ENVIRONEWS

INTERNATIONAL SOCIETY OF ENVIRONMENTAL BOTANISTS

Newsletter

LUCKNOW (INDIA) VOL. 24, No. 3 July, 2018

IN THIS ISSUE

Condolence message from ISEB on the demise of Prof. Richard F.E. Crang

International Society of Environmental Botanists (ISEB) and CSIR-National Botanical research Institute Lucknow, India deeply mourns the sad demise of Prof Richard F.E. Crang (formerly Professor, University of Illinois at Urbana–Champaign, USA). Prof. Crang was the first Life member of ISEB, from overseas. He readily accepted our invitation to come down to Lucknow to formally inaugurate our first International Conference on Plants and Environmental Pollution (ICPEP-1) held in 1996. During his stay here, he endeared himself to nearly 400 delegates who had come from different parts of the world. In ISEB and CSIR-NBRI he made lot of friends and admirers and earned enormous goodwill and respect by his informal and friendly behaviour. His wide knowledge, eloquence and persuasive skill impressed one and all.

Before ISEB could launch its own website, Prof. Crang on his own, designed and launched a website for ISEB in his department and regularly asked us to provide him inputs and highlights of our activities to update it. He was very keen to visit India again and attend subsequent ICPEP conferences but consistent ill health prevented him from doing so. When ISEB's Scientific Journal, International Journal of Plant and Environment was launched, he readily agreed to contribute a research paper in the very first issue.

ISEB conveys its deepest sympathies, to his wife Mrs. Mary Crang and bereaved family members and prays to God to grant peace to his noble soul.

LETTERS

Diverse species of insect pollinators around the globe including honeybees, naïve bees, moths, butterflies, some specialized species of beetles and flies are showing a trend of sharp decline in their numbers due to numerous anthropogenic factors like over application of agri-chemicals, industrial pollution, Global Warming and Climate Change, parasitic diseases of bees, colony collapse disorder, lack of suitable nectar foraging plants and habitats to mention only a few. Pollinator insects are essential for agriculture, apiculture and forestry industries and for securing the dynamics of our ecology and economy. Conservation of insect pollinators is therefore important from the perspective of food security as they are responsible for pollinating over 70% of food crops around the planet. Hence we have the future in our hands to protect the insect pollinators like bees today; to secure our future for tomorrow. There is an important issue that deserved serious attention and strong support to secure the future of both our ecology and economics together. We must realize that loss of key insect pollinators means significant loss to the stability of our natural ecosystems, agricultural, horticultural and apicultural productivity. We need to connect our local communities to this grave ecological crisis facing our farmer-friendly, natural insect pollinators. We need to educate the public; more importantly our younger generations to the importance of conservation of the highly endangered insect pollinators. Often important research articles published in prestigious science journals and magazines escape the attention of ordinary citizens. It is also important to explain to the public the importance and challenges pollinator conservation in non-technical terms; and in as simple language as possible to spread the urgent message. Hence both print and electronic media can serve as excellent outlets to reach potential stakeholders; who could play significant roles in the efforts towards successful conservation of insect pollinators.

Dr. Saikat Kumar Basu, UFL,
Lethbridge AB, **Canada**
saikat.basu@alumni.uleth.ca

I am very sad to hear about the demise of Prof. R.F.E. Crang. He was one of our greatest supporters and participated in our conferences. He was a great source of inspiration for many of us. Please send a condolence message from the Society to his family. We will miss him.

Dr. P. V. Sane, FNA
(Former Director, CSIR-NBRI, Lucknow) Farmer President ISEB,
Mahanagar, Lucknow, **India**
rajsane@hotmail.com

We are shocked to learn of the sad demise of Prof. Crang. He was a great friend of ISEB and a source of inspiration to all of us. He was always on the forefront in showcasing the activities of our Society and used to take enormous interest in promoting the aims and objectives of ISEB. In his passing away the Society has lost a great friend and well wisher. I pray Almighty to grant peace to the departed soul, and courage and fortitude to the bereaved family members to bear this irreparable loss The Secretary of ISEB may send a condolence message to the family of Late Prof. Crang.

Prof. R. S. Tripathi, FNA, FNIE, FNASc, Vigyan Vibhushana
Formerly, INSA Senior Scientist
CSIR-National Botanical Research Institute, Lucknow, **India**
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International Society of Environmental Botanists has established Fellowship to some meritorious life members of the Society every year. ISEB has selected some 50 life members for awarding ISEB fellowship for the year 2017. I am thankful to you as I am one of the 48 Life members for awarding ISEB fellowship for the year 2017. Dr. Barik has informed me by telephone that he will receive on my behalf the Fellowship on 9th June, 2018. Hope the same has been done.

Prof. (Dr.) Palpu Pushpangadan
[M.Phil., Ph.D., FAS,FBRS, FES,FISEB, FIAT, FNRS, FNSE, FNESA, FNAASc, FNASc, FISNS, FRSC (UK)]
Padma Shri Awardee, UN Equator Initiative Laureate and Borlaug Awardee
(Former Director, CSIR-NBRI & CSIR- CIMAP, Lucknow & KSCSTE- JNTBGRI & RGCB, Trivandrum)
Director General, AIHBPD & Senior Vice President, RBEF
Ravi Nagar, Peroorkada P.O., Thiruvananthapuram 695 005, **India**
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First of all I would like to convey my thanks to the Secretariat of ISEB for organizing the award ceremony successfully. It was a well organized function and obviously reflects the team work. I would like to put forward a few suggestions for the consideration of Executive Council of ISEB.

