



ONLY NEWS PAPER PUBLISHED IN INDIA FOR SCIENTIFIC COMMUNITIES

# NESSA

NATIONAL ENVIRONMENTAL SCIENCE ACADEMY

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October 2018



## National Conference on Chemistry for Human Health and Environment (CHHE)

Theme: *Designing Chemistry for a Sustainable Tomorrow*

Submit Abstract: [gcnc.chem.du@gmail.com](mailto:gcnc.chem.du@gmail.com)

15-16 December 2018

Venue: Conference Center, University of Delhi, Delhi-110007

### Conference Highlights (Sub-themes)

- Earth Sciences
- Environmental Chemistry and Engineering
- Environmental Biotechnology
- Pollution Control Chemistry and Green Chemistry
- Environmental Toxicology and Mutagenicity
- Energy and Environment
- Applications of Environmental Chemistry
- Designing Chemistry for a Sustainable Tomorrow
- Plant Chemistry
- Agricultural Chemistry
- Environmental Design
- Environmental Hazards
- Environmental Biology
- Environmental Sciences



Green Chemistry  
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Organized by:  
Green Chemistry  
Network Centre (GCNC),  
Department of Chemistry,  
University of Delhi,  
Royal Society of Chemistry (RSC)  
London North India Section

In collaboration with  
National Environmental  
Science Academy (NESSA), Delhi

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Former Addl. Director, DRDO, Delhi  
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Convener: Prof. R. K. Sharma  
Co-ordinator, GCNC  
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Registration begins from  
1<sup>st</sup> July 2018

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**LAST DATE : 31<sup>st</sup> October 2018**

**Dr. A.P.J. Abdul Kalam Award**  
(Achievements in the field of Science and Technology)

**Dr. S.Z. Qasim Award**  
(Achievements in the field of Oceanography, Fisheries & Polar Science)

**Prof. TRC Sinha Life Time Achievement Award**  
(Achievements in the field of Environment, Science and Social)

**Smt. Kanak Sinha Award**  
(Achievements in the field of Education)

**NOTE:** *Above awards on nomination basis*

- 
- |  |                                  |
|--|----------------------------------|
| (1) NESA Fellowship Award                  | (2) NESA Eminent Scientist Award |
| (3) NESA Scientist of the Year Award       | (4) NESA Environmentalist Award  |
| (5) NESA Green Technology Innovative Award | (6) NESA Young Scientist Award   |

**NOTE:** *Life Membership of NESA is mandatory for Awards 1 To 6.*

Separate application form should be used for separate awards. The forms are non transferable and it can be had by sending a bank draft of Rs. 1000-00/\$40 only (per form), drawn in favour of **NATIONAL ENVIRONMENTAL SCIENCE ACADEMY** payable at **NEW DELHI**.

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## CONSISTENT EFFORTS NEEDED FOR GLOBAL BIRD CONSERVATION

S. K. Basu

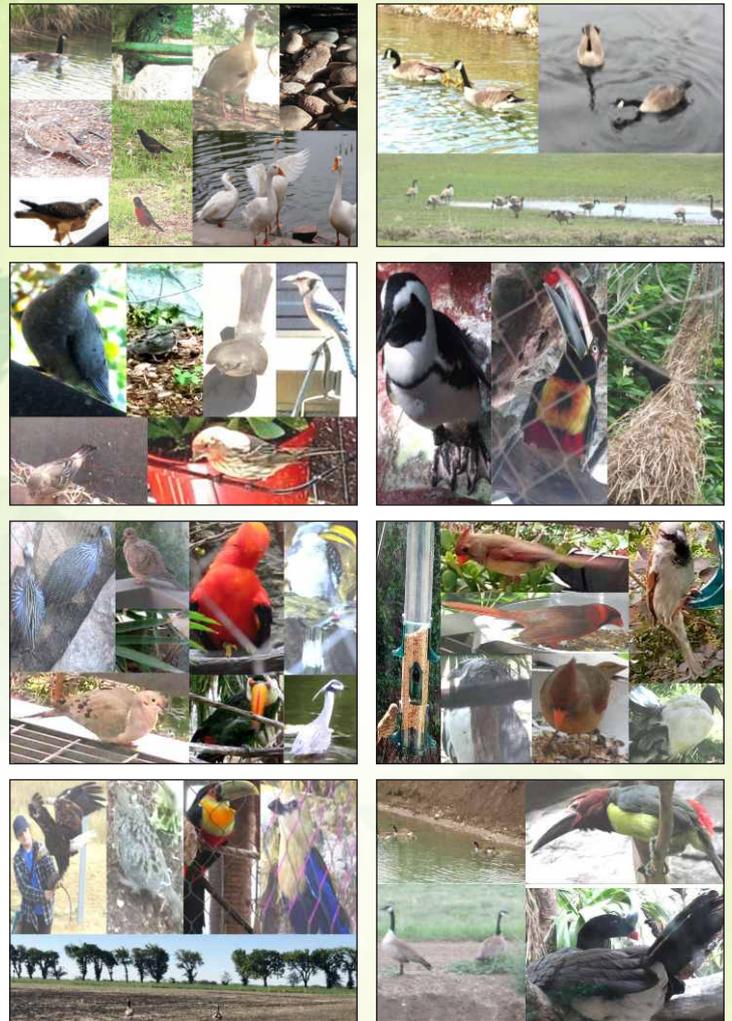
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Birds constitute an important aspect of our natural ecosystem and environment and are an indispensable member of the Animal Kingdom. The avian members have successfully evolved and spread across all the continents around the globe representing different unique habitats and ecosystems. The diversity of bird species across tropical and subtropical to temperate and sub temperate ecosystems as well as in the arctic zone is quite remarkable. The distribution of different bird species from lower to higher altitudes and different forest types such as tropical and sub tropical rain forests, deciduous and evergreen forest ecosystems, freshwater, estuarine and marine habitats, river valleys, bamboo forests, mountains, deserts, islands, archipelagos, atolls and coral islands in both the hemispheres is spectacular in nature. The diversity in bird sizes, feathers, scales, color of the plumage, beaks, feet, tail, eyes, eggs and nest are all unique and represents different distinct fields of research under ornithology (the study of birds). Modern ornithology deals with different aspects of bird research such as bird taxonomy and systematics, comparative bird anatomy and morphology, oology (study of bird eggs, nests and bird behavior), bird evolution, genetics and speciation, biogeography, ecology and conservation. Ornithology, a distinguished branch of zoology has developed into a major subject area over few centuries of dedicated research and investigations by countless bird scientists and researchers, amateurs, bird lovers and enthusiasts who dedicated their entire life for their admirable passion for birds.

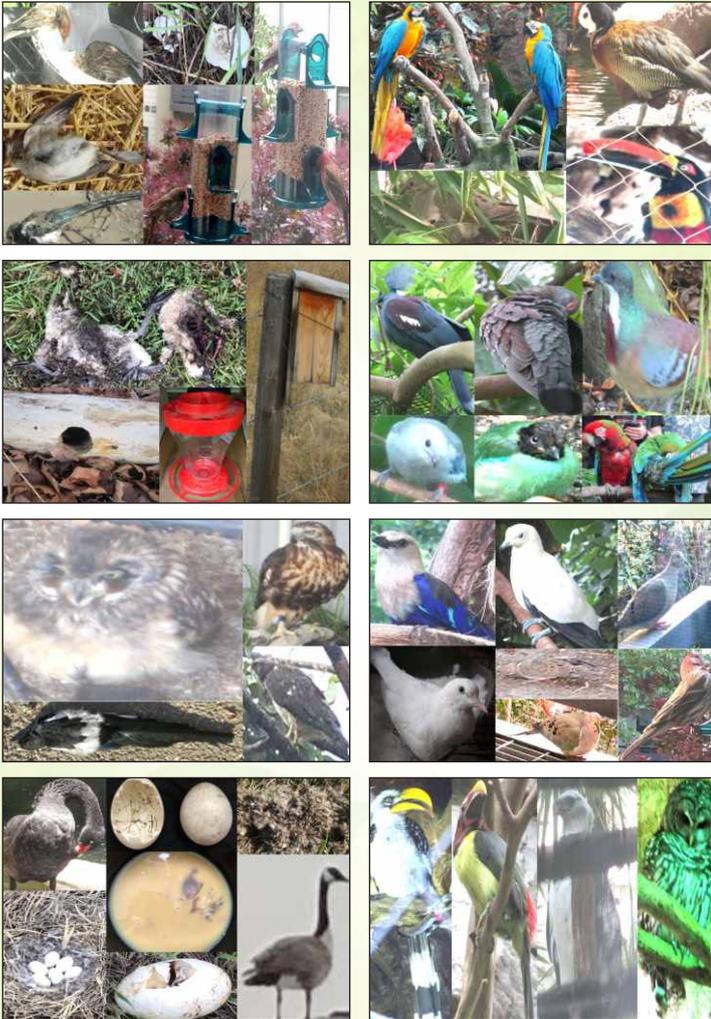
Birds in general are responsible for performing a large number of ecological services that helps in maintaining the ecological homeostasis. Bird ecological services include maintaining the predator-prey relation across different ecological trophic levels, where some species play the role of serving as protein rich food sources while others in serving the role of predators to keep natural bird populations under regulation, regulating natural insect pest populations, dissemination of seeds and fruits, cross pollination of flowers to mention only a handful. Today poultry birds like turkey, chicken, ducks, geese, quails etc serve as an important human and animal food sources in the form of meat and eggs. The poultry birds around the globe are an economically affordable and notable supply of protein and fats in our regular diet. Thus birds are a big component of human life as a natural component of our ecosystem, as an important food source, as both pests and pets as a source of inspiration for arts, aesthetics, sculpture, literature, legends, folklores, myths

