the existence of biological species causing structural damage on the cell membrane. The temperature during the process remains unchanged i.e. the technology is considered as non-thermal technology. In food processing two types of plasma sterilization is used cold plasma sterilization and the atmospheric plasma sterilization. This technology can be used for pretreatment of food products, packaging and to increase the shelf life. This technology has a great potential in the food industry.

Keywords: Plasma, Non-thermal process, Sterilization.

An Empirical Analysis of Agricultural Diversification and Food Security in Himachal Pradesh

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ABSTRACT

Food security is a measure of the availability of food and individuals' accessibility to it, where accessibility includes affordability. Though a lot of stress is being given on this issue but still it is a major concern in the present millennium. India ranked 76th among 113 countries in Global Food Security Index 2018 and 103rd out of 119 countries in Global Hunger Index 2018. To cope up with this strenuous situation agricultural diversification has emerged as a curative measure. Agricultural diversification can prove useful in managing food security by assuring availability of food in sufficient quantity and quality. Himachal Pradesh owing to its mountainous geographical set up offers a great variation in agro-climatic situation which offers immense opportunities for agricultural diversification. Himachal Pradesh has more opportunity to increase the agricultural productivity and tough challenges to overcome the gap between food demand and supply. The present study was undertaken for the year 2018-19 to examine the status of agricultural diversification in Himachal Pradesh and estimate the food security from the view point of food availability and extent of gap between demand and supply of food. The study puts forth that a very low Herfindahl Index (0.22), which implies that the state is highly diversified. It also reveals that the actual availability (S_a) of food commodities after kept for seed feed and post harvest losses were 85-80 per cent. The total production (S_t), total consumption (S_c), actual availability (S_a) and supplied through public distribution system (S_g) of wheat were 667623 MT, 100143 MT, 567480 MT and 241416 MT respectively. The analysis shows that Himachal Pradesh is almost secured and having ample opportunities and resources to attain food security. High agricultural diversification shows the state has diverse production base and variety of food products. Therefore, the food security can easily achieve in the state. The analysis shows that Himachal Pradesh is almost secured and having ample opportunities and resources to attain food security. High agricultural diversification shows the state has diverse production base and variety of food products. Therefore, food security can easily be achieved in the state.

Key words: Agricultural Diversification, Herfindahl Index, per capita food availability, food security

Morphological and Biochemical Assessment of Nine Genotypes of Flax Seed (*Linum usitatissimum* L.) under Salinity Stress

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ABSTRACT

In the era of global climate change agricultural productivity is threatened by array of abiotic stresses with scarcity of irrigation water. Overcoming the deleterious effect of abiotic stressors is most prominent challenge for enhancement of germination, seedling character and physiological analysis. Therefore, the present study was carried out with the aim to evaluate the physiological responses of nine heterosis line of linseed (*Linum usitatissimum* L.). Seed germinated under four level of salinity stress (100 mM, 150 mM, 200 mM, and 250 mM NaCl) to look insight the adaptive mechanisms involved. The germination percentage, root length, shoots length, and seedling vigor index was significantly varied under different treatments of salt stress. Markers of oxidative stress, such as peroxidase (pox), superoxide dismutase (SOD), proline (pro) and malondialdehyde (MDA) might be the central components of adaptive mechanism of plants to maintain cellular ionic homeostasis under salt stress were determined. The outcome of this study emphasized that the gradual increase of NaCl decreased all the morphological characteristics except the oxidative stress markers. We found that all the tested genotype showed differential response in terms of proline and MDA content along with peroxidase and SOD, to counteract and remedied the salt stress through maintenance of cellular osmotic adjustment. Among all the tested genotypes SHA7, followed by SHA8 and SHA9 performed exceeded record of germination and seedling characteristics through osmotic adjustment by the regulation of ionic homeostasis by oxidative stress markers.

Key Words: Linseed, Heterosis, Seed vigour, Antioxidant

Mechanism of Isolation & Characterization of a novel compound, Sulphated Polysaccharides called Fucoidan from Marine Algae, inhibits invasion of hepato-carcinoma by up-regulating p42/44 MAPK-dependent NDRG-1/CAP43
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ABSTRACT

Fucoidan a family of sulphated polysaccharides isolated from brown algae that exhibit anti-tumor, anti-thrombotic, anti-inflammatory and anti-viral activities. In particular, the anti-cancer effects and low toxicity of fucoidan make it a potentially valuable candidate for cancer chemotherapy. Fucoidan effectively suppresses cancer cell proliferation *in vitro*, and inhibits metastasis and angiogenesis. In this study the anti-metastatic effects of fucoidan were investigated *in vitro* in human hepatocellular carcinoma (HCC) cells (Huh-7 and SNU-761) under normoxic and hypoxic conditions and *in vivo* using a distant liver metastasis model involving injection of MH134 cells into spleen *via* the portal vein. Thus, fucoidan displays inhibitory effects on proliferation of HCC cells and protective effects on hepatocytes.

In the present study, After Isolation and characterization of Fucoidan, the effects and mechanism of action of fucoidan in HCC cell invasion *in vitro* and *in vivo* and its hepatoprotective effect against BA will be evaluated the importance of the hypoxic microenvironment to the survival of HCC cells, studies will be carried out under normoxic and hypoxic conditions.

