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ICPEP-4

Fourth International Conference on Plants & Environmental Pollution (ICPEP-4)

7-10 February 2010 **Venue: NBRI, Lucknow, India**

Organized by

International Society of Environmental Botanists (ISEB)
&
National Botanical Research Institute (NBRI), Lucknow, India

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- Environews is also supplied in exchange for scientific literature published by reputed organisations.
- All correspondence should be addressed to : **The Secretary, International Society of Environmental Botanists,** National Botanical Research Institute, Lucknow - 226 001 (India).
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LETTERS

Please, pass on my greetings and new e-mail address to everybody whom I met in Lucknow during ICPEP-3 Conference.

Esmira Gasan Alirzayeva
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Baku, **Azerbaijan**
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I hope all is well with you and your colleagues. I have so many happy memories of my visits to Lucknow and the NBRI. I am well and have reached normal UK retirement age, but will be continuing at Imperial College on a part-time basis, however, I will be relinquishing my position as Director of our M.Sc. in Environmental Technology, which I have held for 28 years and after 2500 graduates, of which half are from overseas. My best wishes for the future success of ISEB. I cannot say how pleased I am to see how it grows in strength. There has never been a time when our subject and, in particular, its global dimensions have been of greater importance, with all the problems of food shortages, global change and biodiversity requiring expert botanists in ever growing numbers and with a multi-disciplinary understanding of the complex issues involved.

Prof. Nigel Bell
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Greetings from Chicago-land, IL! It has been quite some time, and I wish to inform all my friends from ISEB that I am still about and have been following many of the activities of the Society.

Two years ago, I moved from Champaign-Urbana to Riverside, Illinois (a near-west suburb of Chicago. Being in the Chicago area, there are many things to do culturally, and I have a great interest in the Art Institute, the Lyric Opera and the botanical gardens**.**

I am still interested to work for ISEB, although I find that my schedule is now just as busy as when I was working at University of Illinois Urbana-Champaign. If there is something that I can do within my limited abilities to assist the Society, please let me know as I want to deserve the honors that the organization has bestowed on me in the past.

Prof. Richard F.E. Crang
Ex-Professor, Department of Plant Biology,
Univ. of Illinois, **U.S.A.**
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(Advisor, ISEB)

A Pew Global Attitudes Project report (http://pewglobal.org/reports/display.php?ReportID=252) found that two-thirds (65%) of Indians who had heard of global warming said they personally worry a great deal about it. (By comparison, only 19% of Americans surveyed identified global warming as an issue worth worrying a great deal about.)

The Pew Research results are rather puzzling given that the green movement in India, compared to the US, is still in its infancy. Unlike the US, where consumer goods companies are struggling to keep up with consumer demand for green (i.e., environmentally benign) products, there are still relatively few green products on the market in India to the best of my knowledge.

India is projected to become the world's third largest economy within the next 20 years. The living standards of most Indians will rise accordingly. Increasingly it seems, the Indian consumer will be caught between wanting to do the right thing by way of the environment, and enjoying a richer (i.e., energy consuming) life. Will Indian consumers be willing to forgo the rewards of hard work for the sake of curtailing global warming?

The answer to this and similar questions would seem to rest largely in the ability of consumer activists to enlist others in their cause. So far, there are signs Indian companies--not consumers, are taking the lead in promoting green awareness.

I am preparing an article about green awareness in India, and wonder whether you or readers of *Environews* would be willing to comment on the relative roles of consumer goods companies and green activists in building environmental awareness in the country.

Randall Frost, Ph.D.
Pleasanton, CA **USA**
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Hope you are as usual busy with the ISEB group I am still in Turkey and continuing my work at my parent University. Last few months were too hectic for me

because I had to complete my part involving 3 books (Biosaline Agriculture and High Salinity Tolerance, Published by Birkhauser Verlag-2008; Environment and Culture in the Mediterranean (In Press with Cambridge Scholars UK) Salinity and Water-Implications for Crop Improvement (In Press with Springer).

I am trying hard for the ICPEP, which is to be held in Turkey in 2009.We have solved the problem of living and meals but no success up till now with the procurement of travel grant. This is the reason we have not opened our website so far.

Prof. Dr. Munir Ozturk
Center for Environmental Studies
Ege University, Bornova, Izmir-**Turkey**
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Department of Biotechnology in association with the National Informatics Centre has now designed and developed a comprehensive web site on Biocontrol Strategies for Eco-Friendly Pest Management (http://www.dbtbiopesticides.nic.in). The site was inaugurated by the Secretary, Department of Biotechnology on 23rd June 2008.

The site provides the information on: Biocontrol Agents; Botanical and Novel Biopesticides; Research Achievements; Upcoming events; Resource Directory of Scientists, Manufactures, Company List; Ongoing and completed projects so far; Referral Laboratories; Guidelines for registering Biopesticides;

As the site is recently hosted, I would request you kindly to have a look on to this web site and give your valuable feedback/suggestions, if any, to email address info.biopest @nic.in.

