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NATIONAL ENVIRONMENTAL SCIENCE ACADEMY

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NESA Annual Awards 2020 Notification No. 4

APPLICATIONS ARE INVITED

date is extended upto 25th Oct. 2020

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AGE 45 and above. The recipients shall get Citation, Certificate, Memento and a Gold plated medal, and can suffix F.N.E.S.A. after their names.

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206, Raj Tower-I, Alaknanda Community Centre,
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NANOMATERIALS FOR SOIL AND WATER REMEDIATION IN AGRICULTURE

Monika Kundu, Achchlelal Yadav and P. Krishnan
[1]Scientist, Division of Agricultural Physics,
ICAR-Indian Agricultural Research Institute, New Delhi
*Corresponding author: *mkkundu07@gmail.com*

Sustainable food production is of global concern today in view of the increasing population. In addition, the increasing food production competes with the available limited natural resources. To enhance food production, the natural resources, soil, water and other biodiversity parameters will be exhaustively used. Since soil care is a fundamental subject in the path of achieving sustainable agriculture, the importance of soil health is on top priority. The remediation of contaminated soils and water by nanomaterials in agriculture is a matter of evolving research area that is gaining a substantial growing attention. The unique characteristics of these nanoparticles, nanocomposites and nanostructures involves their high surface area, enhanced reactivity and novel instantaneously emerging properties when dealt at the nanoscale level has opened new avenues for contaminants' removal applications. However, still the use of these nanomaterials poses several challenges. One such challenge is their tendency to form aggregates and to get themselves agglomerate. Other might include, the diversity and dynamic nature of the geochemical characteristics of most media, that can drastically limit the effectiveness of these materials.

Nanomaterials (NMs) have the capacity to improve the soil and water quality and remove the contamination like unwanted microorganisms, heavy metals, and others. In this regard, the nanomaterials are currently being used to improve the quality of agricultural soils. Due to large surface to volume ratio of nanomaterials, they are highly reactive and possess various properties to be applied in field of agriculture. Soils can be contaminated with a variety of pollutants that may pose threat to human health due to various industrial and agricultural activities.

In order to restore the quality of soil, nanomaterials have been used as alternative to conventional remediation practices. In this regard there are some nanomaterials such as zeolites, carbon nanotubes and iron oxide nanoparticles that are highly useful in soil remediations. Zeolites are commonly used as adsorbents and catalysts for different pollutants in soils. Ca-type zeolites are generally preferred for remediation of soils for heavy metals in various farmed lands. In addition, zeolites are very effective for radioactive elements also that may be present in soils. On the other hand, iron oxide nanoparticles are found to be environmentally friendly approach for soil treatment to improve quality of soil. Nano iron oxides can be pumped or spread directly to polluted soils with insignificant risks of secondary contamination. Many studies have reported that treatment of soil polluted with heavy metals using nanoparticles of iron oxides can reduce the concentrations of these toxic substances in soil by adsorption (Fig.1). Also, nanomaterials such as silver nanoparticles (NPs), and other metallic and metallic oxide NPs, such as titanium oxide, magnesium oxide, copper, copper oxide, zinc oxide, cadmium selenium, and cadmium telluride are being used as antimicrobial agents.

Advantages of nanoparticles based soil and water remediation

- Due to very high specific surface area of nanoparticles, it has been observed that such systems have significant increases in their bioactivity.
- The enhanced surface area of nanomaterials, lead to more intimate contact with the contaminants in soil and water
- Use of nanoparticles in the crops helps in improving crop productivity and soil fertility
- The use of nanofertilizers ensures enhanced nutrient delivery at lower costs than their conventional counterparts
- Nanoparticles ensure target specific delivery of agrochemicals in the field.
- Nanotechnology in soil and water treatments promotes precise use of inputs with enhanced productivity.

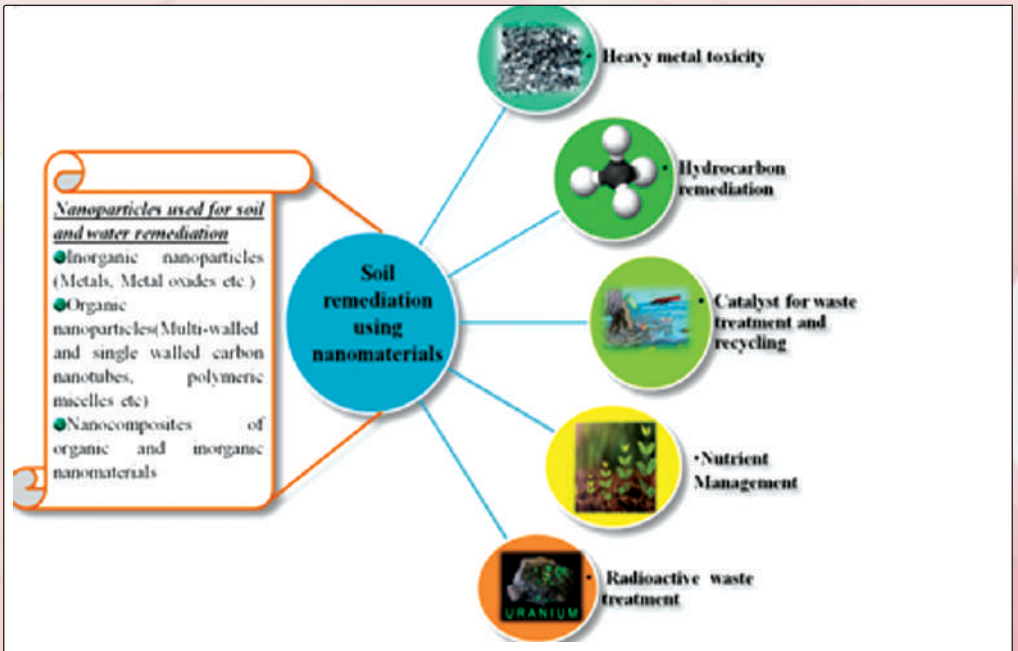


Fig. 1: Soil remediation applications using nanoparticles.

Conclusion

In the recent times, the application of nanoparticles for maintaining soil health and fertility ensuring sustainable food productions is a growing area of research. Along with this the leaching of chemical dyes, agrochemicals, industrial wastes etc. in water is a matter of concern which requires immediate research attention. Nanoparticles treatments in this regard are proving boon for water remediation to tackle such challenges. In coming future, the area demanding use of engineered nanoparticles for target specific applications will further gets developed in terms of methods and technologies with improved strategies with integrated use of nanotechnologies with other disciplines.

BIOLOGICAL NITROGEN FIXATION: A CORNERSTONE IN MAKING ECO-SAFE ENVIRONMENT FOR FUTURE GENERATION

Neeraj Pal[1] and Abhishek Singh[2]
[1]Department of Molecular Biology and Genetic Engineering GBPUA&T, Pantnagar, UK, India
[2]Department of Agricultural Biotechnology, SVPUA&T, Meerut, Uttar Pradesh, India
E-mail: *intmsc.abhi@gmail.com*

Increasing population, rapid urbanisation is leading to a permanent reduction in the share of productive farmland, which in turn affecting the sustainability of the food system and causing food shortages (Bricas, 2019).By 2050, it is estimated the Earth will hold 10 billion people, a population that will need to feed a 56 per cent rise in agricultural production. If we look back in the beginning of the eighteenth century, we will come to know that initially just 3.4 percent of the world's population was urban, compared to around half in 2000and there was sufficient food production at that time to feed that population because of the availability of the sufficient natural resources. However, as the urbanization started growing since the 19th century during the era of industrialization. Initially, the increased industrialization, mechanization, use of natural resources had a positive effect and contributed to a dramatic rise in food production, thereby allowing an increasing non-farmer population to be fed. Soon after, natural resources started depleting, most of the time in order to meet this growing need for food, agricultural land per unit area required to achieve maximum efficiency and highest quality product, excessive use of chemical fertilizers in agriculture raised rapidly. However, we forgot that use of everything in excess has negative impacts too, this increase in food production is achieved at the price of over consumption of nonrenewable or slowly renewable resources like coal, oil and natural gas, mined phosphorus, as well as water due to the development of motorized irrigation. In addition to this loss of resources, the environment began to saturate with pollutants: nitrogenic waste, green house gases, eutrophication and pesticides resulting in long-term environmental damage. Because certain fertilizers contain heavy metals (e.g. cadmium and chromium) and high radionuclide concentrations, these fertilizers later become the main source of heavy metals and radionuclides in plants, and some result in inorganic pollutant accumulation(Çevre et al, 2004). Greenhouses, aquaculture especially large amounts of chemical fertilizers used during the peak season, so dangerously polluted well water, especially water resources, crop production quantity and quality of product deteriorates. Problems caused by too much fertilizer: As a result of high levels of nitrogen fertilizer use, the amount of nitrate can increase in drinking water and rivers. As a result of the phosphorous fertilizer being transported with the surface flow, the amount of phosphate can increase in drinking water and rivers. High level of Nitrogen fertilizer used plants grown in soils consists of carcinogenic substances such as nitrosamines, especially plants such as lettuce and spinach leaves are eaten. They get into harmful accumulation of nitrate and nitrogen oxide in their leaves.

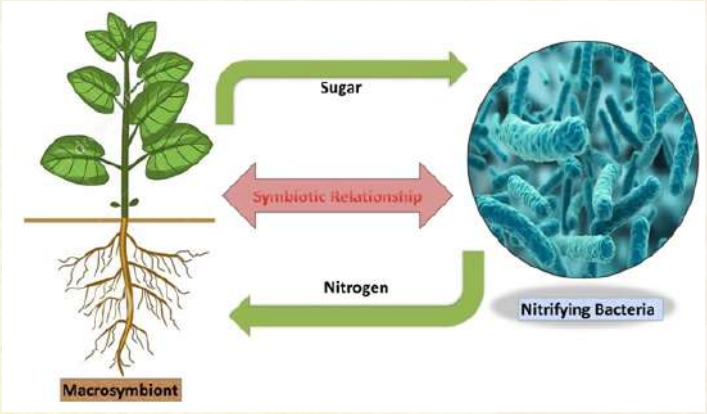
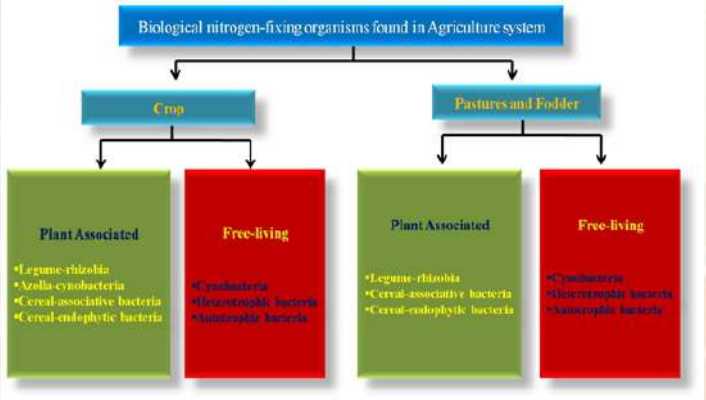


Fig. 1: Overview of Biological Nitrogen Fixation

Over the last few decades, the agriculture policy in India has undergone a major change through diversification and emphasis on sustainable production system to feed the population together with the environmental safety. For decades, scientists and agronomists have identified biological nitrogen fixation, as one of the possible strategy to increase global nitrogen use efficiency, which will therefore be a significant target in efforts to sustainably intensify agriculture.