1. The individual elected fellow should be presented by Secretary of ISEB (with a brief citation/narration of his/her academic achievements) to President, ISEB for admission to the Fellowship and presentation of Fellowship Award Certificate.
2. The elected fellows who could not attend the award ceremony function in person should also be presented to President, ISEB for the admission to the Fellowship in Absentia. I will surely circulate and encourage researchers (Canada also other countries who are in my contact list) to participate in the conference.

With warm regards,

Prof. (Dr.) Mohammed Latif Khan, FNIE, FNESA, FISEB, FNAAS
Department of Botany, Chairperson, Nodal Centre for University Ranking Process
Dr. Harisingh Gour Central University, Sagar, M.P., **India**
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IUBS is involved in 2 projects on science education, outreach and public engagement granted by ICSU. In the first, which is entitled "Trans-disciplinary Research Oriented Pedagogy for Improving Climate Studies and Understanding (TROP-ICSU)", IUBS is the leading institution together with the International Union for Quaternary Science (INQUA).

In the other called "A Global Approach to the Gender Gap in Mathematical, Computing and Natural Sciences: How to Measure It, How to Reduce It?", IUBS is one of the ten collaborating partners, with IMU and IUPAC as co-leaders.

The TROP ICSU project is conducting a preliminary survey to understand how topics in climate are currently discussed in classroom. The survey is available in several languages (English, Català, Français, Deutsche, Hindi, Italiano, Español). The survey in the Gender Gap project is open until 31 October 2018. It is also available in several languages (English, French, Chinese, Japanese, Russian, Spanish, and Arabic.) You are welcome answer these surveys and forward them to your colleagues and networks. Your involvement in this dissemination will be very important to us. The surveys are also available on IUBS website.

Nathalie Fomproix, Ph.D
Executive Director IUBS, **France**
nfomproix@iubs.org
www.iubs.org

The first ever Fellowship Induction Ceremony of the International Society of Environmental Botanists marked the beginning of a new era where by creating an atmosphere towards ownership and bondage amongst fellow colleagues and also create a sense of responsibility to come together for a good cause. The cause being taking the ISEB global with new benchmarks and standards that would attract and retain quality human resources into the ambit of environmental botany that cuts across research disciplines. The ISEBians would stand like plants that are not only the source of oxygen for all dependent living organisms, but also the enabler of better atmosphere for human survival by carbon sequestration and regulating the hydrology. I wish the history of ISEB is enriched with new literatures and success stories. Although it would be droplet, I would try and do my best for the cause of ISEB - A. Arunachalam FISEB

Dr. A. Arunachalam, Ph.D., FISEB
Principal Scientist & Scientific Officer
Office of the Secretary, DARE & Director-General, ICAR
Room No. 101, Krishi Bhavan, New Delhi, **India**
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WELCOME NEW LIFE MEMBERS

Dr. Ramakant Madhu Bagul, Associate Professor, Dept of Botany, MGSM's Arts, Science and Commerce College, Jalgaon.

drrmbagul@gmail.com

Dr. Atul Kumar Upadhyay, National Post Doctoral Fellow, Babasaheb Bhimrao Ambedkar University, Lucknow.

upadhyay.eb@rediffmail.com

Dr. Priyanka Dhar, National Post Doctoral Fellow, Pharmacognosy & Ethnopharmacology Division, CSIR-National Botanical Research Institute, Lucknow.

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Dr. Vinay Sahu, Senior Technical Officer, Bryology Laboratory, CSIR-National Botanical Research Institute, Lucknow.

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Dr. Seshu Lavania, Professor, Department of Botany, Lucknow University, Lucknow.

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Mrs. Isha Pathak, SRF (DST Inspire), Bryology Lab, CSIR-National Botanical Research Institute, Lucknow.

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Dr. Kiran Gupta, UGC Post Doctoral Fellow, Lucknow University, Lucknow.

sunrays79@gmail.com

ISEB FELLOWSHIP AWARDS 2017

International Society of Environmental Botanists organized First Fellowship Award function on 9th June, 2018 to award ISEB fellowship 2017 to following ISEB Life members. For this purpose, function was held at CSIR-NBRI auditorium in the presence of a distinguished gathering of scientists. Prof. S.K. Barik, President ISEB and Director CSIR-NBRI personally handed over the certificates to the awardees. On this occasion eminent Scientist Dr. Nitya Anand, former Director of Central Drug Research Institute, Lucknow was the Guest of honour.