A number of factors have been impacting bird populations around the globe. Some of the most significant factors have been poaching, trafficking of live birds and bird trophies and body parts such as eggs and nests, chicks, heads, beaks, tails, feathers, nails, eyes, bird organs (gizzard, liver, kidney, gall bladder etc) through various illegal border crossings to underground wildlife black markets with turn around in terms of millions of dollars per annum, habitat destruction, habitat loss and habitat fragmentation, natural and anthropogenic forest fires, overexploitation of forest and natural ecosystems by local human populations for their heavy dependence on scanty forest resources for the purpose of their daily sustenance, ever



increasing demand for bush meat in absence of poultry and animal farm in poor developing and under developed nations. Furthermore, illegal hunting of water fowls, ground nesting birds as well as migratory species moving from one country or continent to another is getting slaughtered at unprecedented rates impacting their population dynamics significantly. Global Warming and Climate Change has also been investigated to impact global bird populations together with extensive agricultural and industrial pollution.

Therefore it is important that bird conservations be given a priority for the long term security and protection of our feathered friends. The most important aspect of bird conservation is to spread credible education and awareness about the ecological and economic importance of birds in our lives among the common people through pictures and images, videos, documentaries and wildlife movies, posters and pamphlets, books and magazines, lectures and presentations. Different zoological gardens, natural history museums, aviaries, wildlife and bird rehabilitation and reintroduction centers, conservation societies, non government organization dedicated to the cause of bird conservation can play a vital role in educating people regarding avian life, diversity, behavior, ecology and distribution. Once people would see and identify birds in their life their interest for bird conservation will increase several folds. Educational institutions such as schools and colleges should be involved in bird awareness programs as they help in building passion for conservation among children and young



adults as they are the citizens for tomorrow and needs to be sensitized regarding conservation issues.

It will be important to provide alternative livelihood for people living in rural areas so that they are not exclusively dependent on adjoining forests for their daily sustenance that is putting heavy anthropogenic pressures on scanty forest resources and negatively impacting bird population due to human disturbances, over exploitation and illegal encroachment damaging premier bird habitats as well as bird nesting, breeding and foraging sites. Economic packages and alternate livelihoods for tribals, remote rural communities, forest residents, forest fringe dwellers, landless marginal laborers, migrants and

nomadic communities, legal and illegal refugees and immigrants taking shelter in forested areas to avoid persecution, exploitation, political destabilization and economic down turns will be necessary for making any conservation programs successful particularly for economically backward developing and under developed nations. Unless the human factors are included in the conservation equation it is never going to be possible to effectively protect any wildlife and forest around the globe and bird conservation is no different from that.

It will be also important to restrict or completely ban tourism or eco-tourism in sensitive ecosystems and habitats like coastal areas, cliffs and mountains, islands or aquatic ecosystems from exploitation to protect bird habitats. Continuous surveillance and monitoring for uncontrolled forest fires need to be conducted regularly. People should be encouraged to practice animal husbandry in the form of maintaining farm animals, poultry and livestock to reduce human pressure on wild bird meat. Strict legislation and monitoring by concerned government agencies and non government organizations should be regularly conducted to curb illegal seasonal hunting, poaching, live bird and bird trophy, body parts and organ trafficking to illegal, international wildlife markets and to stop and prevent regional black markets on wild bird trade and trafficking within the boundaries of a country.

Joint Conservation Initiative (JCI) between adjacent countries can help in effective conservation and reintroduction efforts. Regular bird surveys need to be conducted by both professional and amateur organizations across the borders to identify vulnerable, endangered critically endangered and extinct in wild status of different bird species. Such surveys will help take proper initiative in protecting birds and wildlife and their forest habitats. Habitat quality for protected habitats, reserve forests, national parks, sanctuaries and biosphere reserves need to be monitored and assessed to identify issues such as environmental pollution, illegal encroachments inside protected habitats, incidences of poaching, wildlife trafficking, stealing and over exploitation of major and minor forest products. Holist approach, sincere efforts, comprehensive bird conservation strategies, rigid political will, collaboration and coordination between different government and non government agencies and organizations and making ordinary citizens, a major stakeholder in the conservation process are important factors that can contribute towards successful global bird conservation efforts.

**Source:** Sikkim Express **Photo credit:** S. K. Basu



## PLANTATION DRIVE BY THE ACADEMY

The Academy Members are requested that whenever they plant a tree on their birthday or any other event, please send us the photographs with report so we can publish the same in our newsletter. This will inspire and encourage many more life members of the Academy to participate in the “Green drive” of the Academy.

Members are also requested to preferably plant a medicinal plant which can benefit each and every one around us. Also they can form a committee in their RWA for plantation of tree on weekends.

**Dr. Shefali Gola**  
Editor, NESA E-newsletter

## DNA FINGERPRINTING IN PLANTS: A BOON FOR DUS TESTING

Nimisha Sharma<sup>1</sup>, Anil K Dubey<sup>1</sup>, Meenakshi Malik<sup>2</sup> and Sanjay Kumar Singh<sup>1</sup>

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The DNA fingerprinting unlike the usual fingerprinting which is based on the morphological features and primarily restricted to humans is revealing the identity of an organism at the molecular level. In fact this is the technique of finding the genetic identity. This is primarily based on the polymorphisms occurring at the molecular level that is on the base sequences of the genome. The basic techniques involved in genetic fingerprinting were discovered by geneticist Alec J. Jeffreys in 1984. In the field of forensics, this technique contributes significantly. With advent of time, development of numerous techniques paved way for the use of this technique in different areas providing newer opportunities to this technique. The DNA profiling is primarily used in plants for protection of biodiversity, identifying markers for traits, identification of gene diversity and variation etc. The most popular techniques used with relevant to plants are RFLP, RAPD, ISSR, SSR, CAPS, and AFLP etc. DNA profiling is the process of determining an individual's DNA characteristics, which are as unique as fingerprints. DNA analysis intended to identify a species, rather than an individual, is called DNA barcoding. DNA profiling has also been used in the study of animal and plant populations in the fields of zoology, botany, and agriculture. A reference sample is analyzed to create the individual's DNA profile. The DNA profile is then compared against another sample to determine whether there is a genetic match. Each person's DNA contains two copies of these markers one copy inherited from the father and one from the mother. Within a population, the markers at each plants DNA location could differ in length and sometimes sequence, depending on the markers inherited from the parents. The combination of marker sizes found in each person makes up his/her unique genetic profile. When determining the relationship between two individuals, their genetic profiles are compared to see if they share the same inheritance patterns at a statistically conclusive rate.

