

6th International Conference on Environment and Ecology (ICEE 2020)

BOOK OF ABSTRACTS



Venue:
UNIVERSITY OF ALLAHABAD
(A Central University)
Prayagraj, Uttar Pradesh, India

24-25-26 February 2020

BOOK OF ABSTRACTS

6th International Conference on Environment and Ecology (6th ICEE 2020)

Theme:

Make India Clean as well as
Cleaning up Technologies

ISBN: 978-81-943461-2-8

24-25-26 February, 2020

Venue: University of Allahabad (A Central University)
Prayagraj, Uttar Pradesh, India

Hosted by:

Dept. of Botany and Centre for Environmental Sciences
University of Allahabad, Prayagraj, Uttar Pradesh, India

In Association with:

International Foundation for Environment and Ecology
Kolkata

In Collaboration with:

Confederation of Indian Universities (CIU), New Delhi
Asian Biological Research Foundation (ABRF), Prayagraj, India

First Edition: February 2020

Copyright: International Foundation for Environment and Ecology, Kolkata

ISBN: 978-81-943461-2-8

Price: INR 100

DISCLAIMER

The authors are solely responsible for the contents of the abstracts and papers compiled in this book. The publisher or editors do not take any responsibility for the same in any manner. Errors, if any, are purely unintentional and readers are requested to communicate such errors to the editors or publisher to avoid discrepancies in future.

Published by:

International Foundation for Environment and Ecology
Kolkata, West Bengal

E-mail: icee.contact@gmail.com
ifee.foundation@gmail.com

www.ecologyfoundation.in
www.icee.net.in

Composed and setting by:

Sindhusarash
Kolkata- 700118
E-mail: sindhusarash@gmail.com

Organising Committee of 6th ICEE 2020

Chief Patron:

Prof. R. R Tewari, *Hon'ble Vice Chancellor, University of Allahabad, Prayagraj, Uttar Pradesh*

Patrons:

Prof. (Dr.) P R Trivedi, *President, Confederation of Indian Universities (CIU), New Delhi*

Dr. Chander Mohan, *Advisor and Scientist-G, Minister of Sc. and Tech. (Govt. of India) and Former Director of Vigyan Prasar (Govt. of India)*

Prof. S.C. Agrawal, *HoD of Botany, University of Allahabad, Prayagraj, Uttar Pradesh*

Prof. Sudip Barat, *President, International Academy of Science and Research, Kolkata*

Dr. V C Srivastava, *President, Asian Biological Research Foundation, Prayagraj*

Dr. Subir Mukhopadhyay, *President, International Benevolent Research Foundation, Kolkata*

Dr. Amit Krishna De, *Executive Secretary, Indian Science Congress Association*

President:

Dr. Tridib Bandopadhyay, *President, International Foundation for Environment and Ecology, India*

Organising Secretary:

Prof. D. K.Chauhan, *Dept. of Botany, University of Allahabad, Prayagraj, Uttar Pradesh*

Joint. Org. Secretaries:

Dr. Pawan Kumar Jha, *Centre of Environmental Science, University of Allahabad, Prayagraj, Uttar Pradesh*

Dr. Kumar Suranjit Prasad, *Centre of Environmental Science, University of Allahabad, Prayagraj, Uttar Pradesh*

Convener:

Dr. A K Verma, *Secretary, International Foundation for Environment and Ecology, India*

Jt. Conveners:

Dr. Shri Prakash, *KAPG College, Prayagraj, Uttar Pradesh*

Dr. Arnesha Guha, *Scientific and Environmental Research Institute, Kolkata, West Bengal*

National Advisory committee:

Dr. Tanmoy Rudra, *Executive Secretary, Confederation of Indian Universities (CIU), New Delhi*

Prof. Hanuman Prasad Sharma, *Pro Vice Chancellor, Sido Kanhu Murmu University, Dumka, Jharkhand*

Prof. V. Subramanian, *Jawaharlal Nehru University, New Delhi*

Prof. Girjesh Kumar, *University of Allahabad, Prayagraj, Uttar Pradesh*

Prof. Mahendra K Gupta, *Jiwaji University, Gwalior, Madhya Pradesh*

Prof. Parthib Basu, *University of Calcutta, West Bengal*

Prof. Manimekelan A, *Bharathiar University, Coimbatore, Tamil Nadu*

Prof. Harbansh Kaur Kehri, *University of Allahabad, Prayagraj, Uttar Pradesh*

Dr. K L Barik, *North Orissa University, Baripada, Odisha*

Prof. N. B Singh, *University of Allahabad, Prayagraj, Uttar Pradesh*

Prof. Satish Patil, *Dr. Babasaheb Ambedkar Marathwada University (BAMU), Aurangabad, Maharashtra*

Prof. Satya Narain, *University of Allahabad, Prayagraj, Uttar Pradesh*

Dr. Vidya Nath Jha, *Principal, MRM College, Darbhanga, Bihar*

Dr. Aniruddha Ray, *Principal, Santiniketan B.Ed College, Bolpur, West Bengal*

Prof. S. M. Prasad, *University of Allahabad, Prayagraj, Uttar Pradesh*

Prof. P V Jabde, *Principal, SBES College of Science, Aurangabad, Maharashtra*

Prof. A. L. Ramanathan, *Jawaharlal Nehru University, New Delhi*

Prof. I. R. Sidiqqi, *University of Allahabad, Prayagraj, Uttar Pradesh*

Prof. R. K. P. Singh, *S. M. N. R. University, Lucknow*

Dr. Sudhir Kumar Singh, *University of Allahabad, Prayagraj, Uttar Pradesh*

Prof. N. K. Dubey, *Banaras Hindu University, Varanasi*

Prof. Madhu Laxmi Sharma, *Govt. KRGPG Autonomous College, Gwalior, Madhya Pradesh*

Prof. A. K. Raghuvanshi, *Banaras Hindu University, Varanasi*

Prof. Asish Kumar Panigrahi, *University of Kalyani, West Bengal*

Prof. Gopal Shankar Singh, *Banaras Hindu University, Varanasi*

Prof. Apurba Ratan Ghosh, *The University of Burdwan, West Bengal*

Dr. Prashant Shrivastava, *Banaras Hindu University, Varanasi*

Dr. Anshumali, *IIT, Dhanbad*

Prof. Preeti Kulshrestha, *Govt. KRGGPG Autonomous College, Gwalior, Madhya Pradesh*

Dr. Ajay K. Srivastava, *Head of PG Dept of Botany, St. Xavier's College, Ranchi, Jharkhand*

Local Organising Committee:

Dr. Ajay Singh

Dr S K Chauhan

Er. Birendra Singh

Mr Prabhakar Singh

B. K. Diwedi

Dr. Vandana Srivastva

Mr. Yashvant

Atul Shrivastava

Piyush

Kirti

Nirdesh

Anushree

Shivesh

International Foundation for Environment and Ecology

International Foundation for Environment and Ecology (IFEE) is an autonomous non government and non political organisation has been established on the auspicious occasion of the World Environment Day on 5th June 2014 based on its incorporation as a Charity under the Central Act II of 1882, Government of India head quartered in Kolkata, West Bengal with the main objective 'To Protect Our Mother Earth'.

The motivation for the establishment of this organisation has been based on the issues of environment protection and education discussed in the deliberations at Founes in 1971 and later at Stockholm in 1972 , Rio de Janeiro in 1992 , Johannesburg in 2002, Copenhagen in 2009 and also on the resolutions and recommendations of the Intergovernmental Conference organised by UNEP and UNESCO.

The activities of IFEE will include the strategies for creating more researches on environment among the globe for ensuring environmental protection and simultaneously encouraging a balanced and a sustainable growth in all countries of the world by using clean as well as cleaning-up technologies through new and emerging techniques for climate change management, environmental and disaster education, , waste management, green business and technologies besides strengthening of diplomatic relations among nations for protecting our Mother Earth.

The idea is also to promote environmental education among the school and the college going boys and girls by “Catching Them Young” and for designing appropriate technologies to ameliorate environmental problems.. This will be possible as IFEE has the qualified inventory of experts for establishing universities, colleges, institutions, schools and other training enterprises in different countries with the latest equipment and infrastructure for conducting formal, informal, open, distance, online, internet and webbased environment-centric programmes in all countries of the world.

Activities of IFEE

IFEE encourages environmental development and protection through the spread of universal quality education and supports the involvement of communities and citizens in the endeavour. The activities of IFEE are discussed below.

1. Consultancy to different institutions and universities at national as well international level with a view to solve environmental problems.
2. Launching of Bachelor's, Master's and Doctoral Degree Programmes through mutual and technical cooperation for initiating study and research based activities in the areas of, geoinformatics, bioinformatics, human rights, disaster management, sustainable development, ecology and environment and other allied fields.

3. Conducting environmental impact assessment along with pollution monitoring and control in sugar, leather, petro-chemicals, pharmaceuticals, cement, paper, rubber, steel, thermal power plants and mining industries.
4. Collaboration for scientific and environmental research work for promoting technological innovations in different fields related to environment.
5. To institute, honour and award persons and institutions for their immense contribution and dedication to protect and conserve the environment and promoting the path of Sustainable Development.

Areas of Activities

1. Scientific, Social & Environmental Research
2. Environmental Education & Literacy
3. Environment and Human Rights
4. Sustainable management of hazardous waste and substances;
5. Enhancing environmental awareness and promoting transparency and public participation in decision-making, and access to justice in environmental matters,
6. Promoting effective engagement of women and youth in environmental activities;
7. Supporting disaster preparedness, prevention, response and recovery at community level as well as at national level

International Conference on Environment and Ecology

IFEE organise every year an International Conference on Environment and Ecology at top-notch universities of India in collaboration with Confederation of Indian Universities (CIU), New Delhi since 2015.

The purpose behind the conference is to generate new knowledge related to understanding the background and causes of different ecological and environmental events and calamities at the local and global levels and at the same time set the groundwork for future conferences and publications on environmental and ecological issues. The conference is an ideal forum and platform where all the environmental experts, students, scholars and academicians come together and unanimously decide for the appropriate technology for protecting the Mother Earth.

In the year 2015 ICEE was organised in Kolkata, 2016 at Bharathiar University, Coimbatore, Tamil Nadu, in 2017 it was organised in ST Xaviers College, Ranchi, Jharkhand and 2018 the 4th ICEE has been organised at Gauhati University, Assam.

Awards of IFEE

IFEE recognizes the contribution of scientists, academicians, researchers in the field of science and environment. IFEE has instituted several awards to motivate and further the spirit of the talented ones in the field of science and environment. The selection of the awards is considered mainly on the basis of the merit.

For Colleges/ School/ Institute Category

World Environmental Education and Development (WEED) Award

For Individual Category

1. Scientist of the Year Award (Above 45 Years of age)
2. Young Scientist of the Year award (32-45 years of age)
3. Junior Scientist of the Year Award (Below 32 years of age)
4. World Award for Environmental Research and Development
5. Environment Excellence Award
6. Environmentalist of the Year Award
7. Lifetime Achievement Award for Research/ Teaching (Above 60 years of age)

For further details mail to: ifee.foundation@gmail.com or Call/ WhatsApp on 8017873737

Membership of IFEE

IFEE provides a platform where top Academicians, Researchers, Industrialists, Functional Heads, Managers, Bureaucrats and others come together to share knowledge and experience.

All members of IFEE, will have access to exclusive member benefits, some with free or discount rates. The value of IFEE membership is far more than the cost of membership.

We request you to strengthen the Education Fraternity by enrolling as a valued member of IFEE and leverage from IFEE activities, contributing a bit of yours that can make a big difference to the Community at large.

Life Time Membership Fee: *Rs. 3000 only*

Fellowship Fee: *Rs. 7000 only* (Presently close)*

* Ph.D is essential to become the fellow member. Fellows are entitled to suffix **FICEE** after their name.

For membership mail to: ifee.foundation@gmail.com or Call/WhatsApp on 8017873737

Communication Address:

Dr. Arnesha Guha
International Foundation for Environment and Ecology
42, Station Road, Rahara, Kolkata- 700118, west Bengal, INDIA

Mobile / WhatsApp: 8017873737

Email: ifee.foundation@gmail.com

University of Allahabad (A Central University)

Allahabad University has always occupied an esteemed place among the universities of India for over a century now. Established on 23rd September 1887, it is the fourth oldest university of India after Calcutta, Bombay and Madras University. The credit for conceiving a large Central College at Allahabad, eventually to develop into a University, is due to Sir William Muir, then Lt. Governor of United Provinces. As a result of his initiative the foundation stone of the Muir Central College (named after him) was laid on Dec. 9 1873 by His Excellency Lord Northbrook. Sir William Muir said on that occasion: "The establishment of a central college at Allahabad has been my earnest desire ever since I assumed my present office. Shortly after coming here I found that a strong wish prevailed among the chief people of the place for a better means of education at Allahabad; and being myself deeply impressed with the same conviction, I took occasion at the first Darbar which I held here to urge upon those present the necessity of showing that they were sincere and in earnest, by contributing to the work. The appeal was widely and liberally met, a considerable sum was subscribed and address was presented to me in 1869, praying for the establishment of the college here." On September 23, 1887 Act XVIII was passed which established the Allahabad University. Like the Universities of Calcutta, Bombay and Madras, the Allahabad University also started as a degree conferring institution. Its first entrance examination was held in March 1889. In 1904 the Indian Universities Act was passed which limited the territorial jurisdiction of Allahabad University to the United Provinces of Agra and Awadh, the Central Provinces including Berar, Ajmer, Mewar and most of the states of Rajputana and Central Indian Agencies. Between 1887 and 1927 at least thirty-eight different institutions and colleges of this area were affiliated to Allahabad University. With the promulgation of the Allahabad University Act in 1921, the Muir Central College lost its independent existence. Between 1922-27 the University had its internal and external wings which were subsequently separated from the University to give the latter a purely unitary, and residential character. In fact the Allahabad University was started with a preliminary loan of Rs. 5240/- from the government to meet its expenses. The loans were repaid in two years. Henceforth, its main source of its income was from the examination fees and sale of Prospectus & Calendar. Being an examining body it met its incidental expenses easily.

In 1892-93 the University began to invest some capital in the Government Securities. In 1899-1900 its reserve fund amounted to Rs. 34,000. The University was thus now in a position to construct its own buildings. In 1909 the present site was selected for

the Library, the Senate House and the Law college. These buildings, which now house the Registrar's Office, Senate Hall and the English Department, were designed by Sir Swinton Jacob and their construction was approved in 1910. The foundation of the Senate House was laid on 17th January 1910 by Sir John Havett, the Chancellor. The construction of the Senate Hall, the Law College and the former Library building was commenced in 1910 and they were completed in 1915 at the cost of Rs. 11,67,275. In 1923 the Government decided to acquire the property of the Indian Press for the University at the cost of about seven lakh rupees. This property comprised the present buildings of the Philosophy Department, the department of Med./Mod. History and the spacious buildings in which there was formerly the Proctor's Office, Post Office, and some rooms which are shared by the Political Science, Med./Mod. History, Ancient History and Hindi Departments. A few years ago this spacious building was demolished. The Indian Press property also included a tiled roofed building behind the dramatic hall and a similar type of building near the Political Science department and another building near the English Department. Of these the first two exist now, the third was demolished recently. Since 1911 many new buildings have sprung up in the Senate House Campus and in the Chatham Lines campus. In the senate House Campus the Union Hall, the old Guest House, the building of the Commerce Department, the N.S.S. building, the buildings of the Ancient History Culture and Archaeology Department, Political Science Department, Department of Oriental Languages, Hindi Bhawan, Psychology department, Education department, Geography Department the New Library building are comparatively new constructions. Likewise in the Muir College Campus several alterations and additions have been made from time to time. Among the new buildings, the buildings of the J.K. Institute of Applied Physics, the new Gymnastic Hall, the new Mathematics Department are some additions. As the years rolled on, the two campuses began to look small. Consequently, the University obtained land from the Cantonment Board to house the department of Business Administration, Law Faculty and Gandhi Bhawan, Recently the bungalow of the late Dr. Bani Prasad has been purchased.

From the beginning the University has been concerned about women's education. It purchased houses for a women's Hostel and College at the cost of Rs. 66,286 and other buildings adjoining the College. While classes for girls were started in the old building, Sarojini Naidu and later Priyadarshini Girls Hostel was constructed for the boarders and recently the Shatabdi Girls Hostel has been constructed to accommodate many more boarders. Ever since the inception of the Muir Central College in 1873, efforts were constantly made to accommodate students coming

from distant places. Formerly there were two boarding houses, one situated in the barrack in Malaka near the jail, where the Swarup Rani Hospital now stands. Later this boarding house was shifted to the tiled outhouse of the Lowther Castle, where the classes of the College were held. Finally it was shifted to a large thatched bungalow near the Bhardwaj Ashram. In 1910-11 the Muir Hostel (Now Amar Nath Jha Hostel) was constructed; the Law Hostel (Now Sir Sunder Lal Hostel) was completed on 1914-15; Pandit Ganga Nath Jha Hostel (initially called New Hostel) was completed on 1928; the Hindu Boarding House (Now popularly called Hindu Hostel), which was formerly a straight building between 1902-22 without two wings was also constructed. About the same time the Oxford and Cambridge courts of the present Holland Hall came into existence. Subsequently, the P. C. Banerji Hostel, the K. P. University College and the Diamond Jubilee Hostels were constructed. A few years back the Tara Chand Hostel was constructed. The Muslim Boarding House (popularly called Muslim Hostel) is the oldest of all these hostels for it was constructed in 1896-97. In this millennium year, the University of Allahabad completes more than a hundred and thirteen years.

Department of Botany, University of Allahabad

The Department of Botany came into existence in 1923 and it is one of the oldest University Departments of Botany in the country. The Department is known for its multidisciplinary character and has earned international recognition for its standards of teaching and research. The Department can be proud of having produced eminent scholars and administrators who have occupied or are occupying high positions within and outside the country. In view of its academic excellence, the Department of Botany has the distinction of being recognised by the UGC under its two programmes: (1) The Special Assistance Programme (1976) and (2) The COSIST Support Programme 1990. The Department offers teaching in three main courses at the post-graduate level viz., (1) Botany (2) Agricultural Botany and more recently introduced (3) Environmental Science With specializations of 10 areas of Botany and 3 areas of Agricultural Botany. Environmental Science has started two years P.G. Degree course from 2002 having semester system. The undergraduate programme is integrated with B.Sc. and recently started B.Sc. (Applied Science) curriculum of the Faculty of Science. The curricula are continuously updated. The ongoing research programmes emphasize diverse areas of functional, structural, applied and evolutionary Botany. The main emphasis is given on the following areas which are identified by the U.G.C. as areas of excellence:

- (i) Palaeobotany and Morphology
- (ii) Microbiology (including Pathology, Mycology and Phycology)
- (iii) Plant Physiology

There are other areas of interest like Plant Taxonomy, Plant Biodiversity, Ecology and Cytogenetics which are also attaining excellence

Centre of Environmental Sciences

Centre of Environmental Studies as an interdisciplinary academic field that integrates numerous academic fields (particularly sciences) to study the structure and function of our life-supporting environment and to know causes, effects, and solutions of various environmental issues.

