



# ENVIRONEWS

INTERNATIONAL SOCIETY OF ENVIRONMENTAL BOTANISTS

## Newsletter

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### CAR-FREE CITIES: HEALTHIER CITIZENS

Private motor cars are an important part of urban transport in cities. Private diesel and gasoline vehicles contribute significantly to a city's air pollution (e.g. particulate matter, such as PM2.5), greenhouse gas emissions (e.g. carbon dioxide (CO<sub>2</sub>) and black carbon), noise pollution and raised urban temperatures and motor vehicle crashes. All of these things can raise the risk of early death and increased incidence of disease.

Furthermore, road and parking infrastructure contributes to soil sealing and takes up space that could be used to create green areas as well as pedestrian and cycling infrastructure, which are beneficial for people's mental and physical well-being.

Some recent studies have focused on the link between car-free initiatives in cities and urban design and planning, city transport and planning, environmental impacts, health effects and socio-economic concerns.

In Europe, for example, primarily driven by the need to reduce greenhouse gas emissions, Oslo will invest in new bike ways, levy congestion charges during rush hours, limit parking spaces and ban all private cars from the city centre by 2019. By 2034, Hamburg plans to ban cars from a number of city roads, which will become pedestrian and bike zones. A green network, linking parks and other open spaces and covering 40% of the city is also being developed. Madrid also plans to pedestrianise the city centre with a view to making it car free by 2020. Germany recently decided to call for a ban on selling all new combustion-engine cars from 2030.

A review of 28 health impact studies related to greater active transport and less car use found people who switched from using a car to active transport received substantial health benefits from increased physical activity. This benefit will outweigh any risk cyclists or pedestrians might experience from exposure to air pollution or being involved in motor vehicle crashes. To ensure that cities are designed around people, rather than vehicles, the researchers say new urban and transport projects should focus on environmental and health priorities, rather than on enabling private-vehicle use.

Numerous studies have linked traffic-related air pollution exposure to early deaths, as well as to lung cancer and cardiovascular diseases, diabetes and obesity. Children are particularly vulnerable to the effects of traffic-related air pollution. The researchers say public health will improve as car-free cities reduce air pollution. A report has shown that levels of nitrogen dioxide (a major air pollutant) fell by 40% in Paris, France and by 20% in Leeds, UK, when cars were banned for one day.

Fewer private cars in cities will mean that traffic noise will also be reduced. One report on the Brussels' environment revealed that noise levels fell more than 10

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decibels on a car-free Sunday. This reduction in noise should result in improved public health, as studies have associated noise exposure with early death from cardiovascular diseases, as well as an increased risk of heart disease, sleep disturbances, high blood pressure, and also with reading comprehension and memory in children.

Heat emitted from vehicles exacerbates the urban heat-island effect in cities. The researchers found no studies that had evaluated the effects of reduced heat from vehicles on urban temperatures, but less heat emitted in cities free of private cars could help to reduce cardio-respiratory problems, especially in children.

Measures are needed to ensure that banning private combustion-engine cars does not shift traffic-related problems to surrounding areas, increase urban sprawl, and create socio-economic divides by making it more difficult for some people to access shops and facilities, which they used to do by private car.

In planning new urban and transport schemes, bringing together planners, environmentalists and public health professionals with policy makers and citizens, is key to public acceptability and successfully guiding the decision-making process. Introducing measures incrementally may help with acceptance and a sequence of pedestrianization, creating cycling tracts, car-free days throughout the year and events to increase appeal and awareness of the measures and benefits.

The researchers also point out that if enough cities become free of private diesel and gasoline cars, there could be a collective reduction in greenhouse gas emissions, which could help to mitigate the effects of climate change.

**Source:** Science for Environment Policy

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## LETTERS

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The BBVA Foundation, in collaboration with the Spanish National Research Council (CSIC) is pleased to announce **the tenth edition of the BBVA Foundation Frontiers of Knowledge Awards**, and to invite you to participate by nominating a candidate or candidates through the institution to which you belong, following the instructions provided in the accompanying call conditions. The same information can be consulted on the Foundation website: [www.fbbva.es/awards](http://www.fbbva.es/awards).

The **BBVA Foundation Frontiers of Knowledge Awards** recognize significant scientific advances of a theoretical, methodological or empirical nature, technological innovations and developments, and the creation of outstanding works of new artistic or interpretative styles in contemporary classical music. Honors also go to diverse endeavors (from research through to practical programs) addressing two core concerns of the global society of the 21<sup>st</sup> century: climate change and development cooperation.

The **BBVA Foundation Frontiers of Knowledge Awards** take in the following eight categories:

**Basic Sciences (Physics, Chemistry, Mathematics); Biomedicine; Ecology;**

**Land Conservation Biology; Information and Communication Technologies; Economics, Finance and Management; Contemporary Music; Climate Change; Development Cooperation.**

The **BBVA Foundation Frontiers of Knowledge Awards** in each category come with €400,000 prize money, a diploma and a commemorative artwork.

Candidates may be one or more natural persons of any nationality, without limitation of number in the case of convergent contributions to a given advance, whether due to a formal collaboration (with the candidates belonging to one or more groups) or parallel working. In the Climate Change and Development Cooperation categories, entries are also open to agencies and organizations in the public or private sector (non-for-profit in the latter case).

It would be an Honor for us to count your organization among those nominating a candidate.

Thank you in advance for your interest and participation.