Dr. Seema Wahab
Adviser, Depart of Biotechnology, Govt. of India, New Delhi, **India**
E-mail: seema@dbt.nic.in

We came across an article "Greening your Environment-Recycle the waste. Make your own compost" by Mr. Jamal Masood, which appeared in Environews (vide ISEB website; http://isebindia.com).We are publishers of "Clean India" Journal, a niche and India's only monthly magazine on cleaning technology, hygiene and maintenance. We feature regular articles on waste management, vermiculture and related issues.

We would like to invite Mr. Masood to contribute articles for publication in the magazine.

Vandana Joshi
Sub Editor, Clean India Journal
Virtual Info Systems Pvt. Ltd., 316, Master Mind-1, Royal Palms, Mayur Nagar, Aarey Milk Colony, Goregaon (E), Mumbai-400065
E-mail <virtualinfosystems@gmail.com>

If I may be of any service in organizing ICPEP-4 conference please feel free to call upon me. I missed the last conference but enjoyed the previous meeting very much.

David A. Grantz, Director
Kearney Agricultural Center, University of California, **U.S.A.**
Plant Physiology-Air Quality Effects
E-mail:. <DAVID@uckac.edu>

I´ve visited your website ***isebindia.com*** and I was wondering if you would like to exchange links with my website, currently I have a Recycling website and I´m looking for other similars like yours. In exchange I'll give you a link from my "Personalcarekiruna Recycling" website (http://www.personalcarekiruna.com/).

Your link will be exactly here:

http://www.personalcarekiruna.com/ (page rank 3, your link will be in Homepage and NOT at links page!!) it´s a recycling and environment website. If you are interested please add to your site the following details for my link:

Title: Waste Collection

Url: http://www.wastecollection.com

Please let me know once it's ready and send me your site details to enable me to do the same for you.

Katie Steven
Webmaster
E-mail: katie.steven@personalcarekiruna.com

As you will recollect we are preparing for an "Int. Conf. on Plants and Environmental Pollution". It is now in the last stages. We expect participation of several Nobel Laureates. The dates have been fixed for the first week of July, 2009. I would like to know if it will be possible for you to move the dates of your 4th Conf. to a later date in 2010, instead of February.

Prof. Dr. Munir Ozturk
Center for Environmental Studies (A Blok)
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On behalf of all the Editors-in-chief of Elsevier Journals, we wish to Communicate to you that we are currently accepting manuscripts in all Fields of human Endeavour. Authors are invited to submit manuscripts

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All submitted papers, if relevant to the theme and objectives of the journal, will go through an external peer-review process. Submissions should include an abstract, 5-10 key words, the e-mail address of the corresponding author. The paper Length should not exceed 30 double-spaced pages including figures and references on 8.5 by 11 inch paper using at least 11 point font. Authors should select a category designation for their manuscripts (article, short communication, review, etc.). Papers should be submitted electronically via email in Microsoft Word or PDF attachments; and should Include a cover sheet containing corresponding Author's name, Paper Title, affiliation, mailing address, phone, fax number, email address etc.

Rex Hammond (Prof.)
E-mail: elsevierjournals@live.co.uk

WELCOME NEW LIFE MEMBERS

Dr. Dharmendra Kumar Gupta is a Scientist at Estacion Experimental Del Zaidin, CSIC, Granada, Spain. After his post graduation from Lucknow University, India in Environmental Sciences, he did Collaborative Ph.D. from National Botanical Research Institute, Lucknow, India and Ehime University, Matsuyama, Japan as a Jawahar Lal Nehru Fellow under the guidance of Prof. Masahiro Inouhe, Dean, Faculty of Science, Ehime University, Japan and Dr. U. N. Rai of NBRI, Lucknow, India and awarded the Ph.D degree from Lucknow University.

After completion of Ph.D. he worked as a Scientist Fellow at NBRI, Lucknow, MASAV Fellow in Israel, Royal Society Fellow (London) at University of York, U.K., Chinese Government Fellow at Zhejiang University, China and Third World Academy of Science, Italy and CNPq Fellow at the University of Santa Maria, Brazil. He has published a number of research papers in various scientific impact Journals. His field of research is Environmental Toxicology and Plant Molecular Physiology.

guptadk1971@gmail.com

Dr. D.S. Jaya is working as a Senior Lecturer in the Department of Environmental Sciences, University of Kerala, Kariavattom Campus, Thiruvananthapuram. After receiving M.Sc Degree in Biochemistry and Ecology & Environment, she started her research work on "Studies on the metabolism of lipids and glyco-conjugates in alcoholism and drug toxicity" under an ICMR Fellowship. She was awarded Ph.D. Degree in Biochemistry in 1993. She was the Principal Investigator of a UGC funded research project.

Dr. Jaya has published 18 research papers in national and international journals and guided ten students for their M.Sc. project work and seven students for their M.Phil theses work. Presently she is supervising nine research students for their Ph.D. work in different aspects of Environmental sciences.

j_ds@rediffmail.com

Dr. Suresh Deka joined Gauhati University for his research work after obtaining M. Sc. Degree in Botany with Specialization in Microbiology from the same University in 1980. He obtained a Ph. D degree for his thesis "Ecology of Root Nodule Bacteria of *Phaseolus aureus* Roxb. with special reference to certain carrier materials".