Centre of Environmental studies mainly focus on all the elements or factors that build or influence our life-supporting biophysical environment, as well as earth processes, ecological systems, biodiversity, natural resources, alternative energy systems, climate change, numerous sorts of pollutions, and so on. Environmental science integrates information from several other disciplines and so is multidisciplinary in nature. Therefore, center of environmental studies covers biology, chemistry, physics, geology, geography, sociology, economics, management, and ethics. Its major subdivisions embrace ecology, geosciences, environmental chemistry, atmospheric science, environmental biology, environmental toxicology, environmental impact assessment, and so on.

Environmental science has an immense scope since it covers a large vary of subjects or problems associated with our advanced life-supporting system. From last two decades, environment science has related to many career opportunities. Major career choices associated with the topic in space of Industries, Consultancy, Research and Development (R&D), Academics, Green marketing, Green media, Green support, NGOs, Government jobs, International agencies.

Today, the planet is facing various environmental issues, starting from local issues like ground water depletion to world issues like global climate change. These issues may be resolved only when everybody cares for the environment; for that, everybody must informed about the causes, consequences, and remedial measures of various environmental problems. To realize this goal, Centre of Environmental studies taught it at PG (M.Sc. - Environmental Science) and research level. The subject bears large importance as it aims at saving the integrity of the life-supporting environment of earth that is a unique planet that sustains life.

Confederation of Indian Universities (CIU), New Delhi

As we approach the Twenty first Century, a number of major challenges face women and men around the world as they interact with one another as individuals, groups, and with nature. Globalisation of trade, of production, and of communications has created a highly interconnected world. Yet the tremendous gaps between the rich and the poor continue to widen both within, and between nations. Sustainable development remains an elusive long-term goal, too often sacrificed for short-term gains.

It is imperative that higher education offer solutions to existing problems and innovate to avoid problems in the future. Whether in the economic, political, or social realms, higher education is expected to contribute to raising the overall quality of life, worldwide. To fulfill its role effectively and maintain excellence, higher education must become far more internationalized; it must integrate an international and intercultural dimension into its teaching, research, and service functions.

The most significant feature of education for mother earth protection in the 21st century is not so much what the French call *li explosion scolaire*, but the knowledge explosion, which has expanded the catchment areas of learning so fast that it takes only a few years now for the state-of-the-art in any field to become obsolete. Different modes and types of communicating for advancement of knowledge are fast changing and becoming more than sophisticated. In this technological era knowledge can easily be dispensed technologically and electronically. Teachers and formal school structures are becoming less important, and the conventional age limits on the learning process are becoming blurred.

Viewing the urgent need for mutual and technical cooperation among the Universities in India, exchange of information, export and import of educational know-how and consultancy, control on duplication of efforts and wastage in higher education, vocationalisation of existing careers besides strengthening the financial health of the existing Universities for implementing educational programmes having social, cultural, technical, economic and positive contents for the optimum development of our country, the "Confederation of Indian Universities (CIU)" has been established with the cosponsorship of selected university level institutions in India.

Asian Biological Research Foundation (ABRF), Prayagraj

The ABRF Prayagraj, India is a self-supporting, academic and research associated body. It is basically non-profit and Non-Government Organization: (1) to provide a common platform for scientists associated with biological sciences to interact with one another for mutual benefit and to enhance the innovative knowledge on the subjects (2) to encourage, facilitate and perform the activities related to conservation of water, nature and biodiversity (3) to promote the new scientific knowledge that has emerged from recent advances and to felicitate the persons and organizations internationally for their outstanding services rendered in basic, applied and modern biological sciences including all branches of Botany, Zoology, Agriculture, Veterinary Science, Environmental Science, Molecular Biology, Biotechnology, Biochemistry, Bioinformatics, Microbiology, and so on (Website: www.abrf.org.in).

International Foundation for Environment and Ecology

Executive Committee (2019-2021)

Patron:

Chancellor (Dr.) P. R. Trivedi
Honorable President, Confederation of Indian Universities,
New Delhi

Chairman:

Dr. Chander Mohan
Advisor and Scientist-G, Minister of Sc. and Tech. and Former Director of Vigyan Prasar (Govt. of India)

President:

Dr. Tridib Bandopadhyay, Scientific and Environmental Research Institute, Kolkata

Vice Presidents:

Prof. (Dr.) Subir Mukhopadhyay (West Bengal)
Prof. (Dr.) P. Sundaramoorthy (Tamil Nadu)
Prof. (Dr.) K. L. Barik (Odisha)
Prof. (Dr.) Madhulaxmi Sharma (Madhya Pradesh)

General Secretary:

Dr. A. K. Verma (Uttar Pradesh)

Joint Secretaries:

Prof. (Dr.) Manimekalan A. (Tamil Nadu)
Dr. Ajay K Srivastava (Jharkhand)

Convenor:

Dr. Arnesha Guha (West Bengal)

Members:

Dr. Manendra Kumar (Bihar), Dr. S. Pradeep (Karnataka), Dr. Sangeeta Dongre (Maharashtra),
Dr. Dipankar Bandyopadhyay (West Bengal), Dr. Biplab Kumar Das (Assam), Dr. K. Pugazhendy
(Tamil Nadu), Dr. S. B Shashi (Bihar), Dr. Suman Singh (Madhya Pradesh), Dr. Nazneen Z.
Deshmukh (Maharashtra), Dr. Preeti Kulshrestha (Madhya Pradesh), Dr. Aniruddha Ray (West
Bengal)



Invited Abstracts



Plant Biodiversity and Biotechnology

H. P. Sharma

Sido Kanhu Murmu University, Dumka

Plants are the basis of life on the earth. In addition to the three essential components, food, shelter and clothing, from the early civilization the plants are known to provide almost all other items such as wood, fuel, oils, cosmetics, resins, gums, tannins, dyes and medicines which are useful for the day-today needs of the forest dwellers and villagers. Besides essential items plants are fully responsible to create fully congenial ecosystem thus giving safety, security and healthy life supporting system.

To meet the various demands of mankind different types of activities, like installation of industries, erection of dams, power stations, colonies, agriculture, and transportation, are under way all over the countries. Specially, the Jharkhand state is very rich in biodiversity because of suitable edpho-climatic conditions. The state is primarily dominated by different types of ethnic communities who mainly depend on plant resources for their revenue generation health and nutritional securities.

The state of Jharkhand has recently been carved out from old Bihar as an independent state. As a consequence different types of developmental activities are underway to bring the state at par with other developed ones. Because of the unrelenting and unscrupulous activities the forests, agricultural lands and other areas are at stake. Moreover, the local people/tribes are being compelled to migrate to new places leaving their original homelands where they were residing for the thousands of years with their rich cultural heritage. These local people are really treasure trove of knowledge and are highly skilled to practice traditional herbal treatments to cure various types of diseases.

It is now high time to protect the plants in general and medicinal plants in particular and related traditional practices/knowledge before it is too late. Their scientific validation is equally essential for their authenticity, so that large scale application may be insured. In this perspective large numbers of ethnomedicinal plants have been documented from different remote and primitive areas of the state as base line study.

There are various *in situ* and *ex situ* methods of prevention, protection, propagation and preservation/ conservation of plant biodiversity. Biotechnological approaches especially DNA bank, pollen culture, micropropagation, root multiplication, slow growth, cryopreservation, hairy root induction are very useful and effective alternate some of the tools for the propagation and conservation valuable plants.

Impact of Temperature and Relative Humidity on The Population Density of Red Cotton Bug, *Dysdercus Cingulatus* (Fabricus)

Manendra Kumar

Dept. of Zoology, B.R.A Bihar University, Muzaffarpur

Dysdercus Cingulatus Fb (Pyrrhocoridae : Hemiptera) is commonly known as red cotton bug or red cotton stainer. It is tropical and subtropical in distribution. It is a serious pest of fibre crops, vegetables, citrus fruits, oilseeds, cereals and a variety of ornamental plants causing immense economic loss to the growers by its adults and nymphs both. Studied on population density in relation to temperature and relative humidity were made in the field conditions of Muzaffarpur (Bihar). Four hosts from family malvaceous, solanaceous and cucurbitaceous were selected viz. Datura, Pilibuti, Phut and Wax gourd. On the Datura, the number of pests varied from 22 to 48 showing the minimum and maximum in May and March respectively. In the hottest months of May and June, the population was minimum. In case of pilibuti the population of the pest varied from 18 to 44 having the minimum in May and the maximum in March respectively. The average range of temperature and relative humidity varied during these months from 24.23^o C to 32.03^o C and 48.39% to 68.17 % respectively. In case of phut, the observations were recorded for seven months from plantation to fruiting period. Range of average temperature was 16.2^o C to 32.03^o C and RH from 48.39% to 82.0%. Population of the pests varied between 15 to 50 in May to November respectively. In case of Wax gourd, the observations were recorded from October to March. In these months the number of pests varied from 27 (Minimum) to 41 (Maximum). The temperature ranged between 16.2^o C to 26.36^o C while RH was 75.0% to 82.00 %. It is evident from the results that the number of pests gradually decreased with the increase of temperature and fall of relative humidity. Hence, it is concluded that the lower temperature coupled with higher humidity provided the suitable conditions for the pest population.

Air Pollution and Fundamental Right to Clean Air

Tridib Bandopadhyay

Scientific & Environmental Research Institute

Through judicial pronouncements, the right to live in a clean and healthy environment has been incorporated as a fundamental right under the ambit of Article 21 of the constitution of India. Article 21 provides for the right to life and personal liberty, which states “No person shall be deprived of his life or personal liberty except according to procedure established by law.” This article imposes a duty on the state to protect the life and liberty of the people. While resolving cases relating to the environment, the Supreme Court of India treated the right to live in pollution free environment as a part of fundamental right to life under Article 21 of the Constitution. The judiciary considered the right to clean or the good environment as fundamental to life and upheld as a fundamental right. Right to clean air to breathe is the precondition to live in a healthy environment. The World Health Organization also emphasized in Nov, 2018, every human is entitled to clean air to breathe.

Under Swachh Bharat Abhiyan, National Air Quality Index (AQI) was launched on 17-09-2014 in India. The Central Pollution Control Board (CPCB) together with State Pollution Control Boards (SPCBs) started the National Air Monitoring Program (NAMP). An Expert Group was constituted with air quality experts, medical professionals, academicians, and advocacy groups. The technical study carried out by IIT Kanpur recommended an AQI scheme in 2014. But implementation of Air Quality standards by the States remained slack, primarily due to the increasing population of diesel-run vehicles, continuation of old and ill-maintained vehicles, spurt in construction activities without following guidelines for dust abatement, and so on. The study of Air Quality Life Index (AQLI) conducted by Chicago University showed, air-pollution is reducing lifespan by 4.3 years on average for the Indian citizens. While the Supreme Court of India banned plying of diesel-run vehicles in Delhi-NCR, the City of Kolkata continues to add 65% of the vehicles run by diesel. Studies carried out on the impacts of air-pollution on Kolkata-residents' based on visits to the clinics and dispensaries of Govt. Hospitals showed, respiratory diseases (85.1%) have outnumbered waterborne diseases (14.9%). The scenario in the other cities may not be much different. There remain different standards and enforcement mechanisms at different states and political interference. With the ground realities, the desired emission levels can be restricted only by means of after treatment emission control systems, controlling sources of dust generation, increasing green cover along road-side and restricting vehicles' tail-pipe emissions, and above all, political will of the states' administrative hierarchy.

Keywords: *Pollution, Ambient Air Quality, Air Quality Standard, Air Quality Life Index*

Status of Fish Diversity in Nepal

Dilip Kumar Jha

*Animal Science, Veterinary Science and Fisheries,
Agriculture and Forestry University, Chitwan, Nepal*

Nepal is a land linked country located in South Asia between China in the north and India in the south, east and west. It possesses series of the rocky and inaccessible hilly terrains having more than 6000 rivers. The watersheds with different altitudinal variations from 60m-8848m represents a total of 252 fish species. Among them 236 species are indigenous while 16 species are exotic. These species belong to 15 orders, 40 families and 120 genera. Among the orders, Cypriniformes has the highest number of species (50.8%) followed by Siluriformes (30.1%), Anabantiformes (5.5%)Perciformes (2.4%), Synbranchiformes (2.4%), Anguilliformes(1.2%), Clupeiformes (1.2%), Salmoniformes (1.2%), Tetraodontiformes(0.4%) while Beloniformes, Cichliformes, Cyprinodontiformes, Gobiiformes, Mugiliformes and Osteoglossiformes represented each by about 0.8%. Eighteen species of fishes are reported as endemic to aquatic resources. These endemic fishes are included under the families Cyprinidae, Psilorhynchidae, Balitoridae, Nemacheilidae, Bagridae, Sisoridae and Anguillidae. A greater part of these endemic species are vulnerable and insufficiently known. The existence of different species of carps, catfishes, snake heads, gars, gobies, perch, feather-backs, loaches, eels and puffers in the aquatic system support livelihoods of people. Several species of fishes are vulnerable due to overexploitation of resources and appropriate measures are urgently needed for their conservation.

Keywords: *Ichthyo-faunal diversity, major river system, conservation*

Biodiversity Status of Mud Eel, *Monopterus Cuchia* (Hamilton-Buchanan, 1822) in Bangladesh

B. K. Chakraborty

Dept. of Fisheries, Dhaka, Bangladesh & Bangladesh Agricultural University

Apparent declines in abundance of mud eel, *Monopterus cuchia* in the eight divisions of Bangladesh have prompted concern regarding a long-term determination of this important economic resource. From the survey of eight divisions according to treatment T_1 , T_2 , T_3 and T_4 the total production of mud eel was recorded to be 14795.55 ± 186.77 , 14201.48 ± 190.33 , 13385.98 ± 178.66 and 11946.38 ± 168.06 mt in the year 2013, 2014, 2015, 2016 and 2017, respectively. A decreasing trend of total population of mud eel in the country was identified between 2013 and 2017. The decreasing type was logarithmic ($y = -1518 \ln(x) + 15070$), where $R^2 = 0.810$. There is a significant trend in case of mud eel production. In between 2013 and 2017, a decreasing tendency was recorded in case of using line and by hand, and an increasing trend was found in case of trap. According to (99.22-99.61)% responded reported that increasing destructive fishing pressure, harvested brood during breeding season and high rate uses of agro-chemical are mainly reasons of decline mud eel population. The status of this species is very critical position. So, a policy should be designed and implemented by joint discussing with Ministry of Fisheries and livestock, Agriculture and Environment. Eco-friendly catch of mud eel is to be practiced until established mud eel seed production to minimize the requirement of seed production of *M. cuchia* in aquaculture field.

Keywords: *Mud eel, Survey, Biodiversity, Harvesting, Production.*

Correlation between Fish Species Diversity and Physico Chemical Characteristics of Rivers in Selected Wildlife Sanctuaries, Kerala

Manimekalan, A. and Vijaya Lakshmi N

Dept. of Environmental Sciences, Bharathiar University, Coimbatore, India

Water chemistry may be considered as one of the vital environmental factor affecting the diversity of all freshwater habitats of the region (Raju *et al.*, 2011). The chemistry of surface water is well controlled by both natural and manmade sources (Krishnaswami and Singh, 2005). Pollution of aquatic systems makes an obvious change in its physico chemical characteristics to an extent that the growth of the fish community is affected (Khanna *et al.*, 2007). Fishes are the good indicator for any water body. Water bodies with standard water quality support high fish diversity and vice versa. To understand this concept a study was conducted in Aralam, Chinnar and Idukki wildlife sanctuaries, Kerala. The present study was carried out over a period of one year (June 2017 to May 2018). The basic physico-chemical parameters such as pH, conductivity, salinity, ORP, temperature, TDS and were analysed in the field itself using portable water analyzing kit. The samples which collected from the different sites were filtered with whatmann filter paper. The similarities in species composition among the sites were analysed by using cluster analysis. This dendograms shows the similar species among all sites. It helps us to identify which species is common to all sites. The heavy metals which are present in the fresh water was analysed through the ICPMS. Some of the elements like Be, Mg, Al, K, Cr, Mn, Fe, Ni, Mo, Zn, Se, Na, Cu, are high in value when compared with standards. But these do not have any impact on an environment. The heavy metals like As, Mo, Cd and Pb are present below to the standard values and hence shows lesser effect. On comparison of 9 sites, **pH** is high in Confluence of Kurikkathodu and Chinganipuzha and low in Kodakanambhaithodu, **Conductivity** is high in Kodakanambhaithodu and low in Uruttipuzha, **Salinity** is high in Kodakanambhaithodu and low in Uruttipuzha, **TDS** is high in Kodakanambhaithodu and low in Uruttipuzha, **ORP** is high in Kodakanambhaithodu and low in Meenmuttythodu, **Temperature** is high in Confluence of Kurikkathodu and Chinganipuzha and low in Kurikkathodu, **DO** is high in Kodakanambhaithodu and low in Meenmuttythodu. The Shannon diversity index (*H*) that is commonly used to characterize species diversity in a community. The highest number of species was recorded in Kettucherra with the value of 0.954 and the lowest number of species was recorded in Vairamani 0.477. High correlation between species diversity, Salinity and water temperature did not correlate with other water quality parameters. It shows water quality parameters are almost same in all the sites and did not have any variation in the water quality. There is a direct correlation between water quality parameters and fish diversity.

Keywords: Water, Species, diversity, Aralam, Chinnar, Idukki, Rivers, Shannon index and Correlation.

Dietary and Hormonal Manipulation in Advancing Maturation for Quality Seed Production of Indian Major Carps and Catfish

Ajay Kumar Pandey

ICAR-National Bureau of Fish Genetic Resources, Canal Ring Road, Lucknow, India

With the steadily growing importance of culture fisheries, the fish culturists should improve the technique necessary for securing basic requirement, the production of young ones (fry and fingerlings) for stocking. Hence, the artificial propagation technique needs constant refinement for obtaining quality fish seed at the desired times of the year. Recent advances in fish endocrinology have led to a better understanding of the hormonal factors involved in the control of gamete production, mode of their action and regulation of their secretion during different stages of reproductive cycle. Environmental stimuli like photoperiod and temperature are perceived by the brain which releases gonadotropin-releasing hormone (GnRH) that binds specifically to receptors in the pituitary gonadotrops and stimulates secretion of gonadotropic hormone (GtH- I, II) which enhance gonadal development and final maturation. GtH-I functions at the target sites in two ways- it induces synthesis and secretion of estradiol-17 β during pre-vitellogenic phase which, in turn, induces vitellogenesis or yolk production during post-vitellogenic phase, GtH-II triggers the synthesis of 17 α , 20 β -dihydroxyprogesterone (17,20-P) responsible for the final gonadal maturation leading to ovulation and spermiation. The recent identification of three GnRH (GnRH 1, GnRH 2 and GnRH 3), kissproteins, two kiss genes (kiss-1, kiss-2) and two kiss receptors (GPR54)-kiss 1r and kiss 2r as well as cytochrome P450 aromatase gene (CYP19) in brain and gonads (ovary and testis) have given better insight into mechanism of hormonal interactions in fish reproduction. Role of pheromones are also gaining importance in advanced phases of reproduction involving the synchronization of maturity, attraction of prospective mates, triggering spawning behaviour and release of gametes.