### METHODOLOGY

#### DNA Isolation

High molecular weight DNA from plant tissue can be isolated in a number of ways. All methods involves basic steps of removal of all cell wall and nuclear membrane around the DNA and the separation of DNA from other cell components such as cell debris, proteins, lipids or RNA without affecting the integrity of the DNA. The most commonly preferred method is CTAB method (Doyle and Doyle, 1990).

#### DNA quantification and quality assessment

DNA quantification and quality assessment is done by using UV-VIS spectrophotometry. Normally quality check is performed through the A260/A280 ratio that is 1.8 value shows the highest purity, if more than 1.8 shows the presence of RNA contamination and less than that shows the protein contamination (Sambrook, et. al, 1989). Agarose gel electrophoresis is carried out of isolated DNA samples for visualization of bands. For perfect extraction, there will be clear single bands otherwise smear like image will be seen. That is in case of degraded DNA. For PCR based methods the DNA samples are diluted for PCR requirements. The optimum concentration is usually 30-50ng/ $\mu$ L.

#### PCR based-SSR markers

For fingerprinting a number of molecular markers are available here we focus mainly on simple sequence repeats (SSR) markers. Simple sequence repeats (SSR) or microsatellites are a class of repetitive DNA elements. The di-, tri- or tetra-nucleotide repeats are arranged in tandem arrays consisting of 5–50 copies. SSRs are abundant in plants, occurring on average every 6-7 kb. These repeat motifs are flanked by conserved nucleotide sequences from which forward and reverse primers can be designed to PCR amplify the DNA section containing the SSR. SSR alleles, amplified products of variable length, can be separated by gel electrophoresis and visualized by silver-staining, autoradiography (if primers are radioactively labelled) or via automation (if primers are fluorescently labelled). SSR analysis is amenable to automation and multiplexing and allows genotyping to be performed on large numbers of lines, and multiple loci to be analyzed simultaneously. SSRs can be

identified by searching among DNA databases (e.g. EMBL and Gene bank), or alternatively small insert (200-600bp) genomic DNA libraries can be produced and enriched for particular repeats (Powell *et al.*, 1996). From the sequence data, primer pairs (of about 20 bp each) can be designed using different software's. Polyacrylamide Gel Electrophoresis (PAGE) is conducted (6% acrylamide solution), stained and the observed the bands or we can use metaphor (4%) gel.

#### Advantages of SSR markers

Single loci are typically amplified, resulting in one or two bands depending on the homo or heterozygous state in diploid organisms, i.e., microsatellite markers are locus-specific and codominant. Many differently sized alleles may exist in a population, and the level of heterozygosity can be extremely high. The allelic polymorphism at microsatellite loci is mainly caused by a variable number of repeat units. For example, different alleles of a (CA)<sub>n</sub>-type microsatellite usually differ by 2, 4, 6, 8, 10, bases etc. PCR-amplified microsatellite markers are inherited in a Mendelian fashion. The large number of alleles and high levels of variability among closely related organisms made PCR-amplified microsatellites the marker system of choice for a wide variety of applications.

#### Limitations of SSR markers

In case of SSR markers non-amplifying alleles (null alleles) are commonly observed. In non-amplifying alleles, mutations in one or both primer binding sites prevent PCR amplification. Individuals homozygous for a null allele do not show any band at all, whereas heterozygotes have only one band and therefore mimic a homozygote on a gel. Undetected null alleles can give the erroneous impression of an apparent homozygote excess in population studies. Null alleles can also interfere with the interpretation of inheritance data. The problem may be solved by redesigning primer pairs for the locus, avoiding the mutated primer binding site. Moreover, multiple microsatellite loci should be examined in population studies to reduce the influence of null alleles. Prior sequence information is required to generate these markers that aid more cost.

#### Applications of DNA profiling

The precise, fast, cost-effective, and correct identification of important plant species must in agriculture and related fields such as plant proprietary rights protection (Camlin 2001; 2003). Conventional methods of cultivar identification are based on morphological traits. Although it is usually cost-effective, morphological assessments may have their limitations, including (1) insufficient variation among cultivars, (2) subjectivity in the analysis, (3) influence of the environment and management practice, and (4) expression of some characters only in certain developmental stages that required more time, space and resources. These factors triggered the exploration of alternative strategies for varietal characterization, including biochemical markers (allozyme and isozymes), cytogenetics, analysis and DNA profiling. New varieties are sometimes derived from already-protected varieties by repeated backcrossing, by genetic engineering, or as a selection from natural or induced mutations or from somaclonal variants. These are called essentially derived varieties (EDVs). EDVs usually look very similar to the protected variety but are sufficiently different to be given a name of their own. Potentially, molecular markers could aid in the recognition of EDVs by testing whether there is a certain level of conformity with the original variety.

A breeder can be granted intellectual property rights for a new plant variety called plant breeders' rights (PBR). When a breeder has PBR for a certain cultivar and a certain region, for example, the United Kingdom or Europe, he or she can charge royalties on sales of the material used for propagation. In Europe, these rights can be obtained from the Community Plant Variety Office (CPVO). Two other organizations involved with the legal arrangements to protect members from infringement of their rights are the International Union for the Protection of New Varieties of Plants (UPOV) and the International Seed Federation (ISF). The criteria for obtaining PBR include the passing of so called distinctness uniformity stability (DUS) test. The new cultivar must be distinct from all other cultivars already described, it must be uniform so that all propagated individuals are as similar as possible, and it must be stable. The DUS test is carried out as an observation trial, lasting one to several years, during which primarily morphological characteristics such as flower color, height, bushiness, etc., are recorded. The large number of new cultivars produced requires that a huge number of trials must be undertaken, in which the new cultivars, as well as older but similar cultivars, are analyzed and compared.

The identification of sufficient distinctness from cultivars in the reference collections is becoming a problem in the major horticultural and agricultural crop species. Therefore, the potential use of molecular methods for cultivar description and identification is now being researched, e.g., by the UPOV Working Group on Biochemical and Molecular Techniques. One of the main problems with molecular methods is that a minimum genetic distance between varieties must be defined to protect the breeders of already existing cultivars. Clearly, a single base pair difference does not warrant the registration of a new cultivar. Two important ways in which molecular markers could aid DUS testing are (1) determining distinctness and (2) specifying which existing cultivars should be included in a reference test set. Eventually, DNA fingerprints may become part of a passport for well-described crop varieties. However, it is unlikely that they will ever fully replace morphological traits, given that distinctness for DNA markers may not necessarily reflect morphological distinctness (Law et al., 2001). The accuracy of cultivar identification can be quantified by calculating the probability of finding identical fingerprints by chance. For this type of estimation, a correct reference group and an associated database are necessary.

**Conclusion**

Classical techniques like anatomy, physiology, morphology etc. more advantageous with the addition of molecular approaches for evaluation of the genetic variability.

DNA fingerprinting, in plants not only helped in identifying species but also in defining a new realm in plant genomics, plant breeding in conserving the biodiversity and promises a very powerful tool in our future endeavors.

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**PLANT GROWTH PROMOTING RHIZOBACTERIA A BOON FOR AGRICULTURE**

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**Plant Growth Promoting Rhizobacteria (PGPR)**

Population growth and increase in food requirement is the global problem. It is inevitable to introduce new practices that help to increase agricultural productivity. Use of plant growth promoting rhizobacteria (PGPR) has shown potentials to be a promising technique in the practice of sustainable agriculture. A group of natural soil microbial flora acquire dwelling in the rhizosphere and on the surface of the plant roots which impose beneficial effect on the overall well-being of the plant are categorized as PGPR. The use of PGPR has been proven to be an environmentally sound way of increasing crop yields by facilitating plant growth through either a direct or indirect mechanism.

**Direct mechanisms**

Plant growth promoting rhizobacteria having direct mechanisms that facilitate nutrient uptake or increase nutrient availability by nitrogen fixation, solubilization of mineral nutrients, mineralize organic compounds and production of phytohormones.

**In-direct mechanisms**

PGPR are the rhizosphere bacteria that can enhance plant growth by a wide variety of mechanisms like production of antibiotics, siderophores, HCN, hydrolytic enzymes etc.