Dr. Deka visited the University of Ulster, Northern Ireland UK under an overseas programme of DBT, Govt. of India to carry out Post Doctoral Research on Bio-surfactants.

After serving several research and teaching organizations in Assam, he joined as an Assistant Professor in the Resource Management and Environment Division, Institute of Advanced Study in Science and Technology, Guwahati in 2004 and is working there till date. Dr. Deka has completed four projects as Principal Investigator/Co-Principal Investigator. Currently he is steering two research projects as Principal Investigator. Two research scholars have obtained Ph.D. degree under his supervision and four scholars are currently working under his guidance.

<sureshdeka@yahoo.com>

NABARD JOINS ISEB

National Agricultural Bank for Rural Development, Mumbai, India's premier public sector banking institution has joined International Society of Environmental Botanists as an Institutional Member. ISEB welcomes Shri. Sukhbir Singh, Chief General Manager and Shri R.C. Sharma Assistant General Manager to its family.

IHBT JOINS ISEB

Institute of Himalayan Bioresource Technology, Palampur (H.P.), a prestigious CSIR laboratory of the country has joined ISEB as an Institutional Member.

ISEB extends a hearty welcome to IHBT's highly distinguished Director Dr. P.S. Ahuja and his colleagues.

NEWS FLASH

Prof. R.S. Tripathi, FNA (INSA Senior Scientist, NBRI and the Life Member and Advisor, ISEB) has been nominated by the Department of Science & Technology (Ministry of Science and Technology), Government of India, as Member of Core Committee on "National Mission for Sustaining the Himalayan Ecosystem". The Committee has been constituted after the announcement of a National Action Plan on Climate Change and on the direction of the Prime Minister's Office. The tenure of the Committee, is initially for a period of three years.

Prof. Tripathi has also been nominated by the Ministry of Environment & Forests, Government of India, as Member of the Technical Committee on Biodiversity on the recommendation of the Scientific Advisory Committee of the Ministry. The Technical Committee has been set up to guide, review and monitor the performance of the ENVIS Centres established by the Ministry across the country. The tenure of the Technical Committee will be for a period of three years.

Dr. (Mrs.) Seema Mishra, a Research Associate at the National Botanical Research Institute (NBRI), and a Life Member of International Society of Environmental Botanists has been awarded the prestigious, 'Alexander Von Humboldt Fellowship for Postdoctoral researchers'. Under this fellowship she will work on "Time-dependent analysis of arsenic species and phytochelatins in arsenic-sensitive and arsenic-tolerant mutants of *Arabidopsis thaliana*" at Helmholtz Centre for Environmental Research, Leipzig, Germany from January 2009 to December 2011.

Dr. Mishra was awarded Ph.D. degree by Lucknow University in 2007 for her thesis on 'Studies on phytoremediation of toxic metal ions with special reference to metal binding polypeptides in selected plant(s)' supervised by Dr. R.D. Tripathi, a Senior Scientist at NBRI and Prof. (Mrs.) A. Khare of Lucknow University.

Environews reaches Romania

University of Agricultural Sciences and Veterinary Medicine, Cluj-Napoca, Romania has expressed a desire to receive ***Environews*** on gratis and to have an exchange partner agreement with ISEB for regular exchange of publications between the two organizations.

LITERATURE RECEIVED IN EXCHANGE

International Society of Environmental Botanists has received the following publications under the Exchange of Scientific Literature Programme:

1. NOTULAE BOTANICAE HORTIAGROBOTANICI CLUJ-NAPOCA 2008; vol. 36, Issues 1 and 2 Published by the University of Agricultural Sciences and Veterinary Medicine, Cluj-Napoca, **ROMANIA**
2. NCSTC COMMUNICATIONS, February & March 2008 Published by Rashtriya Vigyan Evam Prodyogic Parishad, Department of Science & Technology, New Delhi, **INDIA**
3. PARYAVARAN ABSTRACTS, Vol. 23; Nos. 1-4, 2006 Published quarterly by the Environmental Information Division, Ministry of Environment & Forests, New Delhi, **INDIA**
4. ACID NEWS, No. 2, June 2008 Published by the Swedish NGO Secretariat on Acid Rain, Goteborg, **SWEDEN**
5. BBAU-VOICE, Vol. 1, No. 1 & 2; Vol. 1, No. 3, 2008 Quarterly Newsletter of Babasaheb Bhimrao Ambedkar University, Lucknow, **INDIA**

Effects of Climate Change on Plant Pathogens

USHA MINA[1] AND PARIMAL SINHA[2]
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Introduction

Recent years have witnessed a steady increase in National and International concern over the sustainability of the global environment. Climate change has emerged as the most prominent of the global environment issues. Global climate has changed ever since industrial revolution and by now it is ascertained that major greenhouse gases especially CO_2 increased by 30%. Tropospheric ozone has increased two- to five- folds since the last century. According to IPCC's latest report, global mean temperature would rise between 0.9 and 3.5°C by the year 2100. Speed of climate change and the unpredictability of its characteristics are of great concern with respect to the pathogens, insect pests and weeds that reduce crop yield. The classic disease triangle recognizes the role of climate in plant diseases as no virulent pathogen can induce disease on a highly susceptible host if climatic conditions are not favorable. Climate influences all stages of host and pathogen life cycles as well as development of disease. Disease severity over a period can fluctuate according to climatic variation.

