CGES Newsletter

CLEAN AND GREEN ENVIRONMENTAL SOCIETY

Lucknow (India) Vol. 7 No. 1 March 2022

SPECIAL ISSUE

VISION

Clean and Green Environment for Healthy Life

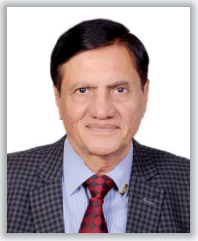
MISSION

To Strive for A Clean and Healthy World

In This Issue

Clean and Green Environmental Society

Green Villa, 2/111, Vishwas Khand,
Gomti Nagar, Lucknow-226 010
(U.P.), India
Telephone: 0522-4006408;
Mobile: +91-9415343141
E-mail: cleanandgreenenv@gmail.com
scsharmagardener@gmail.com
Website: cgesindia.org



PRESIDENT'S MESSAGE

Greetings for the New Year 2022 to all the Members and Associates of Clean and Green Environmental Society, CGES. Let us toast to Yesterday's Achievements and Tomorrows Bright Future. I hope all your dreams come true in 2022-Onwards and Upwards.

Our story begins with a few friends who gathered a few years back to exchange ideas with the vision of "Clean and Green Environment for a Healthy Life" and "To strive for a Clean and Healthy World".

These are difficult times with the new variant of COVID 19 in our midst, which has made life difficult and one has to work from home (WFH). Thankfully the new variant 'OMICRON' is not as deadly as the previous one, but still we need to take care of ourselves and our loved ones. We need to practice wearing masks, social distancing and wash our hands.

It is my pleasure to inform you that Clean and Green Environmental Society, in collaboration with CSIR-National Botanical Research Institute (CGES-NBRI) will be organizing third National Conference on 09-10 April 2022 in the CSIR-NBRI auditorium.

The Theme of the Conference will be "Eco-Restoration and Biodiversity Conservation".

Due to COVID-19 Protocols we could not have many physical meetings but were able to organize several Webinars on subjects of interest and relevance, along with Chander Bhanu Gupta Agriculture PG College, B K T Lucknow.

Dr. S C Sharma, Senior Vice President of the Society and the driving force behind the activities of CGES visited the Taj-Mahal City, Agra from 03-06 Dec 2021 for inauguration of the Bougainvillea Exhibition and Chrysanthemum show and delivered a talk on "Bougainvillea-A long journey from Brazil to India". Dr Barun Sarkar, an eminent Gynaecologist of Agra and the Chief Guest of the function mentioned about the medicinal value of the Bougainvilleas for the treatment of diabetes. Dr Sarkar presented the "Life Time Achievement Award" to Dr S C Sharma on behalf of the Horticulture Club of Agra for his outstanding Research and Development work on the Bougainvilleas.

Once the COVID situation improves, CGES will have physical meetings and workshops on various subjects of interest to make people aware of the environmental problems and also on health care and construction of energy efficient and environmental friendly buildings. CGES would like to involve the School Heads and Principals to create awareness amongst the children about the different aspects of environment and health care for responsible and better living. CGES is regularly publishing CGES-News Letter, which provides interesting and informative articles on various topics for spreading the message of Clean, Green and Healthy India.

My sincere thanks and appreciation to Dr S C Sharma Senior Vice President, Dr Yogesh Sharma Secretary General, Prof Naveen Arora, Prof S K Barik, Prof P K Seth, Col Ajai Gupta, Dr. S.N. Pandey and the CGES Advisors, Executive Counsellors and Life Members for their constant guidance and support.

The central question of today is "How can we live better". The answer to the question is "Take care of your beloved ones and yourself. Stay home, stay healthy and be happy".

On behalf of all our friends of the CGES, thank you to your dedication to making the environment BETTER for a healthy life and for making Clean and Green Environmental Society a vital force for a clean and healthy world.

सुमेर अग्रवाल

Er. Sumer Agarwal
President
CGES & Chairman, Levana Group, Lucknow -226 001
Email: sumeragarwal@gmail.com

CGES New Life Members

Mr. Shiv Balak Prasad, Dr. Mukul Pandya, Dr. Ranjana Bansal, Dr. Ashok Shiromany, Mr. K.S. Gujral, Mrs. Daisy Gujral, Dr. Sushil Gupta, Mrs. Sunita Gupta.

Prof. P.K. Seth FNA
Former Director

Industrial Toxicological Research Institute
Lucknow-226 001

MESSAGE

Let me wish all members and associates of the Clean and Green Environmental Society (CGES) a very happy, prosperous and a healthy 2022 in all respects. We all passed through difficult times and some of us have lost our beloved ones due to COVID infections and have learnt new norms of life. Using the technological advances CGES remained active in spite of the difficulties as it organized several webinars on subjects of current interest and concern, which were well attended. The efforts of our Secretary General, Dr. Yogesh Sharma continued interest and guidance of Dr. S C. Sharma, Senior Vice President of the Society and the President Er. Sumer Agarwal highly appreciable. Dr. S.C. Sharma along with Mrs. Parvati Sharma were invited by the Horticulture Club, Agra to inaugurate the Bougainvillea Exhibition and Chrysanthemum Show at the Colonel's Country Green during December 3-6, 2021. Dr. Sharma also delivered a talk entitled **"Bougainvillea A Long Journey from Brazil to India"** and took the opportunity to appraise the august gathering about the CGES. Several persons showed interest in the activities of the Society. Considering the outstanding R&D work on Bougainvilleas, Horticulture Club Agra conferred Dr. S.C. Sharma the Life Time Achievement Award.

I hope there will be opportunity to have physical meetings, which however do not seem to be in near future as the cases of COVID infection are increasing with emergence of new mutants of the virus..We must remain alert and strictly follow the COVID protocols.

Once again greetings for the New Year.

Prof. P.K. Seth FNA
Former Director
Industrial Toxicological Research Institute
Lucknow-226 001

Conservation of plants: Need of the hour

Priyanka Agnihotri*, Shailja Tripathi and Tariq Husain

Plant Diversity, Systematics & Herbarium Division, CSIR–National Botanical Research Institute,
Rana Pratap Marg, Lucknow, India–226001
*E-mail: priyagni_2006@yahoo.co.in

Biodiversity is a source of significant economic, aesthetic, health and cultural benefits which form the foundation for sustainable development. Biodiversity refers to the variability among the different species of plants and animals present on the earth. Plant diversity forms one of the most fundamental characteristics of the environment. Plants have been of indispensable significance. They are an integral part of life and form the backbone of one great interdependent system. There are about 3,91,000 described plant species in the world. Plant diversity has a direct control over the climate regulation, maintenance of food reservoirs, mitigation of soil erosion, enhancement of medicinal sources, protection of watersheds and providing shelter to animals.

Unfortunately, the vast plant diversity of earth is endangered due to human and natural activities which will result in biodiversity loss over a long term and there are considerable evidences that contemporary biodiversity decline will lead to subsequent decline in the functioning and stability of ecosystem. Anthropogenic elements dominate the natural factors responsible for the biodiversity loss. Human activities have been a source of biodiversity crisis, with high rate of extinction of species. The scale of human impact on biological diversity has been increasing exponentially primarily because of the world wide patterns of consumption, production, trade, agricultural, industrial and settlement development. Those processes that drive extinction are also responsible for eroding the environmental services on which humans are dependent. Therefore, it is imperative to say that an alarming situation is already existing which requires immediate efforts for the conservation of biodiversity so as to prevent it from further decline. Conservation efforts necessarily need to be prioritized.

Conservation is the protection, preservation, management or restoration of wildlife and natural resources. Conservation of plants ultimately aims at protecting the species from becoming extinct at local, regional and global level. In the last few decades, the steady decline in the diversity of genes, species and ecosystems hindered the way to a sustainable world. Before setting up the ways for conservation, the reasons for the loss need to be understood. Plants face many threats driven by different factors. One of the most important causes of decline and extinction of plant species include anthropogenic factors which result in alleviated population sizes. Habitat loss, fragmentation, degradation, introduction of exotic species, climate change, overexploitation and pollution are the major factors responsible for loss of plant diversity. Recently, climate change has also been revealed as a major driving force for plant extinction as it directly interferes with the growth and flowering in plants. To a greater extent, climate change alters the geographical distribution of plant species, leading to their extinction. Besides, overexploitation of the economically important plants for commercial and medicinal use obviously results in decreased plant diversity. During the last decades, atmospheric carbon dioxide has reached unprecedented level along with the nitrogen deposition which is expected to have pronounced effects on environment, especially the plant communities.

Considering the present situations, it is the time to adopt offensive and integrated approach towards plant conservation rather than the defensive one. Within the face of the global biodiversity crisis, and the often tightening budgets, traditional and effective ways should be adopted for the conservation of biodiversity. Following more offensive and integrated approach, rational conservation policy for the protection of plants should be implemented mainly focussed on creation of space for plants, improvement of environmental quality for plants, developing targeted conservation policy for specific plant species and enhancing the social awareness for plant conservation through education programmes.

Besides, different *in-situ* and *ex-situ* methods provide effective ways for conservation. *In-situ* is the conservation of habitats and ecosystems where organisms naturally occur. It includes the set-up of

biosphere reserves, national parks, wildlife sanctuaries, sacred groves and biodiversity hotspots. On the other hand, ex-situ conservation is a set of techniques involving the transfer of target species from its native habitat to a place of safety like a botanical garden or gene bank. The primary objective of *ex-situ* conservation is to support conservation by ensuring the survival of threatened species and maintenance of associated genetic diversity.

Owing to immobile habit of plants, habitat loss is particularly disastrous for them, as they disappear with their habitat. Therefore, the preservation of the remaining habitats and the enlargement of existing habitat patches is precondition for any conservation strategy. Preservation of habitat quality usually enhances the population size and flowering probability of plant species which in turn accelerates the reproductive success of the plant species by reducing inbreeding depression. In addition, the establishment of 'corridors or stepping stones' may counter balance fragmentation of the land and reduce its negative implications for plant population. Increased connectivity can help to improve the persistence of plant species. The cost effective conservational strategy also includes identification of biodiversity hotspots where exceptional degree of endemic species is facing considerable habitat loss. Currently, there are 36 biodiversity hotspots on our planet inhabiting 2.5% of the earth's surface and supporting about more than half of the world's endemic plant species. Apart from conservation within their natural habitats, threatened and endangered plants may also be preserved ex- situ. Botanical gardens and seed banks fulfil an important role in the preservation of highly endangered species, playing an operative role in complementing in-situ conservation. Moreover, overexploitation of the medicinal and other economically important plants should be controlled so as to prevent them from becoming threatened and get extinct.

It is true that conservation of plant diversity has acquired less attention than those of animals. As a result, conservation of plants is greatly under-resourced. Therefore, conserving plants is a complex task for which a series of combined efforts is needed. Though, there are certain barriers to the goal of achieving effective conservation including incomplete survey of plants, incomplete assessment of IUCN, uneven global coverage of protected areas and absence of enthusiasm towards the conservation of plants, which need to be overcome; yet integrated efforts involving a combination of well- designed, well-regulated and well-managed system would help to achieve the target of zero-extinction of plants and their efficient conservation.

Conservation of Medicinal Plant Diversity in Indian Himalayan Region

The use of natural herbal drugs to alleviate suffering is perhaps as old as the origin of man itself on this planet. Plants and animals with medicinal properties were held in the highest esteem in indigenous medicine system all over the world. All indigenous remedies, whether traditional or modern, have originated directly or indirectly from folklore or modern, have originated directly or indirectly from folklore and rituals or measures hold the key to the treasures of folk medicinal knowledge and ethno medic-botany. It is estimated that 70-80% of people worldwide rely chiefly on traditional herbal medicine to meet their primary healthcare needs and the global demand for herbal medicine is not only large, but growing. The use of alternative medicine is growing because of its moderate costs and increasing faith in herbal medicine. Allopathic medicine can cure a wide range of diseases, however, its high prices and side-effects are causing many people to return to herbal medicines which tend to have fewer side effects. A great amount of traditional knowledge about the use of medicinal plant species is still carried and orally transmitted by indigenous peoples. Regions with less accessibility and a comparatively slow rate of development, such as and mountainous areas like the Himalayas are excellent examples. Because of the fast acceleration of market demand for herbal medicines, and recent controversies related to access, benefit sharing and biopiracy, the documentation of indigenous knowledge is of urgent priority. Indigenous knowledge, supplemented by the latest scientific insights, can offer new holistic models of sustainable development that are economically viable, environmentally benign and socially acceptable. Currently, approximately 25% of allopathic drugs are derived from plant based compounds, and many others are synthetic analogues built on prototype compounds isolated from plant species. According to the World Health Organization (WHO), as many 80% of the world's people depend on traditional medicine to meet their primary health care needs.