Symbiotic rhizobacteria belonging to the genera like *Acetobacter*, *Acinetobacter*, *Alcaligenes*, *Arthrobacter*, *Azoarcus*, *Azospirillum*, *Azotobacter*, *Bacillus*, *Beijerinckia*, *Burkholderia*, *Derrxia*, *Enterobacter*, *Gluconacetobacter*, *Herbaspirillum*, *Klebsiella*, *Ochrobactrum*, *Pantoea*, *Pseudomonas*, *Rhodococcus*, *Serratia*, *Stenotrophomonas* and *Zoogloea* in particular, are the integral parts of rhizosphere biota.

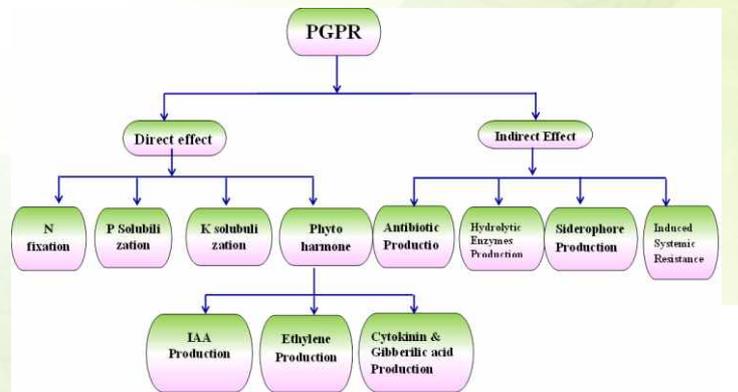


Diagram shows direct and indirect mechanism of PGPR on plant growth

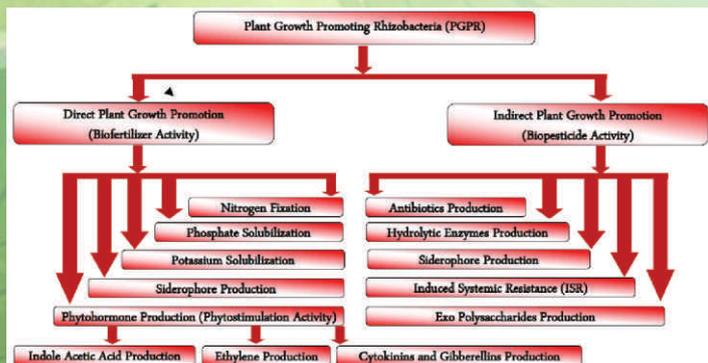


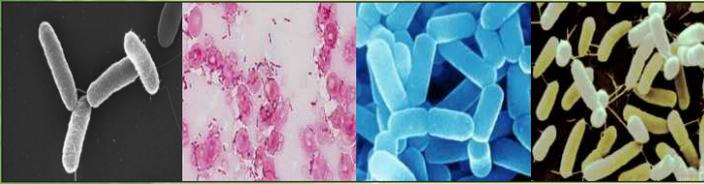
Fig.: Schematic diagram showing plant growth promoting bacteria affect plant growth directly and indirectly.



Acetobacter Acinetobacter Alcaligenes Arthrobacter



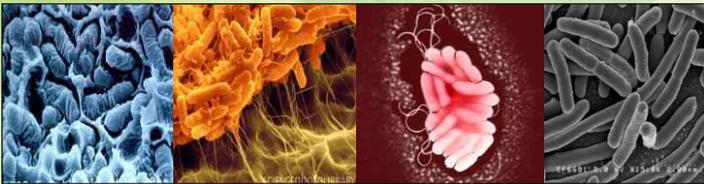
Azoarcus Azospirillum Azotobacter Bacillus



*Beijerinckia Burkholderia Enterobacter Gluconacetobacter*



*Herbaspirillum Klebsiella Ochrobactrum Pseudomonas*



*Rhodococcus Serratia Stenotrophomonas Zoogloea*

**Commercialization of PGPR**

The success and commercialization of plant growth promoting rhizobacterial strains depend on the linkages between the scientific organizations and industries. Different stages in the process of commercialization include;

- ✓ Isolation of antagonist strains

- ✓ Screening
- ✓ Fermentation methods
- ✓ Mass production
- ✓ Formulation viability
- ✓ Toxicology
- ✓ Industrial linkages
- ✓ Quality control and field efficacy

**Formulation of PGPR**

Formulation for inoculants containing an effective bacterial strain. The use of inoculant formulations involving carrier materials for the delivery of microbial cells to soil or the rhizosphere is an attractive option.

**Properties of carrier material**

- ✓ High water holding capacity
- ✓ High water retention capacity
- ✓ No heat production from wetting
- ✓ Nearly sterile
- ✓ Chemically and physically uniform
- ✓ Nontoxic in nature
- ✓ Easily biodegradable
- ✓ Nonpolluting
- ✓ Nearly neutral pH

**Drying** is a part of development of formulation of microbial inoculants.

**Storage** under vacuum

Crop	Recommended bio-fertilizer	Application method	Quantity to be used
Field crops & Pulses : Chick pea, Groundnut, Soybean, Beans, lentil, Lucern, berseem, Green Gram, Black gram, Cowpea, Pigeon Pea	Rhizobium	Seed treatment	200 ml / acre
Cereals: Rice, Wheat, Oat, Barely	Azotobacter/ Azospirillum	Seed treatment	200 ml / acre
Oil seeds: Mustard, Sesame, Sunflower, Linseed, Castor	Azotobacter	Seed treatment	200 ml / acre
Millets : Pearl Millet, Finger Millet, Kodomillet	Seed treatment Azotobacter	200 ml / acre	
Maize & Sorghum	Azospirillum	Seed treatment	200 ml / acre
Tobacco	Azotobacter	Seedling treatment	500 ml / acre
Tea & Coffee	Azotobacter	Soil treatment	400 ml / acre
Leguminous plants/ trees	Rhizobium	Soil treatment	1- 2 ml / plant



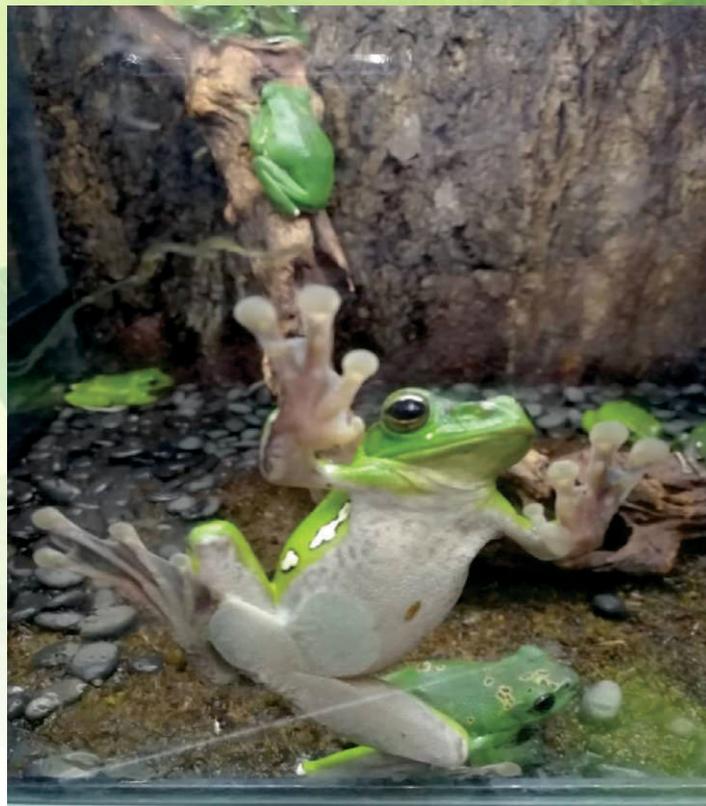
प्लास्टिक रुपी बीमारी हटाएँ!  
पर्यावरण को स्वस्थ बनाएँ!  
हर परिवार को लेना होगा संकल्प  
प्लास्टिक का छोड़ना होगा विकल्प