Keyword: Marine Algae, HCC, Hepatocellular Carcinoma Cells, Liver metastasis,

Global survey of waste utilisation of by-products from the processing industry

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ABSTRACT

Waste utilisation in the present era is the concern of the developing food processing industry globally. Waste refers to the bi-products of the different processing technology being used in the industry which varies according to the final products to be obtained from fruits, vegetables, grain etc. Due to the lack of knowledge about the utilisation of these bi-products such as peels, pips, skins, seed and seed coat are being discarded or dumped by the industry which is considered as harm to environment and waste of the rich nutritional value still present in them. It is pertinent to note that these wastes are easily available in enormous quantity with respect to less cost of purchase which can be mended with different processing technologies into the nutritionally rich feed: for human and animals and for use of value addition of pectin, fibre, flavour and biotransformation. This study is presented with the concern of technologies which are spreading innovative ideas for the waste utilisation methodologies capable of transforming waste into valuable products.

Keywords: by-products, fruits, vegetables, grain, technologies.

Abiotic stress tolerance in wheat: An overview

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ABSTRACT

Wheat is an important cereal crop of the world and India as well; fulfill the food and nutritional requirement of millions of people across the world. Wheat provides 20% dietary protein to the people all over the world. There is significant contribution of wheat in fulfilling the global food demand, so to meet the demand of growing population it is very necessary to maintain a steady rate in its production. The wheat productivity has been declined during recent years due to global climatic changes and several abiotic stresses. Wheat is affected by various abiotic stresses such as drought, high temperature, salinity and many others. These abiotic stress severely affects growth and yield of wheat. There are various methods and strategies through which we can improve the tolerance of wheat like breeding methods but breeding for stress tolerance is complicated as it is controlled by polygenes and their expressions are influenced by various environmental elements so breeding for wheat abiotic stress tolerance will not be sufficient to achieve high productivity, so it is essential to apply some molecular methods and approaches like QTL mapping, molecular markers etc. In this review we have discussed various mechanism of abiotic tolerance, how abiotic stress affects various physiological, biochemical processes, grain yield and various molecular and conventional approaches through which we can improve the tolerance in wheat against abiotic stresses.

KEYWORDS: *Wheat, drought, heat, salinity*

**BOOSTING RICE YIELD THROUGH SYSTEM OF RICE INTENSIFICATION (SRI)
IN DISTRICT CHANDALI, UP, INDIA**

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ABSTRACT

The experiments on System of Rice Intensification (SRI) were conducted in 2*2*2 factorial randomized block design with two types of cultivars (hybrid seed-RPH-6 and improved seed-BPT-5204), two age of seedling (10 days & 12 days) and two space of transplantation (25cm*25 cm and 30 cm*30 cm) at instructional farm of Krishi Vigyan Kendra, Chandauli and farmers fields during Kharif 2009 and 2010, respectively. The data on plant growth parameters, yield attributes and economics/net profit were recorded to test the productivity enhancement of rice through SRI in district Chandauli, Eastern Uttar Pradesh, India.

The results reveal that the T5 treatment (hybrid cultivar RPH-6 seedling age 10 days and transplantation space 25cm*25 cm) performed significantly superior in terms of plant height (90.33 cm & 82.40 cm), root depth (26.18 cm & 27.98 cm), spike length (67.62 cm & 64.62 cm), number of grains per spike (333 & 332 grains), grain yield (7318 kg & 6750 kg per ha) and economics /net profit (Rs 37682 & Rs 45003 per ha). Whereas T6 treatment (hybrid cultivar RPH6, seedling age 10 days & transplantation space 30*30 cm) provided maximum root spread (48.29 cm & 45.40 cm), root biomass (34368 cm³ & 41063 cm³) and test weight (25.03 g/100 grains & 24.86 g/100 grains). In the trial, hybrid cultivar RPH-6 showed tall nature with less numbers of tillers in comparison to improved cultivar BPT-5204.

The improved cultivar BPT-5204 (also known as Shabha Mahsuri) generally exhibited more number of tillers per hill (62.33 and 60.00 tillers) and consecutive number of spikes per hill (62.00 & 60.00 spikes) under T1 treatment followed by T3 treatment i.e. 55.33 and 57.67 tillers per hill as well as 55.33 and 56.33 spikes per hill whereas maximum number of days to 50 percent flowering (93.67 days & 95.66 days) in T4 treatment followed by T2 treatment (92.00 days & 94.33 days) .

The overall performance of SRI technology boosted rice productivity in terms of plant growth , grain yield and economics/ net profit in T5 treatment followed by T6 treatment. It indicate the SRI technology influenced productivity of rice in the district Chandauli- rice bowl area of eastern Uttar Pradesh, India.

Character association and Selection indices in F₂ Population of Brinjal (*Solanum melongena* L.)

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ABSTRACT

The first segregating population of brinjal i.e. MLC-1 x Longai (oblong) was evaluated along with parents i.e. Longai (oblong), Manipur local -1 (MLC-1), Manipur local -3 (MLC-3) and check varieties (JC-1, SM-6-7) during Rabi 2017-18 with objectives to identify genetically improved lines in segregating population based on the knowledge of the association between yield and yield-related traits that trigger the selection efficiency. The F₂ population MLC-1 x Longai (oblong) showed significant variability for all eight characters viz., plant height (cm), number of branches per plant, number of fruits per plant, fruit weight (gm), fruit length (cm), fruit breadth (cm), fruit volume (cc) and yield per plant (gm) under study. The study revealed highly significant positive correlation of the characters number of fruits per plant, number of branches per plant recorded positive and significant association with yield per plant in F₂ plants of MLC-1 x Longai. Selection indices were constructed in the F₂ population using these characters for improvement of yield in brinjal. Based on the efficient selection index, genotypes were given scores or ranks and the best 5% plants were selected i.e. plant number 2, 12, 10, 3, 11 and 19 in F₂ plants of MLC-1 x Longai.