**Rafael Pardo** (Director)  
BBVA Foundation

**Emilio Lora-Tamayo** (President), CSIC  
Webiste: [www.fbbva.es/awards](http://www.fbbva.es/awards)

Bees along with several species of moths, butterflies, beetles and flies are important insect pollinators that are responsible for pollinating several major agriculturally and horticulturally important crop species, forest and orchard tree species; and numerous wild herbs, shrubs and trees that constitute the core framework of our fragile ecosystems. In addition, some species of birds like the humming birds; and some mammalian species like bats and small rodents are also known to serve as natural pollinators. Of all the pollinator species, native bee species hold special significance since they not only serve as natural pollinators; but also serve as an important natural resource for producing natural honey and bee's wax for the highly profitable bee farming or Apiculture industry globally. Bees and other insect pollinators are, therefore, absolutely important for the global agriculture, horticulture, forestry industries; and for securing the natural ecosystems. However, global bee populations are showing alarming signs of decline due to indiscriminate use of pesticides in agriculture, global warming and climate change, environmental pollution, lack of abundant bee foraging species. Hence bee nutrition to help them survive across seasonal

fluctuations, diseases and parasitic infestations by other predatory insect species. Hence, to secure the future of agriculture and environment, it is absolutely necessary that the vanishing native bee species and other insect pollinators are saved from the dangers of extinction. It is therefore important to establish suitable bee habitats or bee

sanctuaries constituting bee-friendly native herbs, shrubs and trees so that the bees and other insect pollinators could have constant supply of nectar and pollen grains to sustain their hives and are capable of growing their next generations without anthropogenic and natural disturbances. Using pollinator seed mixtures comprising of some

legumes, oil seed plants as well as native and indigenous wildflower plant species can also serve effectively as bee sanctuaries to conserve bees and other insect pollinators.

**Saikat Kumar Basu**  
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## NEWS FLASH

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### **Prof. S.K. Barik, Director CSIR-NBRI and President ISEB**

- Delivered an invited lecture entitled, "Conserving threatened plants" in National Symposium on Current trends in Biological Sciences at Sardar Patel University, Vallabh Vidyanagar, Gujarat on 20<sup>th</sup> January, 2017.
- Was the Guest of Honour and delivered a Special lecture entitled, "Current trends, approaches and perspectives in ethnobiological studies" in the National Seminar on "Ethnobiology and Traditional Knowledge in Biodiversity Conservation - Approaches and Dimensions [ETKBC - 2017] at Assam University, Silchar on 2<sup>nd</sup> February, 2017.
- Delivered Prof. K.S. Bhargava Memorial Lecture at Department of Botany, DDU Gorakhpur University, Gorakhpur on 9<sup>th</sup> February, 2017.
- Delivered a lecture entitled, "Integrated approach to species conservation" in the one-day seminar organized by Department of Botany, Visva-Bharati, Santiniketan, West Bengal on 19<sup>th</sup> February, 2017.
- Was the Chief Guest of the Valedictory function in the National Symposium on "Issues and challenges in Ecological Sciences" at Department of Botany, Banaras Hindu University, Varanasi on 25<sup>th</sup> February, 2017.
- Delivered Plenary Talk and Chaired, plenary session in the Fourth Lucknow Science Congress at Babasaheb Bhimrao Ambedkar University on 4<sup>th</sup> March, 2017.

**Dr. R.D. Tripathi**, Ex-Chief Scientist, CSIR-NBRI & Emeritus Scientist CSIR and Additional Secretary, ISEB attended "International Symposium on Plant Biotechnology for Crop Improvement" at Indian Institute of Technology Guwahati, Assam during January 20-21, 2017 and gave Plenary Talk on "Strategies for reducing arsenic levels in soil and crop for sustainable environment and agriculture".

Dr. Tripathi, also gave an invited talk on "Bioremediation and Molecular approaches for reducing Arsenic contamination for sustainable environment" and chaired a session on 'Environmental Microbiology and Biotechnology' in the 4<sup>th</sup> Lucknow Science Congress at Babasaheb Bhimrao Ambedkar University on 3<sup>rd</sup> March, 2017.

**Prof. Pramod W Ramteke**, Dean, Post Graduate Studies and Head, Department of Biological Sciences, Sam Higginbottom University of Agriculture, Technology & Sciences, Allahabad, U.P. (India), and a Life member of International Society of Environmental Botanists (ISEB) delivered an invited lecture on "Plant growth promoting rhizobacteria (PGPR) in sustainable cultivation of medicinal plants" at the National Conference on Development and Advancement in conservation, propagation and Sustainable utilization of medicinal plants (DSUMP 2017) held during January 20-21, 2017 at Gautam Budha University, Greater Noida (India).

He also delivered another invited lecture at the International Conference on Technological Advancement for Sustainable Agriculture and Rural Development (TASARD 2017), entitled "Rhizobacteria in Sustainable Agriculture Development" held at NASC, New Delhi during 20-22 February, 2017.

**Dr. Pankaj Srivastava**, Research Associate at ICAR-Indian Institute of Soil & Water Conservation (IISWC), Dehradun (India) and a Life Member of International Society of Environmental Botanists (ISEB) has won the best poster Award for the poster presentation, entitled "Enzymatic and Microbial status in different phases of degradation" at the Conference on Farmers First for Conserving Soil and Water Resources in North Eastern Region, Assam Agriculture University (AAU), Khanapara, Guwahati, Assam held during 9-11 February, 2017.

**Dr. Neelima Jerath**, Life member of International Society of Environmental Botanists has joined as Pro Vice Chancellor of Desh Bhagat University, Punjab (a private University at Mandi Gobindgarh near Ludhiana) after her retirement as Executive Director,

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Punjab State Council for S&T and Director General, Pushpa Gujral Science City, Punjab (and Ex-officio Member Secretary of Punjab Biodiversity Board & Punjab Innovation Council).

**Dr. Sudhakar Srivastava**, Assistant Professor, IESD, BHU Varanasi and a Life member of International Society of Environmental Botanists (ISEB) participated in the National Conference on “Emerging Scenarios of Ganga River Development & Water Resource Management”, jointly organized by Mahamana Malviya Research Centre for Ganga River Development and Water Resource Management (MMRCGRDWRM) and Institute of Environment and Sustainable Development (IESD) during 28<sup>th</sup> February to 1<sup>st</sup> March, 2017, at Banaras Hindu University. Dr. Srivastava was also the Joint Organizing Secretary of the Conference.