Since the pleasant ecosystem of microorganisms around plant roots, biological nitrogen fixation studies have thrown up surprises and fascinating ideas for study. On the other hand, biological nitrogen fixation provides a natural way of supplying plants with nitrogen. It is an important component of many aquatic and terrestrial ecosystems in our biosphere (Wagner, 2011). Biological nitrogen fixation (BNF), discovered by Beijerinck in 1901, is carried out by a specialized group of prokaryotes. These organisms utilize the enzyme nitrogenase to catalyze the conversion of atmospheric nitrogen (N_2) to ammonia (NH_3) (Beijerinck 1901). Plants can readily assimilate NH_3 to produce the nitrogenous biomolecules. These prokaryotes include aquatic organisms, such as cyanobacteria, free-living bacteria, such as *Azotobacter*, *Escherichia coli, Desulfovibrio desulfuricans* etc. Bacteria forming associations with plants, such as Azospirillum, and most notably, bacteria, such as *Rhizobium* and *Bradyrhizobium*, forming symbioses with legumes and other plants.



Approaches to make Biological nitrogen fixation applicable in Agriculture

Since the advent of recombinant DNA technology in the 1970s, researchers have used genetic approaches to study and manipulate the nitrogen fixation genetics in order to transfer the capacity to cereal crops. First approach is by genetic engineering but beinghypothesized that this may not be feasible in cereal crops. Another approach was considered in which, free-living diazotrophs are estimated to generate a fixed amount of nitrogen equal to nearly 60 per cent of the nitrogen generated industrially through Haber-Bosch, and can provide a significant fraction of the nitrogen required for model plants and cereal crops.

1. Engineering plants for nitrogen fixation

Functional expression of nif genes (genes encoding nitrogenase enzyme) in plants by genetic tools (Liu et al. 2019).Nitrogenase enzyme being sensitive to oxygen needs to be separated from oxygen production in plants for success of this approach. Nif genes could be expressed either in mitrochondria or chloroplast during this approach. However, engineering the mitochondrial genome has been a difficult challenge, as mitochondrial DNA is relatively inaccessible; instead, leader sequences can be attached to nuclear-encoded Nif proteins, facilitating their transmission to mitochondria. Recently, this strategy has been applied to target Nif proteins to mitochondria of the yeast, *Saccharomyces cerevisiae* and the model plant *Nicotiana benthamiana*. On the contrary, chloroplast engineering is reasonably straightforward with the ability to extremely abundantly transform large genetic clusters and express polycistronic transcripts. In tobacco chloroplasts, the structural nitrogenase gene NifH and the accessory protein NifM were inserted and expressed and found to be active, possibly because plastid electron transport systems can operate instead of the bacterial nif electron transport system. Oxygen levels in plastids, however, can still compromise nitrogenase, so alternative strategies may be needed to isolate expression of nitrogenase from oxygen either spatially or temporally(Bloch *et al*. 2020).

An alternative approach to expressing nitrogenase in plant organelles is to recreate nodule-forming symbiosis of legumes and rhizobia in cereal crops. The molecularprocesses governing legume-rhizobia signaling, nodule organogenesis and maintenance have been well studied in model species. Example-*Lotus japonicus*, nodulation by complementation with the corresponding receptor from the non-symbiotic model plant *Arabidopsis thaliana*, suggesting that the underlying signaling mechanisms of nodulation exist in most plants. Remarkably, nodulation signaling is carried out by plant hormones, which are common to all plants, suggesting that the building blocks for this capability may be present in cereal crops (Van Deynze *et al*., 2018).

2. Harnessing rich associative microbiome of plants for nitrogen fixation

Broad variety of bacterial genera have the ability to fix nitrogen, and are considered to be either associative or endophytic rhizobacteria, including *Azospirillum, Azotobacter, Burkholderia, Gluconacetobacter, Herbaspirillum, Klebsiella, Paenibacillus,* and *Pseudomonas*. This ability to fix nitrogen through this kind of relationship is regulated by sophisticated signalling pathways between the microbe and the host (plants). Although this kind of relationship is less specialized in cereal crops and rhizosphere bacteria than the symbiosis of legume-rhizobia.It is estimated that more than one third of endophytic bacteria are diazotrophs, indicating that endophytic associations are selective for nitrogen fixation. Inoculation by biological nitrogen fixing plant growth promoting crop rhizobacteria offers an integrated approach to disease control, growth promotion operation, and conservation of nitrogen levels in agricultural land. Isotopic studies on sugarcane have shown that certain endophytic and root-associated bacteria provide with atmospheric nitrogen through nitrogen fixation in unfertilized conditions and the model grass Setaria, maize, and wheat when applied as inoculants to roots in greenhouse studies. Though another study on an indigenous land race of maize, shown that, up to 82% of the nitrogen content of the crop is contributed by nitrogen fixation, which further indicates that associative nitrogen fixing bacteria can have a major effect on crop production (Van Deynze et al., 2018).Although inoculation of crops with known plant-associative diazotrophs has improved crop growth and yield in low-nitrogen field trials, the performance of these strains has been inconsistent, and some strains that perform well in greenhouse studies fail to improve crop growth in field conditions (Compant *et al*. 2019). These factors and a lack of yield improvement in nitrogen-rich conditions may limit the use of these natural diazotrophs as inoculants in commercial agriculture.

Conclusion and future prospects

The growth of the human population and the looming effects of climate change create a sense of urgency around providing sufficient and sustainable nitrogen for crop production. Increasingly, developed nations are implementing voluntary programs and mandatory regulations on nitrogen management practices to reduce local effects of nitrogen pollution as well as greenhouse gas emissions. Still, adoption of nitrogen management best practices by farmers has lagged due to the risk of under fertilization resulting in yield loss While great strides have been made toward engineering cereal crops for nodulation and nitrogenase expression, the complexity of these approaches puts them on a longer timescale than desired for affecting short-term change. On the contrary, nitrogen-producing microbial inoculants could have animmediate impact in both industrial and smallholder agricultural systems and human beings could be protected from the toxicological effects of these xenobiotics.

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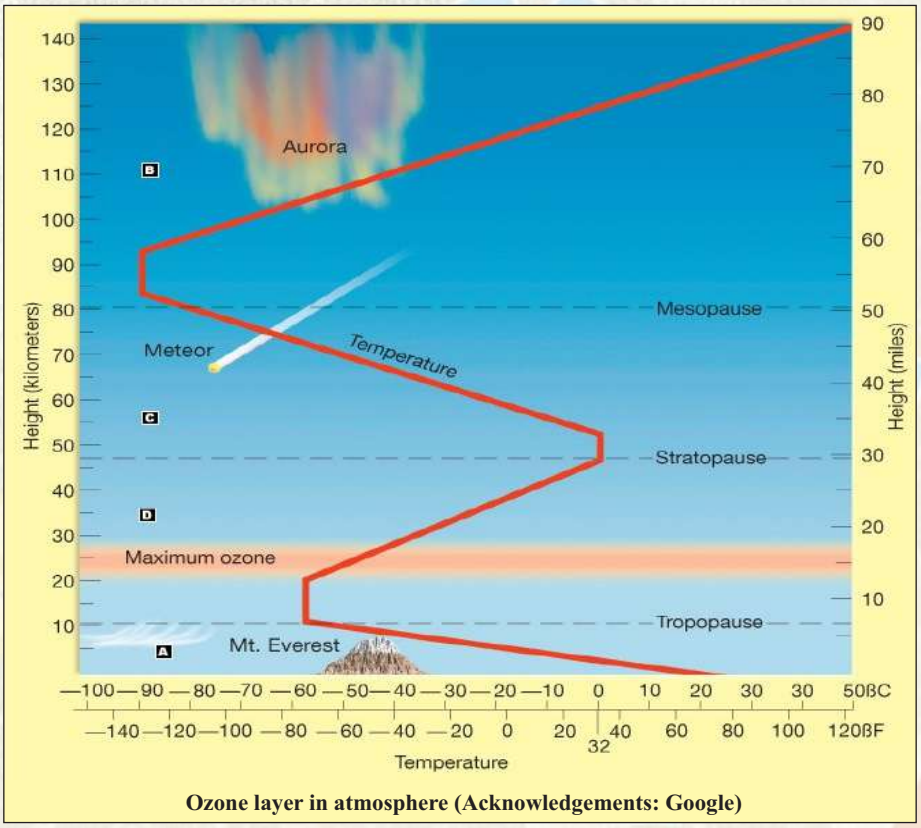
OZONE LAYER-A SHIELD FOR LIVING BEINGS

Anup Kumar
Haryana Space Applications Centre (HARSAC)
Panchkula-134112, Haryana
Email: *anup0106@yahoo.com*

Sun is a source of many types of radiations. Some are beneficial and some are harmful to living beings. Atmosphere plays vital role in checking the sun radiations to reach earth. In atmospheric layers in lower part of stratosphere (about 20 Km-40 Km) a layer of ozone plays vital role in absorbing 97% to 99% ultraviolet radiations (UV) (wavelength 200 nm to 315 nm).

Ozone layer was discovered by French Physicists Charles Fabry and Henri Buisson in 1913 and its properties were studied by G.M.B. Dobson a British Meteorologist. G.M.B. Dobson developed spectrophotometer (Dobsonmeter) to measure stratospheric ozone from the ground. Dobson unit a convenient measure of the amount of ozone overhead is named in honor of G.M.B. Dobson. In 1930 Sydney Chapman a British Physicist discovered the photochemical mechanisms that give rise to the ozone layer.



Ozone layer in atmosphere (Acknowledgements: Google)

Distribution of Ozone
Thickness of ozone layer is thinner near the equator and thicker near the poles because of atmospheric circulation and solar intensity. Maximum ozone is produced over the tropics and transported towards poles by stratospheric wind patterns. In northern hemisphere ozone layer is thickest in the spring and thinnest in the fall.