## CAN TREE FROGS BE GOOD POLLINATORS?

S. K. Basu

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Amphibians are important bioindicators and play an important role in performing various ecological services for helping to maintain ecosystem dynamics and equilibrium. It is quite unfortunate that due to a number of natural and anthropogenic factors different amphibian species are being threatened with imminent dangers of extinction around the planet. Many such amphibians (frogs and salamanders) provide primary nitrogen to epiphytes through their feces as well as help in disseminating seeds after fruit consumption through their fecal deposits far and around performing crucial ecological services. The role of amphibians as potential pollinators has not yet been fully explored and well documented. However, small tree frogs inhabiting tropical and sub tropical ecosystems could be potential pollinators. Many of them take refuge inside high canopy epiphytes like bromeliads and orchids for protection, breeding and nesting as well for foraging for food. Primary pollinator insect species (like bees, wasps, ants, beetles, flies, moths and butterflies) visiting such flowers for collecting pollen and/or nectar are easy targets as prey for such amphibians. While predating on these primary pollinators, the amphibians are potentially brushed with pollens from such highly morphologically specialized epiphytic flowers due to elaborate morphological adaptations achieved through long evolution. Hence, moving from one flower to another; such amphibians could successfully pollinate epiphytic flowers by transferring pollens stuck on their body, mouth, limbs or tongue. Amphibians having moist skin that help in cutaneous respiration could tentatively serve as attachment surface for the pollen grains. It is important to explore and document pollination in such critically endangered species and this could open a new vista in Pollination Biology; and may establish new mutualistic relationship between high canopy epiphytes and amphibians. Acknowledgement: Arunachal Times



## OBITUARY

**Prof. (Dr) Md. Basha Mohideen  
(16.07.1945-16.08.2018)**

**With profound grief and sorrow, we inform the sad demise of Prof. Md. Basha Mohideen on 16.08.2018.**

**We the management, staff & Life Members of NESA pray to almighty to give eternal peace to the departed soul. His memory will live in our hearts forever.**



Prof. (Dr) Md. Basha Mohideen

**In reverence and remembrance of the departed soul the short resume is given below in the e-newsletter of NESA October 2018.**

**Prof. Md. Basha Mohideen, Professor of Zoology and Former principal and Dean, Faculty of Sciences, Sri Vijayanagara Sri Krishnadevaraya University, Andhra Pradesh has a distinguished and a very brilliant academic career. He has obtained his M.Sc. in Zoology from Sri Venkateswara University, Tirupati in 1967 Securing University first rank with a Gold Medal and later Ph.D. from the same University in 1974.**

**For the past 33 years, Dr. Basha Mohideen made significant contribution in the field of Environmental Biology of fishes and from 1974 to 1976 nominated by the UGC, he carried out his past Doctoral research at West Germany on "The different of Environmental Stress from Environmental Adaptation in collaboration with two internally renowned Prof. H. P. Precht and Prof. Otto Kine, University of Kiel and Hamburg, Germany. As an outcome of his advanced research on environmental Biology, it is being referred as "Bashamohideen" a principle of stress and adaptation. As one of the 20 Indian leading biologists, he delivered highly useful and a noteworthy plenary lecture on "Recent trends in thermal Biology at International symposium organised by Prof. T.J. Pandian and Madurai Kamraj University in 1999 where Prof. Otto Kinne, the leading Director from Germany inaugurated the symposium.**

**Prof. Basha Mohideen is a member of the German Zoological Society, Hamburg and founder Vice President of the National Environmental Science Academy, New Delhi and founder of Biosciences Department of S.K. University and Advisory member of several National and International academic bodies. He has 76 research papers to his credit in both National and International research Journals and supervised 23 Ph.D's and 24 M. Phils. He is the recipient of Best teacher award by the Govt. of Andhra Pradesh in 1988 and Best Scientist award in 1986 by National Environmental Science Academy, New Delhi and a Gold Medal from the India Institute of Ecology and Environment, New Delhi and the UNIESCO in 1999.**

**R.S.V.P. NESA**

## **A Brief Report about the National Workshop Impact on global Warming: Ozone Layer (IGWOI 2018) 16 September, 2018**

The National Workshop on Impact on Global Warming Ozone Layer - 2018 was jointly organized by National Environmental Science Academy, New Delhi and School of Natural Sciences, Shiv Nadar University, Greater Noida, UP on 16th September 2018.

The Patron of the workshop **Prof. (Dr.) Rupamanjari Ghosh** was the Chief Guest of the day. She inaugurated the workshop and a brief account about the development and contribution by Shiv Nadar University, Dadri towards higher education and employment.



Vice Chancellor, Shiv Nadar University giving her presentation in the Inaugural Function

**Dr. Sushil Kumar Singh**, Addl. Director, Solid State Physics Laboratory, DRDO, Delhi and Organizing Secretary introduced the theme of the Workshop and welcomed all sponsors, speakers and delegates to the "Ozone Day" workshop.



Organising Secretary, IGWOL 2018 delivering his welcome address with theme of the Workshop

**Prof. C.R. Babu**, Professor Emeritus, Centre for Environmental Management of Degraded Ecosystems (CEMDE), School of Environmental Studies, University of Delhi, delivered a key note address on the occasion of Ozone Day. He also discussed various aspects of Ozone depletion & its impact on human health.



Prof. C.R. Babu delivering his Keynote address in the workshop

**Prof. Javed Ahmad**, President, National Environmental Science Academy, Delhi introduced the Academy & its activities to all the delegates of the workshop.



Prof. Javed Ahmad introducing the NESA

**Dr. Laxman Prasad**, Former Advisor, Department of Science and Technology, Govt. of India, Delhi acted as Chairperson of the first technical session of the workshop.



Dr. Laxman Prasad, Vice President, NESA chairing the first Technical Session

**Dr. Sanjay Bajpai** from Technology Missions Division (Energy, Water & all Other) Department of Science and Technology, Govt. of India, New Delhi was invited as guest of honor in the first technical session. He delivered his talk on Energy Innovation for Sustainable Environment.



Dr. Sanjay Bajpai delivering the invited talk during National Workshop

**Prof. Manju Mohan**, Head, IIT, Delhi was invited speaker. She spoke on status, issues and solutions regarding Ozone.



Dr. Manju Mohan delivering her invited talk

**Prof. Umesh Chand Kulshreshtha** from School of Environmental Sciences, Jawaharlal Nehru University, New Delhi delivered his lecture on Integrated atmospheric Chemistry approach for controlling air pollution in Delhi. He also discussed on dust and its role in air pollution. Causes of Air pollution were also discussed in detail during his lecture.



Prof. Umesh C. Kulshreshtha delivering the invited talk during National Workshop



Prof. Javed Ahmad along with Dr. P.G. Dastidar, Scientist F, Ministry of Earth Sciences, Govt. of India

**Dr. P.G. Dastidar**, Scientist F from Ministry of Earth Sciences, Govt. of India, New Delhi also spared his valuable time and attended the workshop throughout the whole day.

Post Lunch Session was chaired by **Dr. D.S. Rawal**, Additional Director, Solid State Physics Laboratory, DRDO, Delhi.

**Prof. K.S. Rao**, from Department of Botany, University of Delhi delivered his lecture on effects of Ozone layer formation and depletion on human health and food security. He classified Ozone as good as well as bad entities. He described the Chapman Cycle regarding ozone production. Montreal Protocol was also discussed by him during his talk. He also emphasized that Ozone is harmful for the development of plants. Ozone injury has been described by him in various plants. It is a bioindicator. Effect on crop yield was also discussed by him during the talk.



Prof. K.S. Rao delivering his invited talk during the National Workshop



Prof. K.S. Rao delivering his invited talk during the National Workshop

**Prof. Jaswant Singh**, Head, Department of Environmental Sciences, Dr. Rammanohar Lohia Avadh University, Hawai Patti, Allahabad Road, Faizabad, (U.P.) also delivered talk on Impact of UVB radiations and survival of plants at poles. He also showed mentioned that three types of plants are found in North Pole region.

Algae: *Spyrogyra sps.* Moss: *Bryum argentium* Lichen: *Xanthuria elegans*



Prof. Jaswant delivering his invited talk during National Workshop

No flowering plants are found in Arctic zone. Polar bears form the major part of the fauna of the region as per data presented by him. Antarctica is more bigger and harsher than North Pole as per his presentation.



Prof. Tanu Jindal, Amity University giving an invited talk during the National Workshop

**Prof. Tanu Jindal**, Director Department of Environmental Sciences, Amity University also delivered talk on Ozone Layer depletion. She talked about the hole formation based on two different mechanisms. Meteorological and Chemical. She also told that CFCs are mainly responsible for the Ozone Hole.