ISEB Fellowship List (Fellows for 2017)

ĆÆ	*Dr. P.C. Abhilash	Assistant Professor, BHU, Varanasi
2.	*Prof. Madhoolika Agrawal	Head, Botany Department, BHU Varanasi
3.	Dr. K.J. Ahmad	Ex-Scientist, CSIR-NBRI, Lucknow
4.	Dr. Nitya Anand	Ex-Director, CSIR-CDRI, Lucknow
5.	Dr. A. Arunachalam	Indian Council of Agricultural Research, New Delhi
6.	*Prof. Arun Arya	M.S. University, Baroda
7.	*Prof. A.K. Attri	Professor, School of Environmental Sciences, JNU, New Delhi
8.	Prof. S.K. Barik	Director, CSIR-NBRI, Lucknow
9.	Dr. H.M. Behl	Ex-Scientist, CSIR-NBRI, Lucknow
10.	*Prof. J.N.B. Bell	Imperial College, U.K.
11.	*Dr. D.S. Bhakuni	Ex-Scientist in Director's Grade, CDRI, Lucknow
12.	*Prof. C.R. Bhatia	Ex-Secretary, Dept. of Bio-technology, Govt. of India) Navi Mumbai
13.	*Late. Prof. R.F.E. Crang	Former Professor, University of Illinois, U.S.A.
14.	*Dr. Anjum Farooqui	Scientist, BSIP, Lucknow
15.	*Dr. Meetu Gupta	Assistant Professor, Department of Biotechnology, Jamia Millia Islamia, New Delhi

16.	*Dr. Tariq Husain	Scientist, CSIR-NBRI, Lucknow
17.	*Prof. Muhammad Iqbal	Ex-Professor, Botany Dept. Hamdard Univ., New Delhi
18.	Prof. Mohd. Latif Khan	Professor, Department of Botany, Dr. H.S. Gour Central University, Sagar
19.	*Prof. R.K. Kohli	Vice-Chancellor, Punjab Central University, Bathinda
20.	*Dr. Kamla Kulshreshtha	Ex-Scientist, CSIR-NBRI, Lucknow
21.	*Prof. Kumkum Misra	Professor, Department of Botany, Lucknow University, Lucknow
22.	*Dr. C.S. Nautiyal	Bose Fellow, Ex-President ISEB & Ex-Director, CSIR-NBRI, Lucknow
23.	*Prof. L.M.S. Palni	Vice-Chancellor, Graphic Era Univ., Dehradun
24.	Dr. Vivek Pandey	Scientist, CSIR-NBRI, Lucknow
25.	*Dr. P. Pushpangadan	Ex-President ISEB & Ex-Director CSIR-NBRI, Director General & Sr. Vice President, RBEF, Amity Institute for Herbal & Biotech Products, Thiruvananthapuram
26.	*Dr. U.N. Rai	Ex-Scientist, CSIR-NBRI, Lucknow
27.	Prof. Pramod Wasudeo Ramteke	Dean, P.G. Studies, Sam Higginbottom Institute of Agriculture, Technology & Sciences, Naini, Allahabad
28.	Dr. Parth Sarathi Roy	Honorary Professor, UCESS, University of Hyderabad, Hyderabad
29.	*Dr. P.V. Sane	Ex-President ISEB & Ex-Director CSIR-NBRI, Lucknow
30.	*Dr. Samir V. Sawant	Scientist, CSIR-NBRI, Lucknow
31.	Prof. P.K. Seth	Ex-Director, CSIR-IITR, Ex CEO Biotech Park, Lucknow
32.	Dr. S.C. Sharma	Ex-Scientist, CSIR-NBRI, Lucknow
33.	Prof. Y.K. Sharma	Professor, Department Botany, Lucknow University, Lucknow
34.	Dr. B.P. Singh	Ex-Scientist, CSIR-NBRI, Lucknow
35.	*Prof. K.P. Singh	Ex-Professor, BHU, Varanasi
36.	Dr. Mrs. Nandita Singh	Consultant Scientist, CSIR-NBRI, Lucknow
37.	Prof. Rana Pratap Singh	Professor, BBA Univ., Lucknow
38.	Dr. S.N. Singh	Ex-Scientist, CSIR-NBRI, Lucknow
39.	*Dr. Sarita Sinha	Ex-Scientist, CSIR-NBRI, Lucknow
40.	*Ms. Kanti Srivastava	Ex-Scientist, CSIR-NBRI, Lucknow
41.	*Prof. Pramod Tandon	CEO, Biotech Park, Lucknow
42.	Dr. R.D. Tripathi	Emeritus Scientist, CSIR-NBRI, Lucknow
43.	Dr. Renu Tripathi	Scientist, Parasitology, CSIR-CDRI, Lucknow
44.	Prof. R.S. Tripathi	INSA Sr. Scientist, CSIR-NBRI, Lucknow
45.	Dr. Prabodh Trivedi	Scientist, CSIR-NBRI, Lucknow
46.	*Dr. Rakesh Tuli	Ex-President ISEB & Ex-Director, CSIR-NBRI, Mohali, Punjab
47.	Dr. D.K. Upreti	Scientist, CSIR-NBRI, Lucknow
48.	*Prof. C.K. Varshney	Professor Emeritus, Environmental Sciences, JNU, New Delhi and Distinguished Adjunct Professor, AIT, Bangkok
49.	*Prof. H.N. Verma	Vice-Chancellor, Jaipur Nat. Univ., Jagatpura, Jaipur
50.	*Prof. Mohd. Yunus	Vice-Chancellor, M.A. Jauhar University, Rampur

*Awarded in absentia

Role of microorganisms in reclamation of coal-mine spoils

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Introduction

The fossil fuel coal is largely valued for its energy content. Since the 1880s it has been primarily and widely used for electric/power generation. The industrial revolution, which started in Great Britain in the 18th century and from there, it later spread across all over continental Europe and North America, was based on the availability of coal-powered steam engine which expanded the international trade. Coal exploitation, however, has led to negative consequences on the terrestrial and aquatic environments causing soil, air and water pollution and biodiversity loss. Mining activities result in rapid and dynamic changes in land-use patterns as coal-mined lands, albeit prior to mining operations, may have been a forest or an agricultural land with abundant biodiversity. Mining activities have serious impacts on the top fertile soil as the beneficial microbial community is lost and the heavy metal toxicity, altered pH, high temperature and low water holding capacity make the coal-mines area an unsuitable habitat for plant growth leading to the creation of a degraded barren land (Fig. 1). Mining activities cause loss of litter layer, which is an integral storage and nutrient exchange site. Thus, the coal mine spoils become chemically, physically and biologically disturbed and unstable.