Ozone Depletion
In 1976 researchers revealed that ozone layer was depleted by chemicals released by industry, air conditioners and vehicles mainly chlorofluorocarbon (CFC).

Impacts of Ozone Depletion
Ozone is acting as a shield for protecting living beings by absorbing UV radiations. Excess UV radiations may cause skin cancer and other biological disorders in human beings. Temperature increase may initiate melting of glaciers which increase the sea level and submerge islands and coastal regions and disturb the biodiversity and ecological balance.

Checking of Ozone Depletion
Need base uses of air conditioners, vehicles and ban on CFC gases producing industries. Plant trees as and where open space is available. Maximum use of bio-energy, hydro-energy, wind energy and solar energy.

Awareness About Ozone Depletion
To get awareness among people about the importance of ozone layer for living beings, United Nations designated September 16 as the International Day for the Preservation of the Ozone Layer.

Effects of ozone depletion for humans and the environment
Ozone layer depletion causes increased UV radiation levels at the Earth's surface, which is damaging to human health.

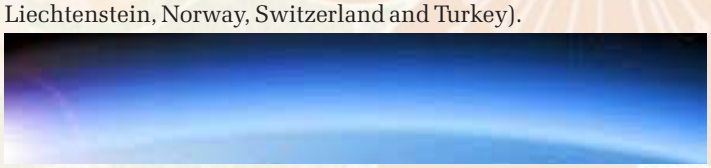
Negative effects include increases in certain types of skin cancers, eye cataracts and immune deficiency disorders. UV radiation also affects terrestrial and aquatic ecosystems, altering growth, food chains and biochemical cycles. Aquatic life just below the water's surface, the basis of the food chain, is particularly adversely affected by high UV levels. UV rays also affect plant growth, reducing agricultural productivity.

Action to protect the ozone layer

The Montreal Protocol
In 1987, to address the destruction of the ozone layer, the international community established the Montreal Protocol on ozone-depleting substances. It was the first international treaty to be signed by all countries of the world and is considered the greatest environmental success story in the history of the United Nations.

The Montreal Protocol's objective is to cut down the production and consumption of ozone-depleting substances, in order to reduce their presence in the atmosphere and thus protect the Earth's ozone layer.

The chart below shows the decreasing consumption of ozone-depleting substances covered by the Montreal Protocol, both globally and by the EEA-33 (the 28 EU Member States plus Iceland, Liechtenstein, Norway, Switzerland and Turkey).



SURVEY REPORT ON ROCK BEES AND BIRDS OF RAMAGOVINDAPURA-ITTASANDRA IN BENGALURU RURAL DISTRICT

Dakshin V. John and M. Jayashankar
St. Joseph's College (Autonomous), Bengaluru-560 027
Email: *jay81zoology@gmail.com*

Honeybees are eusocial insects with their colony consisting of a single queen, few male drones and female worker bees ranging from 2000 to 80,000 in number. Honeybees belong to the genus Apis (Hymenoptera: Apidae) represented by five species in India, *viz*. *Apisdorsata* (Rock bee), *Apiscerana* (Indian bee), *Apisflorea* (little bee) and *Apisandreniformis*, all are native to India, while *Apismellifera* (European bee) is an introduced species.The rock bee or giant bee or the cliff bee is called so owing to their large body size (17-20 mm long). Scientifically known as *Apisdorsata* Fabricius, 1793, rock beenests consist of single large combs about 6 feet long and 3 feet deep suspended from a branch, cliff face or building. Their ferocious temperament disqualifies them to be kept in hives in beekeeping; also their single comb behaviour does not lend itself to beekeeping management practices, although the honey (yielding up to 36 kg honey per comb per year)and other products of these species are harvested. The efficiency of honeybees is due to their large numbers, their agility and faithful tending to a given floral source one at a time.

Fig.1: The banyan tree with bee hives at Ramagovindapura.

The present observations are based on a survey undertaken in January 2020 in Ramagovindapura (13.2156N, 77.9067E) in Hoskote, Bengaluru rural district. It is situated 23kmsaway from the sub-district headquarters of Hoskote. A total of 73 active beehives were spotted spread across the branches of the Banyan tree, *Ficusbenghalensis* (Moraceae) (Fig.1) and very few on the adjacent peepal tree, *Ficusreligiosa* (L.) (Moraceae).Eleven species of birds, Spotted owlet, Parakeet, Red whiskered bulbul, Drongo, Myna, White cheeked barbet, Copper Smith barbet, Beeeater, Koel-male and female, Purple rumped sunbird and the Indian roller were spotted feeding, resting and nesting in the tree. In these 11 species, the most dominant were the Drongo species and the Myna species. The Myna was also in dominance due to the fact that they are omnivores and was able to chomp on the fruits of the tree. The villagers have placed few concrete water tanks near the trunk for their Hej-jenu (Kan: rock bees) to utilize when temperature soars during summer. They have learned to live with their 'flying stingers' by avoiding when they encounter a worker bee encircling them. This mammoth gathering of bee colonies has not deterred the villagers in protecting them. The reports of bee hives in large numbers has seen a decline in recent times according to the locals, shift and gradual decline in cropping, the fall of few prominent branches of the tree are attributed to the decline. *Apisdorsata* is a seasonally nomadic bee migrating to locations about 100-200 km distance every year, studies on their migratory pattern and the assessment of their pollination services needs to be evaluated. Awareness regarding the presence of such large number of colonies has drawn the attention of concerned authorities.

As we enquired about the existence of honey bee colonies in the neighbouring areas, we were told about Ittasandra within a radius of 2-3 kms. It too had a banyan tree, *F. benghalensis* (Fig.2) with 28 active hives and we spotted 7 different species avifauna *viz*., Parakeets, Purple rumped sunbird, Copper Smith barbet, Wagtail, Drongo, Roller, White cheeked barbet. Additionally, across the road was a peepal tree, *F. religiosa*with one active hive and one inactive hive. Although bee hives of Ramagovindapura are known and reported widely. Ittasandra banyan tree with bee hives is a first time report.

Pollination is a valuable ecosystem service and the study area being an agri-horticulture zone the bees would be enhancing agricultural production especially of fruits and vegetables. Regular monitoring and assessment of the colonies needs to be undertaken.

Fig.2. The grand old banyan tree adjacent to the main road in Ittasandra with parakeet inside its broken branches

AN ELECTRONIC INFORMATION PACKAGE IN CABBAGE: MANAGEMENT AND AWARENESS OF IPM IMPLEMENTATION IN UTTAR PRADESH

Meenakshi Malik, Mukesh Sehgal and Surender Kumar
ICAR-National Research Centre for Integrated
Pest Management, New Delhi-110012
Email: *minaxi.2007@gmail.com*

Cabbage is the fourth most widely grown vegetable crop of the country and India is the leading country in the production of the crop.West Bengal, Orissa, Bihar, Assam, Karnataka, Haryana, U.P., Maharashtra and Gujarat are the major growers of the crop.A large variety of vegetables belonging to different groups are being cultivated in the country which includes solanaceous, cucurbitaceous, leguminous, Cole crops, root crops and leafy vegetables.

Being having the natural advantage of diverse agro-climatic conditions, Uttar Pradesh enables production of wide range of horticultural crops and is bestowed with rich bio-diversity and varied agro-climatic conditions which is ideal for growing a large variety of horticultural crops. The sector, which includes fruits, vegetables, floriculture, spices, medicinal & aromatic plants have gained significance in terms of enhanced income per unit area, leading to socio-economic improvement of the people of the state, whereas the vegetables including root and tuber crops occupy an important place in diversification of agriculture and have played a pivotal role in food and nutritional security of ever growing population of our country. The area production and productivity of horticulture crop has considerably increased as the state and central Govt. have focused attention towards these crops. More income per unit area and employment generation in short span of time have attracted the enterprising farmers of the state, which resulted in diversification towards horticulture crops. These crops have proved to be the boon to the small and marginal farmers of the state who accounts for more than 90% holding of the state. This is more important because nearly 70% of the population is dependent on agriculture.

India is the second largest producer of vegetables in the world (ranks next to China) and accounts for about 15% of the world's production of vegetables. The significant achievements have been obtained in terms of production as the current production level is over 90 MT and the total area under vegetable cultivation is around 6.2 million hectares which is about 3% of the total area under cultivation in the country. Potato, tomato, onion, cabbage and cauliflower account for around 60% of the total vegetable production in the country.

Cabbage (*Brassica oleracea* var capitata) being an essential and important crop is good sources of protein which contains all essential amino acids, particularly sulphur containing amino acids, an excellent source of minerals such as calcium, iron, magnesium, sodium, potassium and phosphorus. It has substantial amounts of carotene provitamin A, ascorbic acid, riboflavin, niacin and thiamine. The major varieties of cabbage are Golden acre, Pusa Drum Head, Pride of India, Copenhagen Market, Pusa Mukta, Pusa Synthetic, Midseason Market, September Early, Early Drum Head, Late Large Drum Head and K-1. It is commonly cultivated in cool moist climate. It is grown as a winter crop in plains. It is grown in varied types of soils ranging from sandy loam to clay. It requires a pH ranging from 5.5 to 6.5 for higher production.

The aim for developing the e-package and mobile applications is to give open access of information to all needed for sustainable growth of the country. This proposed knowledge-base based on Information and technology would provide the ample space for filling the gapsin the Indian agriculture.

The research team is trying to develop a need based e-Information package in the form of mobile based app and web-page for management and awareness of IPM implementation in cabbage in Bulandshahr district of Uttar Pradesh.Many ICT in agriculture or e-agriculture interventions have been developed and tested around the world to help agriculturists improve their livelihoods through increased agricultural productivity and income or by reducing risks by connecting farmers to knowledge, networks and institutions. ICT uses for inclusive value chains and success stories on information and communication technologies for agriculture and rural development have documented many cases of use of ICT in agriculture. To smoothen the communication and exchange of information among different research workers and farmers in the crop, the aim is to provide a flexible source of information the farmers of the study area.

4 villages have been selected from the district Hapur and Bulandshar under this research work. As Hapur has a large area cultivated under this crop, the researcher is trying to attempt a comparative study of the farmers between different districts.The secondary data is collected from the online resources and published literature to build a flexible e- package based on the existing knowledge from different sources and field survey using an Integrated crop management approach. Meetings are being organized for linkage development with the personnel of KVK Bulandshahr and Hapur for collection of primary data from the farmers of the village about the real time problems faced by them during the cultivation of cabbage crop.