### WELCOME NEW LIFE MEMBERS

**Dr. Rajesh K. Tewari**, Associate Professor, Department of Botany, University of Lucknow, Lucknow.  
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**Mr. Arnab Majumdar**, Junior Research Fellow, Department of Earth Sciences, Indian Institute of Science Education and Research, Kolkata.  
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### Let's save the self from self-inflicted pollution

**R. K. Kohli, FNA**

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Man by nature wants to lead a comfortable, healthy, long life. This is possible through development. If we do not develop or develop very slow, we may not have access to several things, products and facilities that are needed for making our life comfortable. On the contrary, if we develop very fast, we will have to face problems like air-, water- and noise- pollution, social disparities, congestion, resource depletion and unrest. So we have to look for sustainable way of development/growth.

We tend to accuse industry and vehicles for environmental problems and the government machinery for inaction. We tend to accuse others, little realizing that our own actions are more harmful than those caused by others. We have hardly realized our own contribution towards inviting problems for the self. Instead of becoming a part of the solution we end-up becoming a part of the problem for the self. I propose to share as to how we normally inflict ourselves with pollution and suggest as to what we should save ourselves from it. About 80% of our lives are spent indoors – homes, labs, workplaces etc. So, what-so-ever we do in our houses or workplaces is bound to

affect us more than the pollution outdoor.

Today, without doubt, we are in the age of chemicals. We can't think of anything (food, cosmetics, wearable, medicines etc) that is devoid of chemicals. Daily new products/brands are added to the market. Due to vigorous advertising, we get tempted to the new product. At the same time, we remain worried about the diseases like cancer, heart failure, birth-defects and nervous disorders. It all depends on ones attitude as to which type of life one wants to lead. The risks of our actions and likings depend on (a) genetic makeup and (b) product of dose and exposure of the body to the toxic substance we use. It is up to us to measure the risk to benefit ratio of our action. Some risks like dying the hair, smoking are under our control, while others like depletion of ozone in the stratosphere or global warming or pesticide buildup in the food products are not in our individual hands. The resistance or susceptibility of the body depends on the genetic make-up that our parents have given to us, our body weight, stage and dose of the toxic material we get exposed to and of course

our lifestyle. In this write-up I try to touch upon some such actions which are exclusively in our own hands.

#### What we generally do:

Many of our houses, in strict sense, are more or less places of Pollution. Such houses are termed as Sick-home-syndromes”. In such houses we lay wall-to-wall carpets. These carpets are meant for temperate climates, free of dust. We largely being in the tropical/sub-tropical zone do not need such hygroscopic fibrous flooring that retains humidity and serves as a store-house of microbial/fungal spores and carpet mites. The micro dust serves as RSPM (respirable particulate matter which is most dangerous for our lung function). Likewise, our houses have large windows which we hardly open for fresh air. Instead, we keep them covered with thick double curtains and do not let in even the sunlight. During dry summers we use desert coolers whose stale water is hardly changed and that serves as a source of microbial spores, pollen grains and trichomes from outside into the room. For use, without taking care we switch on the fan and invite the pollutants inside the room. We should switch on the water

first and then the fan. For switching off the cooler, same sequence i.e. water followed by fan is better.

Many of us do not mind smoking cigarettes inside our homes, thereby, polluting indoor air and endangering the lives of our family members by making them “passive smokers”. Some do not stop tobacco smoking and chewing, in spite of vigorous campaigning against it by the Government. Perhaps even educated people do not know that tobacco contains 43 carcinogens (cancer causing chemicals) of class A (known to cause cancer in human beings) as per EPA (Environment Protection Agency of USA).

In order to keep slim many of us prefer to avoid intake of sugar and opt for artificial sweeteners containing aspartyl

phenylalanine or saccharine. The safety of use of such artificial sweeteners is very controversial. Prolonged use is harmful. Likewise, we do not mind talking for very long on cell phones fixing it directly on to the ears or keeping in our chest pocket, little realizing the bad effect of electromagnetic frequency radiations like those of microwave. We eat sweets with silver-foil adhered on its surface, little knowing that it is less of silver, more of lead and aluminum – excess of which leads to avoidable toxicity. Similarly, we are fond of tinned food including juices and soups. The seam of the tin-container is impregnated with lead to check the leakage. The lead ions in acidic medium get dissolved in the food. Intake of such food leads to lead toxicity.

Food shiners, polishing dyes are nothing but the waxes and synthetic food colours (*gulabi, hari, jamuni burfi* etc.) that attract us are mostly the azo dyes known to cause cancer and genetic disorders. The face-paints that our youth is fond of for seeking attention especially during cricket matches or participating in “face-paint competitions” are dissolved in dangerous organic solvents like benzene (known for causing Leukemia – a type of blood cancer), xylene (dries out skin causing blisters), toluene (causes skin irritation). These also contain lot of lead that is known for lowering intelligence and cognitive power. Other sources of lead are gasoline, lead adulterated tin-plating, soldering, batteries, joints of water pipes etc.