Keywords: Brinjal, Character association, Selection index.

USE OF LASER LAND LEVELING IN PRECISION AGRICULTURE

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ABSTRACT

The laser assisted precision land leveling, so called laser land leveling is a precursor modern water saving technology for adopting conservation agriculture practices. It enhances the resource-use efficiency of critical inputs without disturbing the productive resilience of the ecosystem. Land leveling is important for benefit of agronomic, soil and crop management practices, which results in accurate, smooth and graded fields bringing 3-4% more cultivable area which is otherwise owing to channels and bunds. It minimizes the losses of evaporation and percolation by enabling faster irrigation times and by eliminating depressions which saves the water by 25-30%, improvement in yield by 5-15% as efficient use of nutrients under surface irrigation and weed control efficiency over the other conventional land leveling methods. It involves the use of laser (transmitter) that emits a rapidly rotating beam parallel to the required field plane, which is picked up by a sensor (receiving unit) fitted to a tractor towards the scrapper unit. The signal received is converted into cut and fill level adjustment and the corresponding changes in the scrapper level are carried out automatically by a hydraulic control system. The high cost of the equipment, small and fragmented land holdings and lack of skilled labour for operation limits its wider use in India.

PHYTO-TOXIC EFFECT OF ZINC OXIDE NANOPARTICLES ON SEED GERMINATION IN TOMATO (*Lycopersicon esculentum* Mill.)

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ABSTRACT

Zinc plays a vital role for various metabolic pathways in plant systems. Application of Zinc fertilizers can therefore, make a significant contribution towards the goal of higher crop yields. Recently, nanoparticles have received considerable attention due to their increased uptake by plants as they are small in size and have high rate of penetration through plant cell membrane. The present study investigates the effect of Zinc Oxide nanoparticles (ZnO NPs) on tomato crop with a view point of their potential use as future “nano-fertilizers”. Different concentration (0, 250, 500 and 750 mg L⁻¹) of ZnO Nps, were prepared in distilled water and used for the treatment in tomato seeds to study the effect on seed germination and seedling growth. Preliminary studies on seed germination revealed no evidence of toxicity up to 250 mg L⁻¹ ZnO NPs. Seed germination increased in lower concentrations, however showed decrease in values at higher concentrations.

Key words : Nanoparticles, germination, tomato, seedling length, root length.

Designing of Transgenic Crops by RNA Interference (RNAi) Technology

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ABSTRACT

RNA interference (RNAi) is the process by which the translation of a protein is prevented by selective degradation of its encoded mRNA. Craig Mello and Andrew Fire discovered the of RNA interference. RNA interference (RNAi) is a sequence-specific gene silencing phenomenon, whereby sequence specific RNA degradation takes place by the introduction of double-stranded RNA (dsRNA). Even though many gene silencing techniques have been discovered, the RNA interference technology is the first of its kind, with its potentially powerful and specificity, which shows higher gene silencing efficiency and potency than others. RNAi is a naturally occurring phenomenon found exclusively in eukaryotes as the oldest and most ubiquitous antiviral system. It's more advantageous than antisense RNA technology in many aspects like ease and speed. The RNAi pathway involves two ribonuclease machines and by which targeted gene can be either switched on or/ and off, which have a great future scope and role in advanced molecular biology and other biological fields. RNAi has shown promise in development of crops with enhanced carotenoid and flavonoid content of tomato fruit and carotenoid content of rapeseed (*Brassica napus*), increased amylose content of wheat and sweet potato along with high rate of success in genetically modifying of fatty acid composition of cotton seed oil, which are essential fatty acids for better health of the human heart. RNAi is a scientific breakthrough with its most promising and rapidly advancing frontiers and applications in genetic improvement of almost all major crops like rice, wheat, corn, cotton, soyabean, sweet pea, tobacco, apple and opium poppy etc. RNAi technology has been employed successfully in improvement of several plant species by increasing their nutritional value, overall quality, and by conferring resistance against pathogens and diseases and reduction of allergenicity and toxicity in plants. This review providing a clear understanding for better use of the technology for designing of crops with advanced technology, to bring crop improvement to crop productivity and quality.

Keywords: Crop breeding, RNAi, Gene silencing, Dicer and Functional genomics.

Porous Media Approach for Computational Fluid Dynamics (CFD) Simulation in Food Processing

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ABSTRACT

A porous medium in food refers to a solid having void (pore) space that is filled with water (moisture). Computational fluid dynamics is a powerful and advanced numerical method to solve partial differential equations of mass, momentum and energy conservation in fluid flow and heat and mass transfer problem which is govern by porous media approach. Considering computational fluid domain, food system is categorized into two parts i.e. large pores and small. In the large pores, stacks are considering as fluid domain and fluid flow is mostly outside of the domain. For example, in cold storage, transport phenomenon is considered around the stacks and through the empty spaces of these stacked. In this case modelling of transport phenomenon is done by Naiver–Stokes equation that is a generalization of Darcy flow. In the small pores, food itself consider as fluid domain and transport phenomenon takes place inside the domain. In small pores food system, moisture is transported inside the solid in food processing operations such as drying, frying and microwave heating. Most solid food materials can be treated as hygroscopic and capillary-porous. Applications of porous Media Approach for Computational Fluid Dynamics (CFD) Simulation in food are drying process, dryer design, simulation of transport phenomenon and profiling of temperature and velocity in cold storages, cheese ripening chambers, sterilization, canning, thermal sterilization of food in pouches, high pressure processing of food, pulsed electric field processing for pasteurization.