More specifically, e-package involves the conceptualization, design, development, evaluation and application of innovative ways to use information and communication technologies (ICTs) in the rural domain, with a primary focus on agriculture. Apart from the health improvements, the production of vegetables improves the economy of a country as these are very good source of income and employment. The contribution of vegetables remains highest about 60% in horticulture crop productions over the last five years. India is the world largest producer of many fruits and vegetables but there still exist huge gap between per capita demand and supply. Due to inadequate facilities and information related to the crop, multiple times a large production is wasted. Both the central and state governments are encouraging the extension workers/ farmers/ researchers in the form of training's and research through which the commercial production can be increased. Farmers of the concerned region face the problems for identification of pests and diseases related with the vegetable crops especially cabbage, being important commodity of the area. They face tremendous pain to arrive at the decision for their crop right from the selection and raising to the final disposal and managing the crop throughout the cropping season. Farming community get the scattered information in piece meal mode and the more on unscientific basis. Their approach is to get the information for their commodity for managing it in a better way, but lack of proper and timely information as an authentic input is really lacking and missing from the ground reality and therefore they are forced to adopt and use whatever is provided by the seller or the sources. They run here and there in search of proper and scientific information for their commodity and incur harm rather improvement or profit to both their produce as well to the environment.

Past strategy for development of the agriculture sector in India has focused primarily on raising agricultural output and improving food security. The net result has been a 45 per cent increase in per person food production which has made India not only food self-sufficient at aggregate level, but also a net food exporting country.

The strategy did not explicitly recognize the need to raise farmers' income and did not mention any direct measure to promote farmers welfare. The net result has been that farmers income remained low, which is evident from the incidence of poverty among farm households. The low and highly fluctuating farm income is causing detrimental effect on the interest in farming and farm investments, and is also forcing more and more cultivators, particularly younger age group to leave farming. This can cause serious adverse effect on the future of agriculture in the country. Time has come now to replace the existing and absolute technology i.e. time consuming, outdated with a new approach of Information era which could be more economical and beneficial.

चौलाई (रामदाना) की खेती तथा इसका महत्व

पंकज कुमार, अजय कुमार, अरुणिमा पालिवाल, पदम सिंह, विनोद कुमार और इन्द्र सिंह
वी.च.सिं.ग. उत्तराखण्ड औद्यानिकी एवम् वानिकी विश्वविद्यालय
भरसार, वानिकी महाविद्यालय परिसर, रानीचौरी, 249199,
टिहरी गढवाल (उत्तराखण्ड)

रायल बोटेनिकल गार्डन, क्यू, लन्दन की रिपोर्ट के अनुसार वैज्ञानिकों ने लगभग 390,000 पौधों की प्रजातियों को जाना है। जिनमें से 2,034 नये पौध प्रजातियों की खोज 2015 में हुई। इसी रिपोर्ट के अनुसार 21 प्रतिशत पौधे ऐसे हैं जो विलुप्ती की कगार पे हैं। धरती के 10 प्रतिशत भाग से अधिक भाग में वनस्पतियॉ बहुत अधिक संवेदनशील, जलवायु परिवर्तन के कारण हो रही है। इन्हीं में से कम से कम 50,000 पौध प्रजातियॉ मनुष्य के खाने के योग्य हैं। 150 सक्रिय प्रजातियों को सिर्फ भोजन और पशु आहार के लिए उपयोग में लाया जाता है। जिनमें से 15 पौधे प्रजातियाँ हमारे भोजन के लिए 90 प्रतिशत कैलोरी प्रदान करती हैं और 30 पौधे प्रजातियों को 95 प्रतिशत मानव कैलोरी और प्रोटीन के लिए खेती की जाती है। औद्योगिक कृषि की खेती 250 पौध प्रजातियों में 15 प्रजातियाँ 90 प्रतिशत कैलोरी हमारे आहार और 4 पौध प्रजातियों (धान, गेहूँ, मक्का और आलू) से लगभग 60 प्रतिशत कैलोरी सभी पौंधों से वैश्विक स्तर पर उपयोग में लाया जाता है। चौलाई विश्व के 36 सबसे बेहतरीन फसलों में से एक है। अन्य बीजों की अपेक्षा चौलाई मे अधिक मात्रा में प्रोटीन, लाइसिन की मात्रा दोगुनी और अधिक मात्रा में आहारीय रेशे और 5 से 20 गुना कैल्शियम और आयरन क्रमशः पायी जाती है। चौलाई व रामदाना बीज और पत्तियों दोनों सब्जी के रूप में मानव और मवेशियों के आहार के रूप में उपयोग में लायी जाती हैं।

चौलाई की खेती भारतवर्श में उत्तराखण्ड, हिमाचल प्रदेश, जम्मू कश्मीर, तमिलनाडु, गुजरात से लेकर उत्तर–पूर्वी भारत तक की जाती है। चौलाई को भारतवर्ष में बहुत नामों से जाना जाता है जो निम्नलिखित हैं–छोटी चौलाई और लाल साग (हिन्दी), चीरा (मलयालम), राजगिरी (कन्नड़, कोंकण, संस्कृत), बस्टन एफ्रोज और मावल (कश्मीरी), राजगीरा व शवरानी मथ (मराठी), ताज खुरस (पंजाबी), गुलकेश (उर्दू), पुन्कीराई (तमिल), चिलाका थोड़ाकुड़ा (तेलगु), और उत्तराखण्ड में इसे चुआ, चौलाई, रामदाना आदि नामों से जाता है। राजगीरा का अर्थ 'अनाजों का राजा' और रामदाना का अर्थ 'ईश्वर का अपना अनाज' होता है। उत्तराखण्ड के मध्य एवं ऊँचे पर्वतीय क्षेत्रों में इसकी खती काफी प्रचलित है। इसकी पत्ती, तना और बीज सभी उपयोग में लायी जाती हैं। चौलाई के दानों को भूनकर लड्डू, हलवा, लैईया और अन्य बेकरी उत्पाद बनाये जाते हैं। इससे चपाती, पास्ता, बिस्किट, पेयजल आदि भी बनाये जाते हैं। इसकी पत्तियों और तना से सूप और सलाद भी बनाया जाता है।

बुआई का समय

उत्तरी भारत में इसकी बुआई पर्वतीय क्षेत्रों में ऊँचाई पर निर्भर करती है। मध्यम व निचले क्षेत्रों में जून का प्रथम पखवाड़ा, ऊँचे पर्वतीय क्षेत्रों में (1500 से 2400 मी0) मई द्वितीय पखवाड़ा बुआई का उपयुक्त समय होता है। दक्षिण भारत में यह पूरे वर्ष भर उगाई जाती है।

बीज दर

चौलाई का एक पौधा लगभग 60000 बीज उत्पन्न करता है। चौलाई के 1 ग्राम बीज में लगभग 3000 बीज हो सकते हैं। सीधी बुआई में 2–3 किग्रा प्रति हेक्टेयर और पौधा परिवर्तन में 1 किग्रा प्रति हेक्टेयर की दर से बोना चाहिए। जिसकी गहराई लगभग 1.5 सेमी होनी चाहिए। इसे हम 10–15 दिन 95 प्रतिशत के आपेक्षिक आद्रता के पर संग्रहीत कर सकते हैं। लेकिन शोध के परिणामों से यह ज्ञात होता है कि बीज को छिटक कर बोने के बजाय अगर लाइन से बोया जाय तो अधिक उत्पादन प्राप्त होता है। इस स्थिति में लाइन से लाइन की दूरी 40 से 50 सेमी तथा पौधे से पौधे की दूरी रखनी चाहिए और बीज को 1.5 किग्रा प्रति हेक्टेयर की दर से बोना चाहिए।

बीज उपचार

चौलाई की बुआई से पूर्व बीज को 10 ग्राम एजेटोबैक्टर प्रति किग्रा बीज की दर से उपचारित करने पर अधिक उपज प्राप्त की जा सकती है।

चौलाई के लिए तापमान

इसमें बंजर वातावरण में उगने की बहुत अधिक क्षमता हाती है। बीज अंकुरित होने के लिए मृदा का तापमान 18 से 25 डिग्री सेल्सियस की जरूरत होती है। एक अनुकलतम वृद्धि के लिए हवा का तापमान 25 डिग्री सेल्सियस से अधिक की जरूरत होती है। इसकी वृद्धि तापमान के 18 डिग्री सेल्सियस से कम हो जाने पर रूक जाती है और पत्तियों की संख्या भी कम हो जाती है। कटाई के समय ठंड का बढना इसकी वृद्धि को रोकने के लिए बहुत महत्वपूर्ण है। यह बहुत ही सूखा सहनशील पौधा है, लेकिन जल भराव स्थिति के लिए यह उपयुक्त पौधा नहीं है।

चौलाई के लिए मृदा की गुणवत्ता

मृदा अम्लीयता 6.4 $_{p}H$ तक अधिक उपज के लिए उपयुक्त है। 4.7 से 5.3 $_{p}H$ पर सब्जी के लिए उपयोग वाली चौलाई पर प्रतिकूल प्रभाव पड़ता है।

चौलाई के लिए सिंचाई

गर्मी में सिंचाई के दौरान इसकी हर दो हफ्ते बाद पत्तियों को सब्जी के रूप में लिया जा सकता है। अधिक उपज के लिए रेतीली भूमि के होने पर गर्मी में हर 4 से 5 दिनों के अन्तराल पर सिंचाई करनी चाहिए।

खरपतवार निराकरण

अंकुरण के पहले सप्ताह तक इसकी वृद्धि बहुत धीरे–धीरे होती है और लगभग 6 से 10 इंच की वृद्धि के बाद इसकी वृद्धि बहुत जल्दी होती है। इसलिए खरपतवार निकासी बुआई के 15 से 20 दिन बाद पहली निराई व अधिक खरपतवार होने की दशा मे दूसरी निराई, पहली निराई के 20 दिन बाद अवश्य करनी चाहिए।

पोशक तत्व प्रबन्धन

चौलाई की खेती जैविक और रसायनिक दोनों प्रकार से की जाती है। यह फसल अन्य फसलों की अपेक्षा अधिक मात्रा में पोशक तत्वों का अवशोषण करती है। जैविक खेती के लिए 10 टन गोबर की सड़ी खाद अथवा 5 टन वर्मी कम्पोस्ट प्रति हेक्टेयर की दर से अधिक उपज के लिए किया जाता है। गोबर की सड़ी खाद को जुताई से पूर्व 10–15 दिन पहले खेत में छिटक देना चाहिए। अधिक उत्पादन के लिए रसायनिक खाद 60 किग्रा नत्रजन तथा 40 किग्रा फास्फोरस प्रति हेक्टेयर की दर से करना चाहिए। जिसमें नत्रजन की आधी मात्रा तथा फास्फोरस की पूरी मात्रा बुआई के समय तथा नत्रजन की शेष आधी मात्रा बुआई के 40 से 50 दिन बाद खड़ी फसल में निराई–गुड़ाई के उपरान्त प्रयोग करना चाहिए। ऐसी दशा जहाँ मृदा में पोटाश की कमी होती है वहाँ पर 20 किग्रा पोटाश प्रति हेक्टेयर की दर से बुआई के समय अन्तिम जुताई पर करना लाभकारी होता है।