Role of nutrition in broodstock management for quality seed production in fishes has been appreciated during the recent years. Success of induced breeding depends on proper gonadal maturation because fishes reared without adequate food supply do not show full maturity. Also, the breeding of females and males do not synchronize under improper rearing conditions. Induced breeding of fishes for mass-scale seed production has been achieved successfully by employing pituitary gland extract (PGE) (hypophysation) and different synthetic GnRH-based drugs and antagonist dopamine administration in carps, Atlantic salmon, goldfish, *Chanos Chanos*, *Tinca tinca* and a number of catfishes inhabiting Indian waters. Interestingly, dietary as well as hormonal manipulations have resulted in the advancement of maturity in the Indian carps and catfish by 2 months under pond conditions giving scope for re-maturation and multiple breeding of the same fish in subtropical region

of the country for better gamete output. Thyroxine (T_3 , T_4), cortisol and hGH treatments resulted in better larval survival under hatchery conditions. Even thyroxine (T_3 , T_4) treatment (dietary/intramuscular administration) in the female broodstocks resulted in better larval survival in carps and catfish. Modern fish industry is highly specialized exploring more and more possibilities to manipulate reproduction. In spite all the recent advances in reproductive physiology, we are still far behind to understand the basic mechanism (s) involved in process of fish propagation in nature. Knowledge on nutrition and reproductive endocrinology periodically refines the technology of production of quality gametes for the expansion of aquaculture.

Management of Household Pest *Musca Domestical* by Using Some Plant Extracts

Jabde P.V., Deshpande P.A. and Sharma P.P.

Shri Muktanand College, Gangapur, Aurangabad (M.S.), India

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (M.S.), India

Regular use of synthetic insecticides are resulting in health hazards to human and also causing damage to environment. The significant fact is that almost far and wide occurrence of intolerable toxic remains in just about all constituents of ecosystems. Present study carried out to discover environment friendly, economical and efficient plant based insecticides, which are anticipated to be devoid of any residual or the collective toxicity to the human beings. The household insect housefly (*Musca domestica* L.) is considered for the investigation and based on traditional leads 08 plant species were examined. Considering the model protocols adulticidal assays and repellency tests were undertaken. These bioassay methods required to stimulate actual ecological parameters which exist in nature to a certain level. The percentage mortality was found to increase with higher concentrations of plant extracts which indicates direct relationship between the dose and percent mortality. The plant *Argemone Mexicana* L. and *Pimpinella heyneana* (Wall.) Kurz., were shown wide spectrum activity to control *Musca domestica* L. While some other species such as *Ocimum gatissimum* (L.) Pongamia pinnata (L); Pierre.; *Ricinus communis* L.; *Trigonella foenum-graecum* L. and *Vitexnegundo* L. have also shown the activity.

Keywords: Household pests, *Musca domestica*, plant based insecticides.

Effect of Treated Spent Wash Application on Physico-Chemical Properties of Soil and Crop Yield

Doddamani M. B., Hullur S.F. and Kuligod V.B.

*Dept. of Environmental Sciences, College of Agriculture,
University of Agricultural Sciences, Dharwad*

Treated spent wash from M/s. Ravindra distillery and Co, Bidar was soil applied one time before the onset of the Monsoon in the selected farmer's field of Kadwad village, Bidar District during 2017-18. Treated spent was applied on the basis of nitrogen requirements of the crops. Soil samples were collected at two depths, 0-30cm and 30-60cm before the application of spent wash and after the harvest of the crops. Treated spent wash application reduced the soil bulk density and increased the porosity. Water stable aggregates and maximum water holding capacity of the soil was improved along with soil organic carbon and inorganic carbon contents. Observation on pH, EC (dSm^{-1}), Available nitrogen, organic carbon and potassium levels remain well within the prescribed optimum limit indicating eco-friendly utilization of one time application of treated spent wash. Analysis of soil samples before and after harvest of the crops recorded pH values at 0-30 cm depth from 6.12 to 7.87 and at 30-60cm depth it was 6.00 to 7.72. Conductivity varied from 0.18dS/m to 0.42 dS/m at 0-30 cm and at 30-60cm depth it was 0.10 dS/m to 0.35dS/m. Organic carbon recorded at 0-30 cm depth varied from 0.14 to 0.84 and at 30-60cm depth it was 0.12 % to 0.74%. Similar trend was observed with available potassium and nitrogen. No deleterious effect on crop yield was also recorded with one time land application of treated spent wash. Based on the results, it could be concluded that one time land application of treated distillery spent wash could be used in agriculture as a source of plant nutrients. However, soil application of treated spent wash should be once in four years only to avoid any deleterious effects on soil health.

Keywords: *Soil health, soil bulk density, porosity, organic carbon, crop yield.*

Jal-Jeevan-Hariyali : An Ambitious Scheme in Bihar that Envisages to Meet the Current Environmental Challenges

¹ Vidyanath Jha, ² S.B.Shashi and ³ Md. Mansoor Alam

¹ *MLSM College, Darbhanga, Bihar*

² *MKS College, Trimuhan-Chandauna, Darbhanga, Bihar*

³ *+2 Sunderpur Bela High School, Bela, Darbhanga, Bihar*

The state of Bihar witnessed a major water crisis in the summer of 2019. Barring a few districts rich in hillocks, other parts of the state, more particularly those of north Bihar, were water surplus districts but gradual decline in annual precipitation led to the unprecedented crisis. Rivers and other water bodies gradually became devoid of water. As such the Govt. of Bihar has launched an ambitious **Jal-Jeevan - Hariyali** mission that envisages to raise the green cover as well as the water harvesting structures. Old wells and tanks/ponds are being renovated. People are raising their voice for revival of lost river courses. Climate resilient agriculture including organic cultivation (**Jaivik Krishi**) are getting a boost. Crop varieties having low water requirement are being promoted. The State Govt. is also working on a plan for transfer of Ganga water to the parched south Bihar. The state Govt. has also stressed the need for raising a national silt policy. This is on account of the fact that during peak flood season the national river Ganga over flows to inundate a vast area that devastates the state's economy. Farakka barrage adds to this recurring predicament. Embankments on other major rivers raised in post-independence dispensation, are now making the situation worse in the form of raising the beds of rivers that hastens the pace of drainage of the river water. Kosi-Mechi river interlinking project that has been okayed by the government might ease the situation related with availability of river water in the eastern districts of north Bihar.

Study of Biodiversity and Physical Parameters: Green Auditing of BRS College, Barrackpore, West Bengal

Monojit Ray

*Dept. of Chemistry, Barrackpore Rastraguru Surendranath College,
Barrackpore, West Bengal, India*

The present survey based study involves the qualitative analysis of biodiversity and other physical parameters related to environmental health. The diversity assessment was carried out at two campuses of Barrackpore Rastraguru Surendranath College. This extensive study reveals the presence of 256 floral species and 165 faunal species in and around college campuses. The huge faunal diversity is mainly due to high level of floral diversity, which establishes the area as resource-rich habitat with promising reservoir of species. In respect to physical parameter studies, approximate per capita average electricity consumption per month is 3 units; Approximate per capita average consumption on and usage per day is 6.6L of water; sound level 49.7 dB (library) to 70.1 (college gate). Air quality of campuses are also monitored.

Keywords: *Flora, Fauna, Air, Water, Green audit*

Regulations and Management of Underwater Noise

Sunit Kumar Saxena

DAV College Kanpur, Uttar Pradesh

Increased recognition of the risk underwater noise pollution poses to marine species from short- and long-term exposure has led to the development of a series of guidelines and regulations. Voluntary guidelines proposed by the IMO in 2013 focus on maintenance of vessel, ship design, onboard machinery, and vessel operational considerations, such as speed and route choices, to help reduce underwater noise pollution and alleviate associated detrimental impacts (IMO, 2014). Propellers are the main source of underwater noise, due to cavitation, which is the formation of water vapor cavities as water passes over propeller blades. Choosing noise-reducing propellers when available and suitable for the vessel and carefully considering propeller characteristics including diameter, number of blades, pitch, and sections to reduce cavitation could help reduce noise. Regular maintenance and cleaning of propellers to ensure a smooth surface would also help reduce cavitation (IMO, 2014). Vessels traveling at higher speeds increase cavitation, and therefore produce more underwater noise. Therefore, decreasing vessel speeds and imposing speed limits could contribute to decreased noise levels along with fewer ship-strikes .

Effective measures to manage and mitigate the effects of underwater noise on marine species include geographic and seasonal shipping restrictions. Rerouting vessels to avoid marine protected areas (MPAs), migratory pathways, and critical habitats help alleviate some detrimental impacts of underwater noise on marine biota (IMO, 2014). Human activities that produce acoustic signals can be programmed to avoid areas or critical times when the most sensitive species of marine mammals or other species are engaged in activities such as mating, nursing, feeding, or migrating. The International Union for Conservation of Nature (IUCN) recommends that the member states use their national and international legislation to establish noise restrictions, at least in MPAs, which in turn will be included in their management plans (IUCN, 2004).

Keywords: *Underwater Noise Pollution, Marine biota, Marine protected areas, Marine Mammals*

Fabrication of Silver Nanoparticles Using Chitosan (*Portunus Sanguinolentus*) Crab Shell And Its Anticancer Potential on Human Breast Cancer Cell Line (Mcf-7)

¹ Kannaiyan Pugazhendy, ² Veerasamy Sakthidasan, ³ Chokkalingam Jayanthi and ² Poochi Sasikala

¹ Dept. of Zoology, University of Madras, Guindy Campus, Chennai

² Dept. of Zoology, Annamalai University Annamalai Nagar

³ Dept. of Education, Annamalai University Annamalai Nagar

The chitosan collected from the chitin, it is the second most bottomless polysaccharide delivered after cellulose. Chitosan is delivered primarily from the crab shell squander. The present work has been carried out for the extraction of chitin from three spotted crab shell *Portunus sanguinolentus* and transformation of chitin into chitosan. The methanolic concentration of the crab shell of *P. sanguinolentus* was subjected to standard subjective examination and the *in-vitro* cancer prevention agent movement was assessed by the assurance of aggregate cell reinforcement limit antioxidant assay, 1.1-diphenyl-2-picrylhydrazyl (DPPH) radical searching action, Antioxidant action, and Nitric oxide potential and anticancer assay, Effect of Stigmasterol Trimethylsilyl Ether on Cell Cytotoxicity Assay, Effect of intracellular ROS generation in Stigmasterol Trimethylsilyl Ether treated MCF-7 cells, Effect of Stigmasterol Trimethylsilyl Ether on Mitochondrial Membrane Potential (MMP), Effect of Stigmasterol Trimethylsilyl Ether Acridine orange / Ethidium bromide dye staining, Effect of Stigmasterol Trimethylsilyl Ether Induced Apoptosis in MCF-7 Cells, Effect of Stigmasterol Trimethylsilyl Ether DNA damage caused in MCF-7 Cells and *Insilico* molecular docking analysis of 4IFI cancer Protein. The examinations uncovered that the methanol concentrate of could co productively rummage the free radicals in a dosage-dependent way. The outcomes were contrasted and the standard cancer prevention agent ascorbic corrosive. Along these lines, additional research might be justified to think about dynamic mixes of *P. sanguinolentus* that give the cancer prevention agent movement. The discoveries displayed here might have suggestions in the populace illness avoidance field.

Keywords: *Portunus sanguinolentus*, MCF-7 Cells, *Insilico*, Stigmasterol Trimethylsilyl Ether.

Some of The Spices and Traditional Knowledge: A Survey Report

Madhu Laxmi Sharma

Govt. K.R.G.P.G. Autonomous College, Gwalior, M.P., India

India is one of the biodiversity rich countries. Since time immemorial the ethno medicinal applications of the plant species are used among the peoples. India produces a variety of spices, many of which are native, while others were imported from similar climates and have since been cultivated locally for centuries. Spices are the dried form of various seeds, roots, fruits, barks, vegetables, and other plant substances primarily used for coloring, flavoring and preserving the food. It is said about spices, when they are prepared, dried, and stored properly, they can last almost forever. They are needed every day in the preparation of traditional foods. Traditional use of medicine becomes a part of every civilization and are widely used and applied to maintain life. Since spices contain low calories, and being used in tiny forms, there is no danger of any side effect. In fact, they contain proteins and other organic compounds that are necessary for overall health and fitness.

Keywords: *Biodiversity, Spices, Traditional, Health.*

Measurements of Cloud Condensation Nuclei (CCN) in the Vicinity of Forest Fires over Western Himalayan Region Tehri Garhwal (Uttarakhand) India

Alok Sagar Gautam, Karan Singh, Abhishek Joshi and Sanjeev Kumar

Dept. of Physics, HNB Garhwal University Srinagar Uttarakhand

Cloud Condensation Nuclei (CCN) play an important role in determining several aspects of cloud growth. The measurement of CCN Concentration (cm^{-3}) has been performed at high altitude in Himalayan cloud observatory situated at Hemvati Nandan Bahuguna Garhwal University (H.N.B.G.U.) SRT Campus Tehri Garhwal ($30^{\circ}34'$ N and $78^{\circ}41'$ E, 1726 m) located in the Western Himalaya region of Uttarakhand, India. A special event of forest fire was recorded in our study period. During forest fire event, CCN concentrations were increased caused by biomass burning in huge amount. From biomass burning act as CCN, organic carbonaceous aerosol like glutaric acid, succinic acid, oxalic acid, malonic acid etc. emitted. Therefore biomass burning could act as an additional local source for CCN in the Atmospheric of Tehri Garhwal during forest fire event. There are usually more nuclei over land than over water because surface sources of nuclei and vegetation fires produce large number of nuclei which may keep much of a cloud's water in small droplets that fails to reach raindrop size. In this study, the measurement of CCN Concentration in the vicinity of forest fire was observed during 20 May 2019 to 5 June 2019. During this period CCN Concentration was observed maximum $10649.98745 \pm 2695.20172 \text{ cm}^{-3}$ and minimum $1489.77881 \pm 789.49828 \text{ cm}^{-3}$ in 30 May 2019 & 4 June 2019 respectively. The normal CCN Concentration was observed $1746.8 \pm 587.3 \text{ cm}^{-3}$ during one year study period while $5118.398 \pm 2796.864 \text{ cm}^{-3}$ during forest fire event.

Keywords: *Forest Fire, Cloud Condensation Nuclei, Western Himalayan Region.*

A Study on Pollutional Status of River Bhagirathi-Hooghly in The Stretch of West Bengal, India

Ashis Kumar Panigrahi

Dept. of Zoology, University of Kalyani, Kalyani, West Bengal

Ganges (river Ganga) is one of the important river systems in the world and the largest river basin of India covering an area about 1,086,000 km². About one third urban population of the country (37%) live in different towns besides the river. In its entire stretch, river Ganga flows through several states of India namely Uttarakhand, Uttar Pradesh, Bihar, Jharkhand and West Bengal. In its lower stretch the Ganga flows through the state West Bengal by the name “Bhagirathi-Hooghly” and finally meets the Bay of Bengal. Recently this river system is facing the adverse effects of rapid urbanisation and industrialization especially due to the massive discharge of domestic and industrial effluents directly into the river in addition to various agrochemicals through surface water runoff. Although a number of researches work and Government projects have been initiated to assess the pollution load and to improve the water quality of the river but the success rate is quite low. River Ganga is still considered as the sixth most-polluted river in the world. The present work is an attempt to gather all data related to the limnological characteristics of the river and to point out the major sources of pollution (point and non-point sources) in Bhagirathi-Hooghly river stretch of West Bengal.

Keywords: *Water quality, Pollution, River Bhagirathi-Hooghly, West Bengal.*

Air Pollution: A Global Concern

Kamal L. Barik

Dept. of Botany, North Orissa University, Takatpur, Baripada, Odisha

Air Pollution is a burning topic discussed throughout the world. The principal sources of air pollution can either be natural or artificial. The natural sources of air pollution are basically coming from wild fires, wind blow, erosion of soil, volcanic eruption etc. whereas the artificial sources are due to human activity which includes (i) Increase in population (ii) Deforestation (iii) Burning of fossil fuels (iv) Emission from vehicles (v) Industrial operation (oil refineries, power plants and factories etc.) (vi) Agricultural activities (burning of straw and debris in agricultural area) (vii) Municipal activities (damping/ burning of city waste) etc.

What ever the sources of air pollution may be, it produces a number of adverse effects on human beings. Air pollution also causes wide spread damage to animals, plants, manufactured goods (like monuments, buildings etc.), aesthetic value and initiate rise in atmospheric temperature leading to global warming. According to WHO, global warming may cause the spread of various skin diseases/skin cancer and other tropical diseases and affect the physiological and metabolic activities of human beings. It may also affect the distribution of plant and animal species. Moreover, it may also deteriorate the physicochemical characteristics of soil, leading to food and fodder scarcity resulting famine. Melting of glaciers results in the rise of sea level, which leads to flood and wash away several plants and animals in coastal belts, and displaces millions of people. Maldives - a country is already looking for a new habitat due to rise in sea levels. It is also reported that, coastal cities of India i.e. Mumbai, Kolkata, and coastal towns i.e. Puri, Cuttack and Balasore in Odisha are treated to be submerged because of global warming effect. Rise in temperature can also lead to landslides, and increase seismic and volcanic activities. Global warming initiates high intensity storms -the more killer storms, desertification of green lands, widespread extinction of plant and animal species, disappearance of coral reefs, droughts, flow of heat waves, frequent wild fires and many more. It has become a major concern all over the world. If global warming goes unchecked, it is estimated that the world's human population will decrease considerably with the increasing severity of storms, floods, earthquakes, wild fires and natural diseases. Majority of them would succumb to air related illness, starvation and poverty. A day may come; the earth will become a non-living planet. Neither a district nor a state or a country can control the warming effect. It is a global issue. We are all responsible for increase in global average temperature. It is high time to think, plan and work together to stabilize the warning effect on earth. Stabilizing the global average temperature would require large reductions in CO₂ emissions as well as reductions in emissions of other green house gases, and for that we should improve industrial processes i.e. the machinery and vehicle engines by modifying

old machinery. We should installed air treatment plants in industrial areas. The height of the chimneys should be increased to the highest possible level to reduce pollution at the ground levels. Leaded petrol should be banned. Unleaded petrol should be made compulsory to vehicle users. We must avoid use of fossil fuels and go for CNG/ electric energy/ solar energy/ wind energy. We should also use public transport instead of driving personal two wheelers or four wheelers. It is also imperative to replace some of our electricity supply with renewable energy such as solar or wind power. Besides, refrigerator and other electrical appliances should be replaced with gadgets that consume less energy. We should not use Air conditioner whole day and night and use only at the time of exigency. Population growth which is the main causes of air pollution should be brought under control. Nuclear testing and explosion should be banned. Pollution Control Laws i.e. Air Pollution (Prevention and Control) Act including Motor Vehicle Act should be strictly enforced. The Air Quality Standards as recommended by the Central Pollution Control Board must be strictly implemented. Severe punishment/ penalty should be specified and implemented to the defaulter concerned. General public whether educated or not without any age differentiation should aware about the sources, effects and consequence of air pollution through national awareness comparing programmes. Most importantly, we should plan and plant more and more trees in our surrounding, on the coastal belts, waste lands, and road sides to overcome the issue of Air pollution- A global concern.



GROUP - A

**Food Security
and
Safety under Climate Variables**



Germination Behavior of Onion as Influenced by Packaging Materials and Storage Conditions

Meena M.K, Chetti M.B., and Nawalagatti C.M.