The Himalaya is a biodiversity hotspot and a storehouse of endemic medicinal plants, which grow in valleys, hills, terraces and on the exposed flat

mountain tops and valleys. The Himalayan regions are particularly rich in biodiversity because of their varied geographical, physiographical, topographical, climatic and ecological zones. Due to a wide range in altitudinal variations (1000-6300 m), the Himalaya harbors a variety of natural flora comprising subtropical to temperate, alpine and nival floral elements. Of the approximately 8000 species of angiosperms, reported in the Indian Himalaya, 1748 species are known for their medicinal properties. The state of Uttarakhand is a part of north-western Himalaya, and still maintains a dense vegetation cover (65%). The maximum species of medicinal plants have been reported from Uttarakhand, followed by Sikkim and North Bengal. The trans-Himalaya in contrast sustains about 337 species of medicinal plants, which are low compared to other areas of the Himalaya due to the distinct geography and ecological marginal conditions. Recent years have seen a sudden rise in the demand of herbal products and plant based drugs across the world resulting in the heavy exploitation of medicinal plants. Habitat degradation, unsustainable harvesting and over-exploitation to meet the demands of the mostly illegal trade in medicinal plants have already led to the extinction of more than 150 plant species in the wild. More than 90% of plant species used in the herbal industries are extracted from the wild, and about 70% of the medicinal plants of Indian Himalaya are subject to destructive harvesting, and the majority of these plants stems from sub-alpine and alpine regions of the Himalaya. The importance of ethnobiological knowledge on species-ecology can provide leads for new paths in scientific research and conservation, and has received growing attention in resource management worldwide. International agencies such as the World Wildlife Fund (WWF) and United Nations Educational, Scientific and Cultural Organization (UNESCO) as part of their people and plants initiative, are promoting research on ethnobotanical knowledge and the integration of people's perceptions and practices in resource management at the local level.

Due to cultural and ethnic diversity in different biogeographic provinces of the region the traditional knowledge base varies considerably. The indigenous knowledge of the region is unique. Such knowledge is widely followed and relied upon throughout this region, particularly by people of remote areas. Increasing population pressure, and the spread of global market economics and consumerism have already brought profound changes to the region, and its inhabitants are gradually changing their traditional way of life. However, with renewed global interest in traditional medicine and the increasing demand for plant products, the documentation of medicinal plant diversity and associated traditional knowledge is necessary to maintain the cultural view point as well as to establish a sound scientific basis of the efficacy of traditional medicine, and for the conservation of important species.

As a result of continuous and relentless extraction over many decades, many valuable species are facing danger to their survival in their natural habitats. Some of the threatened species are *Aconitum heterophyllum*, *Atropa acuminata*, *Dioscorea deltoidea*, *Dactylorhiza hatagirea*, *Jurinea dolomiaea*, *Nardostachys grandiflora*, *Picrorrhiza kurrooa*, *Podophyllum hexandrum*, *Rheum australe*, *Swertia chirayita*, *Valeriana hardwickii*, *Saussurea royleii*, *Saussurea gossypiphora*, *Saussurea obvallata*, *Pleurospermum brunonis*, *Polygonatum cirrhifolium*, *Fritillaria cirrhosa*, and *Codonopsis ovata*. Unregulated exploitation and disorganized trades are responsible for the sharp decline in the herbal wealth of the area. During our field work in the Himalayan region, we found that a wealth of knowledge regarding the ethno botanical and medicinal uses of plant species lies with shepherds (*Gaddies*, *Gujjars*), healers (*Vaids*) and the old people living in the area. However, these people seldom agree on revealing the information and only through persistent requests and motivation do they share their knowledge about the use of herbs. One superstitious belief is that the herbs loose healing power if their 'secret' is shared with 'outsiders' and another reason they cite is that herbs are useful only when used in combination with 'tantra-mantra' (i.e., occult practices). The Indian Himalayan Region is very rich in plants with medicinal value and concerted efforts are needed for their conservation. To check the loss of biodiversity owing to overexploitation and habitat degradation, effective measures for conservation and management need to be put in place. *In-vitro* propagation techniques and conventional methods to allow for their transplantation into natural habitats will be an important step towards the conservation and management for threatened, rare and endangered species. The development of agro-techniques for high-valued himalayan species can help to meet the requirement of raw material for commercial use and reduce the pressure on the existing populations in natural habitats.

Big Data and Environment: A Big leap towards Sustainability

Dr Rahul Kumar Mishra*

Assistant Professor-Agriculture Statistics
Chandra Bhanu Gupta PG Agriculture Collage-Lucknow

*e-mail: rahul.stats11@gmail.com

Currently, we are living in a chaotic universe with ever-expanding data. The reason is our life in the 21st century, which is codified in the form of numbers, keywords and algorithms. Today, information around us is multiplying exponentially; 90% of the data that exists today on the internet has only been generated since 2016. In 2018 alone this world generated more data than in the previous 10,000 years. New tools and passive data-collection schemes have made it possible to gather massive sets of data often known as "big data".

Big data analytics is a macro-tool that allows us to analyse the ever-increasing information and develop new advances and solutions. With big data analytics, researchers can now have the best possible picture of an issue and thus identify patterns and relationships in the chaos of data explosion that might have been missed with traditional approaches. Today big data analytics finds it's used in areas as diverse as medicine, agriculture, gambling and environmental protection, thus justifying the statement: Data is the new oil.

From analyse of such big data, we know that in the previous year our planet lost the equivalent of 40 football fields of tree cover per minute. Also, more than a quarter of global tree cover loss between 2001 and 2015 was associated with commodity-driven deforestation. Recently, Australian climate scientist, Steven Sherwood and his team published a paper stating that the estimated increase in world temperatures over the next century would be between 2.5 to 4 degrees Celsius. Their estimate is significantly above the 2-degree threshold enshrined in the Paris agreement and can have a serious effect on the sustainability of our food production system. In this article, our aim will be to explore how big data analytics can help the researchers to answer some of such diverse questions arising in the field of environment, agriculture, sustainable development and other related fields.

Role of Big Data in Reshaping Environmental Protection

Today Climate change is the greatest challenge we face as a species and environmental big data can help us to understand all its complex interrelationships. Satellite-based observation of Earth is capable of calculating, among other things, the influence of rising temperatures on river flows. These types of data provide key information to optimise water resource management, biodiversity, air quality, fishing and agriculture.

Big data analytics significantly help us to defend the environment. New approaches are providing researchers, businesses and governments with the best information possible, allowing them to make highly informed decisions and optimize their approach to resource use and conservation. The application of big data technology can provide us better information in real-time on topics like air quality, global warming, migratory patterns of animals etc., allowing researchers and organizations to take an up-to-date and effective response possible to issues like air pollution, melting of glaciers and man-made dangers to migratory birds. Big data analytics significantly help us to defend the environment. New approaches are providing researchers, businesses and governments with the best information possible, allowing them to make highly informed decisions and optimize their approach to resource use and conservation. The application of big data technology can provide us better information in real-time on topics like air quality, global warming, migratory patterns of animals etc., allowing researchers and organizations to take an up-to-date and effective response possible to issues like air pollution, melting of glaciers and man-made dangers to migratory birds.

Satellite Earth observation data provide a better understanding of global changes, both natural and man-made. Forecasting models, analyses and various tools are created based on this data to improve decision-making processes. With the help of wide network of sensors and satellite data one can measure water-related hazards, analyse water quality and quantity and make interactive risk maps available to the public. Using high-resolution satellite imagery one can keep a track of global forest change just by calculating deforestation by counting trees one by one.

To take an example of how this would work, consider a tank of gasoline. The petroleum extraction industry is one of the most technologically advanced

industries in this world economy. Individual companies collect huge amounts of data on every barrel of crude oil that they extract and sell. Also it is precisely known that gasoline refined from Oil Sands oil generates almost twice the level of greenhouse gas emissions as does North Sea oil. But at the moment, investors and consumers have no way of knowing that, and therefore no way of expressing a preference for the greener version. However, for companies, investors, and consumers who are increasingly basing their purchasing choices on the ecological impact of products, this is a huge problem. Nevertheless, simply by tracking the data of origin of that specific lot one can reach to a better decisive state.

Using Big Data in Agriculture

Currently, there are 7.5 billion people on Earth and it is estimated that around half of the Earth's terrestrial area (around 51 million sq. km) is cultivated. In principle, the planet could feed 10 billion people, but in practice it is not so simple. In coming future there will be no more room for new arable land on Earth, so we need to effectively use what we already have. One of the ways to optimize production and maximize the use of our planet's resources is precision farming, based on information from satellites.

Satellite data enables ongoing monitoring of the situation on Earth, creating models to support agriculture, and managing the risk related to climate change. Using satellite data one can analyse soil moisture and identify areas likely to yield worse crops. Satellite maps can provide farmers with extensive information on the state of crops and arable land, thus helping them to make forecasts, for example to identify crop hazards and estimate damage, thus optimizing the use of fertilizers and pesticides. Using satellite data the farmers can know exactly what is happening to their crops, so that they can sow, plant and harvest crops at the optimal time. This will enable sustainable, efficient and resource-saving agriculture. Information from the satellites can also be used by the officials to plan, implement and verify the subsidy program for farmers. Predictive analytics could further help farmers to plan and cope with increasing climate variability with location-specific information.

Last year in Greece, analyses based on Copernicus satellite data contributed to the reduction of water, chemical fertilizers and pesticides consumption by 19%, as well as an increase of 10% in agricultural production.

Use of Big data to give Early Warning

Surveillance and provision of early warnings is important component of enhancing the capacity to respond to climate change. Passively collected digital data have the potential to enhance the monitoring of climate-related threats and vulnerabilities and can provide real-time awareness and feedback to decision-makers and emergency services. Many big data applications have been pioneered for use in early detection of natural calamity, whereby passively collected data from the use of digital services have been variously used, to cite a few:

- Hazard warning systems, for example, could incorporate social media data to trigger emergency response measures (e.g., heat or flood alert systems).
- Personal devices equipped with sensors could allow the monitoring of human movement before, during, and after a hazard event to aid with disaster response.
- Tweets can be geotagged so disaster management services can map impacted areas in real-time to target efforts, and the Internet can be scraped for recently uploaded photos of affected areas.
- Search queries could be analysed to monitor health-seeking behaviour to detect outbreaks of climate-related diseases, and changes in the magnitude and frequency of climatic risks could be detected through time-series analysis of multiscale data, with the potential to detect "leading indicators" of abrupt change. For example, Covid-related queries coming into search engines can help in detecting Covid epidemics based on it.

Use of Big data in Monitoring and Evaluation

Monitoring and evaluating adaptation are methodologically complex, a task made more difficult because of limited data on adaptation actions and outcomes. Efforts to track adaptation across nations or regions have been challenged by an absence of comprehensive, reliable, and up-to-date datasets. Big data can strengthen the ability for monitoring environmental change and assessing risk at regional and global scales, with important adaptation applications for climate-vulnerable sectors, such as agriculture. A review of existing research suggests that farmers in some regions are adapting to climate change, for example, by adjusting crop-sowing and cultivation dates to account for changing growing-season conditions. Some other real-life example of usage of big data in monitoring and evaluation are:

- Cell phone or social media data could be used to examine how an adaptation program designed to provide storm warnings actually affects

people's movement before, during, and after a storm event, and monitor if and how this changes over time.

- Efforts to fuse different satellite remote sensing products with crowd sourced data have helped to improve the accuracy of global crop land maps, and such techniques could be extended to improve assessment of cropping-adaptation activities that are important to farmer livelihoods and food security in low-income and subsistence settings.
- Researchers in the aftermath of Hurricane Sandy found the use of Twitter data to be more effective in predicting the location and severity of storm damage than models developed by the US government's Federal Emergency Management Agency.
- Bottom-up perspectives on adaptation development, implementation, and effectiveness can be documented from social media through sentiment analysis of large volumes of posts or by examining "Likes" or "Dislikes" of posts.

Big Data and Renewable Energy

Using big data one can strengthen the competitiveness of renewable energies in relation to fossil fuels. Some of the contributions of environmental big data to different clean technologies can be listed as:

- Wind power: The use of complex algorithms to construct predictive models of wind conditions helps determine the amount of energy that is going to be produced. It will help predict generation production more accurately.
- Photovoltaic energy: Big data optimises the efficiency of power stations by allowing them to adapt to the luminous intensity at any given moment.
- Hydroelectric power: The management of large volumes of data can contribute, among other aspects, to avoiding leaks in the power plants and to having greater control over water flows.

Consumers in the renewables' sector will also benefit from this information revolution. On one hand, the connection of data from smart meters with weather forecasts will make it possible to adjust demand in real time, favouring the creation of fully customised tariffs. On the other hand, the Internet of Things will make it possible to reduce energy consumption, for example, by adapting lighting and ambient temperature or the consumption of certain household appliances to each and every need.

Big Data's Contribution to Sustainability and Smart Cities

The UN says that by 2030 two thirds of the world's population will be concentrated in large cities. This reality poses environmental challenges that can be efficiently tacked by employing big data. Some of the important ongoing initiatives to create smarter, more sustainable cities based the analysis of big data include:

- The Trash Track project installs GPS sensors in waste to better understand recycling pathways. It will optimise waste recovery and recycling through the centralisation of data.
- The All Aboard system optimises public transport planning using mobile phone location data.
- The Crisis Mappers Net community analyses data from different sources (satellite images, geospatial platforms, simulators, etc.) to warn of natural disasters and facilitate a rapid response.
- The Copenhagen Wheel is a bicycle wheel that collects data on air quality, noise levels and road conditions.