Coal extraction processes are typically differentiated by whether they prevail on the surface or beneath the earth. Most coal seams are buried too deep under the earth not suitable for opencast mining and indispensably require underground mining, a process that currently accounts for nearly 60 percent of world's coal output. The soil debris is heaped in the form of dumps known as mine spoil. The surface coal mining completely eliminates or harms the existing flora, destroys the horizons of a soil profile altering microbial communities, displaces or destroys fauna and their habitat, reducing biodiversity, degrades air quality, deteriorates current land use patterns, and to a certain extent permanently transforms the general topography of the entire area. Because of adverse soil conditions, the coal-mine spoils require reclamation for their speedy recovery. Different physical and chemical remediation technologies have been developed over the years but are less feasible on a large scale as they may be site-specific or have an economic concern. Biological reclamation involves the returning of the coal-mine spoil to near about its original stage by restoring the nutritional property of soil through re-vegetating the land. Reclamation through the plant and microbial communities on these sites not only has significant effects on soil fertility, which enhance the ecological succession, but are also sustainable and economically feasible. It makes the ecosystem healthy by creating proper vegetation and microbial flora that improves the soil structure and quality so that it can support plant growth and reduce pollution.

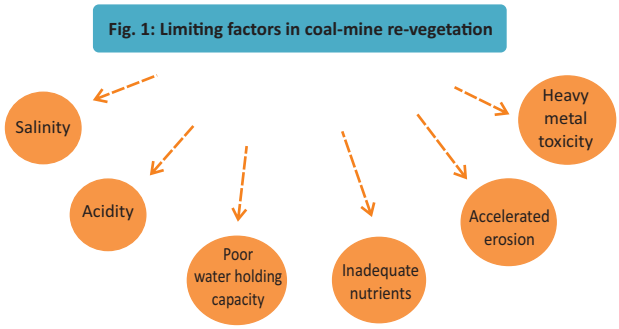


Fig. 1: Limiting factors in coal-mine re-vegetation

Microbes and plant growth

Ecosystem stability depends on the interactions between the abiotic components with biotic components which include the diverse primary producers i. e plants, and microbes. Plant growth promoting microorganisms mainly comprise bacteria, fungi and arbuscular mycorrhizal (AM) fungi. The application of plant growth promoting rhizobacteria (PGPR) mitigate the effect of stress in plants by various direct and indirect mechanisms like production of plant growth regulators, nitrogen fixation, solubilisation of inorganic phosphate, mineralization of organic phosphate, siderophore production, exopolysaccharide secretion and their role in various ecosystem processes like nutrient cycling, seedling establishment and in soil structure formation. These PGPR have a potential to fight with diverse environmental stresses such as

drought, high and low temperatures, soil salinity and heavy metals. Their root colonizing ability and different mechanisms of action have made them applicable as a reliable component in the management of degraded ecosystem including the coal mine spoils. Screening an efficient microbe with stress tolerance potential and competence in the restoration of coal mine spoils is the most important aspect of the reclamation programs.

Arbuscular mycorrhizae are the mutually beneficial symbiotic relationship of soil-borne non-pathogenic fungi with the roots of terrestrial higher plants and are found in almost 80% of plant species. The AM fungi help in increasing the phosphorus uptake and other nutrients, enhance plant growth directly through production of hormones, increase the protein, lipid, sugars, and amino acid levels, providing biologically fixed nitrogen, alleviating tolerance to heavy metals, salinity and provide resistance to root-borne phytopathogens. During this symbiotic relationship, the fungal hyphal network functionally extends the root system area of their host plants. Thus, plants in symbiotic association with AM fungi have potential to take up mineral nutrients from an enlarged accessible soil volume and are estimated up to 47-fold compared to a normal plant. Most of the naturally growing plant species surveyed at coal-mine spoils show mycorrhizal infection in roots. The reservoir of the mycorrhizal inoculum is generally the adjoining vegetated areas from where the inoculum spreads. The inoculum is chiefly comprised of spores, hyphae or the root debris which can easily spread. As the succession proceeds at the mine spoils, there is an increase in the AM inoculum level in the soil which helps in the further establishment of new plants through various mechanisms as depicted in Fig 2.