University of Agricultural Sciences, Raichur, Karnataka

Seed is the foundation of agriculture for enhancing crop production. But the availability of quality seed is the main constraint to crop production in developing country like India. The use of quality seed can contribute significantly to increased grain yield as well as to increased availability of every day's food intake. Packaging materials and storage conditions extending the storability of seeds during long term storage. Research on storability of seeds in India is of recent origin with the development of organized seed production and marketing. It is stipulated that 80 per cent of certified seeds produced in India require storage for one planting season and 20 % of seeds is carried over for subsequent sowing. However, when the awareness and infrastructure is developed, substantial quantity of seeds can be stored for few planting seasons as a safeguard against monsoon failure and as a precaution against production of poor quality seeds. So, a lab experiment was carried to study the influence of various packaging materials and storage conditions on germination behavior of onion seeds with following objectives:

1. To study changes in seed germination and seed quality parameters under different packaging and storage conditions of onion seeds
2. To study influence of packaging and storage conditions on the appearance of onion seeds

Freshly harvested seeds of onion (ArakaKalyan) were procured from Seed Unit, Main Agricultural Research Station, Dharwad. After procurement of seed materials, the seeds were dried under sun light till the required moisture content (6-8 %) for storage is attained. These seeds were further used for storage under different storage conditions and containers. The temperature in the cold storage was around ($4^{\circ}\text{C} \pm 1^{\circ}\text{C}$), and relative humidity 70-80 %. For ambient storage, bags were stored in the laboratory at room temperature ($25 \pm 2^{\circ}\text{C}$). The seed of onion crop was packed in aluminium foil and vacuum packed polythene bags of 10.0 g capacity; while 500 g in cloth bags. After the packaging of all the seeds in different containers; 50 % bags were stored properly in the iron racks without stacking such that all the bags were uniformly exposed to the particular treatment condition while 50 % bags were stored under cold storage for a period of 18 months.

The results of the study was revealed that seeds stored in vacuum packed bags maintained higher values for germination per cent (91.3 & 91.1 %) Fig. 1, root length (8.63 & 8.55 cm), shoot length (7.69 & 7.65 cm), and seedling vigour index (1491 &

1476) of onion seeds irrespective of storage conditions i.e. cold storage and ambient storage, respectively after 18 months of storage period (Table 2). The seeds were also observed for appearance at 0, 6, 12 and 18 months of storage and it was found that upto six months there was no appreciable change in the appearance of seeds. The seeds started deteriorating and it was visible from 12 months onwards (Plate 1). These results are in agreement with the study of Kumari et al (2001), Shelar et. al (1992), Padama and Reddy (2000), Hong and Kim (2004) in onion crop seeds.

The present study concluded that seeds stored (under cold storage and room temperature) in moisture impervious containers viz., vacuum packed and aluminium foils gained less moisture and showed higher seed quality parameters compared to other moisture permeable containers such as cloth bags. Considering the changes in seed quality parameters studied, it is suggested that the vacuum packaging and aluminium foils perform better for storing seeds in areas with high temperature and humidity.

Keywords: *Germination, Root and Shoot length, seedling Vigour Index, seed appearance, Vacuum packaging and storage.*

Positive Correlation between Indian Sarus Crane and Agriculture

¹Shri Prakash and ²Ashok Kumar Verma

¹ Dept. of Zoology, KA PG College, Prayagraj

² Dept. of Zoology, Government Post Graduate College, Saidabad, Prayagraj

The Indian sarus crane, *Grus antigone antigone* is the 'State Bird' of Uttar Pradesh. It is the monogamous, non-migratory and world's tallest flying bird. This is the only resident breeding crane of Indian sub continent, prefers open habitat like marsh areas, abundantly irrigated paddy fields, grass land and wetland. It has been categorised globally as 'vulnerable' by *International Union for Conservation of Nature* in its Red List because of its rapid population decline, which is projected to continue, as a result of widespread reductions in its wetland habitats. The cranes are well known for their faithfulness and living togetherness. A positive correlation was observed between the crane occurrence and the wetland.

Keywords: *Sarus crane pair, wetland, habitat, vulnerable and conservation.*

Role of Allelopathy in Ecological Agriculture

Awanish Kumar Singh

Dept. of Botany SGN Govt. P.G. College Muhammadabad, Gohna, Mau, UP, INDIA

Allelopathy is a common biological phenomenon by which one organism produces biochemicals that influence the growth, survival, development, and reproduction of other organisms. These biochemicals are known as allelochemicals and have beneficial or detrimental effects on target organisms. Many crops exhibit allelopathic interactions that play a significant role in the complex environment of agroecosystems. Several studies have shown that allelopathic crops reduce growth, development and yield of other crops growing simultaneously or subsequently in the fields. Another aspect of interest regarding crop allelopathy is that allelochemicals may exhibit inhibitory effect on the same crop which is commonly called as *crop autotoxicity*. Nowadays allelopathic crops are being used as an important tool in managing weeds and harmful pests under sustainable pest management programs. In this context several cover/smother and green manure crops with allelopathic nature hold a good promise as well as challenge for the future as they have a potential to suppress noxious weeds. Likewise, the decomposing residues of such crops can also be used for managing harmful weeds and pests. The traditional practice of crop rotation which declined with the discovery of synthetic herbicides can also be revived, if allelopathic potential of rotational crops is well understood. Crops with less allelopathic potential can be genetically improved by incorporating desired genes encoding the synthesis of allelochemicals. Integrated weed control in most respects the principle of greening and environmental protection simultaneously with increased weed control and saving energy. Allelopathic strategies aim at reducing environmental pollution and maintaining ecological balance especially soil fauna and flora through reduced use of chemical herbicides or substituting them with natural products (plant and microbial products). Pure allelochemicals extracted and identified from some crop plants can also be used as bioherbicides.

Keywords: *Allelopathy, allelochemicals, crop rotation, weed management, ecological mechanism*

Study on Effect of Different Irrigation Techniques and Saline Water Levels on Soil Properties and Growth of Tomato (*Solanum lycopersicum*) Crop under Tungabhadra Project Command Area

¹ Rajkumar R. H., ¹ Nemichandrappa M., ¹ Anilkumar T. Dandekar.,
² Ayyanagowdar M. S., ² Polisgowdar B.S., ³ Satyanarayana Rao
and ⁴ Vishwanatha J.

¹ Dept. of Soil and Water Engineering, CAE, UAS, Raichur

² Dept. of Irrigation and Drainage Engineering, CAE, UAS, Raichur

³ Main Agricultural Research Station, UAS, Raichur

⁴ AICRP on Saline water scheme, A.R.S, Gangavathi, UAS Raichur

The experiment was conducted at Agricultural Research station, Gangavathi (Karnataka) during 2018-19 and 2019-20 to study the effect of three (Furrow-M₀, Surface drip-M₁ and Subsurface drip-M₂) different irrigation techniques and five (0.65 dS m⁻¹-S₀ normal water, 2 dS m⁻¹-S₁, 3 dS m⁻¹-S₂, 4 dS m⁻¹-S₃ and 5 dS m⁻¹-S₄) different irrigation water salinity levels on soil properties viz., soil pH and soil salinity in tomato (*Solanum lycopersicum*) crop under Vertisols of Tungabhadra Project Command. The soil pH was maximum at the top surface during after harvest in first year and decreased in second year during before sowing under all the treatments. In subsurface drip technique the pH at the 15-30 cm was less as compared to 0-15 cm because of buried drip laterals to a depth of 20 cm. In case of surface drip the top surface (0-15 cm) was having slightly less pH as compared to (15-30 cm) after harvest because of frequent application of water at the top surface through drippers. In case of surface drip, more salt were present at 20 cm distance apart from the dripper at 0-15 and 15-30 cm depths. In case of subsurface drip irrigation, accumulation of salts was more at the soil surface but it was lesser at near and below the buried dripper but increased with distance from the dripper. Due to upward capillary action, more salts accumulated on the top surfaces and at periphery of the water front outside the root zone and less at the root zone of the crop because of continuous salt leaching downwards under subsurface drip. More salt accumulation was observed as salinity level increases. The soil salinity for tomato crop in the active root zone varies within a narrow range. Hence, the salinity was not much affected to the plant roots (20 cm depth). Therefore subsurface drip irrigation can be preferred over furrow irrigation whenever saline water is used under drip irrigation upto a threshold limit of 2 dS m⁻¹. The maximum number of plants per treatments, plant height and number of branches per plant during 30, 60, 90 and 120 days after transplanting (DAT) were recorded higher under subsurface and surface drip as compared to furrow irrigation except plant height during 30 DAT. Similarly, under different irrigation saline water levels, maximum number

of plants, plant height and branches were recorded under 0.65 dS m⁻¹ and 2 dS m⁻¹ treatment and least was recorded in 5 dS m⁻¹ treatment. From the study it was concluded that the growth of tomato was good under subsurface drip and surface drip as compared to furrow irrigation under main treatments and under sub treatments, 0.65 and 2 dS m⁻¹ treatments performed better as compared to higher salinity levels. Whenever there is shortage of fresh water, saline water upto 2 dS m⁻¹ can be used to grow tomato without much effect on the crop growth.

Keywords: *Subsurface drip, Surface drip, Capillary, Salinity, Tomato, Plant height, Branches.*

Sulphur and Calcium Consecutively Regulate Nitrogen Metabolism in Leaves of Mustard Seedlings Grown under Arsenic Toxicity

Rachana Singh and Sheo Mohan Prasad

Dept. of Botany, University of Allahabad, Allahabad, India

Agricultural crops are severely been affected by arsenic (As), especially when irrigated with As laden water. In the present investigation, the combined impact of sulphur (S: 60 mg S/kg sand) and calcium (Ca: 250 mg Ca/kg sand) was studied on nitrogen metabolism status of mustard seedlings suffering from As (As₁: 15 mg As/kg sand and As₂: 30mg As/kg sand) toxicity. Results revealed that both the doses of As decreased nitrate (NO₃⁺) and nitrite (NO₂⁺) content along with the activities of NO₃⁺ assimilating enzymes: nitrate (NR) and nitrite reductase (NiR), and ammonium (NH₄⁺) assimilating enzymes: glutamine synthetase (GS) and glutamate synthase (GOGAT) of mustard plant; whereas improved ammonium (NH₄⁺) content and glutamate dehydrogenase (GDH) activity. In contrary to this, simultaneous exposure of S and Ca to As stressed mustard seedlings caused improvement in the above mentioned parameters thereby reducing As accumulation except NH₄⁺ content, which was found to decrease upon combined application of S and Ca.

Keywords: *Arsenic, Brassica, Calcium, nitrate (NO₃⁺), ammonium (NH₄⁺), nitrate reductase (NR), nitrite reductase (NiR), glutamine synthetase (GS), glutamate synthase (GOGAT) and Glutamate dehydrogenase (GDH) and Sulphur.*

Potential Modules of Integrated Farming Systems and Ancillary Activities in Karnataka

¹B.K. Desai, ²Pralhad and ³Satyanarayana Rao

¹ University of Agricultural Sciences, Raichur, Karnataka

² ICAR-Krishi Vigyan Kendra, Raichur, UAS, Raichur

³ MARS, Raichur, UAS, Raichur

The Farming System, as a concept, takes into account the components of soil, water, crops, livestock, labour, capital, energy and other resources with the farm family at the centre managing agricultural and related activities. The farm family functions within the limitations of its capability and resources, the socio-cultural setting, and the interaction of these components with the physical, biological and economic factors. It is the result of a complex interaction among a number of interdependent components. To achieve it, the individual farmer allocates certain quantities and qualities of four factors of production: land, labour, capital and management, which has access the processes, like crop, livestock and off farm enterprises in a manner, which within the knowledge he possess will maximize the attainment farm income. Scientifically designed and tailor made IFS certainly will help to achieve the vision of doubling the farmers income by 2022.

Concerns regarding environmental safety and sustainability of land productivity are increasing among scientists, administrators and environmentalists. It is doubted whether the strategy adopted during the green revolution era could be continued any longer under the challenging conditions of this new century. Already, a section of people in the world is questioning the propriety of conventional agriculture, and a few of them are advocating alternative practices that are perceived to lay foundation for sustained production. On these lines, systems like alternative agriculture, natural farming, organic farming etc. were proposed at various conventions. However, the scientists harping on the success of green revolution continue to doubt whether such a system can really be functional, productive and meet the growing demands for agricultural products in this e-age. These emphasize the need to develop new strategy of living with the nature and nurturing it for sustainable production and doubling of farm income. After six years of implementation and evaluation of several IFS models following potential components are identified to enhance farmers income.

Objectives

- To identify existing farming systems in specific area and assess their relative viability
- To formulate farming system models involving main and allied enterprises for different farming situations

- To ensure optimum utilization and conservation of available resources and effective recycling of farm residues within system;
- To maintain sustainable production system without damaging resources base environment.
- To raise overall profitability of farm household by complementing main allied enterprises with each other.

Integration among the components of farming system is often employed as a livelihood strategy in small farms and it plays a pivotal role in meeting the multidimensional needs of the farm family. A field experiment was conducted on performance of integrated farming system (IFS) over conventional farming system for one ha. area at Main Agricultural Research Station, Raichur, Karnataka for three successive years of 2010-11 to 2012-13 under irrigated conditions in medium black soils to explore the productivity and profitability under irrigated condition.

Components of IFS

1. Cropping system : Redgram , Groundnut, Sunflower, Green gram, Black gram, Soybean, Safflower, Chilli, Bajra, Navane, Bengalgram, Rabi Jowar, Safflower, rabi/ summer groundnut.
2. Fodder crops components : NB-21, Guinea grass, Stylosanthus Improved fodder & Silo pits.
3. Horticulture Components:
 - a. Vegetable crops: Brinjal, Onion, Leaf vegetables, Clusterbean
 - b. Segment Bund Planting: Drumstick, Curry leaf, Fig, Bottle guard, Fodder
 - c. grass Custard Apple
 - d. Boundary planting: Guava, sapota, citrus, Ber, pomegranate, mango, coconut
 - e. Flower crops: Jasmine, rose, marigold
4. Forestry and Agro forestry on Bunds : Neem, Pongamia, Tamarind, Teak, without affecting adjacent lands.
5. Subsidiary enterprises : Farmhouse, kitchen garden, vermicompost pits-with trellising gourds (thatched roof), Compost Pits, Desi cow, Backyard Poultry, Honey bee, Fisheries, Sheep /Goat
6. Live Fence : Glyricidia, Agave, Sesbania.
7. Soil and Water conservation structures : Farm ponds / dugout ponds, Bunds, Terraces
8. Precision farming through micro-irrigation components under protected irrigation.
9. Post harvest processing and value addition.

Among the system evaluated IFS has recorded higher average net returns (Rs. 1, 50,710) and benefit cost ratio (3.61) over conventional method as it records average net returns of Rs.65, 000 with benefit cost ratio (2.85). The productivity and profitability during third year (2012-13) was more than second and first year under IFS. During third year of IFS records higher net returns (Rs. 2,45,398) with 4.63 B:C ratio than second year (Rs.1,29,442 net returns with 3.34 B:C ratio) and first year (Rs.76968 net returns with 2.53 B:C ratio) respectively. From above results IFS method for irrigated situations enhances productivity and profitability of the farmer and sustains soil productivity through recycling of organic sources of nutrients from the enterprises involved. In this system, animals are reared on agricultural waste and animal power is used for agricultural operation and voids are used as manure and fuel. The most notable advantage of utilizing low-cost/no-cost material at the farm level for recycling is that it will certainly reduce the production cost and ultimately improve the farm income considerably.

IAA Mitigates the Negative Impacts of Silver Nanoparticles by Inducing Antioxidant System on Wheat Seedlings (*Triticum aestivum* L.)

Namira Arif and Devendra Kumar Chauhan

Dept. of Botany, University of Allahabad, Prayagraj, India

Experiment was carried out to investigate the negative impacts of silver nanoparticles (AgNPs) on shoot length, root length as well as ROS generation. Wheat seedlings were hydroponically grown under suitable and controlled lab condition. Seedlings were exposed to 200 μ M and 500 μ M AgNPs treatment. AgNPs affected the plant height and biomass by inducing the generation of reactive oxygen species (ROS) and by alter the structure of wheat root due to deformation of root epidermis, cortex as well as stele. Whereas supplementation of IAA (Indole-3 Acetic Acid) in combined treatment shows defensive role against the nanoparticles toxicity. IAA improved the plant height and biomass by inducing antioxidant system as well as by protecting the ultrastructure of wheat root.

Keywords: *Silver nanoparticles, IAA, ROS generation, Antioxidant system, Anatomy.*

Identification of Maize Landraces for Different Traits

¹ Manigopa Chakraborty, ¹ Mukesh Mahto, ¹ Satish Chandra Narayan,
¹ Veena Kumari Tudu, ² Soumitra Sankar Das and ¹ Priyanka Kumari

¹ Dept. of Genetics and Plant breeding, Birsa Agricultural University, Kanke, Ranchi

² Dept. of Agricultural Statistics and Computer Application Birsa Agricultural University,
Kanke, Ranchi

Land races are the main source of diversity and also the reservoir of biotic and abiotic stress tolerance. In crop breeding program, improvement in yield and yield attributing traits are carried out for different suitable traits in different crops. Nowadays, crop yield has been more affected by abiotic and biotic factors. However, the magnitude and intensity of these stresses are increasing dramatically due to climate change causing recurrent droughts, increased temperature and emergence of new diseases and pests. Maize (*Zea mays* L.) is one the important crop in India. It is a photoperiod insensitive crop. It is grown in both season Kharif and Rabi. In Rabi season it takes 30 days more time and is less affected by insect and disease in comparison to Kharif. It is highly diverse crop and based on the characters of kernels, it has divided into flint corn, dent corn, pop corn, sweet corn, flour corn, pod corn and waxy corn. (Kipps, 1959). Though it is a tropical crop, it has got high adaptability to wider climate (55° N - 45° S) and grown up to 2500 m above mean sea level. Most suitable temperature for germination is 21°C and for growth is 32°C. Temperature less than 15°C delays tasseling and silking. Rainfall of 500-700 mm is required for growth. It is widely used in preparation of cattle feed and poultry feed. Food products like corn meal, corn flakes etc. are also prepared. It is also used in making industrial products like alcohol, corn starch (dextrose), glucose, corn oil, corn syrup etc. However, high input and fertilisers cost are main constraints in maize production. Maize hybrids are voracious feeder of Urea in comparison to synthetic and composite varieties. Hybrid breeding is exhaustively used in this crop to exploit the heterosis or hybrid vigour to maximize the yield potential. For hybrid breeding programme, two genetically diversified parents are required which can be selected in different methods by using genetic distance of the heterotic pool. To identify the suitable maize landraces for different traits, the present research was carried out during Rabi 2018-19 with 99 landraces of maize received from NBPGR. These maize landraces were collected from Chhatisgarh, Jharkhand and Madhya Pradesh. Among 99, 7 land races (REG/2016/2204, REG/2016/2205, REG/2016/2263, REG/2017/1829, REG/2017/1830, REG/2017/2013 and REG/2017/1888) were not germinated. Observations were recorded for the traits viz., days to 50% pollen shed, days to 50% silking, days to 75% dry husk, plant height, ear height, tassel colour, silk colour, brace root colour, width of leaf blade and stem diameter. Data was analyzed using SPSS software by different clustering methods viz., Median cluster, ward method, centroid method, between group linkage method and farthest neighbour method. Based on

dendrogram obtained from median cluster method, 92 maize landraces were classified into 7 clusters. Cluster I, II, III, IV, V, VI and VII consisted of 17, 46, 7, 9, 11, 1 and 1 respectively. Detailed information will be discussed in paper about grouping of maize genotypes on the basis of above mentioned traits studied in present experiment. Landraces from different groups such as cluster VI (REG/2017/1104) and VII (REG/2017/832) can be utilized for further breeding programme to obtain climate resilient maize hybrids.