General impacts of climate change on plants

Climate change will influence the geographical distribution and growth of plant species around the world. The magnitude of these impacts would vary depending upon the species involved and their growth patterns, e.g. annual vs perennials, agricultural crop vs natural vegetation, competition, migration, and recovery from disturbances. Therefore, new combinaions of species are likely to evolve. Evidences are now accumulated which suggest that crop production would be affected differently depending on latitude. Although increases in yields are expected at mid and high latitudes, there may be decreases at lower latitudes where food requirements in future will be highest. There are apprehensions that yield gains caused by increased CO_2 could be offset partly or entirely by losses caused by phytophagous insects, plant pathogens and weeds. It is, therefore, important to consider the effect of biotic constraints on crop yields under climate change scenario.

Impact on plant- pathogen systems

Most of the researches on how climate change may affect plant diseases has concentrated on the effects of a single atmospheric constituent or meteorological variables on the host, pathogen, or the interaction of the two under controlled condition. However, interactions are more complex in the real situation, where multiple climatological and biological factors are varying simultaneously in a dynamic environment. Climate change has the potential to modify host physiology and resistance and to alter the stages and rates of development of the pathogen. The most likely impacts would be shift in the geographical distribution of the host and pathogen, change in the physiology of host-pathogen interactions and change in crop losses. New disease complexes may arise and some diseases may cease to be economically important if warming causes a poleward shift of agroclimatic zones and host plant migrate into new regions. Pathogen would be following the migrating hosts and may infect vegetation of natural plant communities not previously exposed to the often more aggressive strains from agricultural crops. Facultative parasites with broad host range may infect plants in their proximity. The mechanism of pathogen dispersal, suitability of the environment for dispersal, survival between seasons, and any change in hostphysiology and ecology in the new environment will largely determine how quickly pathogens become established in a region. Change may occur in the type, amount, and relative importance of pathogens and affect the spectrum of disease affecting particular crop. Plants growing in marginal climate could experience chronic stress that would predispose them to insect and disease out breaks. Warming and other changes could also make plants more vulnerable to damage from pathogens that are currently not important because of unfavourable climate. For example Infection of Eucalyptus by *Phytophthora cinnamomi* is favored in wet soil at temperature of 12 to 30°C, hence the pathogen does not pose a serious threat to the susceptible Eucalyptus spp grown in Southeastern Australia. This situation may change with an increase in temperature due to climate change. As under climate change plants may potentially be unable to migrate or adapt as readily as environmental conditions change. But most pathogens have advantage over plants because of their shorter generation time and in many cases the ability to move readily through wind dispersal. Because of these characteristics, rate of evolution will be highest among pathogens to reduce sensitivity to climate change phenomenon.

Effects of various components of climate change on fungal pathogens

Elevated CO_2: Both enhancement and reduction in disease severity under elevated CO_2 has been reported.

Elevated CO_2 would increase canopy size and density of plants, resulting in a greater biomass production and microclimates may become more conducive for rusts, mildews, leaf spots and blights development. Decomposition of plant litter is important for nutrient cycling and in the saprophytic survival of many pathogens. Because of high C: N ratio of litter as a consequence of plant growth under elevated CO_2, decomposition will be slower. Increased plant biomass, slower decomposition of litter, and higher winter temperature could increase pathogen survival on over-wintering crop residues and increase the amount of initial inoculation available for subsequent infection.

Some fungal pathosystems under elevated CO_2 revealed two important trends. First, delay in the initial establishment of the pathogen because of modifications in pathogen aggressiveness and/or host susceptibility. For example, reduction in the rate of primary penetration of *Eysiphe graminis* on barley and a lengthening of latent period in *Maravalia cryptostegiae* (rubervine rust) has been observed under elevated CO_2. Here, host resistance may have increased because of change in host morphology, physiology, nutrients and water balance. A decrease in stomata density increases resistance to pathogens that penetrate through stomatal. Under elevated CO_2 barley plants were able to mobilize assimilates into defense structures including the formation of papillae and accumulation of silicon at sites of appressorial penetration of *Erysiphe graminis*.

At elevated CO_2, increased partitioning of assimilates to roots occurs consistently in crops such as carrot, sugar beet, and radish. If more carbon is stored in roots, losses from soil-borne diseases of root crops may be reduced under climate change. In contrast, for foliage diseases favored by high temperature and humidity, increases in temperature and precipitation under climate change may result in increased crop loss. The effects of enlarged plant canopies from elevated CO_2 could further increase crop losses from foliar pathogens.