Future Evolution of Ozone; Indoor Air Pollution; Indoor Air Pollutants; Environmental toxicology and Pesticides use were discussed by her. She also forwarded IPM to Govt. of India for the implementation.

The staff of the Shiv Nadar University also participated with more than 100 students from School of Natural Sciences, Shiv Nadar University. 12 papers were also presented through as Posters by the participants from SNU as well as other Institutes.

Shiv Nadar University delivered concluding remarks and appreciated the Secretarial work done by Mr. Gian Kashyap, Mr. Rakesh Kumar Roy from National Environmental Science Academy and Ms. Mercy Mallick from Shiv Nadar University.

**Prof. C.V. Tomy**, Director, School of Natural Sciences,



Prof. C.V. Tomy giving the concluding remarks during the National Workshop

extended vote of thanks in the Valedictory Session of the workshop.

**Best poster** Awards and Certificates were also distributed to the winner participants.

The members of the Organizing Committee and Dr. Kshipra Misra, Vice President, Dr. Kalpana Bhargava, Dr. D.S Rawal etc. from NESA were also acknowledged.



Prof. Jyoti Sharma giving Vote of Thanks during the Valedictory Session

Among the sponsors, **Himalaya contribution was major. Other sponsorees were Save The Environment, Kolkata, BioChain, Ekta Marketing Corporation and Oxform.** Instruments. All the sponsors were thanked for their valuable contributions to the Academy for Organizing Ozone Day 2018 workshop.

The workshop was declared closed with zeal and zest at 6:00 p.m.

## “BEAT THE PLASTIC”-PARTICIPATION IN WORLD ENVIRONMENT DAY 2018 WITH MOEFCC

By

Amity Institute for Environmental Toxicology, Safety & Management & Amity Institute of Environmental Sciences



AMITY UNIVERSITY celebrated WORLD ENVIRONMENT DAY, 2018 with MoEF&CC at Vigyan Bhawan, Delhi. This year India was the global host of United Nations for World Environment Day 2018 celebrations. The theme for this year's edition was “BEAT PLASTIC POLLUTION” and the conference was mainly focused on combating single-use plastic pollution. The conference was named as “THE KNOWLEDGE COALITION”.

The theme urged various stakeholders like governments, industry, manufacturers, NGOs, communities, academics and public to come together and explored sustainable alternatives to urgently reduce the production and excessive use of single-use plastic. Plastics are polluting our oceans, damaging marine life, ecosystem and threatening human health as well. Different sessions were held on plastic pollution and its management, policies for combating plastic pollution etc. Exhibition on the theme was also put up where various states, ministries as well as industries showcased their works.

Amity Institute for Environmental Toxicology, Safety and Management and Amity Institute of Environmental Sciences, representing Amity University participated with full zeal in this event.

The faculty, research scholars and students attended the conference from 1st- 5th June, 2018. Several parallel sessions included were having very relevant topics on current burning issues of environment with session topics as below:

- i. Air pollution in Indian Cities,
- ii. Himalayan Ecosystem,
- iii. Plastic pollution and Management,
- iv. Marine Litter etc.
- v. Corporate sustainability & sustainable development goals
- vi. Water to resource
- vii. Sustainable urban landscapes and smart cities
- viii. Extended producer responsibility

All the people from the department attended different sessions of their interest areas and gained knowledge about the various initiatives taken all around the country and the world with case

studies of success stories on plastic pollution and its abatement.

Amity University was the only university which had set up a stall at the exhibition from 2nd June- 5th June, 2018 and exhibited its environmental initiatives on research, academic programs, courses, conferences, seminars, events, patents, prototypes of technologies etc. Many delegate and visitors visited the stall and showed their interest in the research work that Amity is doing in the field of environment.

We displayed our green technology patents such as:

- Simple Lab/Field Lysimeter.
- Photochemical method for degradation of persistence pesticide.
- Low Cost Water Testing Kit.
- Development of natural pesticides from plants with acetyl cholinesterase inhibitory activity.
- Portable Water purifier
- Rootonics
- Biodegradable plastics
- Herbal Mosquito Repeller
- Rice husk sheet

People showed keen interest in Water Testing Kit, Biodegradable plastic, Portable water purifier etc. and inquired about the technology used for these research work. **Water testing kit was a hit at the stall and all its information pamphlets were exhausted.**

Delegates also discussed about our expedition to Antarctica and Southern Ocean and the research outcome of the expedition. Many exhibitors from industries, academics and students **showed interest in collaboration at Amity University.** They also registered their remarks in the visitor diary.

We showcased the conferences/events/lectures organized by Amity University like World Environment Day, World Water Day, International Earth Day, Ozone Day and Environment Health Day, Guest lectures, seminars, symposiums on environment, International and National Conferences.

Amity students which are working as interns in various organizations like Chintan, GIZ, CSE etc. also visited Amity stall and cheered up.

Visitors also inquired about different courses that are offered by Amity University especially Environment science and engineering which were explained to them and also made them aware of the benefits of getting their wards to study in Amity.

We showcased our ongoing and new courses as below:

- Ph.D. Environmental Sciences (Full Time, Part time)
- Ph.D. Geo-Informatics and Remote-Sensing (Full Time, Part time)
- M.Sc. Environmental Sciences
- B.Sc. Environmental Sciences
- M. Sc. Environmental Health Science and Management
- M tech Water Technology and Management
- PG Diploma in Environmental Impact Assessment & Auditing
- PG Diploma in Disaster Management
- M Tech. Environmental Engineering
- M Tech. Geo-Informatics and Remote-Sensing
- MBA Natural Resource and Management
- Ph.D. Natural Resource and Management



**We highlighted our research projects on:**

- i. Ministry of Earth Sciences (MoES)- Study of contamination of soil and water through heavily loaded unlined drains in Delhi –(2010-2014)
- ii. Department of Science and Technology (DST)- Dissipation, leaching and persistence of Chlorpyrifos in three types of soils with different pH- (2009-2014)
- iii. Ministry of Environment and Forests (MoEF)-Analysis of Surface and Groundwater pollution by Indiscriminate use of Agrochemicals (Pesticides) in selected Paddy, Cotton and Vegetable Growing Farms of India- (2009-2013)
- iv. Screening of microorganism from Indian sector of southern ocean for antimicrobial activity with their molecular characterization under 10th Indian Scientific Expedition to Southern Ocean (2017 till date)
- v. Continuous Ambient Air Quality Monitoring Station (CAAQMS) by UP Pollution Control Board (UPPCB) (2017 till date)
- vi. Participation in project entitled “Environmental Toxicological Studies and Monitoring with NCAOR for estimation of POP’s- (2014 till date)
- vii. Mobile Phone and Tower exposure measurement and Biological Correlations, Department of Science and Technology- 2015 till date)
- viii. Development of a Cost Effective Lysimeter &Method for Leaching Studies to Estimate Risk Assessment of Groundwater Contamination. Department of Science and Technology- (2015 till date)
- ix. Performance evaluation of forward osmosis, membrane system for application within the agriculture and textile industries, DST

UN Global stall was a USP of the exhibition where they showcased about how our environment is getting degraded because of human activities with the focus on plastic pollution which was the theme of the event.

At the plenary ceremony of the event, Prime Minister Sh. Narendra Modi Ji addressed the people present there and told about marine litter, micro-plastic litter, reducing plastics in oceans etc. He showed support for UN initiative to combat plastic pollution.

Videos were showcased at the exhibition giving elaborate knowledge of Amity University, its facilities, research etc. In total 7 videos were exhibited on:

- i. Amity Institute of Environmental Sciences and Amity Institute of Environmental Toxicology, Safety & Management.
- ii. Amity Science & Technology Innovation Foundation (ASTIF)
- iii. Amity Education Group
- iv. Amity Agricultural Initiatives
- v. Amity Solar Energy Project
- vi. Amity movie for conversion of dumping ground to a eco-friendly park by students and 5 presentations
- i. Amity Institute of Environmental Toxicology, Safety & Management (AIETSM)
- ii. Amity Institute of Forestry & Wildlife (AIFW)
- iii. Amity School Natural Resources & Sustainable Development (ASNRSD)

Profile of Amity University was published in Exhibitors booklet issued by MoEF&CC.