Keywords: heat transfer, mass transfer, drying, energy.

Trends and Scope of Indian Horticulture: An empirical study

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ABSTRACT

The horticulture comprises of study of vegetable, fruits, flowers, medicinal and aromatic plants, plantation crops and spices. Out of which vegetables occupied first position in both area and production. The collective area and production of horticulture crops were 16.48 mha and 145.62 mt, respectively in 2002 which have considerably increased to 25.43 mha and 311.61 mt, respectively. The share of area by vegetables, fruits, plantation crops, spices and flowers, aromatic and medicinal plants were 40%, 26%, 15%, 15% and 4%, respectively in 2018. the share of production of vegetables, fruits, plantation crops, spices and flowers, aromatic and medicinal plants were 59%, 31%, 6%, 3% and 1%, respectively in 2018. Horticulture crops have more potential to generate revenue to the farmers as well as enhance the agriculture GDP to the national GDP. The compound annual growth rate of area covered by different horticulture crops were observed highest in flower, aromatic & medicinal plants and lowest in spices. The overall CAGR of area covered by horticulture crops were 2.70% during the mentioned period. The CAGR of production of different horticulture crops were reported highest in flower, aromatic & medicinal plants, and lowest in plantation. The CAGR of total production of horticulture crops were 4.86% during the mentioned period.

Keywords: Horticulture, CAGR, area, production, GDP

Potential therapeutic value of the entomopathogenic caterpillar fungus

Cordyceps militaris

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ABSTRACT

Edible mushrooms had long been used for medicinal and food purposes since decades. Modulates many functions of human body and consequently participates in the maintenance of state of good health, necessary to reduce the risk of many diseases. Modern pharmacological research confirms large parts of traditional knowledge regarding the medicinal effects of mushrooms due to their bioactive compounds, besides being used as functional foods. *Cordyceps* is a highly valued fungus in this regard which thrives in the cold, grassy, alpine meadows on the mountainous Himalayan plateau. Because of the difficulties involved in harvesting, it has been expensively priced. Despite its cost and rarity, the unprecedented medicinal applications of *Cordyceps* have made it a highly valued staple component of the Traditional Chinese Medicine in China. *Cordyceps militaris* is a parasitic fungus on *Lepidoptera* larvae. *C. militaris* is being used for the general promotion of health and longevity. The anti-inflammatory and immune-promoting effects described can potentially facilitate the treatments of other diseases such as arthritis, cancer, tumour and many other diseases also enhances physical stamina. Its medicinal properties are due to variety of therapeutically important constituents including cordycepin (3deoxyadenosine), ergosterol, and glycoprotein, polysaccharides, as a composition which has a very potent anti-cancer, antioxidant and anti-inflammatory activities. Since this fungi is edible and thus can be a food additive or supplement will play a key role in the prevention and cure of various ailments caused by metabolic disorder/ infections. The usage of natural/herbal medicines over the synthetic ones has seen an upward trend in the recent past. *Cordyceps* being an ancient medicinal mushroom used as a crude drug for the welfare of mankind in old civilization is now a matter of great concern because of its unexplored potentials and promoting its cultivation strategies for commercialization and ethno-pharmacological use of this wonderful herb.

Keywords: *Cordyceps militaris*, Traditional Chinese Medicine, Parasitic fungus.

THE EFFECT OF MAGNESIUM, SULPHUR, BORON AND ZINC AS FOLIAR APPLICATION ON THE STORAGE LIFE AND BENEFIT-COST RATIO OF POTATO UNDER TERAJ AGRO-CLIMATIC REGION OF WEST BENGAL

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ABSTRACT

The present investigation entitled, “**The effect of magnesium, sulphur, boron and zinc as foliar application on the storage life and benefit-cost ratio of potato under teraj agro-climatic region of west bengal**” was carried out at the Instructional Farm, Faculty of Horticulture of Uttar Banga Krishi Vishwavidyalaya, Pundibari, Cooch Behar during rabi season of 2017 - 2018. The experiment was laid out in Randomized Block Design with three replications comprising 16 treatments for foliar application of different sole and combined foliar application of magnesium, sulphur, boron and zinc viz., T₁- Mg, T₂-S, T₃-Zn, T₄-B, T₅-Mg and S, T₆-Mg and Zn, T₇-Mg and B, T₈-S and Zn, T₉-S and B, T₁₀-Zn and B, T₁₁- Mg, Zn and S, T₁₂-Mg, Zn and B, T₁₃-Mg, B and S, T₁₄-S, Zn and B, T₁₅-Mg, S, Zn and B and along with control (T₁₆) of no nutrients. In present investigation of the storage life and benefit-cost ratio were improved significantly. The maximum storage life of tubers was 25.12, 25.72, 27.00 and 27.94 per cent, the highest benefit cost ratio was 2.81 was recorded with the foliar application of magnesium (Mg), sulphur (S), zinc (Zn) and boron (B).

Key word: Foliar application, potato, storage life, benefit-cost ratio.