#### Some Common adultrants of foods:

Foods	Adultrants
Cereals (wheat and rice)	Mud, grit, soapstone
Dals - Pulses	Kesari Dal, Metanil yellow (dye)
Haldi powder	Lead chromate
Dhania powder	Powdered cattle dung, horse-dung, starch
Black pepper	Dried papaya seeds
Red Chilli powder	Saw dust, brick powder
Mustard seeds	Argemone seeds
Edible oils	Cheaper oils like mineral oils, argemone seed oil
Milk	Water, extract fat, addition of starch
Honey	Jaggery / sugar
Vanaspati ghee	Paraffin wax, hydrocarbon
Pure ghee	Vanaspati, Paraffin wax,
Food grains	Ergot, Dhatura seeds
Soap	Marble powder

#### Some common practices in food industry:

- Free use of unpermitted synthetic colours like bright green, orange, pink and even brown for brightening up the edible product.
- Toxin, Lead chromate is added to “khoya”.
- Adultrant like Orange II and Rhodamin-B are used in Rasgulla, halwa despite the ban.
- Metinil yellow is used in ice-creams, laddoos, jalebies, biryani etc.
- Green dye is used to color saunf (fennel)

- Roasted channas are rolled into yellow dye used to colour pagries
  - Lead chromate is used for coloring pea, caspicum, lady's finger etc
  - Chicken corners color the chicken tikka etc to give a blood color despite prohibition under PFA Act-1954
- To ward off crawling insects like cockroaches we prefer to Permethrine containing products which though work like natural plant product, Pyrethrin but is regarded as carcinogen of group C (EPA). Most of us do not fail to apply hair dye on to our heads, for deceiving others of our age. Most of the

hair colors / dyes contain Ammonia, Hydrogen peroxide (for initial bleaching of hair), Sodium Lauryl Sulphate (Protein Precipitant) and lead that causes lead toxicity. To keep the contents creamy, most of the cosmetic creams contain ethylene glycol (which is break oil) as anti-freezing agent and hydroquinone that causes allergy, blurred vision and slows reflective movements apart from causing fatigue. Some of the sun-screen lotions and beauty cream for making the stem fairer have such elements that disturb hormonal balance and consequential

Holi Color	Composition	Possible health effects
Gulal	Mica, glass sand	Corneal abrasion, loss of memory, eye-sight corneal ulcer
Black	Lead Oxide	Renal failure, learning disability
Green	Copper Sulphate	Temporary blindness, Eye Allergy
Purple	Chromium Iodide	Bronchial Asthma, high BP, kidney damage
Silver	Aluminium Bromide	Alzheimer's and cancer

health problems. During Holi festival, the coloured powders we use are a source of heavy metal toxicity

Whom do we paint? We paint our friends and relatives and get painted. Why not to prepare our own Holi

Colors? Some possible hints include, *Arrow root, Talcum powder, wheat flour, 'multani mitti', turmeric powder, sandal wood, extracts of marigold, amaltas petals, indigo-blue, beet-roots, mint, coriander, rose petals.*

#### Some tips for healthy living:

Safe Remedies: Instead of using the organic/synthetic pesticides at homes, we should follow the following tips for controlling different categories of pests.

Ants	Squeeze lemon juice at pt. of entry and, leave the peel there ; use chalk powder, damp coffee, charcoal dust, haldi (turmeric) or pepper
Cockroach	Put boric acid in cracks / holes switch boards etc. and plug them. Trap by greasing inner side of wide mouth bottle with potato or stale wine; hang naphthalene ball in the kitchen/bathroom-drains or simply cover the drains with some material like wood or stone
House fly	Paste honey on a piece of yellow cardboard and hang it. Housefly will stick to it. Or make the room dark leaving a slit of the door or window open and shoo the flies out.
Silver fish	Use borax in book racks, wardrobes. Boric acid is safe for vertebrates
Stored food pests	dry food and store in air tight container or add boric acid powder or mix
Mosquito	Terminator with UV-A lamp, mosquito net, bath before retiring

#### We should avoid the following:

- Drinking or bathing in chlorinated water and first flush of tap water to avoid bleaching of hair.
- In northern Indian belt, fluoridated tooth paste or better change brands every month to avoid fluorosis.
- Excessive use of cell-phone direct on the ear (*use ear-phone*); for long talks prefer landline.
- Ajenomoto / Ascent (tastemaker), synthetic colored foods, highly spicy food, Tinned food, food deep-refried in same cooking oil.
- Smoking of tobacco and excessive hard liquor.

- Storing food in polythene and plastic container especially the oily cooked food.
- Eating salad in Restaurants.
- Using cheap cosmetics (better make your own).
- Laying carpets especially in summers and rainy seasons.
- Using cheap holi gulal (better make your own).

#### Some substitutes of beauty products:

- Besan—a very good Cleanser;
- Haldi—a good natural disinfectant.
- Milk Cream- replenishes body oil;
- Honey—a strong cleanser, nourisher and healer.

- Glycerin with rose water is a good moisturizer.
- Multani mitti (Fullers earth) removes dead cells of the skin.
- Sandal wood improves skin texture; Natural oil nourishes body skin; Un-boiled milk has a strong cleansing power.
- Neem datun saves infection in buccal cavity.
- Hair cleansing with Reetha, Amla and shikakai.
- Fruits and vegetables good source of vitamins, minerals and medium of removing wastes from body.
- Drinking clean water is the best for getting rid of toxins of the body.

## Alien plant invasion: An Indian Perspective

R. S. Tripathi, FNA

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The importance of plant invasions in the transformation of landscapes did not escape the attention of Victorian biologists including Darwin and Wallace. Darwin (1872) pointed to the rapid spread of alien cardoon (*Cynara*

*cardunculus*) and a tall thistle (*Silybum marianum*) in Argentina, and Wallace (1905) reported abundant growth and distribution of alien *Rumex acetosella* in New Zealand. In recent times, the problem of invasion by alien plant

species has become a matter of great concern all over the world. The migration of plant species from one geographical region to another across natural barriers such as high mountains, seas, and oceans has been taking place

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since time immemorial, but the movement of plant species through natural dispersal agents has been rather slow. However, with globalization there has been a phenomenal increase in trade, tourism, travel and other human activities, and this has caused both intentional and unintentional introduction of species from one country to another at a pace that was never witnessed before (Tripathi 2009). If a plant species arrives in a territory where the habitat conditions are similar to those of its native place, it germinates, survives, grows, reproduces, and produces self-sustaining populations in natural and semi-natural ecosystems in the course of time. Many exotic species may grow luxuriantly in the new environment, expand their range of distribution at a fast rate, and even pose a serious threat to the native species of the invaded area. These alien invasive species are characterized by rapid growth, high reproductive capacity, efficient dispersal mechanism, strong competitive ability, and ability to adapt physiologically to new environmental conditions. Thus, they are able to cope successfully with the biological and physical conditions of the invaded territory.