Also, the big data analytics can help businesses and governments to become more sustainable by optimizing their use of resources. Automated building systems, driven by big data collection, can automatically deactivate systems that aren't in use, saving energy. For example, networks of sensors can collect data on a buildings' water and energy use, allowing businesses to see where they may be inefficiently spending resources. In some buildings cooling systems that continue to function or exhaust fans that run even when the building is unoccupied. With big data analytics, companies can pinpoint and cut back on unnecessary expenditures. Some advanced systems can even automatically adjust building systems to optimize the use of energy. These systems can, for example, deactivate lighting when the system detects that no worker is using a certain room or corner of the office. Analysis of energy data can also detect machine malfunctions that don't impact operations but do create large, previously undetected energy spikes.

Big Data: Towards Socially Responsible Data

Due to their activity, companies are one of the agents that produce the greatest negative impact on the environment. Now a day companies publish their sustainability reports within the framework of the annual report. These reports provide details on the strategies and actions they are implementing to minimise this impact. In recent years, big data has been contributing to making companies more

sustainable by allowing them to:

- ❖ Optimise energy management and resource use.
- ❖ Reduce carbon dioxide emissions derived from production.
- ❖ Reduce emissions from vehicle fleets by improving routes.
- ❖ Anticipate repair needs and replace machinery monitored using sensors.

In short, it helps companies to be aware, not only of their direct impacts, but also of those that are more difficult to control, those produced throughout their entire value chain. Big data has become a powerful tool for monitoring and controlling sustainable development.

Role of Big Data in Achieving the UN's Sustainable Development Goals:

SDG 1: No Poverty: Spending patterns on mobile phone services can provide proxy indicators of income levels.

SDG 2: Zero Hunger: Crowd sourcing or tracking of food prices listed online can help monitor food security in near real-time.

SDG 3: Good Health and Well-Being: Mapping the movement of mobile phone users can help predict the spread of infectious diseases.

SDG 4: Quality Education: Citizen reporting can reveal reasons for student drop-out rates.

SDG 5: Gender Equality: Analysis of financial transactions can reveal the spending patterns and different impacts of economic shocks on men and women.

SDG 6: Clean Water and Sanitation: Sensors connected to water pumps can track access to clean water.

SDG 7: Affordable and Clean Energy: Smart metering allows utility companies to increase or restrict the flow of electricity, gas or water to reduce waste and ensure adequate supply at peak periods.

SDG 8: Decent Work and Economic Growth: Patterns in global postal traffic can provide indicators such as economic growth, remittances, trade and GDP.

SDG 9: Industry, Innovation and Infrastructure: Data from GPS devices can be used for traffic control and to improve public transport.

SDG 10: Reduced Inequality: Speech-to-text analytics on local radio content can reveal discrimination concerns and support policy response.

SDG 11: Sustainable Cities and Communities: Satellite remote sensing can track encroachment on public land or spaces such as parks and forests.

SDG 12: Responsible Consumption and Production: Online search patterns or e-commerce transactions can reveal the pace of transition to energy efficient products.

SDG 13: Climate Action: Combining satellite imagery, crowd-sourced witness accounts and open data can help track deforestation.

SDG 14: Life below Water: Maritime vessel tracking data can reveal illegal, unregulated and unreported fishing activities.

SDG 15: Life on Land: Social media monitoring can support disaster management with real-time information on victim location, effects and strength of forest fires or haze.

SDG 16: Peace, Justice and Strong Institutions: Sentiment analysis of social media can reveal public opinion on effective governance, public service delivery or human rights.

SDG 17: Partnerships for the Goals: Partnerships to enable the combining of statistics, mobile and internet data can provide a better and real-time understanding of today's hyper-connected world.

Real Life Example Based on the Use of Big Data

Case 1: Air pollution is currently affecting the lives of over a billion people across the globe and with current trends, the situation will only get worse. Often the exact source of the air pollution, how it's interacting in the air and how its dispersing cannot be determined, the lack of such information makes it a difficult problem to tackle. With advances in modern technologies and new Big Data solutions, it is becoming possible to combine sensor data with meteorological satellite data to perform extensive data analytics and forecasting.

Recently, a NASA owned satellite captured image of smoke streaming from fires in the fields of northern Pakistan, Punjab and Haryana moving toward Delhi, one of India's most populous cities (see Fig 1). As of November 16, the satellite has detected more than 74,000 fire hotspots in Punjab only. In these regions, particularly in the states of Punjab and Haryana, it is found the farmers use fire as a fast, cheap way to clean up and fertilize fields before planting winter wheat crops.

As per Pawan Gupta, a Universities Space Research Association (USRA) scientist at NASA's Marshall Space Flight Centre at least 22 million people were affected by smokes on daily basis during this episode

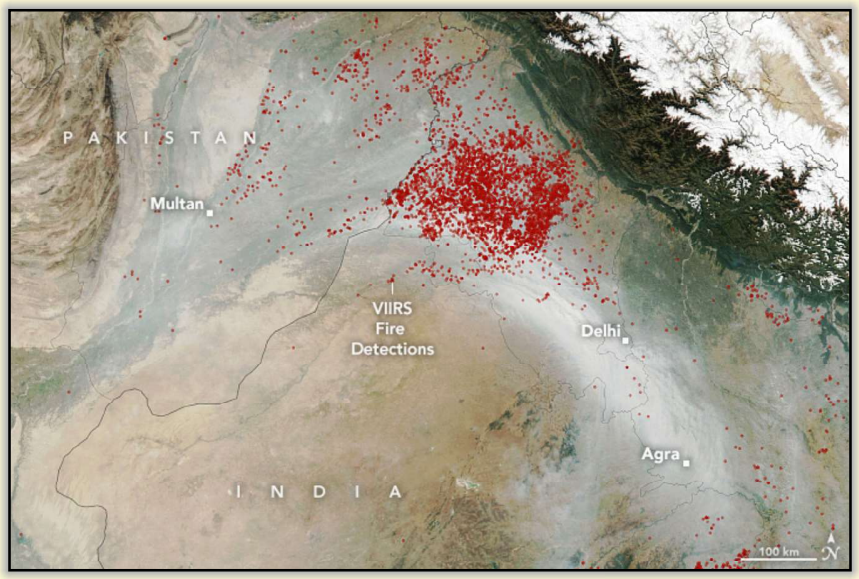


Figure 1: Fire hotspots in North-western part of India on November 16th, 2021 (courtesy: NASA)

of stubbleburning leading to a range of respiratory, cardiovascular, and other health problems. The high pollution levels led to partial lockdowns, school closures, and halts in construction in Delhi and other cities.

Case 2: The journey of migrating birds is fraught with human-made danger—like hunting, fishing operations and navigation-disrupting light pollution. With advance notice, it's possible for scientists to mitigate some of these dangers, pushing for moratoriums on hunting and fishing and requesting that people turn their lights out when possible.

However, these strategies only work if you know when the birds will take flight. Despite the seasonal regulatory of migration, the migratory patterns of individual birds remain challenging to predict. New migration-prediction algorithms, however, can change this. By taking advantage of more than two decades of radar data, one forecast model was able to explain more than 80 percent of the variance in bird migration patterns—giving scientists a much better idea of when birds will need protection from human-made danger.

Thus we see that with the help of networks of sensors one can generate the best possible information which will in turn help for the climate researchers, businesses and governments to take necessary steps. By adopting big data technology to process the large volumes of data collected by sensors one can create visualizations of a situation. These visualizations can help researchers draw connections between geography and data—identifying areas where the problem has trended up over time, and identifying potential causes.

For example, in case of air pollution the government agencies can take advantage of pollution monitoring to plan and issue early warnings to the travellers and locals, so that precautions can be taken to prevent exposure to unhealthy levels of pm2.5 pollution. Detecting a trend and raising an alert prior to pm2.5 levels breaching the unhealthy threshold is critical for public safety and health. Having good air quality data and performing data analytics can allow people to adapt and make informed decisions. Thus we see that through Big Data analytics it will be possible to pinpoint the pollution source and dispersion trends days in advanced.

Challenges in using big data

Some of the challenges in the use of the big data are:

- ❖ Data-ownership, related privacy and security issues: These issues need to be properly addressed, but when this is applied too strictly it can also slow down innovations.
- ❖ Data quality: The data under consideration must be reliable and should come with reasonable precision, but all that is very challenging when its size is big and it is being collected in real-time data. Availability of data on open platform is also mandatory for its wide research.
- ❖ Sustainable integration of Big Data sources: Integration of many different data sources is challenging but since it is crucial for a research to happen this has to be done in a sustainable manner.
- ❖ Intelligent processing and analytics: One of the principal challenges of employing Big Data is that it is often unstructured and heterogeneous which requires a smart interplay between skilled data scientists and domain experts.

Nelumbo nucifera (Lotus): A multi-utility majestic plant species

Anil K. Goel[1] and S.C. Sharma[2]

Introduction

Nelumbo nucifera 'East Indian Lotus' is an old world Asiatic species, now widely distributed in many Asiatic oriental countries, including India, Thailand, Japan, China and Taiwan. This species possesses many racial variants and ecotypes which have crossed naturally due to its wide phytogeographical distribution, adaptations to varied climatic regimes and also by man over the centuries.

Nelumbo is one of the oldest flowering plants on this planet. Lotus flower has been the most perfect, elegant and beautiful. Since time immemorial, it has been the symbol of purity, beauty, divinity and eternity. Lotus is an important constituent of the aquatic ecosystem. A pond full of lotus plants in bloom exhibits a captivating effect on all of us. Lotus possesses extraordinary aesthetic, medicinal, nutraceutical, ayurvedic and economic values. Lotus is not only important in India but is highly revered in whole of South East-Asian region. The Lotus flower is said to be the centre of the universe in Hindu religion. The flower represents our country India and the leaves depict the surrounding various cultures and countries. There is a legend that the lotus plant arose from the navel of the Great God 'Vishnu' and at the centre of flower sat 'Brahma'. The role of 'Brahma' was to recreate the universe after the great flood **(Fig. 1).**

The lotus plant possesses versatile symbolic significance for decoration purposes throughout the Indian sub-continent as well as the other eastern countries. It is grown and conserved in ponds and aquatic bodies and the flowers are treated with great reverence. Lotus has been synonymous to the purity and eternity. *Nelumbo* is found from Kashmir to Kanyakumari showing enormous phenotypic elasticity and diversity with a large number of racial/ecological variants in different shapes, sizes and shades. Every year on Republic Day, the Government of India awards to some of the distinguished personalities in various fields, the honours like 'Padmashri', 'Padmabhushan' and 'Padmavibhushan'. Similarly, the Golden Lotus trophy is awarded every year to the best feature film produced in India. Due to its multifarious significance, it has always found significant place on the coins and postal stamps of many countries all over the world.

Fig. 1: Nelumbo flower with other flowers for offerings at Lord Jagganath Temple, Puri, Odisha

Distribution

The genus *Nelumbo* Adans. is widely distributed throughout tropical and subtropical regions of the world. It is found in lakes, ponds, quiet streams and estuaries of tropical and subtropical zones. *Nelumbo nucifera* Gaertn. distributed over a wide range of phytogeographical regions, exhibits great diversity in different shapes, sizes and shades of red, pink and white flowers **(Figs. 2-3).** This species generally known as 'East Indian Lotus' is an old world Asiatic

Fig. 2: *Nelumbo nucifera* (single light pink cultivar)

Fig. 3: *Nelumbo nucifera* (white & pink double flowrers)

taxon widely distributed to many tropical and subtropical Asiatic countries, including India, Sri Lanka Myanmar, Indonesia, Malaysia, Thailand, Korea, Vietnam, Japan, China and Taiwan. It is also naturalized in Northern Australia, Hawaii and to the Volga river delta area where the river flows into Caspian Sea (near Southern Russia).

In India 6-7 decades ago, ***N. nucifera*** was widely distributed in the ponds and lakes in almost all the geographical regions of the country ranging from Kashmir to Kanyakumari. During the intensive survey it has been revealed that the population of ***N. nucifera*** has dwindled considerably in the Indian subcontinent. Lotus is spectacularly seen in ponds on both the sides of highway from Thiruvananthapuram to Kanyakumari in various shades of pink and white colours.

In Manipur Lotus grows widely in the wetlands. But in recent years the population of this species in the wild habitat is declining due to shrinkage of wetlands and land use change of water bodies. Small population of lotus is also cultivated in ponds of many households in the valley of the Manipur. Lotus is sacred to the people and believed that it considerably lowers the level of water pollution. Fresh water Sanapat Lake is located in the Bishnupur district of Manipur state in north-eastern India. This lake covers an area of 55 hectares is a natural lotus growing area.

Habitat and ecology

Lotus (*N. nucifera*) has been a wetland macrophyte. It occurs widely in subtropical, tropical, sub-temperate and temperate regions throughout the country in fresh water aquatic bodies. Throughout the Indian sub-continent, there are many shallow water bodies with an average depth of less than two meters inhabiting this species. Growth of the floating leaved plants is governed by the ability of their petioles to elongate as per the water depths. *Nelumbo* is well known for the elongation of its petioles by intercalary meristematic growth following a rise in the levels of water. The aquatic weeds, like *Eichornia crassipes* (Mart.) Solms. 'Water hyacinth' checks drastically the growth of this taxon. Especially the white flowered *Nelumbo* is getting eradicated rapidly by the invasion of such weeds. In Odisha region multi-petalled white coloured Lotus is quite common where as in West Bengal multi-petalled pink and white coloured *Nelumbo* have been located mainly in the Midnapur region.