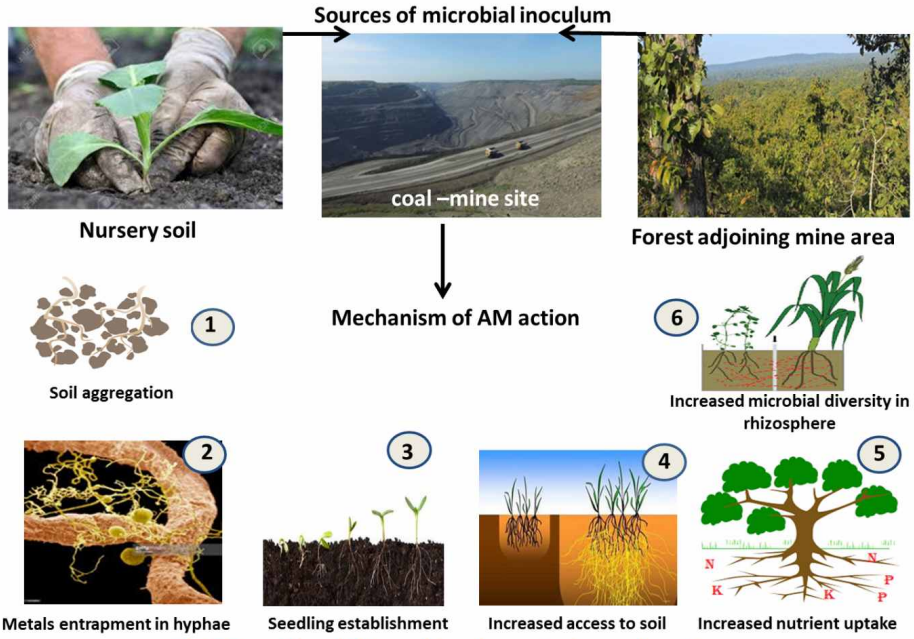


Fig 2: Benefits of Mycorrhizae in coal-mine reclamation
(Source of pictures-www.google.com)

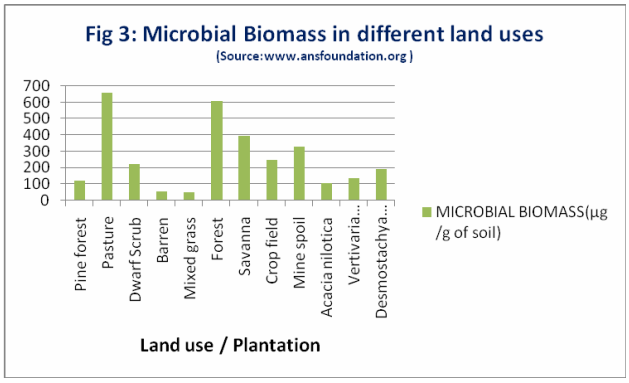
In older plantations, five genera of AM fungi including Acaulospora, Glomus, Gigaspora, Scutellospora and Sclerocystis are reported. Out of these, Acaulospora and Glomus are found in high frequency. The mycorrhizae colonization are reported to reduce the detrimental effects of increased temperature, alter plant–water relations, improve their resistance to drought, increase stomatal conductance and transpiration rates, besides suppressing the various soil-borne diseases and thus facilitate the establishment as well as the survival of pioneer vegetation during the stress conditions. Mycorrhizal fungi also influence the microbial diversity and abundance in the mycorrhizosphere. The abundance of trace elements in the coal mine spoils is the most challenging part in the process of reclamation. Phytoremediation is a sustainable and inexpensive technology of removing pollutants including heavy metals from the environment. Fungi colonizing the roots are capable of accumulating large amounts of heavy metals which may be up to 20% of dry mass production in plants, indicating that microbial biomass may promote the mobilization of metals in the soil system. In addition, they can alienate metals from the soils by biosorption and/or bioaccumulation processes. The fungal cell wall components can be very effective in heavy metals binding due to the presence of free amino, hydroxyl, carboxyl, amine and other functional reactive groups. Some of the microorganisms can also mediate heavy metals precipitation process by producing a larger quantity of various organic acids or autolytic enzymes such as the acid phosphates or pigments, which additionally check the leaching of metals.

Calculations by Söderström show that the surface of interaction between soil–fungal communities may be up to 0.14 m2 in 1 g of soil. Glomalin, a protein produced by AM fungi, seems to be an effective candidate in sequestering Cu, Cd, Pb and Mn found in abundance in coal mine spoils. Retention of heavy metals in the extraradical mycelium of ectomycorrhizae has been proposed as a tolerance mechanism by these fungi which support plant growth under stressed soil condition. The fungi can detoxify metals by intracellular precipitation processes. In recent years, a plethora of transmembrane transporters controlling the intracellular trafficking and distribution of metal ions have been detected in plants and microorganisms. The preferential intracellular detoxification strategy in fungi as well as plants is mainly attributed to metal chelation by cysteine-rich peptides (CRPs) such as reduced glutathione (GSH), phytochelatins (PCs) and metallothioneins (MTs). AM fungi are thus an attractive microbial system that may help in plant-based environmental clean-up.