## ALTERNATE USES OF PADDY STRAW: EFFECTIVE WAYS TO CURB MENACE OF RESIDUE BURNING

By

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### INTRODUCTION

Residue management of paddy in the rice-wheat cropping system is one of the most challenging tasks faced by the farmers of the Indo Gangetic plains (IGP), which occupies around 10 million ha (Mha) area in our country (Mahajan and Gupta, 2009). About 75 % of the total national food grain production comes from IGP and thus, is often considered the food basket of India. The IGP extends over five states i.e. Punjab, Haryana, Uttar Pradesh, Bihar and West Bengal occupying about 15% of the total geographical area of India (Mahajan and Gupta, 2009). The problem of rice residue management is extensive in these states with special reference to Punjab which alone produces 20 % of the total rice (11 Mt rice grain and 23 Mt rice straw) and 40 % of the total wheat in India. (Kumar *et al.* 2015). The rice crop is harvested by mid October leaving a very short window i.e. 20-30 days for field preparation and sowing of Rabi wheat crop which is done during the last fortnight of November. This limited time span and machine harvesting of paddy gives very less scope to the farmers to go for elaborate land preparation and incorporation of the rice residue. In Punjab, almost 75 % of the residue produced after rice harvest is burnt by the farmers (Kumar *et al.* 2015).

The burning of crop residues has lot of negative impacts on the soil and environment. Also, better alternative uses for the crop residues are available which needs to be explored to convert "waste into wealth". Crop residue burning adds lot of carbon dioxide to the atmosphere and may aggravate the situation of global warming. A study by Jain *et al.* 2014 shows that Punjab alone added 32,299 Gg y<sup>-1</sup> CO<sub>2</sub> due to crop residue burning besides other green house gases like NO<sub>x</sub> and SO<sub>x</sub> during 2008-09. Continuous burning of residue also destroys beneficial soil microbes, reduces the soil organic matter, increases the susceptibility of soil to erosion and reduces the overall soil quality. Along with deterioration in soil quality, a total of 1.34 Mt of nutrient (N, P and K) was lost due to residue burning during 2008-09 (Jain *et al.* 2014).

In the recent past the crop residue burning has created a lot of environmental problems. The residue burning problem has wide spread impact across the country with the worst affected region being the National Capital Region and New Delhi. In 2016, during the pre-winter time Delhi suffered from heavy smog and fog for uninterrupted time span affecting the vehicular traffic and human health, the major cause of which was attributed to crop residue burning ([www.downtoearth.org.in](http://www.downtoearth.org.in)). Not only the northern states but also, the central and southern states like Maharashtra and

Telengana are affected by the burning of residues as the smoke and aerosols gets transported over long distances with the wind circulations. Thus, besides being an important contributor towards air pollution and it also causes different health hazards.

### Alternative Uses of Paddy straw

Paddy straw burning is the major menace which has led to smog, fog and haze like situations for days in the Delhi NCR region. Thus, initiatives to promote alternate uses of residue and proper Policy formulation to encourage farmers to adopt such alternatives are the need of the hour. Some of the alternative uses of paddy straw is discussed here.

**a) Fodder for cattle:** Due to its high silica content rice residue is not considered as a preferred fodder for cattle compared to wheat residue. Though not used as an essential part of animal diet but it definitely has the potential to be used as fodder. Thus, initiatives have been taken by Punjab Agriculture University, Ludhiana to popularize fermented rice straw as a protein rich diet for the cattle (Kumar *et al.* 2015).

**b) Generation of electricity from rice residue:** Several small scale power plants and start-up programs to utilize rice straw for energy generation have cropped up in Punjab. Such programs provide effective alternative platforms for use of the paddy straw in more judicious way (Darmawan *et al.* 2017). A 10 Mega Watt biomass based power plant has been set up in Jalkhuri, Fatehgarh Sahib, Punjab and is operational since 2001. This power plant purchases crop residue directly from the farmer's field, thus, enhancing the income of the farmer's. In a decade (2001-2010) the Power plant could reduce CO<sub>2</sub> emissions by 0.3 million tonnes, thus, giving a huge boost to the Clean Development Mechanism Goals (CDM) (Kumar *et al.* 2015).

Another such power plant, the Sampurna Agri Venture Pvt. Ltd. located in Fazlika, Punjab also utilizes paddy straw for generation of biogas. Bio-methanization process is used for production of biogas from paddy straw. Besides biogas the compost and slurry produced from the plant also helps to promote organic agriculture in the area. These clean energy development processes can act as very good alternatives for effective use of rice straw (Yadav, 2016).

Recently, the Central Government of India has directed National Thermal Power Corporation Ltd. (NTPC) to purchase paddy straw directly from the farmer's field to restrain the hazard of residue burning and improve the air quality in the Northern states. The NTPC has been advised to purchase paddy straw at the rate of Rs 5500/- per tonne from the farmers and help the farmers to generate additional income. The straw will be used as a fuel mix (10 % volume basis) for generation of power (<https://www.thehindubusinessline.com>). Such strong initiatives from the Govt. can help to reduce the wide spread problem of residue burning.



Fig. a: Rice residue burning causes added woes for environmental pollution.

Fig. b: Alternate use of paddy straw for mushroom cultivation.

c) **Use of paddy straw as bedding material/ composting/ mushroom cultivation:** The paddy straw can act as a very good bedding material for cattle and provide comfort and insulation to the cattle. Paddy straw is also used for cultivation of mushroom. The paddy straw mushroom (*Volvarella volvaceae*) gets its name for using paddy straw as the bedding material for germination of mushroom spawns. This mushroom gives higher yield with paddy straw compared to other substrate and contributes to total 15 % of the total world mushroom production (Ahlawat and Tiwari, 2007). Rice straw also acts as a very good fertilizer material rich in N, P and Si and can be used for composting. It improves the soil fertility and overall physical condition of the soil. Thus, utilization of paddy straw in these avenues gives good alternative for its use.

d) **Bio-oil production from paddy straw:** Rice straw can be used for the production of bio-oil by pyrolysis at 2.5 atm pressure and 220°C. The bio-oil produced by this method mainly comprises of organic ester compounds and can be used as bio-fuel (Mohamed and Ashour, 2016). Under climate change scenario, the bio-oil can be excellent substitute for fossil fuel and act as a renewable and sustainable energy source.

e) **In-situ incorporation and straw mulching:** The in-situ incorporation of rice straw in the field done when the residue is left as such in the field and allowed to decompose in the soil. For rice straw mulching, a specially fabricated machine from Punjab Agriculture University, Ludhiana is used for incorporation in the soil surface. The addition of residue helps to recycle the C and nutrients and also improves the soil microbial and enzymatic activities. Soil physical properties like bulk density, water holding capacity all are improved due to incorporation of rice straw. Thus, incorporation of residue is a sustainable solution for its management instead of burning which leads to loss of nutrients and also pollutes the environment at the same time.

f) **Paper production from Rice Straw:** Rice straw is a ligno-cellulose material which can be effectively utilised for paper production. Since the lignin content of rice straw is much less than wood it can be easily converted into pulp (Kaur et al. 2017). This alternative use of rice straw could help save wood trees from felling for paper production and be an environmental friendly solution to use rice straw. Also, the high silica content in rice straw makes it advantageous for paper manufacturing.

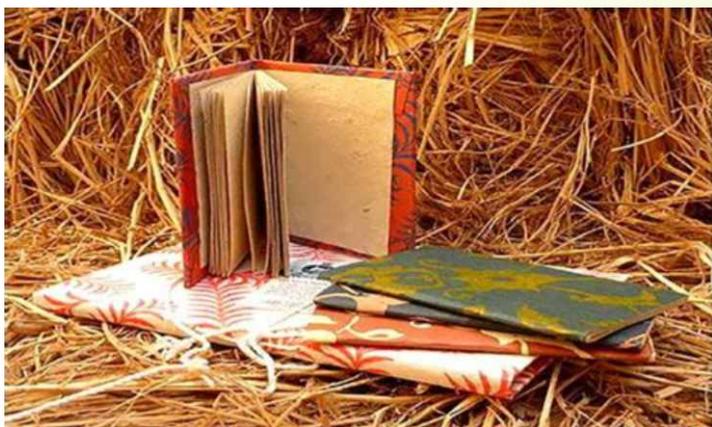
Though the menace of residue burning has aggravated over the years and farmers find it more convenient to burn the residue for field preparation, but several remunerative and alternate uses are available for the same which has been highlighted through this article. In this article we have tried to list the various alternative



uses of the paddy straw which can be taken up by the farmers and small scale industries. The Central and State Govt. should come forward and formulate strategies and policies to directly procure the residue from the farmer's field for remunerative use of the residue. Since labour shortage is one of the major problems faced by the farmer's after the harvesting season, they are reluctant to harvest the residue and rather let it remain in field. So, direct procurement from farm to other industrial area for its use is necessary to effectively implement the alternate uses. Also, mass awareness regarding ill-effects of residue burning and additional income generation due to its alternate use needs to be popularized among farmers. Such alternate uses would not only help to maintain the environment and bring out "green solutions" for several problems but also act as an additional income generation source for the farmer's.