फसल सुरक्षा

सामान्यतः चौलाई में कीट एवं बीमारियों का प्रकोप कम ही होता है। फिर भी कभी–कभी पर्णजालक कीट का प्रकोप हो जाता है। इस की सूड़ी, बाली निकलते समय पत्तियों की निचली सतह को खा जाती है। जिससे पत्तियॉ जालिनुमा दिखाई देने लगती हैं। इस दशा में जैसे ही कीट का प्रकोप दिखाई दे तो डाइमिथोएट के 0.1 प्रतिशत या क्यूनालफॉस के 1.5 प्रतिशत घोल का छिड़काव करना चाहिए।

फसल प्रबन्धन

चौलाई को सहफसली खेती के रूप में महत्वपूर्ण पाया गया है। जिससे आधारित कुछ फसल चक्र निम्नलिखत हैं– चौलाई + गन्ना –उर्द/मूँग (1 वर्ष), चौलाई + लोबिया –गेंहू (1 वर्ष), चौलाई + सोयाबीन –गेंहू (1 वर्ष), चौलाई + राइसबीन –गेंहू (1 वर्ष) तथा चौलाई + उर्द/मूंग (1 वर्ष)।

चौलाई की विभिन्न प्रजातियॉ

वनस्पतिक वैज्ञानिक नाम के अनुसार इसकी बहुत सी प्रजातियाँ पायी जाती है। जिनका क्रोमोसोम संख्या में भी भिन्नता पायी जाती है। कुछ महत्वपूर्ण प्रजातियाँ हैं, जो सब्जी के रूप में उपयोग में लायी जाती हैं वे निम्नलिखित हैं –

एमरेन्थस हाइपोकॉन्ड्रिकस (2n=34), एमरेन्थस लिविडिस (छोटी चौलाई) (2n=34), एमरेन्थस ट्राइकलर (बड़ी चौलाई) (2n=34), एमरेन्थस ड्यूबिस (2n = 34), एमरेन्थस ब्लाइटम (2n = 34), एमरेन्थस स्पाइनस (2n = 34), एमरेन्थस विरिडिस (2n = 34), एमरेन्थस ट्राइटिस (2n = 32), एमरेन्थस ग्रिसिजैन्स (2n = 32), एमरेन्थस काडेटस (2n = 32) तथा एमरेन्थस कूएन्टस (2n=32)

चौलाई की गुणवत्ता

यू0एस0डी0ए0 (2014) के संगणन संकलन के अनुसार 100 ग्राम चौलाई की कच्ची पत्ती में रसायनिक पदार्थों की मात्रा निम्नलिखित पायी जाती है–

पानी (91.69 ग्राम), ऊर्जा (23 किलो कैलोरी), प्रोटीन (2.46 ग्राम), वसा (0.33 ग्राम), कार्बोहाइड्रेट (4.02 ग्राम), कैल्शियम (215 मिग्रा), आयरन (2.32 मिग्रा), मैग्नीशियम (55 मिग्रा), फास्फोरस (50 मिग्रा), पोटेशियम (611 मिग्रा), सोडियम (20 मिग्रा), जिंक (0.90 मिग्रा), विटामिन 'सी' (43.30 ग्राम), थियामिन (0.027 मिग्रा), राइबोफ्लेविन (0.158 मिग्रा), नियासिन (0-658 मिग्रा), विटामिन 'बी6' (0.192 मिग्रा), फोलेट (85 माइक्रोग्राम), विटामिन 'ए' (146 माइक्रोग्राम) और विटामिन 'के' (1140 माइक्रोग्राम)।

लिपिड एक बहुत महत्वपूर्ण न्यूट्रिटिव घटक है जो कि चौलाई के बीज में ट्राइएसाइलग्लिसराल, फास्फोलिपिड, स्क्वालीन और लिपिड स्क्वालीन और लिपिड स्ल्यूबिल विटामिन जैसे टोकोफिराल सबसे महत्वपूर्ण अवयव है। कुछ अल्प महत्वपूर्ण अवयव जैसे फाइटोस्टीराल, वैक्सेस और टरपीन एल्कोहॉल की कुछ मात्रा भी पायी जाती है। हवा और गर्मी का प्रभाव भी इनके अवयवों पर पड़ता है।

चौलाई में अधिक मात्रा में जरूरी एमिनो एसिड जैसे लाइसिन, मिथियोनीन, थ्रियोनीन और सिस्टीन पाये जाते हैं। लिपिड ओलेइक एसिड, पालमिटिक एसिड और लिनोलेइक एसिड के रूप में बीज के भ्रूण में पाये जाते है। चौलाई में एण्टिन्यूट्रिस्नल फैक्टर जैसे नाइट्रेट (0.23-0.89 प्रतिशत) तथा आक्सलेट (0.80-1.90 प्रतिशत) पाया जाता है।

चौलाई को मिथ्या अनाज के रूप में भी माना जाता है, जिसके अन्तर्गत कुट्टू भी सम्मिलित है। भौतिक व पाचक स्टार्च भी चौलाई में पाया जाता है। इसमें स्वास्थ्य प्रभाव, एन्टिआक्सिडैन्ट की क्रिया, प्रतिरक्षा क्षमता के प्रभाव, एन्टिट्यूमर प्रभाव, रक्त ग्लूकोज मात्रा, लीवर क्रिया पर प्रभाव, हाइपरटैन्सन, एन्टिएनीमिक प्रभाव, सीलिएक बीमारी और एन्टिएलर्जिक क्रिया के लक्षणों के लिए भी महत्वपूर्ण है।

चौलाई में बीटा कैरोटीन तथा कैश्लियम की मात्रा अधिक होने की वजह से यह हड्डियों को मजबूत, मसल्स रिजनरेसन और रक्त दाब को कम करने में सहायक होता है। विटामिन 'सी' की मात्रा अधिक होने से शरीर से उत्पन्न कोलाजन मे मदद करता है तथा त्वचा को खूबसूरत दिखने में मदद करता है। पत्तियों में फोलेट की उपस्थिति की वजह से यह हृदय संवहनी विकार कम करने के साथ–साथ दिमाग को भी तेज करने में मदद करता है। अन्य में जैसे दृष्टि रोग, श्वसन क्रिया, ठण्ड, कम वृद्धि, एड्स प्रजनन, पेट रोग तथा ज्वर आदि में भी बहुत सहायक है।

चौलाई की कुछ किस्में तथा उनके लक्षण

भारत में चौलाई की कुछ किस्में उत्पन्न की गयी हैं जो निम्नलिखित हैं–

1. **छोटी चौलाई** किस्म आइएआरआइ से उत्पन्न की गयी।
2. **बड़ी चौलाई** किस्म आइएआरआइ से उत्पन्न की गयी।
3. **सी0ओ0–1** किस्म कोयम्बटूर से उत्पन्न की गयी।
4. **सी0ओ0–2** इसकी तुड़ाई 20–25 दिन बुआई के बाद की जाती है। यह किस्म 130 कु0 प्रति हेक्टेयर की पैदावार देता है।
5. **सी0ओ0–3** यह किस्म 30 टन प्रति हेक्टेयर की पैदावार हरी पत्ती के रूप में देता है।
6. **सी0ओ0–4** यह किस्म पूरे तमिलनाडू में उगाई जाती है। इसकी उपज 2555 किग्रा प्रति हेक्टेयर बीज के रूप में और 8200 किग्रा प्रति हेक्टेयर हरी पत्ती के रूप में पौधों की छटाई के बाद 25 दिन पर देता है।
7. **सी0ओ0–5** इसकी बुआई का समय जून से सितम्बर और जनवरी से मई के बीच में होती है। इसकी उपज 40 किग्रा प्रति हेक्टेयर है।
8. **लाल साग, पूसा किरन** इसकी पहली तुड़ाई बुआई के 21 से 25 दिन बाद की जाती है। इसकी तुड़ाई का समय 70 से 75 दिन में हो जाती है। इसकी उपज 35 टन प्रति हेक्टेयर है।
9. **पूसा लाल चौलाई** इसकी खेती उत्तरी मैदानी इलाकों में की जाती है। इसकी तुड़ाई का समय 95 से 100 दिन में हो जाती है। इसकी उपज 45 से 50 टन प्रति हेक्टेयर है।
10. **दुर्गा** यह प्रजाति एन0बी0पी0जी0आर0 शिमला द्वारा विकसित की गयी। यह प्रजाति उत्तर–पश्चिमी हिमालयी क्षेत्र के लिए उपयुक्त है। यह पक कर 110 दिन में तैयार हो जाती है। इसकी उपज क्षमता 22 से 25 कु0 प्रति हेक्टेयर आंकी गयी है।
11. **अन्नपूर्णा** यह प्रजाति एन0बी0पी0जी0आर0 शिमला द्वारा सन 1986 में विकसित की गयी। इसकी उपज क्षमता 20 से 25 कु0 प्रति हेक्टेयर आंकी गयी है। इसके दाने में 14.50 प्रतिशत प्रोटीन पाया जाता है।

उत्तराखण्ड की उन्नत प्रजातियॉ

प्रजाति	विकसित करने	साल	उपज क्षमता (कु0 प्रति हेक्टेयर)	प्रोटीन प्रतिशत	तेल प्रतिशत	अनुमोदित स्थान
पी0 आर0 ए0 –1	गो0 ब0 पन्त कृषि एवं प्रौद्योगिक विश्वविद्यालय के वानिकी एवं पर्वतीय कृषि महाविद्यालय, रानीचौरी	1996	20 से 22	14.50	9.20	उत्तराखण्ड राज्य के पर्वतीय क्षेत्र के लिए
पी0 आर0 ए0 –2	गो0 ब0 पन्त कृशि एवं प्रौद्योगिक विश्वविद्यालय के वानिकी एवं पर्वतीय कृषि महाविद्यालय, रानीचौरी	2000	20 से 22	14.101	2.10	उत्तर–पश्चिमी हिमालयी क्षेत्र के लिए
पी0 आर0 ए0 –3	गो0 ब0 पन्त कृषि एवं प्रौद्योगिक विश्वविद्यालय के वानिकी एवं पर्वतीय कृषि महाविद्यालय, रानीचौरी	2003	20 से 25	14.081	2.00	उत्तर–पश्चिमी हिमालयी क्षेत्र के लिए
वी0 एल0 चुआ–44	वी0प0कृ0अनु0	2006	12 से 15	–	–	उत्तर–पश्चिमी हिमालयी क्षेत्र के लिए संस्था अल्मोड़ा

All the readers are requested to share articles related to global, nature, environment, renewable and non-renewable resources, biodiversity and other inter-related topics to publish in the NESA e-newsletter. The suggestions for the betterment of the society can be shared with others. Our academy is very old and has more than 2199 life members. We hope that members will contribute more articles and send their suggestions/comments in future.. **Editor Newsletter.**

MANAGEMENT OF INSECT-PEST OF MANGO: AN ONLINE SUPPORT TOOL

Meenakshi Malik, Mukesh Sehgal and Surender Kumar
ICAR-National Research Centre for IPM, New-Delhi-110012
Email: *minaxi.2007@gmail.com*

Mangifera indica, is an evergreen fruit tree in the family Anacardiaceae grown for its edible fruit and is one of the most widely cultivated fruits in the tropics. Mango is believed to originate from India or Burma (Myanmar). Being the National fruit of India and Pakistan and the National tree of Bangladesh, there are several hundred cultivars of mango worldwide that varies in size, shape, sweetness, skin color and flesh color depending on the cultivar.