DEVELOPMENT EFFORTS ON THE NUTRITIONAL IMPORTANCE OF FRUIT CROPS ADDRESS MALNUTRITION, FOOD SECURITY AND RURAL DEVELOPMENT

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ABSTRACT

The fruits are the best source for overcoming micronutrient deficiencies. These are rich sources of protein, carbohydrate, fat, minerals and vitamins. It is utilised for making value added products such as jam, jelly, juice, ready-to-serve beverage, pickle, murabba, squash, candy, powder, etc. Above all, there are several economic uses of fruit plant parts starting from root bark, leaves, fruits and seeds. The most fruit plant leaves, which is associated with Indian system of medicine, used as an ingredient of Ayurvedic medicine system and possess antioxidant, anti-cancer, anti-ulcer, anti-ageing, anti-bacterial properties and blood purifying properties. Also, fruit crops grown as avenue tree or as wind break helps to conserve the ecosystem and biodiversity. Use of some minor fruit crops is hampered by poor information on production, nutritional value, consumption patterns and use, poor information on economic benefits and market opportunities, few improved planting materials, lack of improved production technologies and lack of marketing channels. Considering all the above, cultivation of these crops for larger scale and increase the processing industries to improve the nutritional diet and overcome the problem of malnutrition, generates the employment in the rural areas. The full paper deals with creating awareness on importance of fruits, contribution to local nutrition, income and health of natural ecosystem.

Key words: Fruits, Health benefits, Malnutrition, Nutritional value.

Application of Radio Frequency Heating in Food Processing

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ABSTRACT

Technologies such as sterilization and pasteurization, drying, smoking, fermentation, freezing/refrigeration, salting etc have successfully been used to add value and/or extend the useful shelf life of agricultural produce for decades. Recent demands to explore cheaper energy sources, as well as concerns to minimize greenhouse emissions, require food-processing alternatives that are efficient, environmentally friendly, and cost attractive. In this regard, electro-technologies have been recognized to have great potential, and are uniquely positioned to address the current food safety, quality, nutritional, and efficiency challenges. Radio frequency heating forms a part of innovative techniques based on electromagnetic heating and other non-thermal methods have the potential of providing high quality foods economically. Radio frequency is a non-ionizing electromagnetic wave with the frequency range between 1 and 300 MHz and it can penetrate deep into the dielectric materials such as food and produce heat volumetrically through dipole rotation and ionic polarization. Although quite limited in terms of its application in the food industry as a whole, the consumer demand for ever-tastier, ever cheaper, low or no-fat, chemical free and safe products have recently extends its application in the food processing. RF heating in current scenario is the preferred method in modern industries for product cooking, baking, drying, pasteurization and other applications.

Keywords: Radio-frequency, Electromagnetic wave, Dipole rotation, Ionic polarization

Milk: Health Benefits and Situation in India

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ABSTRACT

Milk has been considered healthy nourishment. While known for its calcium richness and thus necessary for our bones, milk also contains more than 9 other vital supplements including protein, sugars, nutrients, minerals and fats. Milk and milk items are not strictly high in calcium, however the calcium they give is highly bioavailable, i.e., it is available effectively to the body. Conversely, smaller levels or even less bioavailable calcium are present in most plant sources. In India milk production has slowly increased over the years from 55.6 million tons in 1991-92 to 176.3 million tons in 2017-18, at an average annual growth rate of 4.5 percent. Milk is India's biggest production worth about Rs 6.5 lakh crore. It is considerably more than paddy and wheat brought together. Until the 1970s, the per capita consumption for each person was just 110 gram per day. It's 360 gram every day for every adult today and it's really rising. During 2017-18, the per capita milk accessibility in India was 375 gm/day and is estimated to increase to 592 gm/day by 2023-24. For India, the livestock economy is significant and supports 73 million rural families. The main motive of this research is to learn about the health benefits and supply per capita and milk production in present and future time.

Key words: Milk, Calcium, production, per capita availability etc.

Plant growth and seed yield in chilli var. (Pant-C1) under the influence of chemically synthesized nanoparticles

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ABSTRACT

In order to determine the effect of zinc oxide and aluminium oxide nanoparticles on growth and yield in chilli, an experiment was conducted in *rabi* season (2016) at crop Experimentation Centre Department of Genetics and Plant Breeding SHUATS, Allahabad in randomized block design (RBD) having three replications with nine treatment combinations. All the treatments showed significant effects on growth and yield. The seeds treated with high concentrations of zinc oxide nanoparticles showed better effects while low concentrations was not too effective. But aluminium oxide was not too much effective on growth and yield due to the toxic effects. Hence it was seen that zinc oxide has positive effects and aluminium oxide showed negative effects on growth and yield in chilli.

Key words: Nanoparticles, Chilli, Growth, Yield, Treatment.

Abnormal transition of mango floral primordial into fruit bud during malformation disorder: A malady of metabolic disturbance in mango plant due to biotic and abiotic stresses

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ABSTRACT

Mango is truly acknowledged as —King of fruits in India because of its unique flavor and aroma. It finds multiple uses in raw, ripe and processed form. Mango is an important source of income and livelihood not only for the mango growing farmers but also for the nation in terms of foreign exchange. Mango based agro industries are showing negative growth in domestic and international trade because of poor quantity and quality of fruits. Deadly disorder reported as malformation is major cause of this setback. This malady is categorized into vegetative and floral, with floral malformation being considered more fatal as affected panicles produce abnormal flowers hindering fruit set. The most established etiology for this disorder is suspected to be surge of ethylene production in the plant under stress condition which causes metabolic disturbance and in turn bring about ultrastructural abnormalities in floral bud making it unfit for bearing fruit. The change in developmental activity during transition from floral primordium into fruit bud was revealed through botanical microtomy report in healthy and malformed floral bud of var. Chausa in reference to level of endogenous ethylene in the plant.