The problem of biological invasion has been recognized by the Scientific Committee on the Problems of the Environment (SCOPE) as central problem in the conservation of biological communities. Invasive alien plants have serious ecological implications for the conservation of native biodiversity, maintenance of plant community structure, plant succession, and ecosystem processes in the areas invaded by them. The problem of plant invasion has engaged the attention of ecologists, conservationists, and environmentalists all over the world over the past 4 to 5 decades, especially after the launch of the Global Invasive Species Programme (GISP) by SCOPE. However, in India, so far the problem of

plant invasion has not been addressed adequately, although in India too, several exotic plants have invaded the high-value biodiversity areas and have adversely affected the natural and semi-natural ecosystems.

### **Alien Plant Invasion in India**

The extent of distribution, rate of spread, and persistence of invasive alien species directly influence the native biodiversity of an invaded region, therefore, the trends in invasion by alien species have been identified as an important indicator of the loss of biodiversity. Biological invasion is one of the major threats to biodiversity, next only to habitat destruction. In northeast India invasion of plant species is triggered by human-induced habitat fragmentation, land degradation, forest degradation, land-use and land-cover changes, Jhum cultivation and other kinds of anthropogenic stresses that impact natural ecosystems. Studies on population dynamics and growth of a number of exotic species such as *Chromolaena odorata*, *Ageratina adenophora*, *Ageratina riparia*, and *Imperata cylindrica* in relation to burning, age of "jhum" fallows, associated vegetation, varied density and light regimes, and soil conditions have clearly revealed that these weeds are particularly successful in disturbed habitats (Tripathi 1985). The facilitative effect of these drivers on plant invasion may presumably be mediated through the reduction in various kinds of biotic and physical resistances that would have been offered by the undisturbed host plant community. The quantification of the extent of influence exercised by different kinds of environmental resistances to an invading plant species in a host community could be a very challenging area of ecological study. Apart from causing depletion of native biodiversity, invasive alien species alter species composition of plant communities, affect physical, chemical and biological properties of soil, and

affect the plant community development and ecosystem processes adversely, but reliable quantitative data available on these aspects are few and far between. The effects of invasive alien species on the distribution, abundance, and population dynamics of native plant species in natural ecosystems, hydrology, soil biology, and ecosystem process need to be studied in detail. In India, a good number of high-value biodiversity sites have been invaded by invasive alien plants but unfortunately, studies on the biology of plant invasion are rather scanty. The biology and population dynamics of a number of exotic weeds were studied by the author and his collaborators in the department of botany at North-Eastern Hill University, Shillong, Meghalaya, from the 1980s onwards. Research on weed biology has also been conducted at several other universities and research organizations in India, but the plant invasion perspective is missing in most of these studies.

There is every likelihood that invasive alien species would adversely affect vegetation pattern and processes by progressively replacing existing indigenous flora in not only high value biodiversity areas such as the northeastern region of India and the Western Ghats but also in other parts of the country. Adhikari, Tiwari and Barik (2015) identified the hotspots of alien species invasion in India through Ecological Niche Modelling (ENM) using species occurrence data of IAS from the Global Biodiversity Information Facility (GBIF). About 49% of the total geographical land area of India was predicted to be prone to invasion at moderate to high levels of climatic suitability. According to this study, nineteen of 47 eco-regions of India harboured invasion hotspots. Most ecologically sensitive regions of India, including the "biodiversity hotspots" and coastal regions coincide with invasion hotspots, indicating their vulnerability to alien plant invasion.

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The intersection of anthropogenic biomass and ecoregions with the regions of 'high' climatic suitability was classified as hotspot of alien plant invasion.

ENM has also been proved to be a powerful tool in predicting the invasion potential of specific IAS under different climate change scenarios (Barik and Adhikari, 2011). Such knowledge base is crucial for guiding the formulation of an effective policy and management strategy for controlling the invasive alien species.

### Important aspects related to plant invasion

Some of the interesting aspects and exciting points emerging as a result of analysis and synthesis of the scientific information gathered on the ecology of plant invasion (Tripathi 2009, 2013) are presented below:

- Genetic changes are likely to occur in a species subsequent to invasion in a new region, and these changes may hold the key to its success in the invaded land. An invading species that colonizes a novel environment has to face a genetic challenge, because it has not experienced the selective pressures presented by the new environment. Despite this, most alien species become successful invaders, although they have to face challenges from the already well-adapted native species. Biologists need to find out the underlying mechanisms and processes that make the invading species so successful in their new environments.
- Invasive alien species (e.g., *Eupatorium odoratum*) are intrinsically better competitors than the native species. And so they offer strong competition and pose a serious threat to native species in the invaded region (Yadav and Tripathi 1981). The native species of an area show a

decline in resource use, and the invaders can increase their distribution and abundance at the expense of the resident species. This may cause a drastic reduction in the population size of several native species and some of them may even be eliminated from their natural habitats.

- Most invasive plant species possess high phenotypic plasticity (Rai and Tripathi 1983) coupled with hybridization capacity and highly efficient reproductive strategies. Rai and Tripathi (1983) have reported that in case of *Galinsoga ciliata* and *Galinsoga parviflora* the reproductive effort showed considerable plasticity, but it is maintained at a fairly high level even under the stressed ecological conditions. Their populations are characterized by the presence of at least three seedling cohorts, which emerge at different times, and these seedling cohorts differ in their half-life, survivorship, and seed output (Rai and Tripathi 1984). This adds to their level of plasticity and contributes to their adaptability, ecological success, and ability to invade new areas.
- Many invasive plant species, for example, *Ageratina riparia* or *Eupatorium riparium* (Rai and Tripathi 1984), *Parthenium hysterophorus*, *Chromolaena odorata*, and *Ageratina adenophora* (Tripathi et al. 2012), release chemical compounds into the environment, which are not generally harmful to them, but those chemicals suppress the growth of other species growing in the close proximity of invasive species. This negative effect (often referred to as an allelopathic effect) of invaders on the native species confers a tremendous competitive advantage on the former. The "chemical release"

hypothesis offers a plausible explanation for the spectacular success of invasive plant species in the areas that they invade.