It has been demonstrated by various studies that vegetation has a significant influence on the abundance of microorganisms in surrounding bulk soil and rhizosphere. Plants adapted to grow on polluted sites can be used for restoration of coal-mine spoils to improve soil structure and organic content. Most reclamation models utilizing plants like *Pongamia pinnata*, *Gmelina arborea*, *Dalbergia sissoo*, *Dendrocalamus strictus*, *Azadirachta indica*, *Albizia procera*, *Albizia lebbeck*, *Emblica officinalis*, *Jatropha curcas*, *Terminalia arjuna*, *Pennisetum pedicellatum*, *Tectona grandis*, *Eucalyptus camaldulensis*, *Acacia auriculiformis*, *Acacia catechu*, *Acacia nilotica*, *Casuarina equisetifolia*, *Azadirachta indica*, *Cassia siamea*, *Eucalyptus* hybrid, *Grevelia pleridifolia* and *Leucaena leucocephala* have shown excellent improvement in soil organic matter. Most studies have shown that the primary colonisers of a coal mine have a dominance of Asteraceae species. To increase the microbial population in a coal-mine spoil, the organic matter and humus need to be increased. Different plant species that are cultivated in various combinations with endemic grasses have a significant impact on the structure of rhizospheric microbial community that can beneficially affect the nutrient cycling and plant establishment on coal-mine spoils. Grasses after death and decomposition contribute to soil organic matter and also provide mulching to the soil. *Acacia mangium* and *Acacia catechu* have potential to acclimatize to stress conditions originated due to coal mining activities. The plant root exudates have the potential to disintegrate the coarse particles into smaller particles such as clay which is important for maintaining soil aggregation and structure. The rhizosphere of these plants usually harbours useful microbes like symbiotic nodular bacteria, mycorrhiza helper bacteria, saprobic fungi and many PGPR. These organisms not only influence the plant growth by stimulating the production of vitamins and hormones and acquisition of nutrients but also help in overcoming the abiotic stress components of the soil and hence are widely exploited in the coal-mine restoration programs.

Microbial community and soil health

Ecosystem functioning is primarily governed by soil microbial dynamics as they have an important role in linking the chemical, physical and biological components of the soil and thereby making it fertile. Microbial biomass acts as a sink as well as a source of nutrient in dry tropical environment. The cycling of nutrients by microbes regulates the sustainability of any plant community in absence of which plant community will not be able to regenerate. Soil microbial biomass varies according to the land uses which are important parameters to get an idea about the soil health as illustrated in Fig. 3.



Increase in soil organic content and microbial biomass results in increased functionally diverse microbes which make an ecosystem stable and functional.

Soil properties and the plant cover determine the microbial community of a place and together they determine the trajectory of ecosystem development. Microbial associations are critical for ecosystem functioning as they are directly involved in organic matter

decomposition and nutrient cycling. Microbial communities play a crucial role in improving the soil fertility and productivity by breaking down organic matter into inorganic forms of mineralized nutrients accessible for plant uptake. During opencast mining, the mine spoils or overburdens created are often devoid of essential nutrients and have relatively lower water holding capacity. The gradual improvements in physical and chemical soil properties after reclamation of overburden dumps through re-vegetation aided by microbes is due to control of soil erosion, increasing organic matter and formation of humus with the increasing age of plantations and decrease in heavy metal content. The gradual reduction in the bulk density values of the reclaimed sites has been found with increasing the age of plantations. Studies have shown that depending upon the coal-mine site; complete microbial recovery may take up to 26 years after surface coal mining, with an average time of 20+ years. In general, the most important phase of microbial community recovery is between 5 to 14 yr after the initiation of reclamation programs.

Conclusions

Mining activities lead to significant degradation of the ecosystem. Long-term and large-scale measures are required in order to build greater resilience in a coal-mine degraded soil. The most suitable approach for reclamation of coal-mine spoils is through re-vegetation by use of native and indigenous plant species harboring plant growth promoting microbes in their rhizosphere which help in establishing stable biogeochemical cycle that further improves soil quality. Soil quality, microbial biomass and their diversity are the major factors governing ecosystem succession on a fresh coal-mine dump and its ecological restoration.

NEWS AND VIEWS

What do animals do during a solar eclipse?

People have reported animals acting strangely during an eclipse. Birds fall silent and bees return to their hives, as if it were nightfall. If the sun winks out in the middle of the day, birds may fall silent and bees leave the fields. Tales have reported animals behaving strangely during a solar eclipse's totality. That's when the moon completely blocks out the sun.

Orb weaver spiders have been observed taking down their webs during an eclipse, just as they do each night.

There's a lot of *anecdotal* evidence for how animals and even plants respond to a totality. But there's not a lot of hard science. The California Academy of Sciences in San Francisco is running a project on it. Tales alone aren't enough for scientists to conclude anything certain about how wildlife typically behave during a solar eclipse.

But such tales do go way back. Perhaps the earliest record comes from 1544. That's when an unknown observer wrote that "birds ceased singing" during a total eclipse. Another observer in 1560 reported "birds fell to the ground."

In the past century or so, however, scientists have tried to approach the question in a more systematic way. The Boston Society of Natural History in Massachusetts collected observations during a 1932 eclipse. Study volunteers took part in what they believed was "the first comprehensive and scientifically conducted study of the behavior of animal life during a total eclipse."

Crickets chirped, people reported. Frogs croaked. Gnats and mosquitoes swarmed. Bees returned to hives. Chickens came home to roost. This is an annular eclipse captured by the Hinode satellite in 2011. In an annular eclipse, the moon is slightly farther from the Earth, so it does not block the entire sun.

Eclipse studies in the 1960's and 1970's reported small light-sensitive crustaceans and zooplankton swimming towards the surface. That is similar to what the tiny animals do at night. The sun's brief absence during a 1991 eclipse prompted orb weaver spiders to take down their webs. And during an *annular* eclipse in 1984, captive chimpanzees scaled a climbing structure. Then they turned their faces to the blocked sun. (An annular eclipse is when the moon blocks all but a ring of bright light.)