The second important effect is an increase in the fecundity of pathogens under elevated CO_2. Following penetration, established colonies of *Erysiphe graminis* grew faster and sporulation per unit area of infected tissue was increased several-fold under elevated CO_2. It has been also observed that under elevated CO_2 out of the 10 biotrophic pathogens studied, disease severity was enhanced in six and reduced in four and out of 15 necrotrophic pathogens, disease severity increased in nine, reduced in four and remained unchanged in the other two.

Elevated temperature: Increases in temperature can modify host physiology and resistance. Both temperature and the length of exposure are important in determining the effect of climate change on disease severity. Even if the temperature change may be well within the limits of current climatic variability, a modest warming can cause a significant increase in cumulative-temperature above a critical temperature threshold to affect crop physiology and resistance to a disease. Temperature change might lead to appearance of different races of the pathogens hitherto not active but might cause sudden epidemic. Change in temperature will directly influence infection, reproduction, dispersal, and survival between seasons and other critical stages in the life cycle of a pathogen.

At higher temperature, lignification of cell walls increased in forage species and enhanced resistance to fungal pathogens. Impact would, therefore, depend on the nature of the host-pathogen interactions and mechanism of resistance. A rise in temperature above 20°C can inactivate temperature sensitive resistance to stem rust in oat cultivars. Increase in temperature with sufficient soil moisture may increase evapotranspiration resulting in humid microclimate in crop canopy and may lead to incidence of diseases favoured under warm and humid conditions. Some of the soil-borne diseases may increase at the rise of soil temperature. If climate change causes a gradual shift of cropping regions, pathogens will follow their host. Analysis of long-term data of wheat and rice diseases in China has shown trends of an increase in minimum temperatures in association with the abundance of rice blast or wheat scab. In most locations, temperature changes had significant effects on disease development. However, these effects varied between different agro-ecological zones. In cool sub-tropical zones such as Japan and northern China, elevation of ambient temperature resulted in greater risk of blast epidemics. Situations in the humid tropics and warm humid subtropics were opposite to those in cool areas. A lower temperature resulted in greater risk of blast epidemics.

Elevated levels of atmospheric pollutants (ozone and nitrous oxide): Most air pollutants indirectly influence diseases through their effect on host. Ozone induces reactions similar to those normally elicited by viral and other pathogens. Of the 49 bacteria and fungal pathogens examined, exposure to elevated ozone concentration enhanced disease in 25, did not affect 10 and reduced 14. Pollutant concentrations, which inhibit pathogen development, also injure the host. Similarly, infection by plant pathogens can alter

ozone sensitivity of plants. Exposure to 5-10 ppm ozone for a few hours can cause visible injury to sensitive crops like barley, tomato, onion, potato, soybean, tobacco, and wheat.

Plants appear to be less sensitive to nitrous oxide, however, higher concentrations can cause water-soaked lesions, which soon turn brown. Ozone and nitrous oxide injury on plants in turn may add new problem to pathologists in diagnosis. Current climate change scenarios predict a further increase of tropospheric ozone, which is well known to inhibit plant photosynthesis and growth process. Ozone can also predispose plants to enhanced biotic attack, as proposed in particular for necrotrophic fungi, root rot fungi and black beetles. However, at present it does not seem possible to predict whether increased ambient ozone will lead to higher or lower disease likelihood in particular plantpathogen system. Several root pathogens show a preference for stressed trees, although the direct role of ozone is not always evident. Onions injured by ozone exposure were more susceptible to *Botrytis cinerea,* but not to *B. squamosa*. Increased onion yields and reduced dieback when filters removed ambient ozone has been also observed in some experimental studies.

Acid rain: Most studies on the effect of acid rain were done with simulated acid rain since it is not easy to establish experiments under field conditions. In first year of experiment no effect of acid rain has been observed on any of four pathosystems: alfalfa leaf spot, peanut leaf spot (PLS), potato late blight (PLB), and soybean brown spot. In the second year, PLS severity decreased with increasing acidity and the dose response was linear; PLB severity showed a curvilinear response to acid rain.

Elevated ultraviolet B: There is considerable information on the effects of increased UV-B on crops and natural vegetation and on the growth and life cycle of pathogenic organisms such as fungi. Studies indicate that the UV-B component of solar radiation plays a natural regulation on plant diseases. Stimulatory effect of near-UV light on reproduction of many fungi, and spore production in *Leptosphaerulina trifoli* peaks at 287 nm are reported. Fungi differ in their sensitivity to UV-B. Some strains of *Septoria tritici* are more sensitive to UV-B than others and *S. nodorum*, as a species, is more sensitive than *S. tritici*. UV-B radiation can modify the relative composition of phylloplane organisms, such as pink and white yeast. Continued exposure to enhanced UV-B radiation lowers the level of antifungal compounds in foliar parts. UV-B has been shown to reduce tolerance of rice to blast (*Pyricularia grisea*) and although higher UV-B reduced plant biomass and leaf area; there was no increase in blast severity. There are some evidences that sunlight can influence pathogen by causing accumulation of phytoalexins or protective pigments in plant tissues. Therefore, UV-B may affect plant diseases directly via the pathogen or indirectly via the host.