Keywords: Land races, heterosis.

PGPR An Effective Ecofriendly Tool For Mitigation of Salinity and Sustainable Agriculture

Prabhat Kumar Chauhan and Sudhir K. Upadhyay

Dept. of Environmental Science, V.B.S. Purvanchal University, UP, India

Soil salinity is a major issue in agricultural field which hampered the growth of crops and the problem of soil salinity observe globally. In India about 10 million ha of arable land is salt affected. The high concentrations of salt in the soil have detrimental effects on crops as well micro flora and fauna. In the present study, different agricultural soil field zone of district Jaunpur revealed that at few sites soils salinity a [NaCl (w/w)] increase as compared with report of censuses 2001. Recently, scientists have tested various strategies to improve the growth of crop plants under saline soils. Since last few decades back several genes from microorganisms and plants have been used to develop transgenic that can grow in saline soils. And at last they introduce an eco friendly concepts which based on Plant Growth Promoting Rhizobacteria (PGPR), they reduces the use of chemical fertilizers and pesticides, and make the sustainable agriculture. Keeping these views in the present study, 6 to 8 % NaCl (w/v) tolerant rhizobacteria were screened followed by observed their PGP attributes. SP12, SP20 and SP 14 rhizobacterial isolates were survived at 6% NaCl (w/v) and produced IAA, SP12 revealed more IAA followed by SP20 and SP14, and all the bacterial isolates induced their IAA production with addition of 25µg tryptophan in broth. P solubilizing activity was observed at Pikovskaya's agar plates supplemented with 6% NaCl (w/v), and isolate SP12 showed good zone. Thus, these bacterial isolate could be effective tool for mitigation of salinity in saline agricultural field.

Keywords: Soil salinity, PGPR, IAA, and P-solubilization.

Risk Assessment of Wastewater Reuse in Suburban Area of Bhadohi, India

Prince Kumar Singh and Rajesh Kumar Sharma

Dept. of Botany, Institute of Science, Banaras Hindu University, Varanasi, India

Wastewater reuse in agriculture is one of the important water resource management strategies in a region where fresh water resources are limited. Further wastewater irrigation is also one of the major environmental concerns as it potentially contributes heavy metal to suburban food systems. Excessive accumulation of heavy metals in agricultural soils through long-term wastewater irrigation may not only result in soil contamination but also poses threats to both the quality and safety of foods. The results of present study showed that there is a substantial build-up of heavy metals in soils irrigated with wastewater for long and their produces. The concentrations of Cu, Zn, Ni, Cd and Cr were recorded as 0.028 mg/l, 0.113 mg/l, 0.16 mg/l, 0.01 mg/l and 0.036 mg/l, respectively in wastewater and 36.52 mg/kg dw, 61.59 mg/kg dw, 42.53 mg/kg dw, 2.03 mg/kg dw and 31.52 mg/kg dw, respectively in soil. Concentration of heavy metals (mg/kg dw) in edible part of test crops were recorded as such spinach, cabbage, radish, paddy, wheat were 13.83, 6.83, 0.11, 19.02 and 22.23 in spinach, 60.7, 46.4, 45.2, 38.2 and 45.1 in cabbage, 23.4, 6.7, 20.71, 48.29 and 38.75 in radish, 5.3, 3.7, 4.4, 2.2 and 3.75 in rice and 8.3, 4.4, 3.4, 8.2 and 9.2 in wheat, respectively. The results indicate that the concentrations of heavy metal in the edible parts of tested vegetables and grain were found above the safe limits. From the present study, it can be concluded that wastewater reuse for cultivating edible crops in such areas is not a suitable approach for wastewater management as it contributed significant amounts of heavy metal to the food chain. Thus, there is an urgent need to develop a strategy to reduce the heavy metal concentration in wastewater for reducing their load in food chain.

Keywords: *Risk assessment, Wastewater reuse, Carpet city, Heavy metals, Food chain.*

Physicochemical Properties and Estimation of Mineral Content in Honey Produced from Different Origins of Prayagraj District Uttar Pradesh

Vibhasa

Dept. of Botany, University of Delhi, Delhi

Honey is a natural sweet substance produced by honey bees, from the nectars of plant flowers and honey dew. The chemical composition of honey varies depending on the plant source, season, production methods, and storage conditions. The paper deals with the physicochemical properties and estimation of mineral content of twenty honey samples collected from different localities of Prayagraj district Uttar Pradesh. Honey samples were analyzed for color, ash content, moisture content, electrical conductivity, total acidity, pH, total solid substances (TDS), hydroxymethylfurfural (HMF), minerals and trace elements. Physicochemical properties were examined according to AOAC methods and minerals were determined by atomic absorption spectrophotometry. The physicochemical parameters were found to be within acceptable ranges (ash content 0.06 - 0.25%, moisture content 13.76-19.37%, electrical conductivity 0.26-0.47mScm⁻¹, total acidity 39-68.3 meq/Kg, pH 3.75-4.9, TDS 6.9-75.2%, HMF- 3.44 mg/Kg to 9.75 mg/Kg). Honey color was from amber yellow to amber dark. The concentration of minerals was Zn 2.70-4.01ppm; Cd- 0.86-0.93 ppm; Fe- 39.80-52.7 ppm, Mg- 17.23-43.28 ppm, Pd- 0.03-0.78 ppm. Physicochemical properties and mineral contents of different origin of honey samples have been compared and discussed in the paper.

Keywords: *Honey, Mineral content, Physicochemical properties*

Risk Assessment of Heavy Metal Contaminated Vegetables in North India

Rajesh Kumar Sharma

Dept. of Botany, Institute of Science, Banaras Hindu University, Varanasi, India

Vegetables are the rich sources of many nutrients required for the growth and development of human beings. Increasing anthropogenic activities such as industrial, agricultural and urban activities have elevated the concentration of many toxic chemicals especially heavy metals in food system which permissible limit under peri-urban ecosystem. Consumption of heavy metal contaminated vegetables can pose many health risks to human via their accumulation in soft tissues e.g. liver, kidney, spleen, etc., as well as by altering the many physiological and biochemical activities. Thus, increasing awareness among the local stakeholders regarding current status of heavy metal in vegetables, associated health risks and strategies for reducing their exposure to heavy metals is urgently required. In the present lecture, the data on heavy metal contamination of commonly consumed vegetables generated from 2002 to till date will be reported. Estimated exposure of local people of Varanasi, Bhadohi (Uttar Pradesh) and Kullu (Himachal Pradesh) to heavy metal via consumption of vegetables will be delivered. The present paper will further help policy makers, scientist, and students in managing the mobility and accumulation of heavy metal in different biotic and abiotic components of environment to reduce their accumulation in food chain.

Keywords: *Risk assessment, Heavy metals, Environment, Food chain, North India.*

Mitigating Role of Activated Charcoal Against Crop Residue Induced Soil Sickness

Nimisha Amist and N. B. Singh

Dept. of Botany, University of Allahabad, Prayagraj, India

Monoculture of high yielding crops is a common trend in modern agro-ecosystems. However, sustainability in agro-ecosystems can be achieved by maintaining balance in crop diversity, space and time. Retention and incorporation of stubbles and plant debris in cropping system have been adopted by farmers recently. Stubble retention may be beneficial in improving soil structure and water infiltration but negative aspects cannot be ignored. Crop residue decomposition starts immediately after coming in contact with the soil. Plant residues are known to alter the soil physical properties. A variety of organic and inorganic compounds are released in soil from crop residues. Accumulation of phytotoxic compounds results in soil sickness causing decline in quality and yield of crops. Greatest phytotoxicity has been reported during early decomposition stages of residue. The main concern regarding the crop residues is the allelopathic nature of these compounds and their impact on the other or same crop plant. The adverse effects of phytotoxins from crop residues on the seedling growth of succeeding crops have been reported.

In the present study the effect of *Zea mays* residue was evaluated on the succeeding crop (wheat). Soil culture experiments were conducted in the greenhouse. The residue (plant debris) was added to the garden soil in five concentrations (0,2,4,6,8 g/kg soil). The residue resulted in decline of growth of wheat seedling as observed through seedling height and biomass, pigment, protein and sugar content. Elevation in lipid peroxidation occurred reflecting the damage to cellular systems, even though a substantial increase in activity of superoxide dismutase (SOD), catalase (CAT), ascorbate peroxidase (APX) and guaiacol peroxidase (POD) was observed. The phenolic content of soil also increased due to addition of residue. The most significant aspect of this study was to investigate the contribution of activated charcoal (AC) towards evading residue induced soil toxicity. AC has large surface area and pore volume, as well as due to its polarity possesses tremendous adsorptive capacity with complex chemical and physical properties. AC can be easily mixed into soil media and it did not impose any negative effect on the wheat seedlings and also decreased the level of soil phenolics in comparison to untreated soil. AC demonstrated counteracting effect on phenolic contents of crop residue and presented as possible solution for alleviation of the residue induced soil sickness.

Keywords: *Activated charcoal; allelochemicals; antioxidants; biomass; lipid peroxidations; wheat seedlings; maize residue.*

Differential Growth, Photosynthetic and Antioxidative Responses of *Helianthus Annuus L.* Seedlings During Three Prolonged Light Intensities

Geeta Yadav and Sheo Mohan Prasad

Dept. of Botany, University of Allahabad, Allahabad, India

Present study was to aim at assessing the impact of three light acclimatizing conditionings—optimum ($400 \mu\text{mole photon m}^{-2}\text{s}^{-1}$), sub-optimum ($225 \mu\text{mole photon m}^{-2}\text{s}^{-1}$) and low ($75 \mu\text{mole photon m}^{-2}\text{s}^{-1}$) on some of the growth parameters of healthy *Helianthus annuus L.* var. DRSF-113 seedlings viz. fresh and dry masses of root and shoot, lengths of root and shoot, leaf area, chlorophyll *a*, *b* and carotenoids. Optimum light intensity was proved to be salubrious for *Helianthus* seedlings as they exhibited maximum increase in all the growth parameters. These results were also corroborated by the results of pigments as the maximum Chl*a*, *b* and Car under optimum light intensity. Perhaps, greater intensity of light which was also the optimum light intensity facilitated the process of photosynthesis which allowed greater assimilation of photosynthates accompanied by more uptake of nutrients and more vigorous growth of the sunflower seedlings. This could be seen in greater activity of enzymatic antioxidants, viz. superoxide dismutase (SOD), peroxidase (POD), catalase (CAT) and glutathione-S-transferase (GST) and accumulated non-enzymatic antioxidants, viz. ascorbate and proline (Pro).

Keywords: *Chl a, b and Car; glutathione-S-transferase; Helianthus annuus L. seedlings; Nutrient uptake; optimum, sub-optimum and low light intensities; superoxide dismutase.*

Response of Coffee (cv. C X R) to Humic Acid Based Substance under Western Ghats Condition

Jayakumar M, Mote Kishor J, Nagaraj Gokavi, Mukharib, D.S, Raghuramulu, Y

Central Coffee Research Institute, Coffee Research Station, Chikmagalur district,
Karnataka, India

A field experiments was conducted on the loamy sand soil at Central Coffee Research Institute (CCRI) research farm, Karnataka, India for two years (2017-18 and 2018-19) to evaluate the influence of humic acid based substance on yield and bean quality of coffee. The trial was laid out in Randomized Complete Block Design comprised of six treatments with four replications. The treatments comprised of T₁: 100 % Recommended dose of fertilizer (RDF), T₂: 100% RDF + Soil Application of Humic acid Granules @ 10 Kg/acre + Humic acid @ 600 ml 200 L⁻¹ (Foliar application 25 days after blossom), T₃: 75% of the Recommended dose of fertilizer (RDF), T₄: 75 % RDF+ Soil application of Humic acid Granules @ 10 Kg/acre + Humic acid @ 600 ml 200 L⁻¹ (Foliar application 25 days after blossom), T₅: 100 % RDF + Nutrient mixture spray (1 kg Urea, 1 kg SSP, 0.75 kg MoP, 1kg ZnSO₄ + 75 ml Planofix 200 L⁻¹ (Foliar application 25 days after blossom) and T₆: 100 % RDF + Humic acid Granules @ 10 Kg/acre + Nutrient mixture spray (1 kg Urea, 1 kg SSP, 0.75 kg MoP, 1kg ZnSO₄ + 75 ml Planofix 200 L⁻¹ + Humic acid @ 600 ml 200 L⁻¹ (Foliar application 25 days after blossom). The research trials for consecutive two years data on the yield attributes of coffee revealed that the total nodes per branch, crop nodes per branch, flower buds per branch, total no. of fruits per branch and fruit set percentage of 17.45, 9.4, 208.65, 153.31 and 3.28, respectively were recorded in RDF + Humic acid Granules @ 10 kg/acre + Nutrient mixture spray (1 kg Urea, 1 kg SSP, 0.75 kg MoP, 1kg ZnSO₄ + 75 ml Planofix 200 L⁻¹ + Humic acid @ 600 ml 200 L⁻¹ (Foliar application 25 days after blossom) (T₆) when compared with T₃ (75% of the RDF) during both the years of study. The maximum yield was recorded among the different treatments, RDF + Humic acid Granules @ 10 kg/acre + Nutrient mixture spray (1 kg Urea, 1 kg SSP, 0.75 kg MoP, 1kg ZnSO₄ + 75 ml Planofix 200 L⁻¹ + Humic acid @ 600 ml 200 L⁻¹ (Foliar application 25 days after blossom) (T₆) recorded significantly highest clean coffee yield (1603 kg/ha), which was statistically on par with T₂ (1476 cc kg/ha) with 43.66% increase in yield as compared to T₃ (930 cc kg/ha) for both the years of study. The same trend was observed in coffee beans grades, nutrients status in plants and post harvest nutrient status in the soil. The net return and B: C ratio was highest in T₂ (2.89) and T₆ (2.83) compared with T₃ (1.91). The study emphasized that adoption of humic acid is an alternative material which can be used for improving soil fertility and supporting plantation production in coffee.

Keywords: *Robusta coffee, humic acid, clean coffee yield, nutrient uptake, quality and economics.*

Effects of Zinc Oxide Nanoparticles in Mitigation of Salt Stress in *Solanum lycopersicum* L.

Ajey Singh, N. B. Singh and Imtiyaz Hussain

Dept. of Botany, University of Allahabad, Allahabad, U.P, India

The use of exogenous application of zinc oxide nanoparticles (ZnO NPs) under salt stress condition has been found to be quite effective to alleviate salt induced damages in tomato seedlings. In this study, seeds of tomato plants were grown in plastic pots filled with sterilized sand and exposed to combinations of different concentrations of salt and ZnO NPs. The treatment with NaCl of highest concentration caused 46, 54, 70 and 79.5% reduction in germination percentage, radicle and plumule length and seedling vigour index (SVI) respectively. Application of ZnO NPs increased growth and diminished effects of salt stress. Combined ZnO NPs and NaCl treatment caused increase of 60, 64, 161 and 219% in germination percentage, radicle and plumule length and SVI respectively as compared with NaCl treated plants. Salinized plants showed a reduction in plant growth parameters i.e. root length, shoot length, fresh weight, and dry weight. There was reduction in photosynthetic pigments viz. total chlorophyll and carotenoids, sugar content and NR activity in the plants exposed to high salt concentration. On the other side, salinity stress boosted the MDA, EL and H₂O₂ level as well as the activities of SOD and CAT in stressed plants over control plants. However, application of ZnO NPs mostly stimulated growth of stressed plants, which was accompanied by increase in the levels of photosynthetic pigments, sugar content and NR activity. On the contrary, priming with ZnO NPs caused a decrement in the contents of MDA, EL, H₂O₂ as well as in the activities of SOD and CAT. It is concluded from the results of this study that priming with ZnO NPs, lessened the negative impacts of NaCl on tomato plants through enhancing photosynthetic pigments, adjusting osmoregulation, and decreasing the contents of MDA and EL. Further, protection under NaCl stress was achieved via recovering the activities of antioxidant enzymes. Further efforts are required to gain a full understanding of how ZnO NPs mitigate the adverse effects of salinity stress in plants.

Keywords: *zinc oxide nanoparticles; salt stress; tomato; germination; photosynthetic pigments.*

Climate Change V/S Crop Plant Responses

Gyan Prakash Gupta

Dept. of Botany, DAV (PG) College, CSJM University, Kanpur, Uttar Pradesh, India

The emission of uncontrolled GHGs and other air pollutants due to industrialization and land use change pattern cause the global warming and led to climate change. Increasing global warming responsible for the difference in temperature, frequency of precipitation, drought events and heat waves etc. By the end of the 21st century, the CO₂ crosses the concentration more than 600-1000 ppm, and it increases the temperature by 1-2° in tropical and subtropical countries. It anticipated that food grain production would decline up to 30% depending plant group (C3 and C4 plant). Here, deals with how C3 and C4 crop plant responses to elevated CO₂ and higher temperature. Increasing concentration of atmospheric CO₂ and higher temperature will promote or decrease crop growth period, development, quality and yield. The various physiological process like photosynthesis, respiration and stomatal conductance are the sole mechanisms for endorsing crop growth. C3 crops grown from ambient (360 ppm) to high (720 ppm) CO₂ concentrations initially it enhances the net CO₂ fixation and growth by nearly 30% but later on it reduced photorespiration processes. Hence, CO₂ acclimation lower down the overall shoot nitrogen concentrations. Later on, this led to a reduction in protein content and ultimately affected the plant growth rate and biomass, whereas even under the ambient CO₂, the C4 plant assimilation capability becomes saturated. The higher temperature influences and maintain the equilibrium between C3 photosynthetic carbon assimilation and photorespiration process. It predicted that after the interaction of atmospheric CO₂ and temperature under experimental conditions, C3 plants more favored under elevated CO₂ whereas, C4 plant more favored under higher temperature. There is a need for mitigation and adaptation strategies to improve agricultural crop production and minimizes the production risk for sustainable development.

Keywords: *GHGs, climate change, global warming, C3 and C4 plant, elevated CO₂, higher temperature, crop productivity.*

Immune Development of Cyanobacterium *Anabaena* PCC 7120 by Exogenously Supplied Hydrogen Sulfide: Mitigation of Al toxicity

Nidhi Verma and Sheo Mohan Prasad

Dept. of Botany, University of Allahabad, Prayagraj

Hydrogen sulfide (H_2S) found as a new player of cell signaling for improvement of crop productivity. Its positive role in amelioration of various abiotic stresses shows its extraordinary work in scientific world. As Aluminium metal vigorously found in acidic soil condition, it affect the yield as well as micro-biota present at that state; cyanobacteria are one of them. As these cyanobacteria are known for its capacity to serve the plants by fixing N_2 so they occupied a great position in our ecosystem. High concentration of Al alters the ability of cyanobacterium *Anabaena* PCC 7120 by declining the growth, pigments, photosynthesis, antioxidants and exopolysaccharides (EPS) whereas by enhancing the reactive oxygen species (ROS) inside the cell that cause severe damage to its functioning. This greater disturbance can be removed by exogenous application of NaHS, as a donor of H_2S . But the researches regarding this aspect are very limited so in this study we have investigated the credible role of H_2S . H_2S alters the negative effect of Al by improving the growth, photosynthetic pigments, photosynthesis, EPS and antioxidants. H_2S also declined the level of SOR, H_2O_2 and MDA by declining the level of Al accumulation inside the cell. To show the exact signaling of H_2S , hypotaurin (HT) used as a scavenger of H_2S and DL-propargylglycine (PAG) as an inhibitor of H_2S producing enzyme. Findings revealed that these scavenger and inhibitor worsened the effect of Al stress. Thus, this study clearly depicts the involvement of H_2S signaling for the amelioration of Al stress.