As it is a well-known fact that the fruit tree suffers from a number of Insect-pests at all stages of development i.e. right from nursery stage to grown-up tree stage, even causing loss to the production and making them unsuitable for marketing and export. The National Research Centre for Integrated Pest Management has tried to develop an online support tool for this important crop which can lead users through clear steps and suggest optimal decision paths or may act more as information sources to improve the evidence base for taking decision at the critical times. Decision support tools, usually considered to be software-based, may be an important part of the quest for evidence-based decision-making in agriculture to improve productivity and environmental outputs. Yet, despite the availability of online tools, the uptake is disappointingly very low. The effectiveness of tools is more important than the quantity used for the successful implementation.

The mango Insect-pests as reported by different authors included in the online support tool viz. Mango (leaf) hoppers, Mealybugs, Leaf Webber, Thrips, Stem borer, Shoot borer, Scale insect, Red ant, Leaf miner, Termites, Shoot gall Psylla, Midge, stone weevil, Fruit-fly, Leaf cutting weevil, Bark-eating caterpillar and Tea mosquito bug.

Image 1. Page layout for Insect-pest of the Mango crop.

The information on the description of all the pests with their procedure of observation is gathered, the scientific name, family and order for the concerned pest is also collected and compiled. The information on the management for the pest's i.e. chemical, biological and cultural control is also collected from the published literature. The collected information is compiled and layouts for the same are developed. The user can identify the insect/pests with the images and if one is successful in identifying the images, the management practices can be followed.

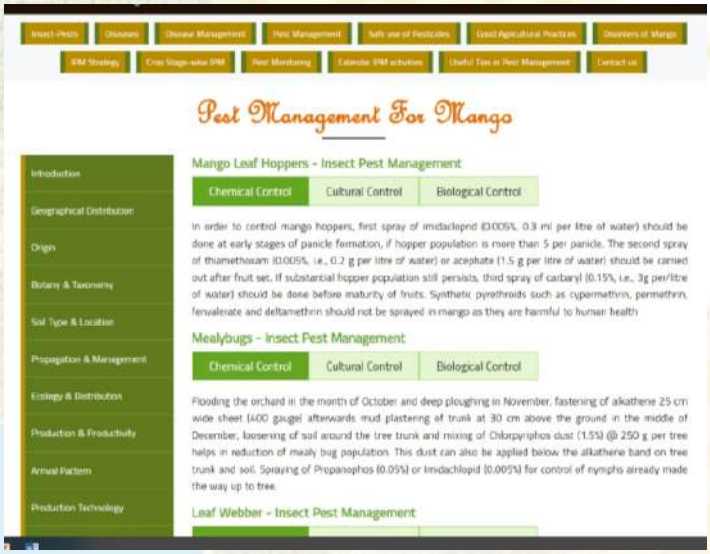


Image 1. Page layout for Insect-pest of the Mango crop.

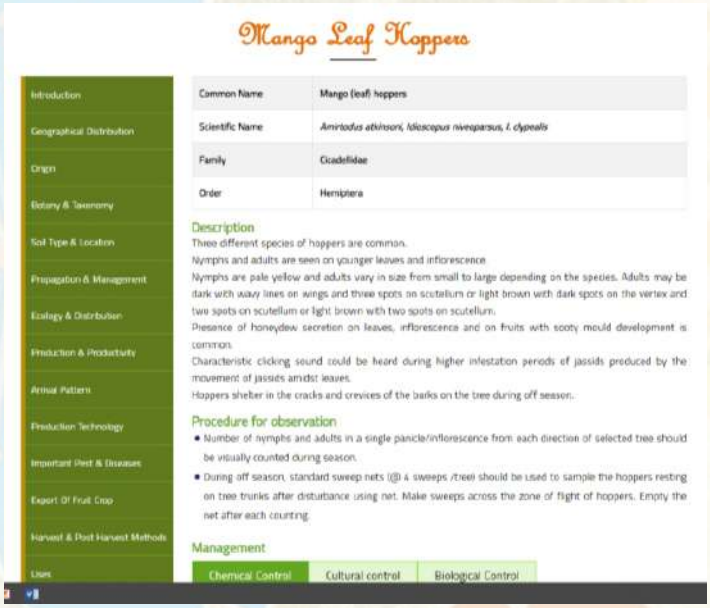


Image 2: Page layout for management practices.

Multiple times, the farmer is lacking the knowledge about the name of Insect/pest, they described them mostly as related to a particular symptom or by the plant part under attack. This helped the researchers to exactly identify the Insects-pest. The major mango Insects-pests reported by farmers in the study area which has cause largest damage to the production of the crop is thrips which was pronounced as Ruzzi in the local language. The results of this research work reveal that farmers' perception on incidence, severity and yield loss due to the different pests and diseases varied across the districts. The knowledge level of farmers on most Insects-pest of the fruit crop and their Integrated Pest management was low. Good orchard management practices like timely pruning, spraying, weeding, manuring and mulching were still lacking among the mango farmers. Many Insect-pests coupled with unsound scientific orchard management practices threaten the exotic mango production potential. Therefore, to improve exotic mango production, awareness creation among farmers about the various pests and diseases is vital. There is also need to build the capacity of farmers and extension workers on the

Integrated pest management practices as a key to development of mango industry.

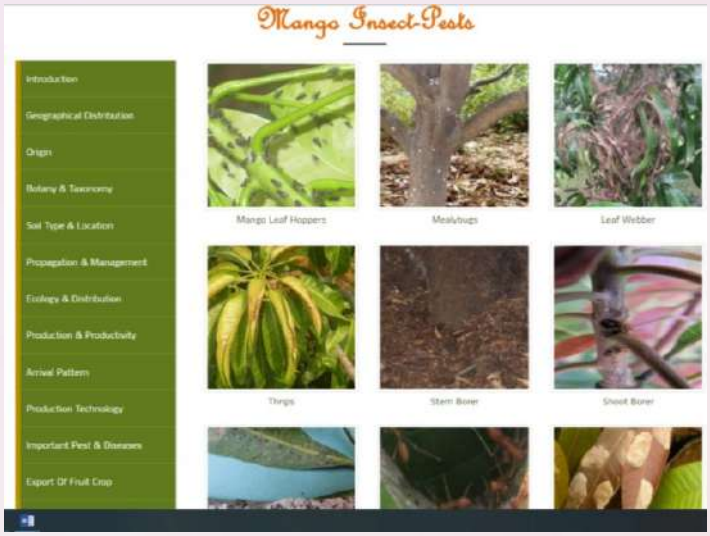


Image 4: Page layout for pictorial presentation of various pest-diseases.

For farmers and their advisers, software tools can facilitate effective farm management by recording data efficiently, analyzing it and generating a series of evidence-based recommendations. The policymakers can also benefitted from increased information sharing, which allows them to gather a more complete overview of the situation on the ground in the country. In this vein, ICTs also have enormous potential to reach the poorest of the poor- those without access to land or other assets and also address gender issues by equalizing access to information and services by women and men. These tools can promote learning, hence which can facilitate technology adoption among the farmers and can also revolutionize early warning systems through better quality data and analysis.

Other decision support tools (DST) that may not be dynamic but act more as information sources. However, despite their apparent value the uptake of such tools by farmers and advisers, has been limited. Rather, we note that there are already a number of high-quality DST available, with many more in the conception and design phase. Therefore, to assist the delivery of existing tools and the design of future tools, we have to identify a number of key characteristics affecting the use of such tools by farmers and advisers. Identification of the factors that should be considered in the design and delivery of successful implementation of DST is an important task and if the designers of such tools can be encouraged to apply the findings as a checklist against which to measure the quality of new tools, then the likelihood of a tool's uptake in on-farm decision making will be increased.

SOME NEW UPDATES ON SARS-COV-2 & COVID-19 & ITS VACCINE

Sajid Husain
Professor, Department of Microbiology,
Ch. Bansi Lal University, Bhiwani, Haryana, India
E-mail: *professorshusain@gmail.com*

New findings:

1. Olfactory the epithelium has odour sensing neurons and the epithelium has 200-700 more ACE2 (receptor for SARS-COV-2) expressing cells (upper nose). Therefore, infected patients are lost to resolve to sense -odor at the source.
2. Concentration of SARS-COV-2 virus particles/ viral load, among infected or asymptomatic patients is equal but the spread of infection is dependent on the distance from the source of infection, stage of the patient, immunity status, age and gender of the patients.
3. Higher percentage of the virus is in the small intestine rather than in the lungs. ACE-2 the receptor is present on all vital organs of the body. As a result of lungs infection, it synthesizes a gel-type chemical in lungs, which hinders in gas exchange, therefore in most of the cases, ventilator did not work but proved to spread of disease to brain.
4. Anti-spike antibodies are in-abundant among recovered patients whereas deceased patients had anti-nucleo-capsid antibodies.
5. Patients who had been infected with other coronaviruses including NL63 along with influenza virus resisted more and helped in the recovery of the patients.
6. Behavior of the virus is different among different races and different genders.

SARS-CoV-2 disturb the immunological response in such a way that no cohesive cognate activity among innate & adaptive system responded.