Effects of climate change on viral pathogens

Most of the climate change studies have been conducted on diseases caused by fungal pathogens. Viral diseases mostly have been ignored. Only few studies have reported the response of plants infected with viral diseases to various climate change components. It has been observed that oats infected with Barley yellow dwarf virus (BYDV) showed greater biomass accumulation to CO_2 enrichment than the healthy plant. Tobacco plants grown at increased CO_2 concentrations showed a markedly decreased spread of virus. It appears that CO_2 rise in the air may have some positive effects, which may likely offset the negative effects of virus infection. However, generali-zation is difficult without much information from different virus-host infections.

Average temperature increase of 0.7°C over the last hundred years and average of 6.3 °C predicted by the year 2100 will dramatically affect both mobile (fauna) and immobile (flora) organisms, resulting in both altered and novel forms of interactions between plants, pathogens and their vectors. Most plant viruses are transmitted by vectors and majority by insects. Particularly aphids are expected to react strongly to environmental changes because of their short generation time, low developmental threshold tempera-tures and ability to survive mild winters without winter storms. An increase in the number of insect vectors will inevitably lead to a higher risk for viral infection of plants. The aphid transmissible complex of barley yellow dwarf viruses in cereals and potato virus Y in potato are amenable to show potential effects on the prevalence of infection because of climate change. In mild winters, high intensity of aphid movement during spring and a high frequency of PVY-infected potatoes have been reported. The severity of viral diseases is determined in large part by the amount of inoculums and the time of infection. The amount of virus inoculum is influenced by winter survival of its hosts. For some viruses, higher temperatures also cause more severe symptoms development. Aphids are expected to have increased survival with milder winter temperatures, and higher spring and summer temperatures will increase their development and reproductive rates and lead to more severe disease. Milder winters are also expected to increase survival of alternate weed hosts of viruses. Increases in frequency and intensity of summer

storms with high winds, rain, and hail will increase wounding of plants and result in increased transmission of viruses by mechanical means. Therefore, with predicted changes in climate, viral diseases of plants are expected to increase in importance. Potentially of greater importance will be the effects of diseases caused by newly, introduced viruses that, because of the changed climate, will be able to persist. A warmer climate might also allow viruses that are present in greenhouses, such as Pepino mosaic virus (PepMV), to establish infection in the field. The main effect of temperature in temperate regions is to influence winter survival of vectors. Natural spread of vectors, pests and diseases is accelerated towards the North, as former climate barriers are no longer effective. This results in more severe outbreaks of plant-disease vectors like aphids, white flies, thrips or beetles, an extension of the period of disease infection further into the growing season and also introduction and establishment of new vector species. The described effects on vectors can have severe negative effects on food production or result in an increased use of plant protection products to control the vectors.

Effects of climate change on bacterial pathogens

Milder and shorter winters are expected to have little effect on soil-borne bacterial pathogens, however, survival of host or debris-borne and vector-borne primary inoculum is expected to increase. Soil-borne, bacterial plant pathogens, such as *Agrobacterium tumefaciens*, may build up their populations in host plants and could be released into the soil where they can survive as primary inoculum in the next season. Host or debris-borne bacteria survive on and in host tissues. On perennial hosts, bacteria, such as *Erwinia amylovora* on apple, overwinter on infected host tissue, and primary inoculum is spread from host to host in the next season. On annual hosts, bacteria such as *Pseudomonas syringae* pv. *phaseolicola* may survive in host debris in soil or on the soil surface. Vector-borne bacterial pathogens, such as *Erwinia stewartii*, survive in insect vectors, and these vectors act as the source of primary inoculum in the next season.

Bacterial pathogens, such as *Pseudomonas syringae* pv. *tomato* and *Xanthomonas campestris* pv. *vesicatoria*, arise from infected seed and possibly also survive in debris, soil, and weeds. Bacteria are spread to their host plants mainly by water, usually in the form of rain splash, and insects. In humid, wet conditions, infected plant tissues can exude masses of bacteria that are spread from host to host by rain splash and insects. Therefore, the warmer drier summers expected with climate change should limit bacterial diseases. However, bacteria often enter hosts through wounds and the expected increase in frequency and intensity of summer storms with high winds, rain, and hail will increase wounding of plants and provide moisture for the spread of bacteria.

Effects of climate change on nematodes

Majority of plant-pathogenic nematodes spend part of their lives in soil, and therefore, soil is the source of primary inoculum. Life cycle of a nematode can be completed within 24 weeks under optimum environmental conditions. Tempera-ture is the most important factor, and development is slower with cooler soil temperatures. Warmer soil temperatures are expected to accelerate nematode development, perhaps resulting in additional generations per season, and drier temperatures are expected to increase symptoms of water stress in plants infected with nematodes such as the soybean cyst nematode. Overwintering of nematodes is not expected to be significantly affected by changes in climate, although for some, such as the soybean cyst nematode, egg viability may be reduced in mild winters.