Keywords: Mango malformation, floral primordial, fruit bud, biotic and abiotic stresses and metabolic disturbance

DISTRIBUTION AND HABITAT PREFERENCES OF PHEASANTS IN AND AROUND DACHIGAM NATIONAL PARK, KASHMIR HIMALAYAS

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ABSTRACT

Pheasants belonging to the order Galliformes, one of the most threatened avian orders, with nearly 25% of the 300 species considered at risk of extinction compared with the overall 12% of all birds in the world (McGowan and Garson, 2002). Currently, 34 species of family Pheasanidae, restricted to Asia, are listed in the IUCN as threatened birds (McGowan and Garson, 1995; Fuller *et al.*, 2000). During the study, Himalayan Monal and Koklass were observed from three sites inside and outside DNP with an average altitude of 2300mts to 2800 mts above sea level. Most of the sightings were recorded in bushy area with coniferous vegetation and grassy litter followed by huge rocky areas. The threat to pheasants was observed during this period of time and was associated with poaching and anthropogenic pressure, followed by predator threat. The sightings were observed following line transect method and call count method.

Key words: Pheasants, Galliformes, Dachigam, poaching, DNP, anthropogenic.

LABORATORY EVALUATION OF SOME INDIGENOUS RAW MATERIAL FOR DEVELOPMENT OF BAIT APPLICATION TECHNIQUE (BAT) AGAINST FRUIT FLY SPECIES, *BACTROCERA TAU* (WALKER)

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ABSTRACT

Cucurbitaceae family is very important vegetable crops in the world including India. Among all the cucurbits, cucumbers are extensively cultivated in India for its wide culinary. The production of cucumber is threatened by the fruit fly. In Himachal Pradesh, India there were eight very important *Bactrocera* spp. was reported trapping with methyl eugenol for male. So in order to manage this fruit fly many have utilizes different method. For managing male adult of fruit fly, mass trapping using pheromone trap is widely used however, for female insecticide were applied. The side effects of utilizing insecticide have been reported by different parts of the world. So bait application technique (BAT) have been started to trap both male and female fruit fly. In this regard locally available raw material use as a bait food was evaluated in laboratory against *Bactrocera tau* attacking cucumber. *B. tau* was raised in the laboratory with collected infested fruits of cucumber at room temperature in specially designed rearing cages (38×38×45cm³). A polythene sheet was fitted over the base of the cage and filled with mixture of sterile fine sand and saw dust up to 5 cm height for pupation. The adults were provided with their natural host as well as a mixture of dry glucose and protein hydrolyzate (Protinex® Dumex Sciences, New Delhi) in the ratio of 1:1 in a Petri plate which was replaced at weekly intervals. Flies were also provided with water soaked cotton swab in a 50 ml beaker. To prevent access of predatory ants to the cages, these were placed in water filled plastic plates in which water was changed daily. For this, 25 males adult and 25 females adult *B. tau* were released together along with different concentrations food baits solution. For 15 minutes, fruit flies visiting on each concentration were recorded under no choice and multiple choice tests. The report revealed that highest attractancy was recorded in hydrolysed protein (46.00 and 46.50 per cent for male and female, respectively), followed by molasses (41.11 and 36.50 per cent, for male and female respectively). Evaluation of bait-insecticide which exposure to *B. tau* under laboratory conditions revealed that maximum mortality recorded in molasses + dichlorvos (97.50 per cent) followed by 96.50 per cent mortality in banana pulp + dichlorvos and 96.00 per cent mortality in hydrolysed protein + dichlorvos. Dichlorvos can be replaced by more environment friendly toxicant spinosad with 24 per cent mortality in hydrolysed protein followed by molasses 22 per cent.

Key words: *Bactrocera tau*, cucumber, bait application technique, spinosad

COMPARATIVE ANALYSIS OF PHENYLALANINE AND TYROSINE AMMONIUM LYASE ACTIVITIES OF VIOLA SPECIES FROM DIFFERENT KASHMIR REGION

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ABSTRACT

The plant *Viola* species belongs to family *Violaceae* which has been recognized as an important medicinal plant due to its traditional therapeutic role in the treatment of respiratory disorders, Laxative, cancer, tumor and many other pathological conditions. In the present study, the comparative phytochemical parameters mostly Phenylalanine ammonium Lyase (PAL) and Tyrosine Ammonium Lyase (TAL) activity was assessed, within the *viola* species and along the altitude gradients, as these are the key enzymes for the biosynthesis of phenyl-propanoid products and are stimulated under stress conditions. The results revealed a significant amount of variation in terms of its phytochemical activities based on different altitudes ranges within *Viola* species across Kashmir valley. The variation can be attributed to the difference in the agro-climatic zones inhabited by *Viola canescens*, *Viola biflora* and *Viola odorata*. In conclusion, among the three *viola* species, the maximum phytochemical and morphological activity was observed in the samples of *Viola canescens* collected from Wangat Conservation Reserve (WCR) at Naranag wildlife area of Ganderbal District, in J&K. Moreover, highest PAL & TAL activities were recorded in descending orders as, *Viola canescens*, *Viola odorata* and *Viola biflora*.

Keywords: phytochemical, PAL, TAL, Kashmir, Viola, climate.