- The herbivores and parasites or pathogens, the natural enemies of invasive species, that were regulating the population growth of invaders in their native place are absent in an invaded region. Invading species generally arrive in new environments without their co-evolved natural enemies from their natural habitats. This may provide invaders opportunities for luxuriant growth and more prolific reproduction, which allow them to outcompete native species and expand their range of distribution. This is the basis of the so-called "enemy release" or "escape" hypothesis, which is employed to explain the spectacular success of invasive alien plants in new environments.

The aforementioned hypotheses or approaches explain why and how alien species become more successful in the invaded land compared to their native place. It may be mentioned that the majority of studies on invasive alien species have been conducted in the invaded territory and surprisingly, we do not have any quantification regarding their abundance, competitive success, aggressiveness, and response to natural enemies in their native land. The soundness of these "invasion hypotheses" can be tested only when we apply a comparative biogeographical approach towards the problem of biological invasion and have sufficient relevant data on invasive alien plants from their native as well as invaded regions. In one of his earlier articles, Tripathi (1985) emphasized that a comparative study of population behavior, individual fitness, and reproductive strategies of invasive alien species in their countries of origin and in the invaded territory could be quite revealing and rewarding.



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## Genetic Diversity and Invasibility of Alien Plants

For any species to become successful in a new environment, it is essential that the species genetically adapts itself to its new environment. It may also be mentioned here that preserving genetic diversity is absolutely necessary for a species to continually adapt genetically to a changing environments. Therefore, investigating the genetic adaptability of invasive alien plant species in the new environments should also be an issue of focus for population ecologists and conservation biologists.

Greater genetic diversity may lead to greater phenotypic variation and adaptability. The greater overall heterozygosity may increase population fitness and reduce genetic bottlenecks that can limit the adaptive evolution of fitness-related traits. Therefore, invasive populations with greater genetic diversity may be at an evolutionary advantage, and there are a number of examples of invasive species that have adapted to evolve adaptive traits in their introduced range. Intra-specific genetic diversity of plant populations is an important factor shaping the diversity and structure of communities, and thus, it is also important for assessing the impact of invasive species on organisms of higher trophic levels. Genetic diversity influences invasion success, however, the increase in invasibility of alien plants vis-à-vis their genetic diversity needs to be tested empirically under varied ecological conditions of India.

### Invasive Alien Plants and Ecosystem Processes

As mentioned earlier, invasive alien species cause depletion in native biodiversity the components of which are well adapted to their physical environment and interactions among themselves. As and when some of the native species are lost, the subtle interactions which contributed to the development of a distinct plant

community and ecosystem structure are disturbed and this may affect ecosystem processes. The complex communities comprising both plant and animal species become simpler, food chain is shortened and food web complexity is reduced. Thus invasive alien species can cause changes in the food web architecture, which provides one of the mechanisms by which ecosystem processes are altered. There could be three pathways underlying the mechanism: (a) trophic cascades in which invasive species may reduce populations of consumers that transport nutrients between habitats reducing inputs and within-system cycling; (b) invasive alien plants producing such secondary metabolites which can adversely affect the species composition and abundance of detritivores, may alter the litter decomposition rates; (c) litter of invasive alien plants could be either less or more palatable to decomposers than the native species, and this may change the litter decomposition rates and nutrient cycling in the ecosystem.

### The way forward

Like climate change the problem of alien plant invasion needs to be addressed very seriously. Indeed, the problem has been engaging the attention of ecologists all over the globe. The economic and ecological costs associated with the invasion of alien plants are indeed staggering. However, in India, so far the problem of alien plant invasion has not been adequately addressed.

There is a strong need for undertaking long-term research programs on different aspects of alien plant invasion in a network mode covering the entire length and breadth of India, as the problem of invasive alien plants is already quite alarming in this country and it is going to further worsen during the next few decades from now. In view of the enormity of the alien plant invasion problem in this country, the

researches related to this subject must be accorded high priority. Aspects of alien plant invasion that need to be addressed on urgent basis are:

- (a) Monitoring the distribution, rates of invasion and population dynamics of invasive alien species under the climate change scenario.
- (b) Pathways of alien species invasion,
- (c) Identifying the hotspots of invasive alien species in India through Ecological Niche Modelling using species occurrence data, and predicting vulnerability of ecological habitats and ecosystems to alien species invasion,
- (d) Impact of invasive alien species on native biodiversity, plant community structure, natural succession and ecosystem processes,
- (e) Impact of alien plant invasion on the diversity and abundance of soil microbes and its implications for nutrient cycling in the ecosystem.
- (f) Bio-prospecting of invasive alien plants emphasizing particularly on the possibility of exploiting their secondary metabolites (e.g. allelochemicals) for producing natural pesticides and drugs.

In view of the various ecological implications of alien plant invasion, there is a need to launch a national website on biological invasion, set up regional biological centres across the country, and create a national biological invasion authority which should cover the entire gamut of problems associated with biological invasion. As the invasion by alien plant species is more conspicuous and serious in India, the proposed authority, initially, could lay a greater emphasis on invasive alien plants than the alien animals.