Effects of climate change on disease development due to abiotic stresses

Diseases can also result from indirect effects, where plants have their defenses weakened by an abiotic factor and are predisposed to infection by plant pathogens. Several important plant diseases are initiated by abiotic stresses, including forest decline diseases, which are an example of a disease complex caused by a combination of plant predisposition and a repetitive sequence of plant stresses that weaken a plant to become susceptible to weak pathogens that then can often infect and kill the plant These weak pathogens, called saprogens, are often ubiquitous inhabitants of soil and decaying plant material and, normally, they do not cause disease in healthy, unstressed plants. However, under conditions of environmental stress, plants can become susceptible to these saprogens and their opportunistic infections. One of the more prevalent examples of these saprogens is the girdling fungi of the genus *Armillaria*. As climate changes, new combinations of hoststresssa-progens will be encountered and might give rise to new types of decline diseases, particularly in tree species. In temperate climates, plants that are stressed by biotic or abiotic factors during a growing season are often predisposed to freezing damage during the subsequent winter. Plant diseases associated with interactions of biotic and abiotic stresses, or disease complexes, are a unique and important area of consideration for assessing the influence of climate change on plant diseases. In particular, forest declines are an

example of plant diseases that result from a combination of interacting biotic and abiotic factors. Such diseases are characterized by a variety of disease symptoms and signs, are typically scattered in a random pattern throughout a population within a region, and are often host-specific, although more than one tree species in a region may have its own specific decline symptoms. Decline diseases are one example where a strong association between climate change and disease incidence and (or) severity has already been established in several forest species. Facts of extensive forest declines have been documented in Europe and North America in ash, birch, balsam fir and maple, and a strong relationship was evident between climate warming in the Northern Hemisphere and the onset of crown dieback in 1925, 1937, and 1981 on selected species of northern hardwoods in eastern Canada.

Impact of climate change on disease management

New dimensions of climate change may add extra uncertainty in management strategies for diseases caused by different pathogens. Delayed planting to avoid a pathogen may become less reliable. There may be problems with applications of bio-control agents in the field because of the vulnerability of bio-control agent populations to environmental variations and environmental extremes If appropriate temperature and moisture are not consistently available, biocontrol agent populations may reach densities that are too small to have important effects, and may not recover as rapidly as pathogen populations when congenial conditions reoccur.

NEWS AND VIEWS

BIOFUEL USE INCREASING POVERTY

The replacement of traditional fuels with biofuels has dragged more than 30 million people worldwide into poverty. According to Oxfam, so-called green policies in developed countries are contributing to the world's soaring food prices, which hit the poor hardest and it also says that biofuels will do nothing to combat climate change. Its report urges the EU to scrap a target of making 10% of all transport run on renewable resources by 2020.

Oxfam estimates that the EU's target could multiply carbon emissions 70-fold by 2020 by changing the use of land. Oxfam's biofuel adviser Rob Bailey, criticized rich countries for using subsidies and tax breaks to encourage the use of food crops for alternative sources of energy like ethanol. According to him, if the fuel value for a crop exceeds its food value, then it will be used for fuel instead. Rich countries are making climate change worse, not better, they are stealing crops and land away from food production, and they are destroying millions of livelihoods in the process.

Biofuels are a divisive issue with strong arguments on both sides. Brazilian President Luiz Inacio Lula da Silva has suggested that the biofuel boom provides developing nations with a great opportunity as it creates profitable export for energy crop producers in Africa, Central America and the Caribbean that could enable them to claw their way out of poverty. But several aid agencies and analysts have warned of the possible downside of biofuel crop cultivation. One UN adviser went as far as describing biofuels as **crime against humanity.**

Source: ***Story from BBC NEWS***

MICROBES HEAT UP

Microbes perform a range of critical functions; such as helping regulate oxygen and greenhouse gases in the atmosphere, fixing nitrogen in soils required for plant growth, and converting waste matter to nutrients. Researchers reported at a meeting of the American Society for Microbio-logy that climate change is already affecting microbial communities in Alaska, where warmer temperatures are raising nitrogen availability in soils, possibly impacting fungal activity and diversity. Shorter freezing periods could also prevent molds that grow under the snow from retaining enough snowmelt, subjecting trees to drought.

Environmental Health Perspectives (EHP)

ALGAE COULD YIELD 30 TIMES MORE BIOFUEL THAN SOYBEANS, WHILE CLEANING THE ENVIRONMENT

Algae could be used as a biofuel while simultaneously cleaning up the environment, according to researchers at the University of Virginia. By feeding algae extra carbon dioxide and sewage can boost algae oil yields to as much as 40 per cent by weight, far in excess of what can be generated from soybeans.