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# BIOTIC STRESSES IN WHEAT (*TRITICUM AESTIVUM* L.) AFFECTING YIELD

By

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## INTRODUCTION

Two main factors which destabilize wheat yields are biotic and abiotic stresses (Table 1), affecting crop productivity and 10% to 90% of its potential yield under non-stressed conditions. Abiotic stresses are those associated with the environment whereas, biotic stresses are induced by other living organisms such as pathogens, insects and weeds. In biotic stress, the major problems encountered by wheat breeders are to develop varieties adapted to a particular environment in order to minimize potential losses due to pests and diseases. Wheat (*Triticum aestivum* L.) suffers from several diseases, which reduce its yield and quality. The major diseases of wheat are rusts, *Alternaria* leaf blight, loose smut, Karnal bunt and powdery mildew. The goal of plant breeders is to introduce genetic resistance into their varieties to minimize the use of chemical protection measures and losses caused due to diseases. In wheat, rusts diseases have been of great economic importance, since the losses caused by these have been widespread.

Patterns of moisture stress	Temperature extremes	Nutrient stress and pH	Biotic stress	Agronomic practices
Terminal humid	Heat stress	P and N deficiency/efficiency	Root rots	Stubble retention
Pre anthesis	Heat stress dry	Deficiency (e.g. Zn)	Nematodes	Zero tillage
Residual moisture	Cold stress	Toxicity (e.g. boron)	Foilar pathogens	Crop rotations
Reduced irrigation	Cold stress-late Frost	Acid soils mineral		Shifting cultivation
General low		Acid soils mineral		Water harvesting rainfall
Shallow, marginal, infertile, eroded lands		Acid soils Organic/ Volcanic		Alkaline soils

Source: Reynolds et al., 2005

## Wheat rusts their impact and control

The rusts are caused by fungal pathogens belonging to genus *Puccinia*, family *Puccinaceae*, order *uredinalis* and class *Basidiomycetes*. Rust fungi are obligate parasites and survive only on living plants. These are most destructive diseases worldwide and have the ability to destroy the entire wheat crop. The rusts are more prominent dynamic and evolution of new races attack previously resistant cultivars. They have the capacity to move long distances with potential to develop rapidly under optimal environmental conditions resulting in serious yield losses. The presence of races capable of overcoming different resistance genes has been demonstrated for all three rust fungi. Most of the grain

yield losses incurred due to leaf and stripe rusts are attributed to infection of the flag leaf, which is thought to be responsible for greater than 70% of grain filling. The yield losses are significant, if the flag leaf is heavily infected prior to grain fill. It appears from historical records that rust epidemics have occurred from time to time in India, the earliest on record dates back to 1786. In 1946-47, the rust epidemics caused a loss of nearly 2 million tonnes of wheat. Leaf and stripe rust appeared in epidemic form in North Western Region of the country which resulted into loss of 0.8 to 1.5 million tonnes of wheat in 1971-1973. Sonalika epidemic of leaf rust caused approximately one million tonnes loss in 1980. The losses are lesser in the areas where environment is marginally warm and not suited for disease. The disease becomes severe only when conditions are unusually favorable such as susceptible cultivars, presence of adequate inoculum load and/ or altered cultural practices. In such situations losses upto 100% may occur. Controlling rust is a complicated job because of constant change in strains (races) of the pathogens. Pathogenic activity of rust can either be curtailed by the cultivation of rust resistant variety or by use of chemicals (fungicides). Chemical control is more effective when rust diseases are identified on susceptible varieties early in the growing seasons. However chemical control of rust pathogens is not eco friendly, expensive and cannot be adopted by small and marginal farmers. Hence, the development of genetic resistance to rusts in host is advocated which is economical, effective and environment-friendly approach to prevent the losses caused by rust epidemics. The wheat production largely depends on the resistance carried by the diverse and well characterized genes. So far, nearly 62 leaf rust and 42 stripe rust resistance genes have been identified and designated as Lr1 through Lr62 and Yr1 through Yr42, respectively.

## Agropyron elongatum-derived leaf rust resistance gene Lr24

Lr24 a dominant gene, first called LrAg and later renamed Lr24. Lr24 present in the genotype Agent is a spontaneous Wheat-Agropyron elongatum (now *Lophopyrum elongatum*) translocation involving 3Ag and 3DL chromosomes. In Agent, the gene Lr24 is tightly linked with the stem rust resistance gene Sr24 and with a gene for red seed colour. Because of their linkage with red kernel colour, the lines could not be exploited in Indian sub-continent as the red grains were not commercially acceptable. However, from a certain white seeded Chinese Spring 3D/Ag induced compensating translocation line, originally induced by Sears (1973) and white seeded improved lines with genes Lr24/Sr24 developed by McIntosh (1976) were usable sources for transfer of these linked genes. However, Lr24 gene is effective to Indian leaf rust pathotypes for the last several years and the cultivars Vidisha, Vaishali and HW2004 carrying Lr24 still stand in the field and occupy a large area in central India.



Fig.1: Infection type of leaf and stem rusts of wheat.



Fig.2: Leaf rust infection on wheat seedlings.

**Genetic manipulation and resistance genes of alien origin**

Although many rust resistance genes have been identified in present day Indian wheat cultivars but most of them are ineffective to prevailing virulent races of rusts. Several genes of alien origin still exhibit resistance to leaf and stem rusts, however, a few of them have been reported to have yield penalty. However, not all genes are disadvantageous rather few of them enhance yield potential, e.g., 1B.1R (Lr26/Sr31/Yr9/Pm8) translocation from *Secale cereale*. Most of the genes conditioning resistance to stripe rust have originated from wheat itself and very few gene(s) have been transferred from wild species (Fig. 1& 2). Incorporation of diverse major genes for leaf rust resistance in popular Indian cultivars as achieved in C306 (a rain-fed cultivar), HD2402 and PBW226 background has provided the desired genetic diversification through the release of cultivars namely, HW2004, HW2044 and HW2045 carrying Lr24/Sr24 and HW2034 (MACS6145) possessing Lr28 in some of the geographical areas in India.

**EVENT / CONFERENCES**

Following are the details of some important conferences:

1. International Conference on Advances in Agricultural, Biological and Applied Sciences for Sustainable Future on 20<sup>th</sup> - 22<sup>nd</sup> October, 2018 at Moot Court Conference Hall, Swami Vivekanand Subharti University, Meerut, Uttar Pradesh, India. <http://agriinventionjournal.com>
2. International Conference on Recent Advances in Medical, Medicine and Health Sciences (ICRAMMHS) on 11th November, 2018 at New Delhi, India. <http://wrfer.org/Conference2018/11/NewDelhi/ICRAMMHS/>
3. National Conference on Chemistry for Human Health and Environment (CHHE) on 15<sup>th</sup> - 16<sup>th</sup> December, 2018 at Conference Center University of Delhi, Delhi 110007. <http://greenchem.du.ac.in/www.nesa-india.org>

**APPEAL TO LIFE MEMBERS**

NESA Life Members are requested to submit short articles for the NESA e-Newsletter that are consistent with NESA's objectives to improve environment. The articles should focus on topics related to environment and facilitate communication and discussion among researchers, academicians and students. The articles for October edition can be submitted to [nesapublications@gmail.com](mailto:nesapublications@gmail.com) before **25th September, 2018**.

Dr. Shefali Gola  
Editor, NESA E-newsletter

To, \_\_\_\_\_  
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