As interesting as these tales are, they also are quite limited. That could change with the 2017 eclipse. Many people now have smartphones. This means that *crowdsourced* research can yield more and better-coordinated observations than ever before.

Source: Science News

EU may ban plastic straws, stirs, cotton buds

The European Union (EU) proposed a bloc-wide ban on single-use plastics such as straws and cutlery while urging the collection of most plastic drinks bottles by 2025. The proposals are part of a growing EU drive to rid the environment of plastic waste which has begun showing up in the food chain. Plastic waste is a big issue and Europeans need to act together to tackle this problem. The proposal will reduce single-use plastics in our supermarkets through a range of measures. The proposals call for banning plastic cotton buds, cutlery, plates, straws, drink stirrers and balloon sticks, but it did not set a deadline. These items must all be made from sustainable materials instead, according to the plan which must be approved by the 28 EU member countries and the European Parliament. Member states must reduce the use of plastic food containers and drinks cups, by promoting alternatives for sale or ensuring they are not offered free.

Source: Times of India

Many plants need bacterial roommates to survive. So why do some kick them out?

When it comes to getting one of their most critical nutrients, some plants recruit tiny friends: soil bacteria that live in bumps on their roots and harvest nitrogen from the air. A new study reveals that these partners are expensive to keep, however, so much so that some species have given up on these microbial gardeners.

Species from 10 plant families—including peanuts, beans, and mimosa trees—all thrive in poor soils because they partner with so-called nitrogen-fixing bacteria. But plant biologists have long puzzled over why the other 18 families in this kingdom, and even some species within those 10, haven't also evolved this beneficial trait.

To find out, researchers sequenced seven genomes of nitrogen-fixing plant species and three closely related species that don't fix nitrogen. They compared the gene makeup of these with 27 other plant genomes, 18 of them nitrogen-fixers. The analysis suggests the ability to form these partnerships evolved in the common ancestor to the 10 families that have this capability but was lost at least eight times after a gene key to the plant getting hooked up with bacteria mutated or was lost altogether, the team reported.

These multiple losses suggest the nitrogen-fixing plants invest a lot of energy in these partnerships, so much so that if there's enough nitrogen in the soil, they stop forming these partnerships and eventually lose the ability to form them at all.

Nitrogen fixation is such a valuable trait that millions of dollars are being spent to endow crops with this ability. But the new work suggests plant scientists need to keep these potential costs in mind.

Elizabeth Pennisi
(In: ***Science***)

We lost tree cover size of Italy in 2017

The world lost tree cover the size of Italy in 2017 as forests were cleared using fire to make way for farms from the Amazon to the Congo Basin according to, an independent forest monitoring network. Tree cover loss, mostly in the tropics, totalled 2,94,000 sq km last year, just short of a record 2,97,000 sq kms in 2016, according to Global Forest Watch, run by the US-based World Resources Institute (WRI). Tropical forests were lost at a rate equivalent to 40 football fields per minute in 2017, Frances Seymour, of the WRI, told a news conference at a June 27-28 Oslo Tropical Forest Forum of 500 experts. Norwegian environment minister Ola Elvestuen said the pace of forest losses was "catastrophic" and threatened efforts to slow global warming. Trees soak up carbon dioxide from the air as they grow and release it when they burn or rot.

"Forest destruction is driving climate change," he said. Norway has invested about $2.8 billion to safeguard tropical forests in the past decade - more than any other rich nation.

Brazil, Democratic Republic of Congo, Indonesia, Madagascar and Malaysia suffered the biggest losses in 2017, Global Forest Watch said, which is based on satellite data back to 2001.

Vast areas continue to be cleared for soy, beef, palm oil and other globally traded commodities. Much of this clearing is illegal.

Brazil alone lost 45,000 sq km of tree cover, down 16% from a record in 2016. Fires raged in the southern Amazon region of Brazil. Justin Adams, of the Nature Conservancy environmental group, said only three percent of public finance for slowing climate change went to natural solutions like forests. Well-managed forests can be a source of jobs and economic growth.

Source: Reuters

LAST AND FINAL ANNOUNCEMENT

6TH INTERNATIONAL CONFERENCE ON PLANTS & ENVIRONMENTAL POLLUTION (ICPEP-6)

Jointly organized by

International Society of Environmental Botanists (ISEB) &
CSIR-National Botanical Research Institute (CSIR-NBRI), Lucknow, INDIA
27-30 November 2018
Venue: CSIR-National Botanical Research Institute, Lucknow-226001, INDIA

Prof. Girish Sahni, Director General, CSIR, Govt. of India, New Delhi - Chief Patron
Prof. Ashutosh Sharma, Secretary, DST, Govt. of India, New Delhi - Patron
Dr. Trilochan Mohapatra, Secretary, DARE & Director General, ICAR, New Delhi- Patron

Prof. S.K. Barik, Director, CSIR-NBRI & President, ISEB
Dr. K.J. Ahmad, Secretary, ISEB
Prof. R.S. Tripathi, Chairman Steering Committee & Scientific Program Committee

Co-sponsored/Supported By

International Union of Biological Sciences (IUBS), Paris
International Union of Forest Research Organizations (IUFRO), Vienna, Austria
National Biodiversity Authority, India