Proving that the algae can thrive with increased inputs of either carbon dioxide or untreated sewage solids will confirm its industrial ecology possibilities to help with wastewater treatment, dealing with solids is one of the most expensive challenges, or to reduce emissions of carbon dioxide, such as coal power-plant flue gas, which contains about 10 to 30 times as much carbon dioxide as normal air, explained a statement from the University of Virginia.

mongabay.com

POLLUTION AFFECTS FLOWER SCENTS

Common constituents of smog destroy floral scents released by flowers to attract bees and other pollinators, according to researches carried out by scientists of Virginia University, U.S.A. Flower scents traveled four times farther in the 1840s, when European scientists began documenting ozone pollution, than they do under today's atmospheric conditions. Because pollinating insects rely partly on scents to find flowers, the loss of fragrant plumes could make it harder for insects to locate pollen sources, jeopardizing pollinators and crop alike.

The validity of plants depends on pollination. If pollinators are forced to spend more time for foraging for food yet collect less pollen to feed their young, insect colonies may suffer nutritionally. Both problems could impact our food supply.

Pollinators aren't the only species dealing with the olfactory effects of air pollution. Researchers have reported that residents of Mexico City, which has some of the world's worst air pollution, people were significantly less able to detect and distinguish between food odors than were residents of Tlaxcala, a geographically similar area with much lower air pollution.

Source: **Carol Potera in *Environmental Health Perspectives (EHP)***

METHYLENE BLUE: A CURE FOR PARKINSON'S DISEASE?

A century-old drug, methylene blue could slow or even cure Alzheimer's and Parkinson's disease in small doses according to researches carried out at Oakland in California. In very low concentrations the equivalent of a few raindrops in four Olympic-sized swimming pool the drug shows cellular ageing and enhances the function of cellular "power plants" called mitochondria.

One of the key aspects of Alzheimer's disease is mitochondrial dysfunction, specifically Complex IV dysfunction. Methylene blue could prevent or slow decline of Complex IV enzyme.

Discovered in 1891, methylene blue is used to treat methemoglobinemia, a blood disorder. But because high concentrations of methylene blue were known to damage the brain, no one thought to experiment with low concentrations.

Children's Hospital & Research Center Oakland & World Science staff

RICE NOT SO NICE FOR BABIES?

In many areas of the world, babies are taken away from the breast or bottle onto rice cereal and other rice-based foods. A study reported in the journal 'Environmental Pollution' finds that rice foods sold in Western super-markets can contain high levels of inorganic arsenic - a baby eating 1 serving of rice cereal each day could take in more of this carcinogen per kilogram body weight than an adult exposed to the maximum allowance in drinking water. Arsenic levels in rice vary depending on where it is grown; the authors suggest using rice from sources in India, California, and Spain.

Environmental Health Perspectives (EHP)

BROCCOLI SPROUT EXTRACT PROVIDES PROTECTION FROM UV RADIATION

A topical application of an extract of broccoli sprouts may help protect people from the damaging effects of ultraviolet (UV) radiation according to a research report from Johns Hopkins. The researchers conducted experiments on six healthy human volunteers. It was found that the degree of skin redness (erythema) caused by UV radiation is markedly reduced when treated with the extract. At the highest doses, UV-induced redness and inflammation were reduced by an average of 37 percent. The extracts were protective even when applied three days prior to UV exposure.

The extract of broccoli sprout is, however, not a sunscreen. Sunscreens work by absorbing UV light and preventing its entry into the skin. Broccoli extract on the other hand, works inside cells by boosting the production of a network of protective enzymes that defend cells against many aspects of UV damage and the effects are long lasting.

Treatment with broccoli sprout extract might be another protective measure that alleviates the skin damage caused by UV radiation and thereby decreases our long-term risk of developing cancer. Sulforaphane is the protective chemical agent that is found in broccoli sprout extracts.

Mohit Joshi in Health Update

SEAWEED GEL REPAIRS HEART DAMAGE

Researchers at Ben Gurion University in Israel developed a seaweed gel that can repair damaged hearts after heart attack and prevent additional damage. In experiments with animals, the researchers found 90 percent of the animals who received the gel injections were able to survive a heart attack as compared to just 40 percent of animals that received no treatment.

The researchers say the gel when injected into a vein in the groin solidifies on the area of the heart, where the tissue has been damaged by an attack. The gel, made from ordinary seeweed, is injected through the vein, which is linked to a catheter. When a heart attack occurs, it damages sensitive tissue in the heart leaving it vulnerable to another attack because the heart is not able to pump blood properly. As per the researchers of the current study, the gel in question acts as a support scaffold to the damaged tissue letting the heart resume its normal function, thus preventing another attack.

Source: Smita Raghav
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Punjab State Council For Science And Tech. MGSIPA Complex, Near Sacred Heart School, Sector-26,CHANDIGARH-160019,
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Contact: Shri T.S. Verma, Symposium Organizing Committee
L&CM Section, BARC, Mumbai, India
E-mail: tsverma@barc.gov.in

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20 21 November 2008; Hamdard University, New Delhi, India
Contact: Prof. M. Iqbal & Prof. Javed Ahmad
Hamdard University, New Delhi-110062
E-mail: miqbal@jamiahamdard.ac.in; javedamd@hotmail.com
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Contact: Dr. P.B. Khare
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Rana Pratap Marg, Lucknow-226001 (India)
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