Keywords: Aluminium, *Anabaena* PCC 7120, Exopolysaccharides, Hydrogen sulfide, Reactive oxygen species

Cytomorphological Effects of Ionizing Radiation in *Eclipta alba* (L.) Hassk

Radha Mishra and Girjesh Kumar

Dept. of Botany, University of Allahabad, Prayagraj

The current investigation engrossed on the role of genetic make-up, morphogenetic markers of bhringraj (*Eclipta alba*) under the influence of gamma irradiation. The genotype was subjected to physical mutagenesis to induce the variability in morphogenetic, cytogenetic characteristics. The seeds of bhringraj were irradiated at different doses of gamma rays viz., 100, 200 and 300 Gy, and the impact on cytomorphological aspects was analysed.

The plant varied in sensitivity to gamma radiations, as observed germination, survival, plant height and cytological aspects. The lower dose of gamma radiation shows stimulatory effect whereas higher dose of gamma radiation shows inhibitory effects. The lower doses of gamma radiation induce chromosomal anomalies such as stickiness, bridges and precocious etc. which are responsible to create variations. The abnormalities may also affect the pollen fertility at the high dose of radiation. The gamma radiation increases the genetic variation in plants. At higher doses radiation has negative impact on several parameters but at the lower doses, gamma ray treatment resulted a wide range of morphological and chromosomal abnormalities which may be useful in inducing beneficial traits in bhringraj.

Keywords: *Mutagenesis, Gamma ray, stimulatory, Traits, Variants.*

Investigation on the Signaling Role of Nitric Oxide under Chromium Stressed Wheat Seedlings: Effect on Growth and Antioxidant Defence System

Abreeq Fatima and Sheo Mohan Prasad

Dept. of Botany, University of Allahabad, Prayagraj

India is the second largest producer of wheat and is susceptible to the use of contaminated water coming through rivers around industries. This causes serious reduction in crop productivity. Therefore the present study was carried out to investigate the role of Cr(VI) toxicity and its possible interaction with nitric oxide in wheat crop under stress. Eighteen days old seedlings of wheat was selected for the study. When wheat roots were exposed to μM concentrations of L-NAME it resulted into considerable root growth inhibition. The inhibition of root growth was higher in seedlings co-treated with Cr (VI) and L-NAME, with respect to the roots treated with Cr (VI) alone. Treatment of roots with L-NAME evoked an increase in superoxide and H_2O_2 levels. L-NAME-induced root growth inhibition is alleviated not only by the application of the NO donor SNP but also by the ROS scavengers. Our results indicate that the increase in ROS increased due to L-NAME (inhibitor of nitric oxide synthase in the animal kingdom) leading to increased ROS level in the root tips due to the reaction between superoxide and NO.

Microbial Concern in Food Security and Safe

Dev Brat Mishra

Dept. of Zoology, Tilak Dhari P.G.College Jaunpur

The food safety & security is being challenged nowadays by global dimensions of food supply. Food security is a measure of a suitability of food and individuals ability to access it. It is great evidence of food security being a many thousands of years ago. The safety and security of food in microbial concern that microorganisms have both beneficial & harmful effect of food quality & safety ie. directly corelated with human health; Despite of it improving the safety & security of nations food supply in present scenario the science on which safety based protection is not sufficiently protect us from the microbial concern of food. The food born disease are common. affecting costly, yet they create human health problems. Several factors like climates, global trade ,the usage of new ingredients & consumer behavior are changing that cause the impact of microbial population in food.

Keywords: *Global dimensions, Nations food, global trade.*

Effective Utilization of Sewage Waste Water through Phytoremediation for Sustainable Agriculture

Sanjeev Kumar Srivastava

SRMS College of Engineering & Technology, Bareilly, Uttar Pradesh

Water is vital for human, animal, and plant life. Water is one of the most essential inputs for the production of crops. Plants need it in enormous quantities continuously during their life. The role of water is felt everywhere; its scarcity causes droughts and famines, its excess causes floods and deluge. For centuries, wastewater has been improperly used in agriculture, presenting potential risks to public health and the environment. In the context of scientific development, and confronted by an increasing water crisis, wastewater reuse merits consideration because the practice helps decrease water use pressure and moderates water pollution. During this time, wastewater reuse was a global concern due to the associated risks to public health and the environment. During the next two decades, water will increasingly be considered a critical resource for the future survival of the arid and semiarid countries. However, agriculture is both cause and victim of water pollution. It is a cause through its discharge of pollutants and sediment to surface and/or groundwater, through net loss of soil by poor agricultural practices, and through salinization and water logging of irrigated land. The requirement of water is increasing day by day due to intensive agriculture practices, urbanization, population growth, industrialization, domestic use, and other uses. In India about 60-70% waste water is generated from metropolitan cities and towns which do not get any treatment. Municipal wastes are being continuously added to water bodies affecting physico-chemical quality of water, making them unfit for use for livestock and other organisms. Much of the nutrients (N and P) come from dirt washed off vehicles or moved by wind, animal faeces, and fertilizers applied to lawns. The waste waters not only provide water for irrigated crops but they are also source of nutrient and organic matter necessary to maintain the fertility of soil. On the other hand, the availability of water resources is declining and the existing water is not enough to meet the needs. To overcome this problem, one available solution is utilization of waste water by using recycling, reuse, and phytoremediation process.

GROUP - B

Environmental Biotechnology and Microbiology, Bioremediation



Antimicrobial, Antioxidant and Cytotoxic Activity of Green Synthesized Copper Nanoparticle of Parthenium Hysterophorus L.

Archana Rai and Rohit Lall

Dept. of Molecular and Cellular Engineering, Jacob School of Biotechnology and Bioengineering, Sam Higginbottom University of Agriculture, Technology & Sciences, Allahabad, India

Natural products are valuable and well known for their biological activities. In the current scenario, the research and analysis of plant leaf extract and nanoparticles synthesis with their biological activities has been expended significantly. For the synthesis of nanoparticles, Copper is the preferred metal among other metals due to its reported use in medical field as antimicrobial agents and its lethality. The aim of the present work is to assess antimicrobial and antioxidant activities of the methanolic leaf extracts and aqueous leaf extract mediated copper nanoparticles of Parthenium hysterophorus. Study also revealed the comparative analysis between methanolic leaf extracts and copper nanoparticles. Synthesis of copper nanoparticles (CuNPs) was confirmed by the change of color of aqueous extract, which were further confirmed by using UV-Vis spectrophotometer. The results indicated that copper nanoparticles have great antimicrobial activity against *Bacillus subtilis*, *Staphylococcus aureus*, *Candida albicans* and *Aspergillus flavus* rather than methanolic leaf extract. These studies confirmed that copper nanoparticles are capable to rendering high antimicrobial efficacy and hence has a great potential in the development of antimicrobial agents. Based on the DPPH, copper nanoparticles found to be good antioxidant when compared to methanolic leaf extract. Furthermore cells viability assay was also done against copper nanoparticles. These results concluded that copper nanoparticles are good source of therapeutic agent and applications of copper nanoparticles based on these findings may lead to valuable discoveries in various fields such as medical devices and antimicrobial systems.

Keywords: *Parthenium hysterophorus, Copper nanoparticles, antimicrobial activity, antioxidant activity, cell viability assay*

Biotechnological Applications of Marine Cyanobacteria Isolated from Odisha Coast

Sabyasachy Parida, Satyabrata Dash, Bijayananda Sahoo and Biswajit Rath

Dept. of Biotechnology, North Orissa University, Sriram Chandra Vihar, Takatpur, Baripada

Cyanobacteria are photosynthetic microorganisms that colonize diverse environments worldwide, ranging from ocean to freshwaters, soils, and extreme environments. Cyanobacteria have gained a lot of attention in recent years because of their potential applications in biotechnology. Cyanobacteria have been identified as a rich source of biologically active compounds with antiviral, antibacterial, antifungal and anticancer activities. In addition to these applications, cyanobacteria are also used in aquaculture, wastewater treatment, food, fertilizers, production of secondary metabolites including exopolysaccharides, vitamins, toxins, enzymes and pharmaceuticals. In this context research is being carried out on selected species of cyanobacteria isolated across Odisha coast for their antimicrobial and antioxidant activity. In addition to this, experiments were also conducted to isolate the UV protective pigments, heavy metal tolerance and bioremediation potential of several marine cyanobacterial species. Future research is focused on isolating many new cyanobacterial strains from this region, producing high value products and genetically modifying existing strains to ensure maximum production of the desired novel compound. Moreover, metagenomic libraries will be constructed to discover new functional genes that are involved in the biosynthesis of biotechnological relevant compounds. Further, attempt will be taken for large scale industrial production of the cyanobacterial products by optimizing incubation conditions and fomenters designs in order to increase productivity.

Keywords: *cyanobacteria; bioactivity; marine; pharmaceutical; secondary metabolites.*

Bio prospective Potentials of the Efficient Phosphate Solubilising Bacteria (PSB) in the Rhizosphere of *Azadirachta indica* L. Growing in the Coastal Regions of West Bengal, India

¹ P. Giri, ² J. Basu, ³ H.Saha, ⁴ K. Biswas and ⁵ P. Bhowmik

^{1,3} Dept. of Botany, Dum Dum Motijheel College, Kolkata, West Bengal, India

² Dept. of Microbiology, Dum Dum Motijheel College, Kolkata, West Bengal, India

⁴ Dept. of Physics, Dum Dum Motijheel College, Kolkata, West Bengal, India

⁵ Dept. of Microbiology, Techno India University, Kolkata, West Bengal, India

Low phosphate availability associated with high salinity in the soil is a great constrain on the crop productivity. Having adverse rhizospheric effect along with the ability to grow in salt enriched soil, *Azadirachta indica* might be a suitable host harbouring microbial wealth of high adaptogenic capabilities in its rhizosphere. The present investigation, therefore, deals with isolation and characterization of efficient phosphate solubilising isolates from the rhizospheric soil of this plant growing in 14 different coastal regions of west Bengal. One *Bacillus* sp. (Strain Bac 196; Gene Bank Accession No. KX641579.1) was isolated which is most competent in terms of phosphate solubilization and salt tolerance. This strain also could be grown *in vitro* in presence of modern antibiotics, suggesting the co evolution of this character with phosphate solubilising and salt resisting efficiency. The quantity of this beneficial strain in the rhizosphere is correlated significantly with total bacterial count (TBC), total nitrogen, organic matter, and availability of magnesium, calcium, potassium and sand. Thus, there is a sufficient potentiality for exploitation of this strain in organic farming not only to the crops of salt enriched soil but also to the other conventional crops subject to proper soil amendment.

Keywords: *Rhizosphere, phosphate solubilisation, Total bacterial count.*

Antibiotic Resistance of Bacteria Isolated from Urban Environmental Soil From West Bengal, With Emphasis on Multidrug Resistance

^{1,2}Jhulan Basu, ³Pranab Giri and ²Priyanka Bhowmik

¹ Dept. of Microbiology, Dum Dum Motijheel College, Kolkata, West Bengal

² Dept. of Microbiology, Techno India University, West Bengal

³ Dept. of Botany Dum Dum Motijheel College, Kolkata, West Bengal

Multidrug resistance is jeopardizing the public health system globally. The global collection of resistance genes in clinical and environmental samples is the antibiotic 'resistome'. The source of many antibiotic resistance genes (ARGs) in pathogens is likely environmental bacteria. Understanding the natural resistome is, thus important in predicting its future evolution. We have analyzed urban soil sample from the Hooghly river industrial belt from West Bengal, India and analysed the relative abundance of antibiotic resistance in culturable environmental bacteriome of that sample. The most frequent antibiotic resistance was to Ampicillin and PenicillinG (100%) and even some 3rd generation Cephalosporins (100% against Ceftriaxone and Cefotaxime) followed by Ceftazidime (83%), Kanamycin (33%), streptomycin (16%) and Vancomycin (16%). Moreover, the effect of antibiotics on the biofilm forming ability of the isolates was evaluated quantitatively under a variety of experimental regimes.

Role of *in vitro* Propagation on Enhanced Production of Important Constituents in *Hypericum perforatum* L.

¹ Arpita (Banerjee) Mukherjee and ² Sarmistha Sen Raychaudhuri

¹ Dept. of Botany, Dum Dum Motijheel College, Kolkata, West Bengal

² Dept. of Biophysics, Molecular Biology and Bioinformatics, University of Calcutta, Kolkata

Since time immemorial, humans have depended on medicinal plants for their primary health requirements. In fact, whole plants have been uprooted from their natural habitats for various medicinal preparations across the world. The reliance on traditional medicines has been increasing multifold. *Hypericum perforatum* L. is one such plant which has been seen as a potential pharmaceutical, and its popularity has increased in recent years because of its antidepressant, antiviral, anticancer and many other important medicinal properties. There are reports that extracts of the plant have been used for centuries in efforts to treat mental disorders as well as nerve pain. *Hypericum perforatum*, commonly known as Saint John's Wort, is a weed, native to parts of North America and is widely distributed in many other parts as introduced species. Being a weed and a potential invasive species, harvesting the plant in the field condition is an inherent risk to indigenous species and the native ecosystems. *In vitro* culture has always been considered an important tool for preservation of genetic resources. The present work examines the possibility of adding value to the biomass production using *in vitro* culture. This work also focuses on the important constituents of the plant and its regenerants. Five important constituents of the plant were studied in different regeneration stages *in vitro* using HPLC. Effect of the application of some additives were also studied on the accumulation of the important constituents within the various *in vitro* stages. It was observed that there was an overall growth in the size of callus and increase in accumulation of two very important active constituents - hypericin and hyperforin. Hence, it was concluded that this *in vitro* technique is an efficient method of large scale production of the important constituents of *Hypericum perforatum*.

Keywords: *Hypericum perforatum*; *in vitro* regeneration; active constituents; HPLC

Bioactive Compounds and Antioxidant Properties of Methanol Extract from Aerial Parts of *Croton Bonplandianum* Bail

Indrajeet Kumar, Umesh Kumar and Rajesh Kumar Sharma

Dept. of Botany, Institute of Science, Banaras Hindu University, Varanasi, India

The present study was carried to evaluate the polyphenolic compositions and antioxidant potential of the methanol extracts obtained from aerial parts of *C. bonplandianum* plants. Total phenolics and flavonoids were quantified in the extracts and were further screened for *in-vitro* antioxidant activities using assays namely; 1,1-diphenyl-2-picryl hydrazyl (DPPH), 2, 2'-azino-bis(3-ethylbenzothiazoline-6-sulphonic acid (ABTS),) and ferric reducing antioxidant power (FRAP) assay. The extract of aerial parts of *C. bonplandianum* plants was also characterized using UV-VIS spectroscopy and GC-MS. The results showed that *C. bonplandianum* plants had the highest amounts of phenolics and flavonoids in leaf (63.2 mg GAE/g fw and 4.3 mg QE/g fw, respectively) as compared to stem (30.5mg GAE/g fw and 2.1 mg QE/g fw, respectively). Leaf extracts possess higher DPPH, ABTS, FRAP activities and IC₅₀ (83%, 72%, 203.8 µM Fe [II]/g fw and 0.8 mg/ml, respectively) than stem extract (79%, 723%, 169.7 µM Fe [II]/g fw and 5.7 mg/ml, respectively). UV-VIS spectroscopy showed maximum absorption between 210nm-220nm which indicates presence of phenols groups in the most of bioactive compounds in the test plants. Results of GC-MS analysis showed that 2,5-dihydroxybenzoic acid, ethyl gallate, stearic acid, 2,4-dihydroxybenzoic acid, propanoic acid, octadecane are the major bioactive compounds in the methanol extract of leaf and stems of *C. bonplandianum* plants. The present study concludes that aerial parts of *C. bonplandianum* plants rich in bioactive compounds and also possesses antioxidant activity. Therefore *C. bonplandianum* plants could be used in pharmaceutical and food processing industries as a potential source of natural antioxidants.

Keywords: *Croton bonplandianum*, Natural antioxidants, *In-vitro* assay, UV-VIS spectroscopy, GC-MS.

Impact of Kinetin on Biochemical Composition, Total Phenolics and Total Antioxidant Activity In Methi

Gausiya Bashri

Dept. of Botany, Aligarh Muslim University, Aligarh, UP, India

Methi (*Trigonella foenum-graecum* L.) plants are widely used as vegetable as well as medicinal plant. Kinetin (KN), a plant hormone is reported to play significant role in diverse physiological processes.

In this study, effect of kinetin (KN, 10 μ M; KN, 50 μ M and KN 100 μ M), was studied on growth, biochemical's (i.e. carbohydrate and protein) and antioxidants (i.e. total phenol contents and DPPH activity) on widely cultivated *Trigonella foenum-graecum* L. seedlings.

KN foliar application at KN and KN dose increased the fresh weight, carbohydrate, protein and total phenol contents, and DPPH activity while KN decreased the fresh weight.

The results suggest that KN at KN and KN produced stimulating effects on the fresh weight, carbohydrate, protein and total phenol contents, and DPPH activity while 100 μ M KN applications resulted into significant decrease in the above parameters as compared to control.

Keywords: *Trigonella foenum-graecum, Kinetin, total phenol contents, DPPH*

Biosorption of Heavy Metals through Lactic Acid Bacteria Produced Exopolysaccharides

Anchal Singh And Pinki Saini

Dept. of Food Technology, University of Allahabad, Allahabad

Lactic acid bacteria (LAB) are a group of related bacteria that produce lactic acid as a result of carbohydrate fermentation. They are generally regarded as safe (GRAS) status and have great ability to produce exopolysaccharide. Exopolysaccharides have several biotechnological applications including food industry, cosmetic, agricultural, pharmaceutical, medical, chemical and others. It also has great importance in heavy metal removal. The biosorption of toxic heavy metals (Pb and Cd) by the exopolysaccharide (EPS) produced by *Lactobacillus reuteri*, *Lactobacillus plantarum* and *Lactobacillus rhamnosus*, a potential biosorbent for metal remediation and recovery was studied. Firstly, the purification and Gram's staining of these bacterial strains was determined. EPS isolation, purification and lyophilization had done from these strains. Assessment of heavy metal biosorption (lead and cadmium) had done using Atomic Absorption Spectroscopy (AAS). The EPS presented an interesting affinity for lead in comparison with cadmium. Lead biosorption (510 mg/l) was near about three times higher than the biosorption of the cadmium. Cadmium showed maximum biosorption 180ppm. Lead biosorption all the EPS's showed maximum biosorption, by reducing the initial metal concentration to around 490, 510 and 400 ppm and minimum 30, 70, 80ppm by the EPS of *L. reuteri*, *L. plantarum*, *L. rhamnosus*. In case of cadmium maximum reduction showed 70, 180, 160ppm and minimum was 30,70,80 ppm through *L. reuteri*, *L. plantarum*, *L. rhamnosus* respectively. All the three EPS's showed very distinct abilities of biosorption through lead and cadmium. This study showed that the EPS was able to absorbed lead and cadmium.