7. Now it is becoming difficult to diagnose and detect other respiratory viruses such as adenoviruses, bocaviruses, enteroviruses, metapneumovirus, human para influenza viruses, human rhinoviruses, measles morbilli viruses, mumps virus, rubella virus and respiratory syncytial virus along with COV-2.
8. Scientists fear other outbreak from Influenza, Nipah and Hendra viruses in coming years.
9. Preprint data shows the transmission of the virus through oral-faecal route, as Poliovirus, COV-2 is also present in the sewage water and faeces.
10. Children age group 7-14 is showing symptoms of Kawasaki disease.

Vaccine status:

Russian vaccine: The Russian vaccine candidate has been developed using the combination of two adenoviruses, Ad5 and Ad26 and engineered with coronavirus proteins.

Russian experts tested frozen and freeze-dried forms of vaccines. The frozen variant of the vaccine-induced a stronger antibody response when compared to the freeze-dried one. It should be noted no placebo & no older person taken into trials. The vaccine was released after phase II trials only and the whole trial was carried on 76 volunteers only. The Russian government wants to carry out phase 3 trials in collaboration with the Indian counterpart.

Covaxin' by Bharat Biotech: (Genome Valley, Hyderabad, India)

This vaccine works by injecting SARS-CoV-2 virus that has been killed in the lab. The candidate aims to use this deadly virus, which is not expected to have the potential to infect or replicate in those injected with it, to induce an immune response by the body. The candidate is currently expected to enter phase II human trials this week (September 12,2020).

Covishield' by University of Oxford-AstraZeneca

One of the most closely watched candidates globally, this vaccine works on the principle that uses a weakened and non-replicating

version of a common cold the virus that infects chimpanzees to carry a code that will tell cells to build just the spiky outer layer of the SARS-CoV-2 virus.

ZyCov-D' by ZydusCadila
One of the indigenously produced frontrunners in the Covid-19 vaccine race, this uses a genetically engineered DNA molecule coded with the DNA sequence of the SARS-CoV-2 virus, against which the immune response is expected to be developed.

HGC019 by Genova Biopharmaceuticals-HDT Bio
This candidate called 'mRNA' vaccines, which make use of the messenger RNA molecules that tell cells to synthesize the spike protein-the spikes found on the surface of the SARS-Cov-2 virus.

USA:	Moderna –NIH has reached to phase 3 trial	
China:	Sinovac / Sinopharm	phase 3 trial
UK:	Astra-Zeneca	Phase 3 trial
India:	Zydus Cadilla	Phase 2 trial
Russia:	Gamaleya	all trials

WHO: multilateral efforts for financing with the help of World Banks through CEPI (Coalition for epidemic preparedness innovations) vaccine for global use.

WHO: WHO is not commenting a single word about any of the vaccines' in the pipeline for safety, efficacy and utility further, the organization (WHO) may issue some narratives after mid-2021.

In addition to above-described companies, a lot of universities-institutes and government-private partnership innovations are engaged in vaccine program on the principles of attenuation, mRNA/ DNA, adenovirus-based spike sequence cloned, nucleic acid-based cloned in a suitable vector. To the other side, many lead molecules have been isolated in nature, and synthesize including peptides to control over ACE2 binding but so far no successful leads has been achieved along with RNAi and other RNA interfering techniques and lead molecules.

Consulted journals: Cell, Nature, Science, Scientist, The New England Journal of Medicine, Immunity.

"Protection is the only deterrent, masking, use of sanitizer and 6 feet physical distancing"!

NESA HONOURED TO HAVE EMINENT LIFE MEMBERS FROM ICAR

Dr. Rakesh Chandra Agrawal
DDG (Agricultural Education) and National Director, NAHEP
KAB - II, Indian Council of Agricultural Research, New Delhi

Dr. R.C. Agrawal is an Agricultural Research Services (ARS) Scientist and an alumnus of the Indian Agricultural Research Institute (IARI), New Delhi. He spent 20 years working in the field of Plant Genetic Resources (PGR) at Indian Council of Agricultural Research - National Bureau of Plant Genetic Resources (ICAR-NBPGR).

Demonstrated leadership in the field of PGR information, documentation and dissemination which resulted in creation of National Information Network of PGR in India (NISM). The databases created by Dr. Agrawal are extensively used at ICAR-NBPGR for PGR management and at PPV&FRA for the identification of reference varieties. Created a platform for management of change in Indian NARS which resulted in development of many technologies and products. Initiated many processes in PPV&FR Authority for the benefit of the farmers like rewards and recognitions for farmers which resulted in recognition of more than 100 farmers and motivated farmers for submitting about 10,000 applications for seeking IPR on their varieties. The FAO of UN elected Dr. Agrawal in 2018 to head a Technical Experts Group on Farmers Rights for its implementation in 144 countries. He has brought many reforms for quality agriculture education in the Indian NARES.

Presently he is the Deputy Director General (Education), ICAR and National Director, National Agricultural Higher Education Project (NAHEP) (ICAR-World Bank) and is providing directions for improving the quality of higher education in Agriculture through 74 Agricultural Universities and attracting youths for pursuing careers in Agriculture and allied sectors. He has initiated many steps to attract young and talented students towards agriculture education. He has developed a mechanism to select the talented students of UG/PG/Ph.D. for getting an opportunity to get internship/training/research in universities across the globe.

Dr. Prabhat Kumar
Principal Scientist (Floriculture and Landscaping) and
National Coordinator, NAHEP , Krishi Anusandhan Bhawan-II
Indian Council of Agricultural Research, New Delhi-110012

Dr. Prabhat Kumar, National Coordinator of Centre for Advanced Agricultural Science and Technology (CAAST) and Component 2 at ICAR-National Agricultural Higher Education Project, KAB-II, Pusa, New Delhi was born on 1st July 1973. He obtained his B. Sc. Degree in 1995 from CSAU&T, Kanpur (U.P.) and M.Sc degree (Floriculture and Landscaping) in 1997 from PAU, Ludhiana, Punjab. He obtained his Ph. D degree in (Floriculture and Landscaping) in the year 2002 from IARI New Delhi. He joined G.B.P.U.A.&T. Pantnagar College of Agriculture, as Assistant Professor on 28th April 2003.

He was selected to the post of Associate Professor on 31st March, 2012 at HNBGU, Srinagar, Garhwal (A Central University, School of Agriculture). He was selected to the post of Senior Scientist at IARI, New Delhi on 23rd July, 2013. Dr. Kumar is actively engaged in teaching of PG and Ph.D students and guiding PG students and Ph. D students at GBPUA&T Pantnagar and IARI, New Delhi. To date, Dr. Prabhat Kumar has guided 10 M.Sc. and 01 Ph.D. students as Major Advisor in the discipline of Floriculture and Landscaping and presently guiding 02 Ph. D students. He has more than 17 years of experience in teaching, research and extension.

He has handled more than 04 externally funded and 6 institute research projects and published 79 research papers in various national and international journals, 35 popular articles, 06 book chapters, 11 technical bulletins and 03 books. He is associated in the development of 4 varieties namely; Pusa Deep, Pusa Bahar Pusa Sinduri and Pusa Shanti.

He is a life member of many professional societies in the field of Horticulture and Agriculture. He is fellow of Indian Society of Horticulture Research & Development in 2011 and awarded Himadri Young Scientist Award in 2012. He has also been conferred with Fellowship of 'Indian Society of Ornamental Horticulture in 2011 and 'Confederation of Horticulture Association of India, in 2012. Received Dr. Ambedkar young fellow award in 2010 by Scientific & Applied Research Centre, Meerut. He has managed twenty-five acres farm in respect to research, teaching and extension activities. Established Model Floriculture Centre (MFC) under Horticulture Technology Mission.

From left to right: **Dr. Rakesh Chandra Agrawal,** DDG (Agricultural Education) and National Director, National Agricultural Higher Education Project (ICAR-WB), receiving NESA Life Membership Certificate alongside **Dr. Prabhat Kumar**, Principal Scientist (Floriculture and Landscaping) and National Coordinator, Nation Agricultural Higher Education Project, Krishi Anusandhan Bhawan-II who also became NESA Life Member and getting a certificate from Dr. RC Agrawal DDG, ICAR in presence of NESA Staff members Mr. Gian Kashyap and Mr. Rakesh Kumar Roy.

NATIONAL AND INTERNATIONAL IMPORTANT ENVIRONMENT DAYS IN SEPTEMBER, 2020

Prabha Singh
ICAR-IGFRI, Jhansi, Uttar Pradesh-284003
E-mail: *prabhabhadauriya72@gmail.com*

September is the ninth month of the year. The original name of the month is taken from the Roman calendar where it is the seventh month (September means seven in Latin). India is a land of festival. People live in unity. Every day is celebrated here. Some of the events, festivals, etc. that fall in the month of September every year and celebrated at the national and international levels are as follows:

Date	Event	Reason to celebrate
1-7 September	National Nutrition Week	to provide knowledge among people about the importance of nutrition and its importance for the human body, for better health.
2nd September	World Coconut Day	to make people aware about the importance of this crop in poverty reduction. This day also commemorate the formation day of Asian Pacific Coconut Community (APCC).
22 August-2 September, 2020	Onam Festival	It is a 10-day festival. Onam is the harvesting festival and marks the homecoming of the mythical King Mahabali. People across the state Kerala celebrate this festival with joy. Celebrations include boat races, martial arts, music, plantain offerings, folk songs, etc.
4th September	National Wildlife Day	focuses on endangered species, preservation, and conservation efforts around the world. Zoos, aviaries and marine sanctuaries provide a variety of ways to get involved.
5th September	Teachers' Day (India)	to mark the birth anniversary of India's second President Dr. Sarvapalli Radhakrishnan. On this day we appreciate and acknowledge the efforts of teachers in making responsible individual.
8th September -	International Literacy Day	to make people aware about the importance of literacy which no doubt is a matter of dignity and human rights. It is key component of the Uns Sustainable Developmental Goals.
14th September	Hindi Diwas	on this day the Constituent Assembly of India had adopted Hindi written in Devanagri script in 1949 as the official language of the Republic of India.
15th September	Engineer's Day India)	to mark the tribute to the Indian Engineer Bharat Ratna Mokshagundam Visvesvaraya.
16th September	World Ozone Day	On this day in 1987, the Montreal Protocol was signed. Since 1994, World Ozone Day is celebrated which was established by the United Nations General Assembly. This day reminds people about the depletion of the Ozone Layer and to find solutions to preserve it.
27th September	World Tourism Day	to highlight the importance of tourism which helps in generating employment and build a future for millions of people around the world.
Fourth Sunday of September	World Rivers Day	In 2020, it falls on 27 September. The day highlights the importance of rivers and generates awareness and encourages people to improve and save water, rivers around the world. It is necessary to care for our water resources.