YIELD OF *RABI* SORGHUM AS INFLUENCED BY SPRAYING OF INSECTICIDES AT DIFFERENT INTERVALS

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ABSTRACT

Sorghum is cultivated under diverse agro-ecosystem and grain yield is influenced by various biotic and abiotic factors which constitutes a major constraint for its production. The experiment was conducted at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad. Experiment was laid out in the split plot design. Main plot constituted five chemical treatments and each main plot was further divided into six sub plots which constituted critical stages of applying the treatments. The field trial was taken on evaluation of yield in *rabi* sorghum as influenced by spraying of insecticides at different intervals, *Atherigona soccata* rondani in *rabi* sorghum during 2014-15. The results revealed that, All spraying intervals with irrespective of treatments recorded significantly higher yield than untreated control (14.71 q/ha). Best results were obtained by spraying at 7, 14, 21 DAE (36.50 q/ha) followed by 9, 16, 23 DAE, 7, 14 DAE and 9, 16 DAE (28.11, 26.79 and 24.75 q/ha, respectively). Irrespective of spraying intervals highest yield was obtained in cypermethrin 10 EC (0.5 ml/l) and imidacloprid 17.8 SL (0.3 ml/l) and were on par with each other (33.56 and 32.10 q/ha). Acetamiprid 20 SP (0.2 g/l), fipronil 5 SC (1 ml/l) and chlorantraniliprole 20 SC (0.3 ml/l) found superior over untreated control by recording 25.41, 23.35 and 19.77 q/ha, respectively. Interaction effect revealed that spraying of cypermethrin 10 EC (0.5 ml/l) and imidacloprid 17.8 SL (0.3 ml/l) at 7, 14, 21 DAE emerged as best treatments which gave 45.56 and 41.48 q/ha respectively. Next best treatments were spraying the same cypermethrin 10 EC (0.5 ml/l) (34.18 q/ha) and imidacloprid 17.8 SL (0.3 ml/l) (33.07 q/ha) at 9, 16, 23 DAE. Lowest yield was found in untreated control (15.35q/ha).

Key words: *Rabi* sorghum, *Atherigona soccata*, Critical stages and Yield

Resource use efficiency of paddy cultivation in Raichur district of North Eastern Karnataka region (Karnataka)

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ABSTRACT

The costs of cultivation in paddy crop were major cost incurred by off farm resources, these resources cost increasing over the years. However, the application of essential plant nutrients through optimum quantity and right proportion through correct methods is the key factor to increase crop production on sustained basis. The result pertaining to this aspect was based on the primary data collected through survey method from paddy cultivated farmers 60 farmers in Raichur district during 2015-16. The study revealed that paddy cultivation of small farmers the regression coefficients of the resource variables were found positive for seed (0.05), FYM (0.39) potash (0.18) and labour usage (0.12), negative regression coefficients was observed for nitrogen (-1.68) phosphorous (-1.10), and PPC (-0.16). The highly significant regression coefficient was observed for nitrogen indicating that one per cent change in its use level would decrease the output of paddy by 1.68 per cent, phosphorous 1.10 per cent, keeping the use levels of the other variable constant. Similarly plant protection chemical (PPC) reflected negative effect on paddy yield but it was non-significant. The significant regression coefficient was observed in case of FYM indicated that the one per cent change in its use level would increase the output of paddy by 0.39 per cent, potash 0.18 per cent. With regard to large farmers, the significant regression coefficient of nitrogen indicates that one per cent change in its use level would decrease the output of paddy by 1.24 per cent keeping the use levels of the other variable constant. Whereas regression coefficients of the resource variables for seed (0.14), FYM (0.51), potash (0.13) and labour usage (0.03) were found positive. The significant regression coefficient observed in case of FYM indicated that the one per cent changes in its use level would increase the output of paddy by 0.51 per cent, potash 0.13 per cent.

Key words: Resource variables, Regression coefficients, Output and Significant.

“Potential of Indian Horticulture, Current Trends, Emerging Challenges and Constraints

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ABSTRACT

India is an agrarian country with varied topography of land, climate, irregularity in rain fall and seasons for cultivation, makes agriculture and horticulture sector more challengeable. The total horticulture production in the country is estimated to be 313.85 million tonnes which is 0.69% higher than the horticulture production of 311.71 million tonnes in 2017-18. The area under horticulture crops has increased to 25.49 million hectares in 2018-19 from 25.43 million hectares in 2017-18. India stands second largest producer of fruits and vegetable crops in the world with first rank in the production of Banana, Mango, Lime & Lemon, Papaya and Okra. Horticulture sector is more profitable than the agricultural sector (Food Grains). Horticulture sector provides employment opportunities across primary, secondary and tertiary sectors. In the recent past new trends of cultivation of horticulture crops such as aquaponics, vertical farming, playhouse cultivation and hydroponics are also the emerging trends supporting the horticulture sector.

In spite of having tremendous growth in the horticulture, there are several challenges needs to mitigate such as minimum support price like food grains, cold storage facilities and transport, higher input cost, lack of machinery / equipment, price fluctuations and market intelligence. There are several other issues such as lack of post-harvest infrastructure facilities, processing facilities, post-harvest losses, trading and marketing, sale of horticulture produce by small and marginal farmers, banking facilities and exploitation by commission agents.