Keywords: *Lactobacillus*, *Biofilm/Exopolysaccharides*, *Biosorption*, *AAS*, *Cadmium* and *Lead*.

Bacteriological Analysis and Identification of Enterobacteriaceae Isolated from Fresh Vegetables

¹ Jhili Sarkar, ² Ragini Gothwal and ³ Nidhi Tripathi

^{1,2} Dept. of Biotechnology & Bioinformatics Centre, Barkatullah University, Bhopal

³ Dept. of Biotechnology and Biochemistry, Career College, Bhopal

Food borne diseases are an increasingly recognized problem involving a wide spectrum of illness caused by bacterial contamination of food. Enterobacteriaceae poses potential human health problems and is mainly transmitted through consumption of contaminated foods. Fresh vegetables are widely consumed as highly nutritious form of food but their chemical composition and nutritive value are often influenced by a number of pathogenic microorganisms. So, it is very important to detect and identify the Enterobacteriaceae microbial flora associated with fresh vegetables. The present study was undertaken to investigate the microbiological quality of different fresh vegetables available at local markets. For the microbial screening of various vegetable samples, Morphological characteristics, Gram staining, Biochemical tests had been performed. Results showed the presence of considerable number of contaminating microorganisms which lead to several food borne infections.

Keywords: *Fresh vegetables, Enterobacteriaceae, Food borne infections, Microbial screening*

Microbial Genetic Engineering as Tools for Bioremediation

Yadav Pradeep Kumar

T.D. College Jaunpur U.P.

Environmental Biotechnology employs application of Genetic Engineering to improve efficiency and cost, which are central to the future of widespread exploitation of microorganisms to reduce the environmental burden of toxic substance. It is burden of toxic substance. It is hope that in future the application of microorganism coupled with Genetic Engineering Technique.

Will make a major contribution to improve the quality of our Environment.

Extraction and *In Vivo* Mass Multiplication of Native Arbuscular Mycorrhizal Fungi from Agriculture Soil

¹ Mangesh Kumar Mankar, ² U.S. Sharma, ³ Sanjay Sahay and ¹ Ragini Gothwal

¹ Dept. of Biotechnology and Bioinformatics Center Barkatullah University, Bhopal MP

² Madhya Pradesh Vigyan Sabha, Quality Control Laboratory, Bhopal, MP

³ Netaji Subhas Chandra Bose Govt. PG College, Biaora, Rajgarh, MP

Plants in their natural habitats are surrounded by the different kinds of microorganisms. Some microbes directly interact with host plants in a mutually for beneficial manner whereas others microbes colonize the plant only for their own benefit. Soil micro flora special reference to fungi develops beneficial symbiotic associations with plant roots and contributes in plant growth is called mycorrhizal fungi (Schenk *et al.*, 2012). Almost 90% of the land plants having those types of beneficial relationship. Initially AMF have been placed in the Phylum Zygomycota and order Glomales. Subsequently changes in classification now they have been grouped into the phylum Glomeromycota (Redecker *et al.*, 2000; Schusler *et al.*, 2001). Characterization of AM fungi by the presence of their unique extra radical mycelium branched haustoria like structure in the cortex cell called arbuscules (Smith and Read, 2008). Plant-AMF relationship greatly extends the absorptive surface area of the host plant root. AMF hyphae penetrate into surrounding soil and plant is able to obtain mineral nutrients specially phosphorus from the soil stock. In return the plant provides carbohydrates to the fungus for their metabolic activities. The fungi utilize these carbohydrates to synthesize and emit molecules like Glycoprotein called 'Glomalin' which has a cementing capacity to maintain soil particles together and is mainly involved in soil aggregation. Some examples AMF are *Glomus*, *Gigaspora*, *Acaulospora*, *Entrophospora* and *Scutellospora*. *Glomus* is the most common fungus found in the rhizospheric soil (Wright *et al.*, 1996). The fungi are obligate biotrophs and do not grow on synthetic media. Moreover, AM fungi have improved host plant growth due to production of growth hormones, increase tolerance to drought and synergistic interactions with other rhizospheric microbes. Native strains having ecological adaptation and more efficient in performance in comparison of exotic inoculums. It is not only more efficient but also cost effective (Wangiyana *et al.*, 2006 AM fungi are one of the fungal biofertilizer has proven potential in plant production sustaining the low input and organic agriculture.

The aim of this study was to extraction, quantitative estimation, morphological identification of native AMF spore and there *In Vivo* mass multiplication.

Extracted native AM Fungal spores by the procedure of sieving and wet decanting method (Gerdemann and Nicolson, 1963) form rhizosphere soil of little millet. AMF spores identified morphologically (spore size, shape, color and wall structure) accordingly mycorrhizal fungi

identification manual of Schenck and Perez (1990) and the INVAM website. *In vivo* mass multiplication of the most promising (dominant) AM Fungi spore was done on maize as a host plant. Multiplication done in a separate earthen pot (30 cm high and 20 cm diameter) with sterilized soil from the same site in controlled condition continuously for three cycles. AMF root colonization was assessed by the method of Phillips and Hayman 1970. Increased AM Fungal spores in rhizospheric soil quantified (per gram of soil) by filter paper technique (Gour and Adholeya, 1994). Propagules such as mixture of maize root bits, soil containing mycelia and fungal spores serve as inoculums (Sharma and Adholeya, 2008).

Most promising (dominant) native arbuscular mycorrhizal fungi spores were extracted from the rhizosphere soil of little millet growing area of Patakot district Chhindwada, Madhya Pradesh. AMF spore morphologically identified mostly from *Glomus* and *Gigaspora* species. Quantitatively estimated AMF spore in the rhizospheric soil of patakot area and found that its natural density 3-4 per gram of soil. After the multiplication AMF root colonization was assessed by frequency distribution method and found that 52.23% roots were infected with Arbuscular mycorrhizal fungus. End of multiplication cycle inoculum of mixed indigenous AMF having 64 propagules/gram of sample.

Native AMF species having more positive impact on plant growth and yield as compare to exotic AMF species and control. The application of native inoculants thus is not only more efficient but also is cost effective for sustainable agriculture.

Keywords: Native AMF, Spore, *Glomus*, *Gigaspora* and Propogules.

Effect of *Arbuscular Mycorrhizal Fungi* on Plant Growth and its Contribution on Reduction of Atmospheric CO₂ Concentration

Atul Bhardwaj and K K Chandra

*Dept. of Forestry, Wildlife and Environmental Sciences,
Guru Ghasidas Vishwavidyalaya, Bilaspur*

Now a day's microbial technologies is playing important role in growth and development of plant by improving uptake of nutrient and to support plant withstand under harsh climatic condition. The technology is also beneficial in improving the quality health and increased the biomass of plant. By applying the *Arbuscular Mycorrhizal Fungi* in plantation work we can secure the survival percentage of plant. In the present study, *Arbuscular Mycorrhizal Fungi* culture was experimented for their effectiveness on *Terminalia arjuna* and *Albizia lebback* forest tree species. *Arbuscular Mycorrhizal Fungi* infected plants grown up rapidly than the non *Arbuscular Mycorrhizal Fungi* infected plant because of the increased photosynthesis rate of plant by obligatory symbiotic association with plant roots. In the Process of photosynthesis atmospheric carbon dioxide used by plant for the food material production. Utilized carbon dioxides are sequestrated on the plant in the form of organic carbon. Atmospheric carbon dioxide play significant role of the climate change like green house effect and normal water acid rain. Increased photosynthesis rate of the plant is an indication of the decreasing carbon dioxide level from the atmosphere.

Exogenous Application of Higher Polyamines, Spermidine and Spermine Ameliorates Fluoride Toxicity in a Susceptible Rice Cultivar by Restricting Fluoride uptake and Activating Defense Machinery

Aryadeep Roy Choudhury

Dept. of Biotechnology, St. Xavier's College (Autonomous), Kolkata, West Bengal, India

The present investigation illustrates the systemic damages caused by increasing concentration of fluoride in a non-aromatic rice variety, IR-64 and aromatic rice, Gobindobhog (GB) and the ameliorative effects of exogenously applied higher polyamines (PAs), viz., spermidine (Spd) and spermine (Spm) in the susceptible rice cultivar, IR-64 subjected to prolonged fluoride stress. Higher fluoride adaptation in GB as compared to IR-64 was evident based on the analysis of the physiological parameters like shoot length, root length and electrolyte leakage along with crucial damage indices like chlorophyll, malondialdehyde (MDA), H_2O_2 and protease activity. Increasing concentration of fluoride affected fresh weight, dry weight, vigor index and relative water content (RWC) to a lesser extent in GB compared to IR-64. GB exhibited lower methylglyoxal accumulation and lipoxygenase (LOX) activity compared to IR-64 during stress. While GB accumulated higher abscisic acid (ABA) level during stress, IR-64 exhibited slow ABA degradation. The higher fluoride susceptibility in IR-64 was also clear from unregulated fluoride bioaccumulation upon exposure to 25 mg L^{-1} NaF stress. Gene expression studies proposed that *CLC2* rather than *CLC1* mediated the fluoride import. Fluoride also triggered higher P-H⁺/ATPase accumulation in GB compared to IR-64, thus highlighting efficient homeostasis in stressed GB. Unlike IR-64, GB could maintain photosynthesis (*RuBisCo* expression), sugar metabolism (α -amylase expression and activity), glycolysis and Krebs cycle even under high concentration of fluoride stress. Treatment with Spd drastically reduced fluoride bioaccumulation in IR-64 seedlings by restricting entry of the anions through chloride channels and enabling better maintenance of the proton gradient via accumulation of P-H⁺/ATPase, thereby improving root and shoot length, fresh and dry weight, RWC, chlorophyll content and activities of pyruvate dehydrogenase (PyrDH), α -amylase, and *NR*. Several oxidative damages like MDA formation, induction in LOX and protease activity, electrolyte leakage, protein carbonylation, formation of H_2O_2 and methylglyoxal (detoxified by glyoxalase II) were all reduced by Spd supplementation. The accumulation of proline, glycine-betaine, total amino acids, higher PAs, anthocyanin, flavonoids, β -carotene, xanthophyll, and phenolics as verified from the expression of genes like *P5CS*, *BADH1*, *SAMDC*, *SPDS*, *SPMS*, *DAO*, *PAO*, and *PAL* in presence of Spd, accounted for overcoming of oxidative damages in the stressed seedlings, in addition to activation of ascorbate-glutathione cycle. The expression and activities of enzymatic antioxidants showed that GPOX, APX, GPX, and GST were the chief ROS scavengers.

Exogenous Spd promoted ABA accumulation by up regulating *NCED3* and suppressing *ABA8ox1* expression. ABA-dependent osmotic stress-responsive genes like *Osem*, *WRKY71*, and *TRAB1* as well as ABA-independent transcription factor encoding gene *DREB2A* were induced by Spd. In another independent study, exogenous application of Spm increased the overall growth in the stressed IR-64 seedlings by significantly restricting fluoride bioaccumulation within the shoots and roots. The Spm-treated stressed seedlings exhibited low chlorosis and induced activity of PyrDH and NR due to reduced accumulation and localization of reactive oxygen species (ROS) in the shoot and root. The extent of oxidative damages were also reduced by Spm as observed from lowered MDA content, electrolyte leakage, protein carbonylation, and LOX and protease activity due to effective detoxification of ROS by the antioxidants like proline, glycinebetaine, anthocyanin, flavonoids, phenolics and higher PAs like Spd and Spm. Excessive accumulation of the toxic methylglyoxal was prevented due to the activation of the glyoxalase system (comprising of glyoxalase I and II) and the ascorbate-glutathione cycle. The enzymes like SOD, GPOX, GPX and PAL actively participated in scavenging of the toxic ROS in the stressed seedlings. Overall, our findings clearly highlighted that Spd and Spm supplementation can mitigate fluoride-induced injuries in IR-64 seedlings by reducing fluoride bioaccumulation and extensive refining of the various defense machineries.

Keywords: Fluoride stress, Rice, Spermidine, Spermine, Polyamine, Defense machinery

An Overview of Microalgal Harvesting with Special Reference to Bioflocculation

Pratibha, Sushma Kumari, Kamleshwar Singh and K. Suresh Kumar

Dept. of Botany, University of Allahabad, Prayagraj, India

Global increase in demand for production of biofuels, coupled with potential efficacy of microalgae, has largely been the driving force for progression in microalgae-based research. Apart from their utilization in renewable energy, these photosynthetic organisms have several other high-value applications (e.g. in biopharmaceutical and nutraceutical industries). However, large-scale cultivation of microalgal biomass and manufacture of microalgal products, require cost-effective technologies. Microalgae have a low sedimentation velocity; moreover, their colloidal characteristic, together with the negative charge on the surface, makes harvesting difficult. Harvesting of microalgal biomass poses as a major bottleneck as it generally accounts for about 20–30% of the total cost of cultivation. Amidst a range of harvesting techniques adopted (coagulation, flocculation, and centrifugation), bio-flocculation has emerged as a cost-effective, non-perilous, commercially suitable method for microalgal harvesting.

Keywords: *algae, bacteria, bioflocculation, factors, flocculant, fungi, harvesting, microalgae, plants, self-flocculation.*

Optimization of Fermentation Condition of Barnyard Millet by *Lactobacillus plantarum* using Response Surface Methodology (RSM)

Urvashi Srivastava and Pinki Saini

Dept. of Food Technology, University of Allahabad

Fermentation of food increases the flavour, texture and palatability of food and also decreases the antinutritional factors. This work was initiated to optimize the fermentation process of barnyard millet by probiotic species i.e *Lactobacillus plantarum* using response surface methodology. Barnyard millet was treated with probiotic fermentation at temperature (30-50°C), time (4-30 hrs.) and pH (3-7). The effect of these fermentation treatments were studied on Iron content, folate content, antioxidant activity (Total Phenolic content and DPPH), FRAP, calcium, zinc, antinutritional factors like phytate and tannin content of barnyard millet by employing a second order central composite design. The coefficient of determination, R² values for folate, Iron content, Antioxidant activity, tannin and phytate content were greater than 0.900. Statistical analysis showed that iron content, antioxidant activity and tannin content were significantly ($p < 0.05$) correlated to pH, temperature and time. pH was the most important factor affecting the characteristics of the barnyard millet as it exerted a highly significant influence ($p < 0.01$) on all the dependent variables. An optimum pH and temperature of fermentation treatment was found associated with an increase in DPPH%, TPC, FRAP calcium, Zinc, folate, Iron content and antioxidant activity whereas it showed a decrease in Tannin, and phytate content. Based on response surface and contour plots, the conditions for fermenting the barnyard millet were optimized at temperature of 40°C, pH 5 and time duration of 38.86 hours.

Keywords: *Response Surface Methodology, Antinutritional factor, DPPH, fermentation, folate, iron*

GROUP - C

Biodiversity Dynamics and Crisis



Ethological Aspects of Migratory Birds in Chupi, Purbasthali, Purba Bardhaman, Wb

Buddhadev Mondal

Dept. of Zoology, Burdwan Raj College

Birds are the most mobile creatures on earth. Long regular seasonal movement of birds from one place to another for some physiological purposes, called **Bird Migration**. Indian subcontinent plays as a host place to a number of migratory birds in winters over a hundred species either in search of feeding grounds or to fulfill the different physiological purposes. In India, migratory birds start to come on the onset of November of every year and they live in different freshwater lakes, ponds, marshy areas etc. which are away from the anthropogenic activities. They prefer most the calm and quiet environment. Usually, Little grebe, Cotton Pygmy geese, Eurasian Wigeon, Red Crested Pochard, Lesser Whistling duck, Marsh Sandpiper, Eurasian coot, Great egret, Grey headed Lapwing, Wood Sandpiper, Kingfisher etc are found in different feeding and breeding grounds in India. We went **Chupi**, the Birds' Paradise of Purba Bardhaman, WB to study the morphology and ethological traits of different types of migratory birds for consecutive last three winters. We knew how migration data are to be collected and what methods are currently being used to increase our knowledge regarding the causes and pathway of migration. Many new procedures have been used to study the bird migration. But direct observation is the oldest, simplest and most frequently used method. A huge number of breeding birds make seasonal movements. The main reason for this is that many bird species cannot over the extreme winter in the areas where they breed as their food supply becomes reduced or disappears entirely, or conversely they cannot breed in their wintering areas due, for example, to Greater Competition From Other Species.

Keywords: *Competition, Bird migration, Seasonal movements, Breeding Anthropogenic activities.*

Phytodiversity Pattern in The Heritage Burial Grounds of Kolkata: A Prospective Carbon Sink of Kolkata

Dwaipayan Sinha

*Dept. of Botany, Government General Degree College, Mohanpur,
Paschim Medinipur, West Bengal, India*

Kolkata had been the seat of political power of the Britishers ruling in the Indian subcontinent ever since its establishment in the 17th century till early 20th century. Right from the initial days of British East India Company, settlements of white colonies popped out in the central Kolkata which later came to be known as a 'white town' and was different from the black town where the native people lived. The populations of white town went on increasing with the proclamation of Indian subcontinent by the Queen of England in 1857. However, the major drawback of the British settlers was the hot and humid tropical climate which was strikingly different from the temperate climate of England. To make the things more worse was the frequent outbreak of vector borne epidemics such as malaria, typhoid, cholera to which the Britishers were most susceptible. This decreased their life expectancy to around 30 years in the Indian subcontinent. Thus in 17th and 18th century frequent deaths amongst British population was noted in Kolkata and this resulted the requirement of burial grounds in Kolkata. Initial burials were often made in church premise but these were proving insufficient with increase in death of the colonizers. Thus some lands were demarcated exclusively for burial purpose and they were generally located in outer fringes of the 'white town' away from the main settlements. To this day some of the burial grounds still stands in the heart of Park Street area of Kolkata. In this study an attempt have been made to compile the vegetation pattern of the burial grounds located in Park street area of Kolkata with the south Park Street Cemetery forming the major study area. Field trips were conducted from time to time to document the plants species growing in the burial zone. It was observed that there has been a classification in the vegetation patterns in the burial zone. The vegetation comprised of some big trees which have been naturally preserved for quite a long time. In addition to it, there has been also a plantation of some ornamental plants by the burial authorities. However the most important feature of the vegetation is occurrence of some undergrowth which are in general absent in other parts of Kolkata due to massive urbanization. In addition to it, families of the buried have also contributed to the phytodiversity of the area by planting horticultural plants around the graves as per religious custom. The region thus satisfies the criteria of sacred grove. It may be concluded from the vegetation growth that these heritage areas are acting as miniature phytodiversity reserve in otherwise busy and polluted city where natural vegetation is hard to find. The area is also acting as an important carbon sink to a large extent thus minimizing the deleterious effect of pollution. These areas can be very well demarcated as small phytodiversity reserve in the city for the conservation, growth and development of tropical plants growing in the Kolkata area.