Organizing Secretaries ICPEP-6

Dr. R.D Tripathi	**Dr. Nandita Singh**	**Dr. Vivek Pandey**
(Emeritus Scientist, CSIR-NBRI)	***(Consultant Scientist, CSIR-NBRI)***	***(Senior Principal Scientist, CSIR-NBRI)***
Additional Secretary ISEB	**Joint Secretary, ISEB**	**Joint Secretary, ISEB**

Inauguration by

Dr. Nathalie Fomproix, Executive Director, International Union of Biological Sciences (IUBS), Paris
27th November 2018, Forenoon

There will be a special session on "Ecology and Silviculture of Sub-tropical and Tropical Oaks under Global Change"
International Union of Forest Research Organizations (IUFRO), Vienna, Austria
(Contact: Dr. Satyanarayan Jena; E-mail: satyanarayanjena2005@yahoo.co.in)

Contact: **Organizing Secretaries, ICPEP-6, CSIR-National Botanical Research Institute, Lucknow, India (E-mail: icpep6@gmail.com; isebnbrilko@gmail.com)**

Contact: **for Abstracts Dr. P.A. Shirke, CSIR-NBRI, Lucknow, India (E-mail: pashirke@nbri.res.in) - Submission Deadline 31 August, 2018**

Contact: **for early bird Registration Organizing Secretaries, ICPEP-6 (E-mail: icpep6@gmail.com; isebnbrilko@gmail.com) – Last date 31 August, 2018**

Contact: **for Accommodation Dr. T.S. Rana, CSIR-NBRI, Lucknow, India (E-mail: guest.house@nbri.res.in)**

IUBS Grant for young Scientists: Recent Ph.D., below 35 years of age; send application with CV on plain paper to Organizing Secretaries ICPEP-6, International Society of Environmental Botanists, CSIR-National Botanical Research Institute, Rana Pratap Marg, Lucknow-226001, India either by post or by e-mail (icpep6@gmail.com) by 31 August, 2018. They must enclose their abstract and duly filled registration form along with their application.

Website : isebindia.com

CONFERENCES

4th International Conference on Environmental Science and Technology (ICOEST)
September 19-23, 2018; Kiev, Ukraine
Contact:Prof. Dr. Özer Çinar
E-mail: info@icoest.eu
Website:https://www.icoest.eu/

10th International Conference on Environmental Catalysis and 3rd International Symposium on Catalytic Science and Technology in Sustainable Energy and Environment
22-27 September, 2018; Tianjin, China
Contact: Dr. Yicheng Zhao
School of Chemical Engineering and Technology
Tianjin University
Tianjin 300350, China
E-mail: ydlilab@tju.edu.cn

International Conference on Ecological Sciences
22-25 October, 2018; Rennes, France
E-mail: sfecologie2018@sciencesconf.org
Website: https://sfecologie2018.sciencesconf.org/

9th International Conference on Global Warming, Climate Change and Pollution Control
5-6 December, 2018; Vancouver, Canada,
E-mail: pollution@toxicologyconferences.org
Website: https://global-warming.conferenceseries.com/

14th International Conference on Environmental, Cultural, Economic & Social Sustainability
17-19 January 2019; Cairns, Australia
E-mail: cairnsinstitute@jcu.edu.au
Website: http://onsustainability.com/2018-conference

International Conference on Medicinal, Aromatic and Nutraceutical Plants from Mountainous Areas and 9th Annual Conference - American Council for Medicinally Active Plants (ACMAP)
February 14-16, 2019; Clement Town, Dehradun, India
E-mail: info@acmap.org, ismp@geu.ac.in
www.geu.ac.in; www.acmap.org

BOOKS

Climate Change Challenges and Adaptations at Farm-level
N.P. Singh; C. Bantilan; K. Byjesh; S. Nedumaran
CABI 2015
ISBN: 9781780644639
Price: $165.95

Water Dynamics in Plant Production
(Eds.): W. Ehlers; M. Goss
CABI 2016
ISBN: 9781780643823
Price: $75.00

Biodiversity and Conservation of Woody Plants
(Eds.): M.R. Ahuja, Shri Mohan Jain
Springer 2017
ISBN: 978-3-319-66425-5
Price: 228,79 €

Plant Conservation Science and Practice The Role of Botanic Gardens
(Eds.) Stephen Blackmore, Sara Oldfield
Cambridge University Press 2017
ISBN-13: 978-1316602461
Price: US $ 99.99

Plant Biodiversity Monitoring, Assessment and Conservation
(Eds.): A. Ansari, S.S. Gill, Z.K. Abbas, M. Naeem
CABI 2017
ISBN: 9781780646947
Price: $225.00

Climate Change and Crop Production
by M. Reynolds
CABI 2017
ISBN: 9781786393081
Price: $75.00

Principles of Environmental Science (8th Edition)
by William P. Cunningham and Mary Ann Cunningham
McGraw Hills 2017
ISBN: 978-0078036071
Price: US $ 29.16

Principles of Food Chemistry (4th Edition)
by John M. deMan, John W. Finley, W. Jeffrey Hurst and Chang Yong Lee
Springer 2018
ISBN: 978-3319636054
Price: U.S. $ 58.87

Published by
International Society of Environmental Botanists,
CSIR-National Botanical Research Institute,
Rana Pratap Marg, Lucknow 226001, India

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