It is interesting to note that this species is able to grow in a wide range of -pH (7.5–9.0) but during its growth brings the -pH to neutral. Eutrophication by agricultural runoff and domestic sewage is commonly held responsible for the explosive growth of this species. During the course of exploration, *N. nucifera* with pink flowers was recorded from a saline lake (-pH 9.3) near Samaspur in Raebarielly district of Uttar Pradesh depicting the variable range of habitats adopted by this species. It has also been observed during investigations that it possesses the ability to uptake heavy metals and can be grown in the ponds receiving industrial effluents and thus serves the purpose of water purification in the aquatic bodies receiving industrial waste water. During the course of studies on *N. nucifera* in CSIR-NBRI Botanic Garden, The germplasm material was collected from various locations in India as well as on exchange from Botanic Gardens from within and outside the country. The germplasm collection was acclimatised and conserved for various R&D studies in a 10-chambered aquatic body in NBRI Botanic Garden **(Fig. 4).**

Fig. 4: A view of lotus races blooming in aquatic body at CSIR-NBRI

Nelumbo is a long-day plant and prefers full sun light, moderate humidity and temperature during the growth season. July is the best time for the flowering in lotus. Deep water is not suitable for the optimum growth of lotus plants. The plant can usually tolerate water up to 1.5 m in depth. If the water level is more, the standing leaves will emerge and the plant will die after sometime. The seeds disposed in the area can protect themselves from the impact of adverse conditions and once the conditions are favourable, seeds start germinating to keep the continuity and survival of this species. The dispersal of lotus seeds is carried out in water by the floods. Lotus prefers calm and shallow water like pond and lake. Ideal depth of the water level is 1.5 m. When leaves dry up and dormancy starts, lotus needs little water but not completely dry soil.

Light clay with rich organic matter is ideal for lotus cultivation. Soil with 6.5-7.5 pH favours lotus cultivation. For the production of lotus flowers, ideal temperature is 30-35^{0}C. Lotus and fish live comfortably and maintain good ecological balance in ponds.

Taxonomy of Lotus (*Nelumbo nucifera* Gaertn.; Family- Nelumbonaceae)

Aquatic perennial; leaves suborbicular, 20 - 80 (-100) cm across, flat while floating and cupped when emerged, glabrous and glaucous on both the surfaces; petioles 1 - 2 m long fistulous beset with hard minute papillae like structures; flowers 8 - 25 (-30.0) cm across, rose-pink to white, fragrant; sepals 1.5 - 5.5 x 0.8 - 3.5 cm, ovate to elliptic, concave, green (in white flowers) or pinkish-green (in rose-pink flowers). Petals 16 - 24 (in single forms) or 116 - 160 (-198) in double forms; stamens up to 230, 2.2 - 5.0 cm long; outermost staminodial in double forms; receptacle 5.0 - 10.0 cm across, spongy, yellow during anthesis; stigma papillose. Fruit oblong to ovoid, glabrous, pericarp thick, hardened, 1.0 - 2.0 cm in length and 1.0 - 1.5 cm in diam. **Flowering & Fruiting March – October.**

Thermoregulation in Lotus flower

Lotus flower works like a thermostat. *N. nucifera* not only produces a significant amount of heat during the sequence of flowering but also regulates temperature quite precisely. If the air temperature varies between 10^0 and 30^{0}C, flowers remain at 30^0 - 35^{0}C throughout their life span of 2 - 4 days. *Nelumbo* flowers are protogynous and have variable sequence of anthesis that favours out crossing through the insect pollinators. A conical receptacle that contains several carpels forms the bottom of an otherwise empty floral chamber before the petals open. Stamens grow around the receptacle and are initially pressed close to it by the petals, but are released when the petals open fully. Starch present in the staminal appendages of *Nelumbo* is thought to be major site of heat production. Common explanation for the heat production in flowers is that it enhances evaporation of flower scent which attracts insects and protects flowers from the cold. This is an incentive for the pollinators particularly endothermic flying insects. Beetles that are trapped overnight fed and copulated with in the floral chamber and get released unharmed in the next morning to carry the pollen to other flowers for pollination.

The environment in the floral chamber would maintain a high body temperature for the insect and promote not only feeding, digestion and reproductive behaviour, but also suitable body temperature for flight. Many insects including beetles and bees require thoracic temperatures of above 30^{0}C to initiate flight and the lotus flower could be directly preparing them for departure, thus eliminating their requirement for endogenous heat production. Alternatively, the flower itself may require a constant temperature for proper development of its own reproductive structures or to protect sensitive parts from damage that might occur if heat production were uncontrolled. The pollens stick to escaping insects, which fly off to repeat the cycle. This sequence prevents self-pollination and promotes cross-pollination which favours high reproductive success thereby increasing the genetic diversity and strong off springs in lotus.

Lotus Seed longevity

Lotus is known as one of the oldest flowering plants on the planet earth. This species is known from the geological records as early as 135 million years dating from the time when dinosaurs roamed the earth in the Jurassic age. Jane Shen-Miller a plant physiologist at University of California, Los Angeles, obtained seven brown oval lotus seeds from Beijing Institute of Botany, P.R. China. In 1995 it was reported that scientists germinated a lotus seed which was about 1,288 years old. The impervious seed coat and the presence of hardy proteins in embryo and cotyledons may explain partially the remarkable longevity of the ancient and sacred lotus. The lotus seed is so robust that it can sprout after centuries of exposure to low-dose gamma radiation. The repair mechanism in the lotus would be very useful if they could be transferred to the other crops, such as rice, corn and wheat whose seed life span is only for a period of few years.

Propagation & Cultivation

Lotus is sexually propagated through seeds and asexually by planting the rhizomes. For the practical purposes storage of seeds for 8 years has no effect on germination rate. For one hectare plantation of the lotus crop 10 kg seeds are required. Hard coat of the seed should be scarified at both the ends on a sand paper. All care should be taken not to damage the flesh of the seed while filing. Seeds are soaked in warm water (25 - 30^{0}C) with 12 hours light to encourage germination. Water should be changed daily until the seeds germinate which takes generally 5 - 8 days. Transplanting should be done after 3 - 4 weeks when seedlings have 2 - 3 leaves and few roots. Seedlings should be planted separately in individual pots and placed in water. The depth of the water should be increased gradually as the plant grows.

Late in spring rolled-up leaves push out of the mud. The crinkled leaf slowly opens during the warm days and soon becomes a big platter with a depression in the centre where the petiole joins from below. However 50% Chromic acid and concentrated Potassium hydrate also help in overcoming the impermeability after a longer period of time. But scarification of seeds was found to be the easiest and safest method for raising the seedlings of lotus. The resulting off springs will differ from both the parents. Further, germinated seedlings will not produce a crop until the following season **(Fig. 5).**

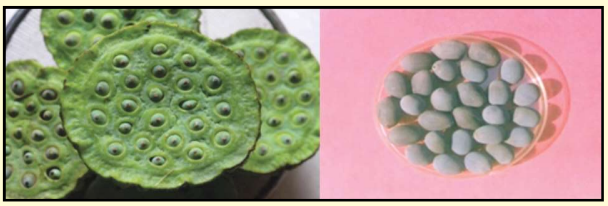


Fig. 5: Fresh green torus and dried matured seeds of Lotus

Vegetative Propagation

Healthy rhizomes are selected for raising lotus crop. To ensure the blooms in the first season, rhizomes should be planted with at least two growing points. The growth points must be protected, if they are broken during plantation, entire rhizome will die. They are shallowly planted in clay soil with rich organic matter. Rhizomes are planted at a 30^0 angle in the mud. Distal end should be placed 10 cm inside the mud and proximal end protruding from the water. The crown of the rhizome should not be covered with soil. Initially the depth of water should be only 6 cm which should be raised gradually up to 30 cm as the crop grows. The ideal water temperature for rhizome plantation is 25- 27^0C. The growing tip should be pointing towards the centre of the pond or pot, as this will develop into a runner. This will branch off and spread throughout the mud, producing aerial leaves and flowers as the season progresses. The rhizome grows at a surprising rate about ten meters in a year. At each node as point of growth, plant produces first a leaf scale on the lower side then other one on the upper side followed immediately by a foliage leaf. From the axil of the upper leaf scale flower emerges which gives the plant great potential for flowering and spreading at the same time **(Fig. 6).**

Fig. 6: Lotus dried & matured torus and rhizomes

Pests and diseases

Lotus plants are seldom affected by aphids, beetles, snails and shrimps. They can be easily managed and picked up by hand or dislodged by spraying a jet of water. They are also attacked by dry spot disease and brown strip disease. Suitable fungicides are used to control them. Aquatic weeds are sometimes a major problem in lotus cultivation particularly during the summer months as the growth of weeds is faster. Commonly found weeds in lotus pond are water-hyacinth (*Eichhornia crassipes*) which spreads fast and cover the entire water surface. Species of *Typha, Lemna, Wolfia,* are other common weeds found in the lotus ponds. Fresh water algae mainly *Spirogyra* also causes much damage to the crop. *Ceratophyllum demersum, Potamegaton crispus* and *Salvinia natans* are also problematic weeds which are found in the lotus ponds. Mechanical removal of these weeds is a safe and easy method. However, in severe weed problem under large growing areas, suitable herbicides in the market may be applied to control the weeds. Lotus cultivation is a great pleasure and profitable business.

Cultivation

Soil preparation in ponds: Lotus prefers to be grown in organically abundant soil media. Soil mixture is prepared with 2/3 loamy clay soil and 1/3 of farm yard manure. Low Phosphorous, high Nitrogen and Potassium are beneficial to the plant growth. The soil mixture should be 20 cm thick at the bottom of the pond. The loamy clay mixture helps for anchoring the rhizomes as they develop.

Water: Lotus grows in a wide range of pH but prefers fresh water. It can grow in the ponds and lakes having pH 6.0 - 6.5 and 7.5 - 7.8. The optimum pH 7.5 is ideal for the cultivation of lotus. The ideal depth of the water should be 1.0 - 1.5 m.

Seed Requirement: Average weight of the lotus seed is 1.0 gm. Thus 10 kg seeds are required for the lotus cultivation in one hectare of pond area.

Rhizome Requirement: For one hectare plantation of the lotus crop, 50 kg rhizomes are required. The density of plantation of rhizomes is recommended at 2 x 2 m apart which constitutes 2,500 rhizome segments. Lotus can be propagated vegetatively by division of rhizomes. The rhizomes with new sprouts are cut into small pieces with three nodes and planted horizontally at the depth of 10 cm keeping eyes above the soil during February–April. The rhizomes can

produce large flowering plants in the same season whereas the seedlings raised from seeds require at least 2 - 3 years for the production of flowers under the subtropical conditions.

The propagation through seeds is also practised in the months of February - March. Seeds are scarified with the help of a sand paper at both the ends and immersed in water. The germination takes place after 5 - 7 days at the normal room temperature. The seedlings are ready for transplantation in the aquatic bodies after 15 - 20 days. The seedling growth fastens as there is rise in the day temperature (30^0 - 35^0C). It requires warm and humid climate for better performance and easily cultivated in the ponds and lakes having 1 metre depth of water.

The bottom of the aquatic body is filled with the mixture of clay soil and farmyard manure in 3:1 ratio with 100 gm each of neem cake and DAP per sq m in a 0.5 m thick layer. The transplantation of rhizomes or seedlings is generally done during February–March. The water level is gradually increased according to the growth of plants in the aquatic body. The flowering in lotus starts from June and continues up to September–October under the climatic condition in the north Indian plains. Lotus plants become dormant during November onwards till January due to low temperature in the winter season. Optimum growth of the seedlings under laboratory conditions was recorded at 30^0C, while it was minimum at 20^0C and below. It has also been observed that the seeds could germinate under high alkaline (pH 9.0) and acidic (pH 5.0) conditions with low germination percentage. However, the extreme alkaline and acidic conditions lower the overall growth of the seedlings. The optimum growth of plants was recorded in the pH 7.5. The effect of burial by sedimentation on the germination of seeds was significantly higher than the seeds buried at less than 2.0 cm depth, or the seeds not buried at all. Lotus plants require full sun shine and warmth for the ripening of the rhizomes. After attaining the maturity the chain like cylindrical rhizomes develop additional anchor and feeder roots, which penetrate the clay soil quite deeply. It makes extremely difficult to uproot them from the lakes and ponds. The different races should not be grown together in one pond. Their germplasm should be maintained separately in different chambers or separate aquatic bodies.

The frost and hail storms can also damage the leaves and flowers of *Nelumbo* during the growing season when cultivated in open conditions. Violent winds can also make a sorry site of tender lotus leaves and flowers. Lotus plants grow profusely during the summer and rainy seasons. The flowers are produced on long pedicels above the level of leaves. The flower buds are picked at maturity and packed 2 - 3 days before opening so that they are able to withstand long distance of transportation.