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## NEWS AND VIEWS

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### Garden grass could become a source of cheap and clean renewable energy

A team of UK researchers, including experts from Cardiff University's Cardiff Catalysis Institute, have shown that significant amounts of hydrogen can be unlocked from fescue grass with the help of sunlight and a cheap catalyst. It is the first time that this method has been demonstrated and could potentially lead to a sustainable way of producing hydrogen, which has enormous potential in the renewable energy industry due to its high energy content and the fact that it does not release toxic or greenhouse gases when it is burnt. This really is a green source of energy. Hydrogen is seen as an important future energy carrier as the world moves from fossil fuels to renewable feed stocks, and our research has shown that even garden grass could be a good way of getting hold of it.

Hydrogen is contained in enormous quantities all over in the world in water, hydrocarbons and other organic matter. Up until now, the challenge for researchers has been devising ways of unlocking hydrogen from these sources in a cheap, efficient and sustainable way. A promising source of hydrogen is the organic compound cellulose, which is a key component of plants and the most abundant biopolymer on Earth.

In the study, the team researchers investigated the possibility of converting cellulose into hydrogen using sunlight and a simple catalyst – a substance which speeds up a chemical reaction without getting used up. This process is called photoreforming or photocatalysis and involves into hydrogen. The researchers studied the effectiveness of three metal-based catalysts – Palladium, Gold and Nickel.

Nickel was of particular interest to the researchers, from a practical point of view, as it is a much more earth-abundant metal than the precious

metals, and is more economical. In the first round of experiments, the researchers combined the three catalysts with cellulose in a round bottom flask and subjected the mixture to light from a desk lamp. At 30 minutes intervals the researchers collected gas samples from the mixture and analysed it to see how much hydrogen was being produced. To test the practical applications of this reaction, the researchers repeated the experiment with fescue grass, which was obtained from a domestic garden.

Researchers say up until recently, the production of hydrogen from cellulose by means of photocatalysis has not been extensively studied. Results show that significant amounts of hydrogen can be produced using this method with the help of a bit of sunlight and a cheap catalyst.

Furthermore, they demonstrated the effectiveness of the process using real grass taken from a garden. This is the first time that this kind of raw biomass has been used to produce hydrogen in this way. This is significant as it avoids the need to separate and purify cellulose from a sample, which can be both arduous and costly."

**Source:** News from Cardiff University.

### Shocking Facts about the Health Dangers of Wi-Fi

Wi-Fi is convenient but many have raised doubts concerning the safety of unseen forces that permeate everything around us. Since the introduction of Wi-Fi in 1997, researchers have performed dozens of studies to explore the subject. The results are clear and shocking — Wi-Fi can negatively affect overall health and brain health, especially in children.

Perhaps most shocking is that this information is not new or even that controversial. In fact, in 2008, the well known publication *Scientific American* ran a piece called "Mind Control by Cell Phone" which explained the danger Wi-Fi has on the human brain.

Let's further explore the potential dangers of Wi-Fi with these 10 facts.

### Contributes to the Development of Insomnia

We feel more awake after using Wi-Fi and even struggle to sleep through the night. Reports of these phenomena have been frequent and even prompted a study in 2007 that evaluated low-frequency modulation from cell phones and its impact on sleep. Participants were exposed to the electromagnetic signals from real phones or no signal from fake phones. Those exposed to the electromagnetic radiation had a significantly more difficult time falling asleep and changes in brainwave patterns were observed.

It's been suggested that sleeping near a phone, in a home with Wi-Fi, or in an apartment building with many Wi-Fi signals can create chronic sleep problems as the constant bombardment of Wi-Fi pollution interferes with falling asleep and sleep patterns. For many, sleep deprivation is just the start for larger problems. The development of depression and hypertension have also been linked to inadequate sleep.

### Damaging to Childhood Development

Exposure to non-thermal radio frequency radiation from Wi-Fi and cellular phones can disrupt normal cellular development, especially fetal development. A 2004 animal study linked exposure to delayed kidney development. These findings were supported by a 2009 Austrian study. In fact, the disruption of protein synthesis is so severe that authors specifically noted, "This cell property is especially pronounced in growing tissues, that is, in children and youth. Consequently, these population groups would be more susceptible than average to the described effects." In short, bathing the developmentally young in Wi-Fi increases their risk of developmental issues.

## Affects Cell Growth

When a group of Danish ninth graders experienced difficulty concentrating after sleeping with their cell phones by their head, they performed an experiment to test the effect of wireless Wi-Fi routers on garden cress. One set of plants was grown in a room free of wireless radiation; the other group grew next to two routers that released the same amount of radiation as a cell phone. The results? The plants nearest the radiation didn't grow.

## Derails Brain Function

Just as the Danish high schoolers noticed problems with concentration, scientists have begun to look at the impact of 4G radiation on brain function. Using MRI technology, research performed just last year found that persons exposed to 4G radiation had several areas of reduced brain activity.

## Reduces Brain Activity in Females

A group of 30 healthy volunteers, 15 men and 15 women, were given a simple memory test. First, the entire group was tested without any exposure to Wi-Fi radiation — no problem. Then, they were exposed to 2.4 GHz Wi-Fi from a wireless access point for about 45 minutes. During that portion of the testing, brain activity was measured and the women had a noticeable change in brain activity and energy levels.

## May Impact Fertility

The results of an animal study suggest that some wireless frequencies may prevent egg implantation. During the study, mice exposed 2 hours a day for 45 days had significantly increased oxidative stress levels. The cellular damage and impact on DNA structure from exposure suggest a strong possibility of abnormal pregnancy or failure of the egg to implant. The Karolinska Institute in Sweden released a warning in 2011, stating: Pregnant women are cautioned to avoid using wireless devices themselves and distance themselves from other users.

## Provokes Cardiac Stress

If you think your heart races when surrounded by wireless networks or 3G

or LTE cell phones, it may not be in your head. A study involving 69 subjects reported that many of them experienced a real physical response to electromagnetic frequencies. Exactly what was the physical response? Increased heart rate — similar to the heart rate of an individual under stress.