The diversification in the horticulture sector become a major source of positive growth for the nation. Horticulture sector has emerged promising source of income generation, employment opportunities, poverty alleviation and export. India may emerge as a one of the biggest producer and exporter if viable policies can be setup by the Govt. of India for proper fund allocation in infrastructure development, research on post-harvest and food processing, technological developments and better policy framework. Horticulture sector with strong policy support with backward linkages will become an industry which can stimulate and sustain growth.

Keywords: Horticulture, Trends, Emerging Challenges, Constraints and Policies

Effect of growth retardants on flowering and fruiting of mango (*Mangifera indica* L.)

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ABSTRACT

Mango (*Mangifera indica* L.) belongs to the family Anacardiaceae and originated in Indo Burma region. Besides, its fine taste and good qualities, it is called „the king of fruits“ and it is considered to be a good source of vitamins, minerals, digestible sugars and trace elements. It is one of the most important fruit crops for the countries of Indian subcontinent in terms of area and production. However, the productivity per hectare is very low. One of the most important factor responsible for low yield and inferior orchard efficiency is biennial bearing, which means that the tree carries optimum load of crop in one year. Plant growth retardants are synthetic compounds used to retard the shoot length of plants and use of growth retardants have been evaluated to stimulate early or more intense flowering. They also enhance early cropping, regular bearing, induce flowering and improves fruit set. Plant growth retardants such as paclobutrazol, cycocel, maleic hydrazide, etrel etc. control tree growth and significantly increased number of panicles per shoot, fruit set and improved fruit quality. This has been achieved not only by reducing cell elongation but also by lowering the rate of cell division and regulating the plant height physiologically. Finally, most plant growth retardants inhibit the formation of growth active gibberellins and can thus be used to reduce unwanted shoot elongation. Growth retardants are also used to enhance the green colour of the foliage, strengthen the flower stems, stimulate flowering and promote resistance against environmental stresses in the crops.

Key words:- Growth retardants, Vegetative growth, Fruit quality and Flowering

Advanced breeding strategy of Rice Biofortification to fight against “Hidden Hunger”

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ABSTRACT

Micronutrient deficiency, also known as “hidden hunger” is an increasingly serious global challenge to humankind. Bio-fortification is the process by which the nutritional quality of food crops is improved through agronomic and conventional plant breeding. Rice (*Oryza sativa*), a staple food which is the source of nutrients, contributing up to 70% of daily calories for more than half of the world’s population. White milled rice grains lose vital nutrients through polishing. Therefore, seed-specific higher accumulation of essential nutrients is required. The physiological, genetic and molecular mechanisms of Zn homeostasis have been well studied, but these mechanisms need to be characterized from a biofortification perspective and should be well integrated with the breeding processes. Several QTLs and gene specific markers have been identified for grain Zn, Fe and there is a great potential to use them in Marker-Assisted Breeding. A thorough characterization of genotype and environmental interactions is essential to identify key environmental factors influencing grain Zn and Fe. Agronomic biofortification has shown inconsistent results, but a combination of genetic and agronomic biofortification strategies may be more effective. Rice biofortification is a sustainable approach to solve “hidden hunger” via genetic engineering/molecular breeding. Recent molecular mapping studies have clearly indicates the co-localization of QTLs for Fe and Zn with those for other potentially toxic metals such as Cd and Pb. In the post-genomic and computational systems biology era, the combination of high-throughput genomics (or sequencing) and robust statistical analysis, particularly QTL mapping studies, will be helpful to dissect the molecular basis of natural diversity for complex quantitative traits in a better way. The recent genomic techniques and marker information can be used for designing breeding programme for bio-fortification or micronutrient enrichment in Rice, it will helps to over malnutrition which is a biggest challenge now worldwide.

Key words: Bio-fortification, Malnutrition, QTL mapping

**Effect of seed germination and growth on medicinal plant
(*Withania somnifera*) by mixed heavy metals (Cd and Ni)
by contamination in water and soil**

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ABSTRACT

Withania somnifera (Ashwaganda) Indian ginseng a valuable herb member of family solanaceae. The impact of heavy metals singly and in combination was studied on photosynthetic and non photosynthetic non pigments, metabolites and enzymes activity and net productivity of *Withania somnifera*. Elevated levels of heavy metals in contaminated soils are widely spread and concern have been raised over the potential risks to human, animals and agricultural crops. This study was conducted to evaluate the effect of mixed cadmium and nickel on seed germination and seedling growth of *Withinaia somnifera* under controlled light and temperature conditions. Treatments were included o (control). 30, 60, and 90 mg kg³ which were made by equal amounts of cadmium (1/4). The heavy metal mixture treatment shaved toxic effects on seed germination and seedling growth of safflower. Increasing the concentration of heavy metal mixture to 180 mg kg¹ showed a significant decrease in seed germination as compared to control treatment (p<0.01). Heavy metal mixture concentration of 60mg kg⁻³ reduced shoot fresh and dry weight (p<0.01). Root fresh and dry weight was diversely affected by the heavy metal treatment. however, the heavy metal mixture concentration of 180 mg kg² produced the lowest amount of both root fresh and dry weight. A negative response of root ans shoot length of safflower to heavy metal mixture application relative to control treatment was observed at 120 mg kg³ (P<0.01). The study suggests that cultivation of *Withania somnifera* in metal polluted soils should be avoided or appropriate control measures be adopted to maintain the heavy metal content of the soil below the damage threshold level. The heavy metal mixture treatment of 60 mg kg³ exhibited the lowest percentage of tolerance in germination and seedling growth characteristics of *Withania somnifera* compared to control.

Key words : Germination, seedling growth, heavy metals, *Withania somnifera*.