The rhizomes are ready for digging in October. Rhizomes are harvested at about 120 days in the warm climates and 150-180 days or after leaves have died in the sub-temperate climates. Seeds are harvested after the pod turns brown. Traditionally the lotus rhizomes are harvested by hand when the seeds mature at the end of summer. In the end of each growing season about 20% of the rhizomes should be left in the pond for next season. It is suggested that a separate pond may be used for propagation for the following year. Rhizomes are frost resistant as they are protected by mud and water.

Lotus Cultivars for various usage

Size, shape, number and colour vary from cultivar to cultivar. Large flowered lotus cultivars are up to 30 cm dia and the small-flowered cultivars are less than 10 cm dia. Number of petals range from 8 to 1000. Petals are white, pink, rosy red, red, light yellow and bi-coloured. The shape of the petal varies from elliptic to long elliptic and are arranged spirally at the base of the receptacle. The single lotus flower transforms into double forms from stamens to stamenoids and finally to the petals.

Studies have shown different lotus cultivars perform differently in their growth habits. Some cultivars produce good flowers but no seed or rhizomes whereas some produce good rhizomes but without or very few flowers and seeds. For instance, 'Quandong' is the only cultivar that is suitable for the rhizome production. Cultivars 'Singapore' and 'Brisbane' produce good rhizomes. 'Green Jade', 'Vietnam-Red' and 'Brisbane' are excellent cultivars for the flower production.

Lotus cultivars have been classified into three categories according to their usage e.g. rhizome, flowers and seeds. Some cultivars may exhibit one or more of the three characters but generally each is classified by its salient feature. There are nearly 400 *Nelumbo* cultivars all over the world. Lotus flowers are termed single when they have less than 25 petals, semi-double if they have 25 to 50 petals and the double if they have more. Lotus cultivars have also been classified as per their height, small, medium and large. The other way to classify cultivars is as per their colour e.g. red, pink, white, pale yellow and their various shades. A very unique and charming 160 petalled pink coloured lotus race from Midnapore,

West Bengal was discovered and introduced in the Botanic Garden of CSIR-National Botanical Research Institute, Lucknow in 1996. This race was named as *Nelumbo nucifera* 'Krishna' (Kamal Krishna) **(Fig. 7).**

Fig. 7: *Nelumbo nucifera* 'Krishna' Pink Double Lotus' in a aquatic body

Economic & medicinal importance

Almost all parts of lotus are edible and eaten in Asia and Australia. Rhizomes of this species were used as food during Deccan famine regarded it as a unique vegetable of the orient. In ancient periods large quantities of rhizomes were shipped to the USA to feed oriental populations. A soup is also prepared from the rhizomes. Another type of soup is prepared with the lotus seeds and the red beans. It is served at banquets for newlyweds for blessings for having a child next year. The soup is also presented at the New Years's festival in China.

Lotus rhizomes are a powerhouse of nutrients extremely rich in vitamins and minerals viz.: Vitamin-B6 and Vitamin-C, Thiamin, Pantothenic acid, Zinc, Potassium, Phosphorus, Copper, Iron and Manganese. Rhizomes are low in calories and it is believed that adding lotus rhizomes in one's diet can significantly reduce the bad cholesterol levels and reduce the risk of cardiovascular diseases. Presence of healthy dietary fibres can help in improving digestion and relieving ailments like constipation and in losing weight. Old Indian and Chinese references are indicative of powerful medicinal properties of lotus against a number of human ailments involving the digestive, reproductive, circulatory and excretory systems. Almost, all the parts have tonic and astringent properties and are recommended for the treatment of spermatorrhoea, gonorrhoea, insomnia, metrorrhagia, dyspepsia etc.

The flowers are used as astringent in diarrhoea, cholera, fever and diseases of liver. They are also recommended as cardio tonic. Flowers are decocted for abdominal cramps, blood discharges, metrorrhagia and non-expulsion of the amniotic sac. In Sri Lanka and Southern India, the flowers are considered diuretic and cooling. Lotus flowers are boiled in milk with equal amount of flowers of *Eugenia jambolana* made into a paste and then balls to the size of an Areca nut. They are given to women for the relief of false pains in early months of pregnancy. The dried pink red petals are used by the Chinese as cosmetic application to the face for improving complexion. The tender leaves, petioles and flowers are also eaten as vegetables. All parts of the lotus flowers and leaves of lotus are a traditional inebriating smoke, similar to mild cannabis. They are brewed into a delightful tea.

The Lotus flowers are used for the extraction of highly valued perfume. As a flower essence, lotus has varied usage. It is called the spiritual elixir helps in meditation by calming the mind and improving concentration. Lotus is an excellent elixir for balancing, cleansing and strengthening the aura. All the chakras are aligned and balanced by releasing, adding, or directing energies to them, thus releasing better health and harmony. Lotus essence can be used in the bath therapy **(Fig. 8).**

Fig. 8: *Nelumbo nucifera* Buds used for Lotus perfume and for decoration in temples and marriage ceremonies

Lotus in Philosophy

The physical characteristics of the plant and beautiful blossoms reflect its spiritual symbolism and properties. The plant has its roots deep in the mud under water. The long, cylindrical stalk passes through the water and rises above the water surface. The mud in which the lotus roots grow, represents material life, while the water through which the stalk passes, represents the astral world. When the plant reaches the surface of the water and opens its bud to the sun, it represents spiritual being. The crown chakra - the energy centre at the top of the head is also called 'the thousand petalled lotus', which is the symbol of final revelation. It is believed that the transformation of the world into paradise can occur through the lotus, which expounds fully the oneness of all life. The fully opened lotus flower has a strong solar character, and its petals are linked to the rays of sun which is symbol of enlightenment. Meditating on the lotus flower brings harmony into all aspects of our wellbeing, within and without.

The idea of enlightenment is symbolised by the life cycle of the sacred lotus plant because it begins humbly in the mud of ponds but soon grows and sends stems and flowers well above the surface of the water thus showing the path of spiritual enfoldment. In 'Bhagavad Gita', man is adjured to be like lotus. He should work without attachment, dedicating his actions to God, untouched by sin like water on lotus leaf and the beautiful flower standing high above the mud and water. We find references of lotus (Kamal) in 'Vedas'. In 'Rigveda' it is mentioned that the earth has emerged from water. This is now confirmed scientifically that life has evolved from water. Lotus is the symbol of the universe. In 'Arthveda' the womb of the mother is compared with the lotus flower.

Lotus silk

Lotus silk is considered as one of the rarest and the most luxurious and beautiful fabrics in the world, produced only in small scale by the indigenous people all across Cambodia, Myanmar, and more recently in Vietnam. This natural fibre is only extracted by a few skilled ethnic craftsmen in these countries. But making lotus silk isn't at all easy. Extracting enough lotus silk even for one scarf can take up to two months, and the final product can cost 10 times more as much as the regular silk.

Lotus silk is obtained from the matured leaf petioles and the floral pedicels which are selected and handpicked regularly by these locals from ponds and lakes. Each petiole/pedicel contains a minuscule amount of thin, sticky fibre, which must be rolled together. The threads need to be processed within 24 hours while they're still wet, otherwise, they'll break. And so harvesting has to be done regularly every day. The lotus crop is only available for harvest during April - September. Extracting the lotus fibre has been a very strenuous and troublesome task. The fibre is incredibly delicate, too. Once it is dried, the threads are carefully weighed down and delicately hand-spooled. Then they're put into the loom immediately. These fibres are fragile, but once woven, can be as durable as the traditional silk or more shiny and elastic than the silk. A 25 centimetres scarf can cost as much as 200 US$. A team of roughly 20 workers can create lotus fibres each day, allowing them to produce 10 to 20 scarves every month. This soft silk is breathable like linen, and slightly more elastic. Such luxurious traits have made it popular with tourists searching for the rare souvenirs and new luxury fibre.

Lotus in landscaping

Lotus growing in the pond or in pot gives great satisfaction. A pond full of lotus flowers is certainly a captivating sight. Due to the environmental degradation, wetlands are decreasing so the lotus population is also threatened. Lotus can be grown in formal or informal designed ponds in the botanic gardens, parks, picnic spots and industrial regions. Lakes and ponds planted with lotus varieties will give boost to the eco-tourism. In these days urban life is full of noise and pollution, people want fresh and clean environment. India is a vast country and there is a great scope for the development of the eco-tourism. Lotus and fish culture is a good combination for balancing the eco-system and improving the economic condition of the local people as well as the progressive farmers. Lotus growing in the lakes and ponds also attracts cranes, ducks and other birds as they get good food for their survival. Restaurants and motels should be established near the lotus lakes to cater the needs of tourists by providing them various preparations and organic products of lotus.

Conservation and Bioremediation

The aquatic bodies and wetlands comprise the most important components of the natural ecosystems. During the last six decades, aquatic habitats are deteriorating rapidly due to extensive demographic pressure, urbanization, invasion of aquatic weeds and increased inflow of industrial effluents causing environmental degradation and serious threat to the natural ecosystems and aquatic habitats. *Nelumbo* falls under the fourth category and its over exploitation for various purposes is a common practice all over the country. This has resulted in the depletion of Lotus population considerably. In Manipur valley, nearly 55 hectares is the lotus growing area. The systematic cultivation of lotus is not only good to improve the local economy of the people but also helps in the conservation of the wet-lands. In Chhattisgarh rich natives prepare small ponds for planting the lotus. In home gardens lotus is the essential component to bring happiness and prosperity.

Lotus has the ability to uptake heavy metals and can be grown in the ponds receiving the industrial effluents and serves the purpose of water purification in the aquatic bodies. Lotus has high tolerance for the sulphur dioxide and can be planted in the ponds around industrial regions. Chromium is one of the most toxic metals widely found in the water bodies. Large scale use of chromium in metallurgical, pigment and dye, textiles and electroplating make these industries potential source of chromium pollution. Chromium is highly toxic to aquatic plants which results in the reduced roots, phytomass and photosynthetic pigments, chlorosis, stunting and

plant death eventually. Lotus plants have shown greater potential in ameliorating the metal load of waste water by active uptake and surface adsorption.

Biological Implications of the Lotus-Effect

The lotus cuticle is the outer most barrier of plants towards their environment and is, therefore, the first protective layer. Because the air contains many kinds of particles, leaf surfaces are continuously contaminated. It was shown that in polluted areas where plants are heavily contaminated with dust, leaf surface temperature increased under isolation. Particles within certain size range occlude stomata and influence stomatal diffusive resistance. Water repellent plants escape from those harmful effects through the Lotus-Effect.

Lotus-Effect plays another important role in the defence against pathogens. Spores and conidia are deprived of the water which is necessary for their germination. Therefore, the epicuticular wax crystalloids and their physical properties may be regarded as the first line of defence against the pathogens. The Lotus-Effect is not restricted to plants; indeed, it is of an overall biological significance, e.g. for insects with large wings, which cannot be cleaned by legs, have water repellent property, using surfaces which exhibit the self-cleaning ability. In this case, not only the removal of particles is of interest, but also the maintenance of flight capability, which may be lost due to an unequal load on the wings.

The self-cleaning mechanism may be the most important function of many micro- structured biological surfaces. This effect can be transferred to the artificial surfaces (e.g. cars, facades, foils) and innumerable technical applications. Now a days, water-repellence has gained keen interest because it represents the basis for a self-cleansing property of such surfaces called the **"Lotus Effect".** The German scientists have developed a unique paint **"Lotusan"** which mimics lotus leaf and repels dust particles and water droplets keeping the building clean.

The special feature of lotus leaves allows water and dirt particles to run off from the leaf surface. The Lotus Effect is due to characteristic molecular structures present on the surface of the lotus leaf which ensures that water drops and dirt remain on the tips of the plant structures, minimizing the leaf contact area with foreign objects. This property is being applied for developing self-cleaning textiles. A project has been undertaken in co-operation with NEES-Institute for Biodiversity of plants at the University of Bonn and BASF. Such textiles would need only water for cleaning, thus saving money and time on washing. Textiles utilizing Lotus Effect would also be more resistant to the wear and tear. Another application of the Lotus Effect is in medicine, scientists at ITV (Institute for Textile Technology and Process Engineering) are investigating how they could be able to alter the surface of implants in order to improve the implants coating with human cells.