विशेष रूप से सीमांत क्षेत्रों में उपेक्षित पौधों का महत्व और बदलती जलवायु में भविष्य के भोजन और पोषण सुरक्षा के लिए स्वदेशी पारंपरिक पौधों का उपयोग

नितेश सिंह
शोध छात्र, वनस्पति विज्ञान, इंदिरा गांधी राष्ट्रीय जनजातीय विश्वविद्यालय, अमरकंटक–484887, मध्य प्रदेश, भारत
इमेलः niteshigntu@gmail.com

कुपोषण, खराब स्वास्थ्य, भूख और यहां तक कि भुखमरी अभी–भी दुनिया की सबसे बड़ी चुनौतियां हैं। चूंकि आने वाले वर्षों में वैश्विक आबादी 10 बिलियन तक पहुंचने की उम्मीद है। इसलिए, कृषि पर सीमित भूमि संसाधनों पर अधिक मात्रा में भोजन, चारा और जैव ईंधन का उत्पादन करने का दबाव है। दुनियाभर में भोजन के लिए खेती की जाने वाले पौधों की कई प्रजातियां उपेक्षित हैं। कम उपयोग (Underutilized) वे हैं जो खाद्य और पोषण संबंधी प्रतिभूतियों को संबोधित करने की क्षमता रखते हैं लेकिन चावल, गेहूं, मक्का किसी भी अन्य प्रमुख फसलों जैसे बड़े पैमाने पर उपयोग नहीं किए जा रहे हैं। उपेक्षित वे हैं जिन पर उचित अनुसंधान ध्यान नहीं दिया गया है क्योंकि अधिकांश अनुसंधान चावल, गेहूं, आदि जैसी फसलों पर केंद्रित हैं, इसलिए वैश्विक जलवायु परिवर्तन के कारण जैविक और अजैविक तनावों के लिए बढ़ी हुई सहिष्णुता के साथ फसल की किस्मों को विकसित करना महत्वपूर्ण है। अच्छे स्वास्थ्य के लिए पौष्टिक आहार सुनिश्चित करने के लिए बाजरा क्रांति पर काम बहुत महत्वपूर्ण है। पोषण के अलावा उपेक्षित और अल्पविकसित फसलें आर्थिक और पर्यावरणीय लाभ प्रदान करती हैं। आजकल, ये दवा कई दवा प्रयोगशालाओं की बढ़ती रुचि के लिए, आधुनिक चिकित्सा में भी महत्वपूर्ण भूमिका निभाती हैं। पौधे के विभिन्न भागों, जिनमें बीज, पत्ते और जड़ शामिल हैं, का उपयोग कई बीमारियों को ठीक करने के लिए किया जाता है। तो, फिर से उन भोजन को अपनाने की जरूरत है जैसे जौ, ज्वार, रागी, कोदो, सामा, बाजरा, समवा, कई ऐसे अनाज जो कभी भोजन का हिस्सा थे, लेकिन धीरे–धीरे प्लेटों से गायब हो गए, क्योंकि इसे गरीबी के साथ टैग किया गया था। हालांकि, इससे पहले कि भूख और गरीबी को कम करने के लिए खाद्य उत्पादन बढ़ाने के लिए चावल और गेहूं की उच्च उपज देने वाली किस्मों को शुरू करके हरित क्रांति की शुरुआत की गई थी। गेहूं और चावल का उत्पादन पहले के कारण दो गुना हो गया, लेकिन अन्य खाद्य फसलों जैसे देशी चावल की किस्मों और बाजरा का उत्पादन कम हो गया। इससे खेती से अलग–अलग स्वदेशी फसलों का नुकसान हुआ और विलुप्त होने का भी कारण बना। तो, समाज, पर्यावरण, पोषण सेवन और खाद्य पदार्थों की प्रति व्यक्ति उपलब्धता पर इसका प्रभाव पड़ता है। उपेक्षित पौधों की क्षमता को अधिकतम करने के लिए, स्थानीय, क्षेत्रीय और अंतर्राष्ट्रीय स्तर पर समन्वित दृष्टिकोणों को लागू करना होगा, जिसके लिए अंततःबहु–हितधारक दृष्टिकोण की आवश्यकता होती है। कुलभूमिका अधिकतम प्रतिशत गिरावट का सामना कर रहा है। कई मौजूदा फसलें तापमान चरमसीमा, पानी की कमी, पानी की खराब गुणवत्ता और प्राकृतिक आपदाओं के कारण कम उत्पादन कर रही हैं। सबसे अधिक ज्ञात क्षेत्रों में जहाँ नमक से प्रेरित भूमि का कटाव हो रहा है, मध्य एशिया में अराल सागर बेसिन के लिए एटलस पॉइंट हैं, भारत में इंडो–गंगेटिक बेसिन, पाकिस्तान में सिंधु बेसिन, चीन की पीली नदी बेसिन, मरे–डार्लिंग बेसिन, ऑस्ट्रेलिया है। ऐसी कई प्रजातियां हैं जो जंगली हैं, और आदिवासी क्षेत्रों की संख्या में खपत की जाती है, लेकिन वैज्ञानिक रूप से अस्पष्ट हैं, और इसमें शामिल हैं सीराटोथीकासीसामोइडीस, अजगंधा, डायोस्कोरियाड्यूमेटोरम, साइपरसएस्कुलेंटस, बिडेंसपाइलोसा, डेनिसोरियमग्लौकुम, सोरघमबाइकलर, डिजिटारियाएक्सिलिस, डायोस्कोरियाड्यूमेटोरम, इपोमेआबटाटस, साइपरसएस्कुलेंटस, कोलोकेसियाएस्कुलेंटा, लुआनाटार्सैसिफोलिया, सेसममरेडियाटियम, क्रैसोसेफेलमरूबेंस, क्रैस्पोइसन, मैक्रोटेलोमाजियोकार्पम, विग्नासबट्रेनियन, स्फेनेस्टाइलिसस्टेनोकार्पा, फेजोलसलुनैटस, कुकुमेरोप्सिसमन्नी, पार्किआबिग्लोबोसा, एडंसोनियाडिजिटा, इरविंगियागैबोनेंसिस, टेमराइंडससिपिडिया, ब्लीचियासिपियाडा, बोइंगियासोपिडिया, सिवनीबोथियाबायरिया, और आर्टोकार्पसअल्टिलिस। हालाँकि, आवश्यक और उपेक्षित फसल प्रजातियों की स्थिति को बढ़ावा देने के लिए कृषि अनुसंधान, प्रजनन, कटाई के बाद की हैं डलिंग और मूल्य संवर्धन, और किसानों को बाजारों से जोड़ना सहित वैज्ञानिक अनुसंधान के लिये बहुत आवश्यक है। इसलिए, भविष्य की खाद्य और पोषण संबंधी सुरक्षा के लिए रोड मैप विकसित करने की आवश्यकता है, जिन्हें जैव प्रौद्योगिकी के माध्यम से फसल सुधार की तरह ध्यान केंद्रित किया जाना चाहिए। जर्मप्लाज्म और ओमिक्स तकनीकों का उपयोग करके अन्य पारंपरिक प्रधान फसलों में पोषण संबंधी गुणों को पहचानने की रणनीतियाँ अनाज और जैव ईंधन फसलों के आनुवंशिक सुधार के लिए तेजी से बढ़ती वैश्विक आबादी को कई प्रतिभूतियां प्रदान करने के लिए आशाजनक दिखाई देंगी। इस प्रकार, आगे के सफल विकास और अतिरिक्त खाद्य उत्पादों को लॉन्च करने के लिए जैव विविधता बनाए रखने के लिए, जर्मप्लाज्म संरक्षण को ध्यान में रखना होगा।

दलहनी फसलों को अपनाने में महत्वपूर्ण क्षेत्र – देश, क्षेत्रीय और महाद्वीपीय स्तरों पर नीतियों का है। सहायक नीतियों के बिना, खाद्य प्रणाली को पूरा करना अधिक कठिन होगा।दुनिया के शीर्ष 20 देशों में फसलों की एक विशेषज्ञ–सूचित सूची प्राप्त करने के लिए, जिन्हें एक नियोजित सर्वेक्षण माना जा सकता है, उन देशों के शीर्ष विशेषज्ञों के नेतृत्व में एक योजना बनाई जानी चाहिए, जो पौधे आनुवंशिक संसाधनों के संरक्षण और उपयोग में शामिल हैं। भोजन और कृषि के लिए। सर्वेक्षण पूरा होने के बाद, हर देश को उन फसलों को सूचीबद्ध करने के लिए कहें जिन्हें वे अपने देश में कम और उपेक्षित मानते हैं और उनकी संभावित प्रासंगिकता को परिभाषित करते हैं। सभी श्रेणियों जैसे अनाज, सब्जियां, जड़, कंद और फल के लिए अलग सूची तैयार की जा सकती है। इसके अलावा, एक और बात यह हो सकती है कि सभी पौधों की अनुक्रमण और उपेक्षित पौधों की सीक्वेंसिंग ताकि अगली पीढ़ी के लिए जीव विज्ञान और विकास की आसान समझ के लिए एक रोडमैप बनाया जा सके। ताकि, भावी पीढ़ी के लिए इसका संरक्षण, और पुनर्स्थापन हो सके और समाज और मानव कल्याण के लिए नए लाभ पैदा कर सकें। धन्यवाद।



मेरी अमरकंटक के आदिवासी क्षेत्रों मे खोज के दौरान ली गई कुछ छायाचित्र

From the Editor's

Dear Readers,

In September issue, we recount the various projects and popular articles. This issue also includes seven Annual awards by Academy for its members actively involved in their field or events and activities organised by the Academy. NESA is well known for its environmental awareness activities.

I humbly request to all the members of the Academy to please plant a single tree on his/her birthday or any member of the family, friends and relatives and share the memorable pictures with us. We would like to include in our Newsletter and it will serve as an inspiration and motivation to many for making our Planet with the motto "Green and Clean Environment".

Once again, I express sincere and huge thank to all the persons who contributed writing the wonderful and inspiring articles, without which there wouldn't have been this newsletter issue. Please continue sharing such articles and share with your friends also.

I would like to thank President and General Secretary, NESA, New Delhi, and the Editorial team including Print, Designer and Publication committee for their nonstop support and efforts throughout this edition.

Hope this edition makes an interesting read. Please feel free to offer any suggestions for improvement.

Dr. R. S. Tomar
Editor

Dr. Sushma Tiwari
Co-Editor

Each ONE Plant ONE

To,

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From
NATIONAL ENVIRONMENTAL SCIENCE ACADEMY
206 Raj Tower -1, Alaknanda Community Centre,
New Delhi -110019. **Ph.: 011-2602 3614**
E-mails: nesapublications@gmail.com; nesapub@yahoo.co.in