## Linked to Cancer?

This is extremely controversial but we can't ignore that plenty of animal models indicate that exposure to electromagnetic radiation increases the risk of tumor development. While human studies are rare, reports and case studies abound. One such case involves a young 21-year-old woman who developed breast cancer. What makes this case unique was that her family did not have a predisposition to breast cancer and she developed the tumor right on the spot she carried her cell phone in her bra.

## You Can Protect Yourself

Although mainstream outlets may ignore the proven dangers, and researchers have identified several methods that can offer a level of defense. First off, reduced melatonin seems to correspond with exposure. Thus, increasing melatonin through supplementation may help offset some of the effects. In animal tests, L-Carnitine provides antioxidant support for nutrients negatively affected by 2.4 GHz radiation.

## Limiting Exposure and Staying Healthy

Although melatonin and L-Carnitine offer a nutritional defense, they don't block exposure. And that's very hard to accomplish anyway. Look at coverage maps from cell phone companies, or notice how many Wi-Fi networks your smart phone prompts for you to join. We're surrounded and bombarded by electromagnetic radiation. Blocking exposure is difficult but there are a few small steps you can take. For one, do not keep cell phones, laptops, and tablets close to your body. And if it's not being used, shut them off (your wireless router too). There are also a number of devices available to counteract electromagnetic frequencies. Check out these ways to protect yourself from laptop radiation and cell phone

radiation, too.

**Source:** Dr. Edward F. Group III, DC, NP, DACBN, DCBCN, DABFM, Founder of Global Healing Center

## Agriculture a major cause of air pollution

Agricultural activities are the dominant source of fine particulate matter (PM<sub>2.5</sub>) in ambient air in Europe, the central US and parts of China, according to a new study from the Earth Institute at Columbia University.

Agricultural air pollution comes mainly in the form of ammonia (NH<sub>3</sub>), which enters the air as a gas from heavily fertilized fields and livestock waste. It blows in over cities, reacts with emissions of oxides of nitrogen (NO<sub>x</sub>) and sulphur (SO<sub>2</sub>) from traffic and industry, and leads to the formation of so-called secondary particles. The combination of intensive agriculture, traffic and industry is unfortunately quite typical for some of the most populated parts of North America, Europe and Asia, which means that these particles are formed where they can cause a lot of damage.

The researchers used a global model to study the origin of fine particulate matter in different regions of the world. They divided the emission sources into three categories: natural, anthropogenic non-agricultural and agricultural. Agricultural emissions were defined as the change that occurred if all agricultural activities were turned on and off.

In Europe, emission precursors from fertilizers and livestock were responsible for 55 per cent of the anthropogenic PM<sub>2.5</sub>. In the US, agricultural emissions represented around half of the human caused emissions. China shows the highest level of agriculture-related PM in absolute figures, and slightly less than half of the anthropogenic PM pollution. India is the only region in the study where agricultural emissions are less significant for PM<sub>2.5</sub> levels in ambient air.

**Source:** The Earth Institute at Columbia University, <http://www.earth.columbia.edu/articles/view/3281>

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12-15 June, 2017; Stockholm, Sweden  
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E-mail: [biomass.conference@etaflorence.it](mailto:biomass.conference@etaflorence.it)

### Rural Development Conference (RDC-2017)

09-11 July, 2017; Bangkok, Thailand  
Contact: Tomorrow People Organization  
Address: Dusana Vukasovica 73  
11000 Belgrade, Serbia  
E-mail: [contact@tomorrowpeople.org](mailto:contact@tomorrowpeople.org)  
Website: <http://www.rdconference.org>

### Annual Congress on Environmental Pollution and Sustainable energy

20-22 July, 2017; Melbourne, Australia  
Contact: Conference Series Ltd.  
2360 Corporate Circle  
Suite 400 Henderson  
NV 89074-7722, USA  
E-mail: [environpollution@earthscienceconferences.com](mailto:environpollution@earthscienceconferences.com)  
Website: <http://pollutioncontrol.conferenceseries.com/asiapacific/>

### 3rd Global Summit on Plant Science

07-09 August, 2017; Rome, Italy  
E-mail: [plantscience@conferenceseries.net](mailto:plantscience@conferenceseries.net)  
Website: <http://plantscience.global-summit.com/>

### 6th International Conference on Environment, Energy and Biotechnology (ICEEB 2017)

20- 22nd August 2017; Kitakyushu, Japan  
Contact: Ms. Lydia Liu  
Conference Secretary  
E-mail: [iceeb@cbees.org](mailto:iceeb@cbees.org)  
Website: <http://www.iceeb.org>

### 12th International Congress of Ecology (INTECOL2017)

20-25 August, 2017; Beijing, China  
Contact: Congress Secretariat  
Shuangqing Road 18, Haidian District  
Beijing, 100085, P. R. China  
Email: [Intecol2017@rcees.ac.cn](mailto:Intecol2017@rcees.ac.cn)  
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### Global Climate Change Congress 2017

24 - 26 August, 2017; Birmingham, United Kingdom  
Website: <http://climatechange.alliedacademies.com>  
Contact person: Helly  
E-mail: [contact@alliedacademies.com](mailto:contact@alliedacademies.com)

### 23rd International Conference on Urban Transport and the Environment

5 - 7 September, 2017; Rome, Italy  
Contact: Stephanie Everest  
Wessex Institute, Ashurst Lodge,  
Ashurst, Southampton, SO 40 7AA  
E-mail: [severest@wessex.ac.uk](mailto:severest@wessex.ac.uk)  
Website: <http://www.wessex.ac.uk/conferences/2017/urban-transport-2017>

### 2<sup>nd</sup> International Conference on Pollution Control and Sustainable Environment

5-6 October, 2017; London, UK  
E-mail: [pollutioncontrol@conferenceseries.net](mailto:pollutioncontrol@conferenceseries.net)  
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