Lotus-crop of the future

Considering the ornamental, medicinal and economic importance, lotus is the crop of the future. Low lying areas in the fields should be utilized for the cultivation and conservation of Lotus. To popularise the lotus crop, Horticulture Departments and Agricultural Universities should take up the research and developmental programmes. There should be model layouts giving the details of the crop cultivation as well as techno-economics. The progressive farmers should be invited to participate in the seminars. Field trips should be arranged for the entrepreneurs. They should be provided literature on the crop. Post-harvest technology for the cut lotus flowers and rhizomes are very important factors. Lotus is deeply associated with our culture. There is a heavy demand for the lotus flowers in the temples and marriage ceremonies. The dry seed pods fetch good price as the excellent dehydrated items in the floral decoration. By the sale of the rhizomes, flowers and seeds one can earn a net profit of over Rs. 75,000/- to 1.00 Lakh per hectare. Fish culture along with the Lotus cultivation can be quite lucrative business. Apart from the domestic market there is good scope for the export of rhizomes in South East Asian countries. *Nelumbo* is one of the best plant species for the conservation of the water resources in the ponds and lakes **(Fig. 9).**

Fig. 9: Flowering of Lotus in Nawabganj Lake in Unnao

*Scientist 'G', Heads, Botanic Garden, Floriculture Bioaerthelo Planning, CSIR-NBRI, Lucknow-226001
**Director Grade Scientist, CSIR-NBRI, Botanical Garden, Floriculture & Bioaerthelo Planning, Lucknow-226001
akgoelofcsirnbri@gmail.com; scsharmagardener@gmail.com

Environment and Health: Post Covid

Surya Prakash Singh
Assistant Professor, Dept. of Physical Education
C.B. Gupta Agriculture Post Graduate, College, Bakshi Ka Taalab
Email : sunlyte69@gmail.com

Recent Worldwide outbreak of COVID-19 has affected every part of our lives, including the physical world. The steps taken to control the spread of the virus and the slowdown of economic activities have significant effects on the environment. The pandemic situation has significantly improved quality of air in different cities across the world, reduced Green House Gas emission, lessened water pollution and noise, and reduced the pressure on the tourist destinations, which helped with the recovery of the ecological system. Moreover, there are also some negative consequences of COVID-19, such as increased medical waste, disposal of disinfectants, mask, and gloves; and burden of untreated wastes continuously endangering the environment .as well as our health has been effected drastically as lung, heart, metabolic problems has shown us how unhealthy our lifestyle is, and how we are in dire need of a major change in our lifestyle.

The outbreak of COVID-19 first emerged at the end of December 2019, from the Hunan seafood market in Wuhan City of China, and declared as an international public health emergency in a couple of weeks by the World Health Organization It is an infectious disease caused by severe acute respiratory syndrome coronavirus-. Genomic analysis revealed that bats could be the possible primary source Although the intermediate source of origin and transfer to humans is not clearly known, The transmission of the virus mainly occurred through person-to-person via direct contact or droplets produced by coughing, sneezing and talking . As of November 2021, the outbreak of the coronavirus disease had spread to six continents, and over 5.2 million people had died after contracting the respiratory virus. Over 133 thousand of these deaths occurred in Italy. Almost every country and territory worldwide has been affected by the COVID-19. The virus is still circulating at very high rates, even in countries with relatively high vaccination rates such as the United States and Germany. As rates of new infections increase, some countries in Europe, like Germany and Austria, are tightening restrictions once again, specifically targeting those who are not yet vaccinated. The effects of infectious and environmental stressors Combined are a major concern. The severity of COVID-19 is strongly associated with age and co-morbidities such as lung, heart, metabolic diseases and obesity which are partly caused by exposure to environmental stressors such as poor urban design, an unhealthy food environment, air pollution and chemical toxicants. The COVID-19 pandemic has dramatically shown that infectious diseases and non-communicable diseases are highly interconnected, the latter strongly contributing to the severity of the former. Therefore its crucial to know the interaction between viral infections and environmental factors of chronic diseases such as chemical toxicants, air pollution, climate change and socio-economic determinants. Moreover, inhalation of wood smoke at a relatively low level was associated with suppressed respiratory immunity, resulting in increased susceptibility to infections as well as to several types of lung disease along these lines, health, environmental enhancement assessment tools should be further developed and harmonized.

Multiple studies over the time have now shown that moderate exercises decreases rates of influenza, pneumonia and other infections as well as chronic diseases like diabetes and heart disease. Staying active supports your immune system in a variety of ways, including reducing inflammation, increasing the presence of innate immune cells, and positively. Affecting your gut microbiome all of which support your body's defense mechanisms. Regular exercise has also been shown to improve our ability to regulate our immune system which may be essential for avoiding the severe symptoms of COVID-19 caused by immune system over-reactions. Since COVID-19 is an infection that affects our upper respiratory system, strengthening the lungs is crucial for better recovery post-COVID. This objective can easily be achieved by practicing some common yoga asanas. The combination of yoga asanas and breathing techniques can help to boost immunity and strengthen the lungs apart from that there are certain tips for a healthy lifestyle:

- ❖ Detoxify your body by drinking at least 6 to 8 liters of water daily
- ❖ Get a sound sleep of 6 to 8 hours
- ❖ Include more green vegetables in your diet
- ❖ Make sure your diet is getting you your daily amount of vitamins and minerals
- ❖ Adopt Ayurveda for a healthy lifestyle
- ❖ Follow basic hygiene practices
- ❖ Do pranayama and meditate regularly

While doing pranayama one can always enhance it through Mudras for more benefits. Mudras used in combination with yogic breathing exercises enliven the flow of prana in the body, thereby energizing the cells in the body.

1. Prana Mudra

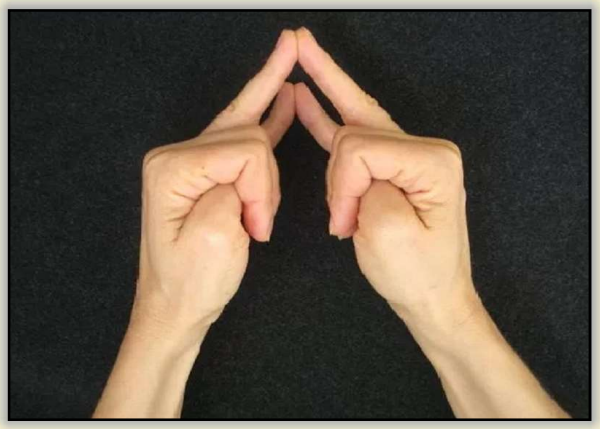
- Sit in a relaxed and comfortable position.
- Join the tips of the little finger, ring finger, and the thumb together.
- Keep the other two fingers relaxed and positioned away from the joint.
- Rest both the hands on your knees and then fold the fingers into the Mudra. While practicing, give slight attention to your breathing patterns and allow the soothing effects of refreshed energy to calm your body and mind.

2. Apana Mudra

- The Apana mudra is a simple way to detox your system by enhancing the cleansing-energy.
- Join the tips of the middle finger, ring finger, and the thumb together
- Keep the other two fingers relaxed and positioned away from the joint.
- Observe your breath and gently relax

3. Shakti Mudra

- Join the little and ring fingers of both hands.
- Fold the index and middle fingers and place them loosely over your thumb.
- Then bend the thumb towards the palms, Focus on your breath.



You can practice this twice every day for about 15 minutes each. This mudra calms the mind and body and helps induce peaceful sleep and an improved immune system. Mudras adjust the flow of energy in our body and thereby facilitate healing.

Yoga postures and pranayama exercises naturally support and boost the immune system. They relieve stress and supply the organs with fresh oxygen and happy hormones (endorphins). A strong immune system is attained by combining a healthy diet, physical activities, and relaxation and breathing exercises. So, it is a great idea to start your day with a simple yoga routine to attain life-long benefits and preventive measures for problems like Covid-19.

Biological Soil Crusts: An Ecosystem Engineers

Rajesh Bajpai

Prof. HS Srivastava Foundation for Science and Society, Lucknow, Uttar Pradesh, India

Email: bajpaienviro@gmail.com

The biological soil crusts (BSCs) are a multifarious community of primitive organisms that flourish worldwide in harsh, arid and semiarid regions where other vegetation such as trees, shrubs, and grasses is scanty. The BSCs play a crucial role in stabilizing bare soil, stemming erosion from wind and rain, trapping moisture, fixing carbon and nitrogen in the soil, and providing shelter for the seeds of vascular plants.

The species that make up soil crusts are basically cyanobacteria (blue green algae), green algae, fungi, lichens, and mosses which have develope synergistic communities to the ecosystems. After the cyanobacteria colonize on soil surface, other organisms may join them. As the successional sequence of crust development would be the cyanobacteria, then lichens, then the mosses, and followed by shrubs and trees.

However, the cyanobacteria and algae remain the dominant components of the crusts, giving a relatively smoother appearance. Cyanobacteria can capture nitrogen from the atmosphere and add it to the soil, so the nitrogen content of crust soils may be several times that of soils lacking crusts. When the water entered the soil, the crusts act as a barrier that reduces evaporation. Further the soil crusts can also provide places where plant seeds are sheltered from the weather extremes and have a greater chance of germinating.

BSCs dominate large areas worldwide that are governed by harsh abiotic conditions including both hot and cold deserts, where they form the most productive microbial communities (Figure 1). Other than soil protection (prevent erosion) and dust trapping by concatenating organic and inorganic material at the top soil layer, BSCs provide important additional ecosystem services because of their ability to weather phosphorus and nitrogen, mineralization as primary production.

However, the cryptogamic ground covers (CGC), including biological soil and rock crusts as well as bryophyte and lichen carpets, occur on several terrestrial ground surfaces. The CGC weathered rock if sufficient water is available, because the poikilohydric, BSC organisms become inactive immediately after drying-out. Consequently, the stage (active vs. inactive) of the crusts is important to calculate the contribution of BSCs to the local nitrogen and phosphorus cycles. Since the phototrophic organisms protect themselves with soluble salts under dry conditions, the reflectance of the organisms changes between active and inactive stages and considering that BSCs play a major role in the terrestrial carbon cycle.

However, the photoautotrophic communities can take up atmospheric CO_2, and many covers containing cyanobacteria can also fix atmospheric N_2. They produce carbon- and nitrogen containing organic compounds such as amino acids, carbohydrates and extracellular polymeric substances. These products, as well as cryptogamic biomass, are partly consumed by plants, animals and other organisms in the surrounding ecosystem or removed by erosion and runoff. Thus, cryptogamic covers are able to fuel food webs by photosynthesis and nitrogen fixation, which is particularly important in arid regions and other terrestrial environments with low abundance of organic nutrients.

Conversely, cryptogams particularly lichens play a significant role in soil stabilization. It is well known that lichen substances are reported in highest amount in the top of 1-2 cm of the apices of fruticose lichen (*Cladonia stellaris*), and they reduced drastically towards the bases of the thalli, being very low in the old part as well as in the soil beneath. Although some earlier studies have reported the lichen secondary substances to be mobile and to leach out from the lichens it is practically insoluble into pure water but soluble in high pH water. These lichen substances may act as food for micro soil biota and sometime act as buffering role in physiochemical properties at rhizspheric regions.

The cryptogamic covers, can also form biominerals and stabilize ground surfaces through the interaction of minerals, cellular filaments and organic polymers. Consequently, it is no doubt that they may act as

ecosystem engineers, for endorsing the rehabilitation of eroded soils in drylands. Their destruction by grazing and trampling enhances erosion and diminishes soil fertility and water retention, and also the conversion of natural lands to human use (for example, agriculture and construction) can reduce the spread of cryptogamic covers.

Consequently, BSCs containing cyanobacteria, algae and lichens were probably the only terrestrial biosensors for a time span of about two billion years. Today, they are still pioneers in the colonization of bare grounds such as deglaciated rock surfaces, volcanic deposits and burnt areas. The importance of BSCs for the functioning of ecosystems on local and regional scales has been addressed in a number of studies worldwide but in India it needs to be a time of research.

Overall article suggests that BSCs on ground, are major players in the global biogeochemical cycles of carbon and nitrogen and should thus be explicitly considered in climate and earth system models. Land-use and climate change are likely to influence the geographic distribution and metabolic activity of cryptogamic covers, which may in turn affect their role in the climate system and represent a previously unrecognized cycle. Regional and seasonal patterns as well as long-term trends in biodiversity, abundance and metabolic activity need to be better characterized for a full understanding of the role of cryptogamic covers in the earth's history and future climate.

Further the spectral responses of BSCs led to a valuable assessment of spatial and temporal patterns in cryptogamic cover mat condition study will provide better results in future. However, in forthcoming we wish to fully utilize BSCs mat volume estimates, physiochemical characteristics studies, in-situ ground drive with a proper data collection design, will use as future challenging endeavor in this regards.

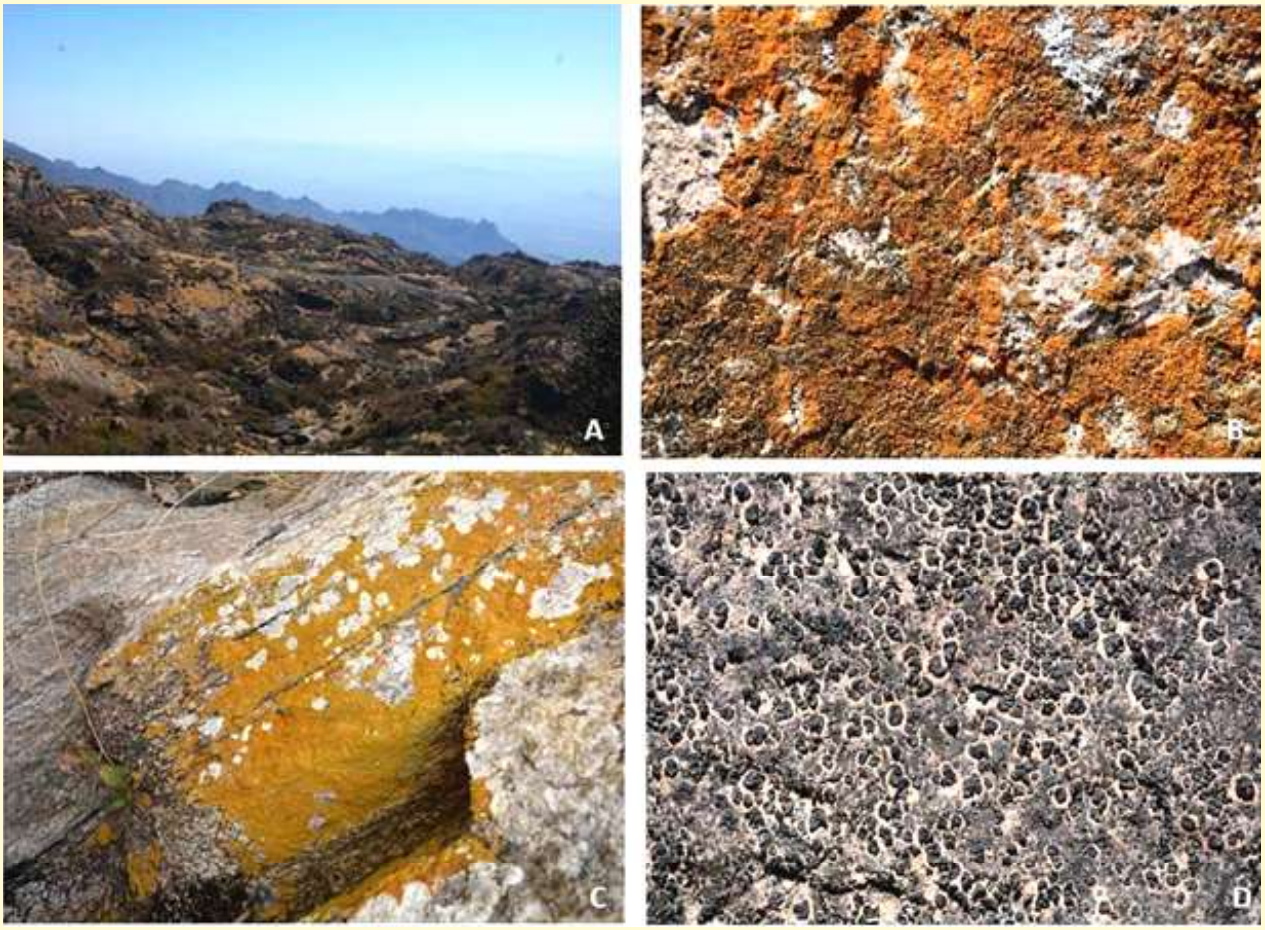


Figure 1: Investigation site **A.** Arid region of Mount Abu, Rajasthan, India (near sunset point), **B & C**. bare rock luxuriantly covered by lichen genus *Caloplaca* **D**. luxuriant growth of member of lichen family Licniniaceae (Photo: Rajesh Bajpai).

राष्ट्रीय कृषि बाजारः ई–नाम

National Agriculture Market (e-NAM)

डॉ. प्रमोद कुमार मिश्र
असिस्टेन्ट प्रोफेसर (कृषि अर्थशास्त्र)
चन्द्र भानु गुप्ता कृषि स्नातकोत्तर महाविद्यालय, बक्शी का तालाब, लखनऊ
वेबसाइट्सः www.enam.gov.in
हेल्प लाइन नं. : 18002700224

बाजार की विसंगतियों को दूर करने और कृषि वस्तुओं के विपणन में मध्यस्थों की भूमिका को कम करने और किसानों की उपज का सही मूल्य दिलाने के लिए 'राष्ट्रीय कृषि बाजार–ई–नाम' की परिकल्पना पैन–इण्डिया इलेक्ट्रानिक व्यापार पोर्टल के रूप में की गयी है। आर्थिक मामलों की मंत्रिमण्डलीय समिति के द्वारा 01 जुलाई 2015 को ''कृषि प्रौद्योगिकी अवसंरचना कोष'' के लिए 200 करोड़ रूपये की मंजूरी दी गयी थी। आगे चलकर 14 अप्रैल 2016 को डा. भीमराव अम्बेडकर की 125वीं जयन्ती के अवसर पर प्रधानमंत्री श्री नरेन्द्र मोदी ने नई दिल्ली के विज्ञान–भवन से 'ई–नाम' की प्रायोगिक परियोजना (पायलट) आधार पर शुरूआत की। प्रायोगिक व्यापार की शुरूआत के समय देश के आठ राज्यों–उत्तर प्रदेश, गुजरात, तेलंगाना, मध्य प्रदेश, राजस्थान, हरियाणा, झारखण्ड एवं हिमाचल प्रदेश की कुल 21 मण्डियों को राष्ट्रीय कृषि बाजार के साझा प्लेटफार्म (ई–ट्रेडिंग पोर्टल) से जोड़ दिया गया था। फिलहाल अब 16 राज्यों और दो केन्द्रशासित प्रदेशों में 585 मंडिया 'ई–नाम' से जोड़ी जा चुकी है। इसके माध्यम से एकीकृत बाजार प्रणाली से किसान एवं व्यापारी देश के किसी भी खरीददार को अपना उत्पाद ऑन लाइन बेचने में सक्षम होगा। जिससे कृषक एवं उपभोक्ता के हितों का अधिकतम प्रतिरक्षण हो सकेगा।

लक्ष्य

'ई–नाम' वस्तुतः अखिल भारतीय इलेक्ट्रानिक व्यापार पोर्टल है जो कृषि उत्पाद विपणन कमेटी से सम्बन्धित सूचनाओं व सेवाओं के सम्बन्ध में एकल खिड़की सेवा प्रदान करता है तथा देश में 'एक राष्ट्र–एक बाजार' की संकल्पना को साकर करने की दिशा में एक क्रान्तिकारी प्रयास है।

उद्देश्य

1. पारदर्शी बिक्री कारोबार तथा विनियमित बाजारों में मूल्य अन्वेषण हेतु एक राष्ट्रीय ई–बाजार मंच उपलब्ध कराना।
2. व्यापारियों के लिए राज्य के सभी बाजारों हेतु एक लाइसेंस उपलब्ध कराना।
3. कृषि उपज के गुणवत्ता मानकों में एकरूपता लाने तथा खरीददारों को सूचित बोली हेतु सक्षम बनाने के लिए प्रत्येक बाजार में गुणवत्ता परीक्षण का प्रावधान। आम व्यापार योग्य प्राचलों को अब तक 25 वस्तुओं के लिए विकसित किया गया है।
4. बाजार शुल्क की केवल एक बार वसूली (किसान से पहले थोक खरीद पर)।
5. चयनित मण्डी के पास मृदा परीक्षण प्रयोगशालाओं का प्रावधान ताकि किसान इस सुविधा का लाभ मण्डी के समीप ले सकें।

क्रियान्वयन एजेन्सी

स्माल फार्मर्स एग्री बिजनेस कंसोर्टियम (SFAC)!

'ई–नाम' और मौजूदा मण्डी प्रणाली के बीच फर्क

'ई–नाम' एक समानान्तर विपणन संरचना नहीं है बल्कि भौतिक मण्डियों के राष्ट्रीय नेटवर्क निर्माण करने वाला एक ऐसा उपाय है जिसके माध्यम से ऑनलाइन पहुँचा जा सकता है। यह ऑनलाइन व्यापारिक पोर्टल के माध्यम से मण्डी की भौतिक अवसंरचना का लाभ उठाने की कोशिश करता है जो स्थानीय स्तर पर व्यापार में भाग लेने के लिए राज्य के बाहर भी स्थित खरीददारों को सक्षम बनाता है।

'ई–नाम' की आवश्यकता क्यों है?

कृषि उपजों के लिए सामान्य राष्ट्रीय बाजार के उद्भव को सुलभ कराने के लिए 'ई–नाम' का निर्माण करना आवश्यक है। वर्तमान में कृषि उत्पाद विपणन कमेटी विनियमित बाजार शेड पहले विक्रय स्थल (अर्थात जब किसान उपज को फसल की कटाई के बाद बेचने के लिए लाते है) से लिए जाने वाले कृषि से सम्बन्धित उत्पादों के व्यापार को स्थानीय, तहसील या अधिक से अधिक जिला स्तर के मण्डी तक ही सीमित करता है क्योंकि एक राज्य के लिए एक एकीकृत कृषि बाजार नहीं होता है और उसी राज्य के भीतर किसी एक बाजार क्षेत्र से किसी दूसरे बाजार क्षेत्र में जाने वाली उपज पर लेन–देन शुल्क भी लगता है। एक ही राज्य के विभिन्न बाजारों में व्यापार के लिए एक से अधिक लाइसेंस आवश्यक है। ये सभी

कृषि उत्पादों को अधिक सस्ता और बहुत अधिक मॅहगा बनाने का कार्य करते है जो बड़े पैमाने की अर्थव्यवस्थाओं और जिला एवं राज्य की सीमाओं के बाहर कृषि उत्पादों की मूल गति को रोकते है। 'ई–नाम' बाजारों के विखण्डन की इस प्रक्रिया को आगे बढ़ाकर पूर्णतः बदलना चाहता है जिसके परिणाम स्वरूप अन्तिम उपभोक्ता के लिए वित्तीय मध्यस्थता का खर्च, फिजूलखर्ची और मूल्य कम से कम हो सके। इसका निर्माण स्थानीय मण्डी की सामर्थ्य पर होता है तथा यह अपनी उपज को राष्ट्रीय स्तर पर पेश करने की अनुमति देता है।

'ई–नाम' कैसे संचालित होगा?

'ई–नाम' इलेक्ट्रानिक व्यापार मंच भारत सरकार (कृषि एवं किसान कल्याण मंत्रालय द्वारा) के निवेश से बनता है। यह राज्य में उपलब्ध किसी बाजार गोदाम के लिए संयोजक की पेशकश करता है (चाहे वह विनियमित हो या निजी) 'ई–नाम' के लिए बनाया गया विशेष साफ्टवेअर हर उस मण्डी के लिए उपलब्ध है जो प्रत्येक राज्य मण्डी अधिनियम के नियमों के अनुरूप आवश्यक अनुकूलन के साथ बिना किसी शुल्क के राष्ट्रीय नेटवर्क से जुड़ने के लिए राजी होता है।

'ई–नाम' से जुड़ने के लिए शर्तें

'ई–नाम' के साथ अपनी मण्डियों को जोड़ने के लिए इच्छुक राज्यों को अपने कृषि उपज विपणन समिति अधिनियम में निम्नलिखित सुधारों को पूरा करना आवश्यक है–

a) इलेक्ट्रानिक व्यापार के लिए विशेष–व्यवस्था।

b) एकल व्यापार लाइसेंस राज्य की सभी मण्डियों में व्यापार के लिए वैध है।

c) लेन–देन शुल्क को एक स्तर पर एकत्र करना।

क्या 'ई–नाम' के कारण A.P.M.C. मण्डी को व्यवसाय का नुकसान होगा?

'ई–नाम' मूल रूप से किसानों के विकल्प को बढ़ाता है जब वे अपनी–उपजों को मण्डी में बेचने के लिए लाते है। स्थानीय व्यापारी उपज के लिए बोली लगा सकते है, अन्य राज्यों में बैठे हुए व्यापारियों को भी इलेक्ट्रॉनिक प्लेटफॉर्म से जोड़ सकते है। किसान स्थानीय प्रस्ताव या फिर ऑनलाइन प्रस्ताव का चुनाव अपनी स्वेच्छा से कर सकते है। दोनों ही स्थितियों में लेन–देन स्थानीय मण्डी की किताबों पर होंगे और वे लेन–देन शुल्क अर्जित करते रहेंगे। वास्तव में व्यापार में काफी वृद्धि होगी क्योंकि विशिष्ट उपज के लिए बहुत अधिक प्रतिस्पर्द्धा होगी, जिसके परिणामस्वरूप मण्डी का लेन–देन शुल्क उच्च होगा।

'ई–नाम' के खर्चे का भुगतान कौन करेगा?

राष्ट्रीय स्तर का मंच कृषि एवं किसान कल्याण मंत्रालय द्वारा विकसित किया गया है, जो रख–रखाव मूल्यों को भी वहन करेगा। जैसे कि उपरोक्त में वर्णित है स्थानीय मण्डियों और सॉफ्टवेअर, ट्रेनिंग इत्यादि को अनुकूल बनाने के लिए एकीकरण लागत का एक बार भुगतान भी राष्ट्रीय नेटवर्क में मण्डी की संस्तुति देते समय कृषि एवं किसान कल्याण मंत्रालय द्वारा अनुदान के रूप में किया जाएगा। उसके बाद स्थानीय स्तर पर सॉफ्टवेअर की बढ़ती कीमतों, गुणवत्ता के लिए कर्मचारियों की लागत इत्यादि उत्पाद की बिक्री के जरिए उत्पन्न होने वाले लेन–देन शुल्क से प्राप्त होंगे। यह उदेद्श्य मण्डी द्वारा किसी अग्रिम निवेश को तब रोकता है जब वह 'ई–नाम' में एकीकृत हो जाता है और अतिरिक्त कर के कारण बढ़ने वाली कीमत को सम्हालने के लिए सक्षम भी हो जाता है।

'ई–नाम' के लाभ किस प्रकार के है?

उपरोक्त प्रयास कोविड–19 लॉकडाउन के दौरान किसान/एफ.पी.ओ./सहकारी समितियों को राहत प्रदान करेंगे। यह ऑनलाइन प्लेटफॉर्म भारत में कृषि बाजार में सुधार के लिए एक विशाल छलांग साबित होगा। कृषि क्षेत्र में 'ई–नाम' की उपलब्धियाँ अग्रणी एवं क्रान्तिकारी रहा है। 'ई–नाम' की परिकल्पना सभी साझेदारों के लिए एक जीतने जैसा समाधान है। किसानों के लिए 'ई–नाम' अपने नजदीकी मण्डी में बिक्री के लिए अधिक विकल्पों का वादा करती है। मण्डी में स्थानीय व्यापारी के लिए 'ई–नाम' माध्यमिक व्यापार के लिए बड़े राष्ट्रीय बाजार तक पहुँचने का अवसर प्रदान करता है। 'ई–नाम' मंच के माध्यम से स्थानीय मण्डी स्तर पर व्यापार में सीधे भाग लेने के लिए सक्षम होने से प्राप्त लाभ थोक खरीददारों, संसाधकों–निर्यातकों इत्यादि सभी को हैं जिससे मध्यस्थता की लागत कम हो जाती है। 'ई–नाम' के अन्दर राज्यों की सभी प्रमुख मण्डियों का क्रमिक एकीकरण होने से लाइसेंस जारी करने के लिए सामान्य प्रक्रियाओं, शुल्क एकत्र करना और उपज की गतिविधि सुनिश्चित हो जाएगी। जिससे निकट भविष्य में हम किसानों के उच्च प्रतिफल, खरीददारों के लिए न्यूनतम लेन–देन एवं कीमत की स्थिरता और उपभोक्ताओं की उपलब्धता के जरिए प्रधानमंत्री को महत्वाकांक्षी योजना किसानों की आमदनी को दो गुना करने का जो 2022 का लक्ष्य है, उसको प्राप्त करना सुगम हो जाएगा। साथ ही साथ देश में 'एक राष्ट्र–एक बाजार' की संकल्पना मूर्त रूप लेगी।

Press Release on World Wild Life Day 2022

On the occasion of 'World Wildlife Day' Society for Conservation of Wildlife organized a programme on 3rd March, 2022 at Kukrail Wildlife Reserve, Lucknow with collaboration of School of Earth and Environmental Sciences, Babasaheb Bhimrao Ambedkar University, Lucknow and Forest Department, Government of Uttar Pradesh. The objective of the programme is to create awareness among people to conserve the biodiversity including both flora and fauna. Biodiversity is declining very quickly around the globe. Some scientists even say that at present we are going through sixth mass extinction and very soon we may lose all the wild mammals. The theme of World Wildlife Day 2022 is "Recovering key species for Ecosystem Restoration" and this theme was declared by United Nations. This theme is chosen to draw attention to the conservation status of some critically endangered species. Restoration of wildlife and the protection of endangered species is of paramount importance. Biodiversity plays a huge contribution to our ecological system, economics, social and human well-being and sustainable development. The United Nations general assembly on December 20, 2013 during 68th session, decided to declare March 3, the day of adoption of the convention on international trade in endangered species of wild flora and fauna, as World Wildlife Day to restore their habitats and ecosystems and promote sustainable use by humanity. As a matter of concern, almost more than 8000 species of wild fauna and flora are endangered and close to 30,000 more are known to be on the verge of getting extinct or vulnerable and estimated that around a million species are said to be extinct. On this occasion society for conservation of wildlife felicitated Dr. Ravi Kumar Singh by wildlife conservation award for excellent contribution in wild life biodiversity.

Prof. Naveen Kumar Arora, President of the Society and Dean, School of Earth and Environmental Sciences, BBA University, Lucknow put light on work done by the society. SCW is group of passionate peoples with objective of conservation of wildlife

flora and fauna and restore biodiversity to fulfill the targets of sustainable development goals. He said that plastics should be banned around 7 km of area around national parks to stop pollution and save wildlife. He said that with collaboration of forest department Uttar Pradesh working for sustainable development we can recover key species and protect our biodiversity. He also informed about the degraded lands and how to improve them by green and sustainable method. He depicted a success story from Kanpur region as well where degraded lands have been converted to fertile.

Prof. Venkatesh Dutta, BBAU, Lucknow, shared his views on river restoration, conservation and importance of rivers and give presentations on how to restore water ecosystem, support economic resilience and their role in environment. He emphasized that to conserve and protect rivers forests should be conserved and a holistic effort is required involving all the stakeholders.

The chief guest of the programme, Dr. Ravi Kumar Singh, DFO, Government of Uttar Pradesh, addressed the students, scholars and NGOs description on history and significance of world wildlife day and sensitized about importance of wildlife reserves and their role and huge contribution to our ecological systems, economic, and human well-being. He interacted with every participants and heard everyone's suggestions to conserve ecosystem. He said that we all should contribute to our society go to the natural habitats to learn and save them. Being the responsible citizens of country we should not buy or use such articles which have been made by poaching of wildlife and there is need to stop direct and indirect harms to wildlife. The forest department did rescue operations and assure their safe rescue. He gave examples of rescue operations done by Forest Department of Uttar Pradesh.

Deepti Verma, Founder Member, Karavan Heritage and Nature Society give her view and shared video on significance of vultures showing their importance in ecosystem. She said we should educate people to contribute in conservation and protection of vultures and plant more tall trees for their nesting.

Several participants also gave their views. Dr S C Sharma from NBRI emphasized upon plantation of useful trees and protection of birds. Prof Shilpi Verma emphasized upon sensitization of school children for environment protection and conservation and Dr Rajshree from BBAU said that there should be more interaction between institutes and indigenous people including city dwellers and students. Preeti Arora, secretary of the society was also present on the occasion. In total there were 200 participants in the programme. In evening the participants went to Kukrail Forest Reserve for look into the breeding program of alligators and turtle.

Dr. S.C. Sharma's Visit to Agra

On the invitation from the Horticulture Club, Agra Dr. S.C. Sharma, Senior Vice President, CGES visited the Taj City from December 3-6, 2021 for the inauguration of the Bougainvillea Exhibition and Chrysanthemum Show and delivering a talk on: **Bougainvillea A Long Journey from Brazil to India.** Dr. Mukul Pandya displayed his splendid collection of 200 specimens of the grafted bougainvilleas on the Colonel's Country Green Show ground. In the welcome address Mrs. Lovely Kathuria deeply appreciated Dr. Sharma coming from Lucknow for participation in the exbition. She highlighted the activities of the Horticulture Club, Agra and future plans. Dr. Barun Sarkar an eminent gynaecologist of Agra was the Chief Guest of the function. Dr. Mukul Pandya introduced Dr. S.C. Sharma, former Director Grade Scientist and former Head, Botanic Garden, Floriculture and Bio-aesthetic Planning, CSIR-National Botanical Research Institute (CGES), Lucknow to the august gathering. Dr. Sharma briefed 250 years of the Research and Development Work on Bougainvilleas and Landmarks in the evolution of the Bougainvillea cultivars. There are nearly 400 Bougainvillea species and cultivars all over the world. Dr. S.C. Sharma told about his own Bougainvillea cultivars, which he evolved at the CSIR-National Botanical Research Institute, Lucknow eg. 'Shubhra', 'Chitra', 'Loise Wathen Variegata', 'Parthasarthy', 'Shweta', 'Arun' etc. Dr. Barun Sarkar mentioned about the medicinal value of the bougainvilleas for the treatment of the diabetes. Dr. Sarkar presented Trophy to Dr. S.C. Sharma as the Life Time Achievement Award for his outstanding R&D Work on the Bougainvilleas. Horticulture Club Agra made Dr. S.C. Sharma and his wife Mrs. Parvati Sharma as the honorary members of the club. Considering the beautiful bracts of the bougainvillea and perpetual flowering, drought resistant and for mitigation the air pollution, Dr. Sharma suggested that the Agra City may be declared as the Bougainvillea City. Members of the Horticulture Club very much liked the idea and assured that they will sincerely pursue the matter. Dr. Ranjana Bansal proposed the hearty vote of thanks to Dr. S.C. Sharma, Dr. Barun Sarkar, judges, members of the Horticulture Club and the media persons. After the function there was a standing ovation to Dr. Sharma from the august gathering on the show ground. During this period, Dr. and Mrs. Sharma visited beautiful gardens of Dr. Ranjana Bansal and Mrs Daisy/Mr. Kuljeet Singh Gujral and was highly impressed with the large collection of ornamental plants, which were nicely displayed in the garden.

Recent Publication

New Dimensions of Environmental Biology
Shyam Narain Pandey, Murtaza Abid, M. M. Ali Khan
First Edition: 2022
Discovery Publishing House
Ansari Road, New Delhi (India)

Events organised during August 2021-March 2022. Sustainable Developmental Goals: Dr. V. P. Sharna, Biodiversity Loss: Protection by Forests: Prof. Naveen Arora. Covid-19 is not going to go: Prof. Amar Prakash Garg. Origin of Pteridophytes: Dr. A. K. Goel. Two days Workshop on Floriculture: Dr. S. C. Sharma, Dr. A. K. Goel, Dr. Arvind Jain, Dr. Shankar Verma, Dr. Daya Shankar, Mr. Girdhari Sharma.

Forthcoming Event

Clean and Green Enviromental Society will organise National Conference on Ecorestoration and Biodiversity Conservation in collaboration with the CSIR-National Botanical Research Institute, Lucknow in September 2022.

Forthcoming Publication

Lotus (*Nelumbo nucifera* Gaertn.): National Flower of India
Authors: S. C. Sharma, A. K. Goel and Y. K. Sharma
Publisher: Bishen Singh, Mahendra Pal Singh, Dehradun (India)

Webinar News

Dr. Pramila Gupta B.H.M.S.

Sri Ashok Kumar
(Former IFS & IRTS (Retd.)

Webinar on **"Homeopathy, A Science or Art"** was organized by Clean and Green Environmental Society on Feb. 20th (Sunday), 2022 11.30 a.m. The speakers were Dr. Pramila Gupta B.H.M.S. and Sri Ashok Kumar (Former IFS & IRTS (Retd.) from Mumbai. More than 60 participants joined it on Zoom.

The homeopathy was defined as a science but when comes to practicing, this is an art. In the talk the discovery, protocol and potency in homeopathy were elaborated at large, correlating it with the vaccination discovery simultaneously. It was told that human body is the host of several diseases. The main emphasis was that in homeopathy the treatment is not done of a disease but of body as a whole, its personality traits, and its reaction, behavior during illness. The treatments of chronic diseases (like B.P., Diabetes, Arthritis, All kinds of Pains, Neuro-problems, Cancer etc.) are available in homeopathy with no side or after effects.

Prof. Naveen Kumar Arora
was awarded
"Excellence in PGRP Research"
by The Asian PGPR Society
at the 6th Asian PGPR National Conference
(3-4 September 2021)
held at Barkatullah University, Bhopal, MP.

Our Banker

भारतीय स्टेट बैंक
State Bank of India
हर भारतीय का बैंक
THE BANKER TO EVERY INDIAN

CGES Executive Body

President
Er. Sumer Agarwal

Vice Presidents
Dr. S.C. Sharma
Er. M.S. Gulati
Prof. Rana Pratap Singh

Secretary General
Prof. Yogesh Kumar Sharma

Secretaries
Col. Ajay Gupta
Dr. R.D. Tripathi
Prof. Naveen Kumar Arora

Treasurer
Dr. S.N. Pandey

Executive Councilors
Dr. A.K. Singh
Dr. Virendra Nath
Prof. S.P. Trivedi
Dr. Tariq Husain
Dr. Priyanka Agnihotri
Dr. V.P. Sharma
Dr. Seema Ghate
Dr. Prerna Mitra
Dr. Rashmi Soni
Mr. Tilak Basu
Er. N.K. Trivedi
Mr. Vasant Pusalkar
Dr. R.C. Chaudhury
Er. M.L. Sharma
Dr. Sanjay Dwivedi

Advisors
Pdama Shri Dr. Mansoor Hasan
Padma Shri Sudhir Sopory FNA
Dr. P.V. Sane FNA
Dr. Girish Sahni FNA
Padma Shri P. Pushpangadan
Prof. R.K. Kohli FNA
Prof. Ashok Sahni FNA
Dr. V.P. Kamboj FNA
Justice K.L. Sharma
Shri L.K. Jhumjhunwala
Dr. Amrita Dass
Prof. P.K. Seth
Dr. Sanjay Kumar
Prof. S.K. Barik
Prof. Sharad Chapekhar

Information Technology Advisor
Col. Ajay Gupta

Environmental Awareness Committee
Dr. Prerna Mitra
Dr. Sadhna Ajay
Dr. Anuradha Sharma
Dr. Rashmi Soni
Mrs. Vandana Pandey

Newsletter Publication Committee
Naveen Kumar Arora
Dr. S.C. Sharma
Prof. Y.K. Sharma
Dr. Jitendra Mishra

Published by
Clean and Green Environmental Society
Head Office
Green Villa, 2/111
Vishwas Khand, Gomti Nagar
Lucknow-226 010, U.P. (India)
Telephone: 0522-4006408
Mobile: 091-9415343141
E-mail: cleanandgreenenv@gmail.com
scsharmagardener@gmail.com
Website: www.cgesindia.org