Keywords: *Kolkata, British, Phytodiversity, Pollution, Carbon sink, Conservation.*

Effects of Fire on Regeneration Pattern and Conservation of *Moghaniachappar* in Sohagibarwa Wildlife Sanctuary, India

¹Sanjay Kumar Pandey and ²Ravindra. P. Shukla

¹ Dept. of Botany, DAV PG College, Gorakhpur, India

² Dept. of Botany, DDU Gorakhpur, University, Gorakhpur, India

In addition to seed germination, many perennial plants also regenerate by vegetative propagation or asexual reproduction. In disturbed forests, the individuals of seed origin (genets) and those of vegetative origin (ramets) together form natural populations of a number of species. The study was conducted in Sohagibarwa Wildlife Sanctuary in Gorakhpur Forest Division, U.P. The sanctuary faced anthropogenic disturbances which intensified towards its periphery. The disturbances included cattle grazing and human collection of fuel wood and minor forest products. Based on the degree of disturbance forested region of the Sanctuary is categorised into three zones: the outer highly disturbed peripheral zone followed by the moderately disturbed middle buffer zone and the least disturbed core zone. The Sanctuary is located at 27° 05' to 27° 25' N and 83° 20' and 84° 10' E at 95 m elevation. *Moghaniachappar* (Buchanan-Hamilton ex Bentham) Kuntze (Papilionaceae) is a common, deciduous understorey shrub which may readily assume the habit of an undertree in the absence of disturbance within sal forests across the forested landscape of north-eastern Uttar Pradesh. We tried to understand why certain hardy species like *M. chappar* produced small and close groups of individuals when subjected to moderate levels of disturbance. We tested the hypotheses of trade-off between ramet proliferation and disturbance level, and between growth pattern and resource conservation. We studied stands of 50 ± 5 yr in a sanctuary by sampling in 1 ha plots within stands facing low, moderate and high levels of disturbance. We sampled a total of 40 quadrats per 1 ha plot to record the age structure of genet and ramet populations of *M. chappar*. We address the population status, regeneration, growth characteristics, soil conservation potential and survival strategy of *M. chappar* in disturbed forest environments of the Sanctuary.

About 50 individuals of *M. chappar* of different ages and sizes were carefully excavated with their root systems intact at each of three disturbance zones. The spread of their root-stock was traced and the basal diameter, shoot extension growth and biomass were measured along the age series (1-6 yr). The age of the rest of the *M. chappar* individuals and their shoot and root biomass were determined by tallying their basal diameter and height with those of measured ones. We traced the architecture and foraging of the root-stock and the shoot extension, and we measured biomass growth and soil conservation by the root-complex. The architectural characteristics and growth features like orthotropic monopodial trunk, continuously growing main axis, homogeneous sylleptic and proleptic branches which later become pendulous, and the hapaxanthic condition in which inflorescence growth stops shoot extension, suggest that *M. chappar* conforms to Stone's model of tree architecture At moderate

disturbance, the root-shoot junction sent many more sprouts, garnered much biomass and became flat and curved. The insurrection of ramets caused fragmentation of the root-complex. This clonal growth strategy, however, was neither clearly 'phalanx' nor 'guerrilla' type. It resulted in intermittent shallow cavities within fragmented root-stock that filled with soil rich in organic matter. The strategy showed potential to restore the soil system and to increase the diversity of minor biota in an otherwise degrading sal forest. In moderately disturbed sal forest, the understorey paved the way to prolific non-seed regeneration of a fugitive mid-successional species, *M. chappar*. The intensity of burning affected population size as well as the proportion of seedlings and mature individuals. At moderate heat stress, the number of individuals as well as the proportion of seedlings per population was highest. Conversely, the highly burnt stands showed lowest proportion of seedlings and greater share of mature plants mostly of sprout origin. Mid-successional species like *M. chappar* established themselves at moderate disturbance and showed a clumped to regular distribution pattern, they exhibited more diverse crown than early successional species. Mid-successional species showed the widest breadth of autoecological traits, reflecting the heterogeneous environment in which they establish and mature. The species rapidly increased the understorey foliage by producing a metapopulation of usable sprouts/ramets that facilitated retention of soil and nutrients within their root traps. The mean biomass allocation towards different compartments was significantly different ($df=3,11$; $p<5\%$) along the age series (1-4 yr). F-ratio, for biomass allocation among three sites, showed considerably high value along the age series. The 2-yr old plants, however, showed highly significant values of F-ratio ($f=4.1$; $df=2,11$; $p<5\%$). Regression analysis revealed that total biomass (Y) was positively related to canopy cover (X) at both the low level ($y=0.239x+0.052$; $r=0.866$; $p<0.1\%$) and moderate level of heat stress ($y=0.33x-0.133$; $r=0.931$; $p<0.1\%$). In case of high heat stress, the total biomass was loosely correlatable with canopy cover ($y=0.430x+0.044$; $r=0.666$).

The estimation of conserved soil by weight and by volume is quite appreciable especially in the light of the number of root complex per unit area and loamy nature of the soil. Thus the ~2-year old individuals of *M. chappar* conserved as much as $0.04 \pm 0.01 \text{ m}^3$ or $56.1 \pm 6.7 \text{ kg}$ of soil on per hectare basis while ~5 years old individuals conserved as much as $5.70 \pm 0.53 \text{ m}^3$ or $7167.2 \pm 367.2 \text{ kg}$ of top soil by volume or by weight respectively. As evident from the unique growth pattern and quick sprouting, multiple uses of shoot biomass and effective hindrance to erosion of top soil by the root system, *M. chappar* shows considerable promise as biomass resource and the agent of soil conservation. Its canopy spread near ground not only help maintain community attributes of the sal forests even in presence of moderate disturbance but also contribute towards the conservation of biodiversity. Although the study is species specific, the vagrant growth strategy of such disturbance friendly species shows a promise to explore new trend in clonal plant ecology and use the potential of such species to recover and rehabilitate the degraded forest ecosystem.

Keywords: Sal forest, disturbance, *M. Chappar*, regeneration strategy, genet/ramet population, root-complex, conservation.

Fish Biodiversity along with Indigenous Species Conservation in Haldia (West Bengal)

Suman Kumar Sahu

Dept. of Fishery, Haldia, Purba Medinipur, West Bengal

The integrated fishery management practices related to proper resource utilization, species diversification with new fish species introduction i.e. Amur Common Carp, Pengba, Milk fish, GIFT Tilapia, Pearl spot and Conservation of indigenous endangered fishes i.e. Pabda, Magur, Singi, Koi, Tengra rearing successfully done by this fish farmers. Fish farmers of Haldia trends to farming by using “Organic Juice”. As per scientific recommendations has helped in long-term rural livelihood improvement for the fish farmers. Fish farmers also recognized in state as well as National level.

Avifaunal Diversity, Abundance and Recent Environmental Threats in Two Floodplain Wetlands of Southern West Bengal, India

¹Santanu Debnath and ²Ashis Kumar Panigrahi

¹ Dept. of Zoology, Brahmananda Kesab Chandra College, Bon-Hooghly, Kolkata

² Dept. of Zoology, University of Kalyani, Kalyani, W.B, India

Birds play an important role of bio-indicator as they are very sensitive to minor changes in the surrounding environment. In the present study the species diversity, abundance and richness of avian population in Purbasthali Lake (23° 27' N and 88° 20' E) and Hansandalake (23° 27' N and 88° 27' E) of West Bengal (India) was investigated to determine the current ecological status and establish avian species checklist. The study was conducted for one year (January 2018 to December 2018). Among different avian families, Anatidae was found to be the most dominant with highest relative diversity in both the waterbodies. Shannon, Simpson and Margalef's diversity indices were also calculated to understand the avifaunal diversity and richness. Different limnological parameters, environmental and anthropological threats were also investigated to understand the present scenario.

Keywords: *Avian diversity, abundance, richness, limnological parameters, environmental threats.*

Population Dynamics and Sustainable Management of Gandhi Bug, *Leptocorisa acuta*

¹ Souren Dutta, ² Nayan Roy and ³ Asif Hossain

¹ Dept. of Zoology, Rabindra Mahavidyalaya, Champadanga, Hooghly, West Bengal, India

² Dept. of Zoology, Ecology Research Unit, M. U. C. Women's College,
Burdwan, West Bengal, India

³ Dept. of Zoology, Sidho-Kanho-Birsha University, Purulia, West Bengal

The life table study of the rice bug, *Leptocorisa acuta* (Thunb.) on rice (R) and non-rice (NR) system were conducted in the laboratory condition. The average individual fecundity was recorded 100.999 and 59.019 eggs on R and NR system, respectively. The nymphs were observed to pass through six instars within the duration of 24 and 22 days respectively on R and NR host. The accumulated survival of adult was 20 ± 0.58 and $12.22 \pm 0.33\%$ respectively on R and NR system. The demographic parameters of *L. acuta* on R was significantly differed ($F=10.931$, $P < 0.005$) from the NR system with higher intrinsic (r_m) and finite (λ) rate of increase (0.020 and 1.020, respectively) through shorter doubling time (DT) of 34.449 days. The total generation mortality (K) of *L. acuta* was minimum on R system (2.7721) and maximum on NR system (3.1496), whereas the overall generation survival (GS) was in reverse order of K values (0.2 and 0.122, respectively). These differences in the demographic parameters are due to better nutritional quality in R system relative to NR system. Thus, by knowing such variations and most vulnerable stages from life table, one can make time based application of appropriate control measures against the pest population.

Keywords: *Oryza sativa*, demographic parameters, nutritional quality, R and NR system, vulnerable stages.

?

Biodiversity Dynamics and Crisis

Vijai Kumar Srivastav Chitravanshi

Dept. of Botany, M.K.D.S.P. Post Graduate College, Raniganj, Pratapgarh, (Up)

Biodiversity is the most complex feature of our planet and it is the most vital. Without biodiversity, there is no future for humanity. Biodiversity is a contraction of the phrase "biological diversity," and refers to the variability of life within a species (judged by the variations in its genetic makeup), an ecosystem, a region and even across the planet. The biodiversity of the Amazon, one of the most biodiverse places on Earth, would include the terrestrial species found in the rainforest, the birds that fly in its skies and the aquatic creatures that swim in the Amazon River. But one could also examine the biodiversity of the Amazon River itself. Biodiversity varies widely across the globe, from places of high biodiversity, such as rainforests and coral reefs, and areas of lower biodiversity, such as agricultural fields. High biodiversity is often considered a sign of a healthy ecosystem, and many conservation efforts are aimed preserving biodiversity.

Today climate change is a global challenge for humankind. Climate change is having significant effects and is a major threat not only for mankind, but also for life on earth as a whole. Climate change represents one of the most important threats to our planet's biodiversity. There is a two between biodiversity and climate. Biodiversity is threatened by human-induced climate change and climate change is already forcing biodiversity to adopt either through shifting habitat or changing life cycles. Plants and animals are endangered due to global warming resulting from increasing concentration of carbon dioxide released into atmosphere through different human activities. Climate has played a critical role in fluctuations of biodiversity levels. There is some evidence that plants and animals are already responding to warmer temperatures. The basic objective of this paper is to analysis the present and future impact of climate change on biodiversity. The air you breath, the water you drink, and the food you eat all rely on biodiversity but right now it is in crisis- because of us.

Keywords: *Global Warming, Climate change, Biodiversity.*

Conservation of NTFPs and their Role in Rural Livelihood of Jharkhand

Sanjeev Kumar

Dept. of Forests, Hazaribagh, Jharkhand

The present paper is an outcome of study carried out to examine various aspects of Biodiversity, sustainable forest management (SFM) and Non Timber Forest Produce (NTFP) in Jharkhand. The study was carried in Dhanbad, East Singhbhum, West Singhbhum, Gumla, Hazaribagh and Chatra districts during 2013 to 2019. Tribes living in and around the forests of these districts are much dependent upon forests for their livelihood. The important tribes of Jharkhand are : Asur, Baiga, Banjara, Bathudi, Bedia, Bhumij, Binjhia, Birhor, Birjia, Chero, Chik Baraik, Gond, Gorait, Ho, karmali, kharia, Kharwar, Khond, Kisan, Kora, Korwa, Lohra, mahali, mal Pahariya, Munda, Oraon, Santal, Savar. As per FSI Report of 2019, there has been an increase of 58.43 Sq. Km of forests in Jharkhand. This enhancement in green cover has increased biodiversity also. Biodiversity underpins ecosystem services, productivity and resilience ecosystem processes such as tree growth, Carbon sequestration, seed dispersal and nutrient depending upon biodiversity. Biodiversity is a sustainable source of livelihood and also influence cultural religious aspects of our country. There is perceptible threat to biodiversity due to over exploitation of natural resources, climate change and land use changes. Of various means, Traditional Knowledge (TK) has been determining factor for sustainable use and conservation of biodiversity. The traditional knowledge has been acquired over ages and treasured by the local communities and tribal living in and around forests. Hence such knowledge has the potential value for sustainable forest management and biodiversity conservation. The paper also discusses how with the adoption of various legal framework, especially National Environment Policy, National Biodiversity Action Plan, adoption of Joint Forest Management Policy, enactment of FRA 2006 and implementation Forest Working Plan Code 2014, issues related to biodiversity have been brought to mainstream in development planning process. Effort of biodiversity conservation has also increased the density of NTFPs in forests. These NTFPs can be grouped into Edible products, Fodder trees and shrubs, Bamboo, Gums, Resins, Medicinal plants and Tendu leaves. These products may be used for subsistence or for sale, providing cash income especially functioning as an economic buffer in times of hardships especially Hungry Season. They get employment in activities related to NTFPs like plucking of Tendu leaves (*Diospyros* sps.), rearing of Silk (*Antheraea mylitta* Drury) and cultivation of Lac- (*Kerria lacca* Kerr). Non-timber forest products are also integrated components of the forestry sector and have been gaining recognition as potential resources for promoting sustainable livelihoods and conservation. The present paper throws light on these NTFPs, their classification, their uses, their role as a source of livelihood and traditional knowledge related to them and a strategy for their conservation.

Keywords: *Biodiversity, Jharkhand, Livelihood, NTFP, SFM*

Bacterial Diversity of Aquaculture Benthos: A Metagenomic Approach

¹ Arijit De, ² Souryadeep Mukherjee, ³ Gobinda Chandra Sadhukhan
and ⁴ Nimai Chandra Saha

¹ Dept. of Zoology, Vidyasagar College, Kolkata

² Dept. of Life Sciences, Presidency University, Kolkata

³ UGC-HRDC, Jadavpur University, Kolkata

⁴ The University of Burdwan, Burdwan, West Bengal

Metagenomics study using high-throughput sequencing techniques paved the way for the most descriptive and analytical approach to provide a deeper insight into the microenvironment dynamics. This technique can be used for prokaryotic community analysis in the most detailed way possible which hitherto was impossible to attain using traditional culture dependent methods. Aquaculture is one of the best practiced and economically viable methods for sustaining the mass as a cheap nutrition source and providing livelihood as well. Recent scientific reports suggest microorganism-based aquaculture techniques as the best possible practice for the sustenance of the aquaculture ponds as well as an economical approach to mitigate the rising maintenance cost. This idea deals with identifying the bacterial diversity of the benthic soil, and its consequent bioaugmentation for achieving sustenance of the pond in an independent manner in the long run. However, as basic data of prokaryotic diversity and its dynamics of aquacultural microcosms is lacking in India, no such practice has been implemented in a large scale. The present study aims to focus on the analysis of prokaryotic diversity of the benthic soil of an aquaculture pond in East Kolkata Wetlands, Kolkata, West Bengal. The methodology adapted was isolation and sequencing of the metagenome by Illumina Miseq using universal V3-V4 primers of 16S rRNA gene and subsequent in-silico analysis of the raw data using QIIME software. For the first part, benthic soil samples were aseptically collected from a depth of 10cm of water column in triplicates. The metagenomic DNA was isolated from samples, tested using agarose gel electrophoresis and quantified using fluorometer. The best quality sample were then used for Illumina Miseq using paid sequencing facilities. The raw data thus obtained were subjected to in-silico analysis using QIIME software. The Paired end reads were demultiplexed and stitched together, and chimera sequences were identified and filtered using the usearch61 algorithm. The OTUs were assigned and clustered at 97% sequence similarity using the UCLAST algorithm, which was also used to assign the taxonomic names. The taxonomic analysis was done from Kingdom level to the Genus level. The alpha diversity of the sample were analysed using the Shannon and the Chao1 indices. The OTU analysis revealed that the sample contains 293102 non chimeric sequences of which 8795 were doubletons. The taxonomic

analysis at phylum level showed that bacteria in the sample belongs to a total of 19 phyla of which the phyla Actinobacteria, Proteobacteria and Gemmatimonadetes were most abundant. In the class level a total of 129 categories were observed of which Actinobacteria, Alphaproteobacteria and Gemmatimonadetes were most abundant. In the order level, a total of 259 categories were analysed, amongst which Actinomycetales, Clostridiales and Rhizobiales were the most abundant ones. In the family level Nocardioideae, Intrasporangiaceae and Xanthomonadaceae were the abundant categories out of a total of 425 categories. Finally in the Genus level a total of 667 categories were observed of which the most abundant were *Phycoccus*, *Flavisolibacter* and *Geodermatophilus*. The Alpha Diversity metrics values obtained are Shannon 9.93 and Chao 1 8795. The heatmap analysis, rank abundance plot, rarefaction curve and Krona chart depicting the entire results were also prepared. From the above analysis it can be said that this is probably a first comprehensive report of prokaryotic community analysis of the benthic soil of aquaculture pond in East Kolkata Wetlands. Other than a very meagre data of a few culture dependent analyses reports, no data of culture recalcitrant bacteria is available for the region. As a part of a larger project to analyse the seasonal variation of the microbiome dynamics this data highlights the variation and variability of the prokaryotes available in the benthic soil microenvironment. The number of categories obtained in taxonomic analyses were huge though all of them could not be identified due to the current limitation of availability of the datasets. This study could pave the way for a better understanding and implementation of microbial based culture methods in the aquaculture pond by identifying the potent bacterial probiotics and pathogens. Subsequent bioaugmentation programs can then be formulated leading to the development of the former and eradication of the later. This data could also be used to ascertain the condition of the pond and formulate methods that could lead to its sustenance in a more scientific and economical way.

Keywords: *Metagenomics, Community Analysis, Illumina Miseq, QIIME, in silico analyses.*

Some Anomalous Specimens of *Cyprinus carpio communis* L from Freshwater Fish Ponds of Jammu District of Union Territory of Jammu and Kashmir

S.P.S. Dutta

Dept. of Environmental Sciences, Jammu University, Jammu

Cyprinus carpio communis is an exotic carp and is distributed in cold waters of Kashmir to warm waters of West Bengal. The fish has been stocked in lotic and lentic water bodies by the Fisheries Departments of the various Indian states. During the hydrobiological survey of freshwater fish ponds in Jammu, four abnormal specimens of adult *Cyprinus carpio communis* were observed among fish collections made by fishermen and have been described. Three adult specimens were shortened along antero-posterior axis, more deep body with truncated trunk and displacement of fins. X-ray radiography reveals that one fish with stump body had anterior to posterior compressed vertebrae with reduced inter-vertebral spaces and highly truncated caudal peduncle with anal fin extending beyond caudal fin base; in the second stump body fish vertebral column is irregular showing vertebral fusion, coiling, lordosis, kyphosis, vertebrae duplication, highly truncated caudal peduncle, anal fin extension beyond caudal fin lobes and only one air bladder lobe is present. In the third stump body fish, first seven vertebrae, after complex vertebrae, are highly degenerated, fused (ankylosis), compressed, with irregular vertebral thickness and inter-vertebral spaces. In the fourth fish, with the dorsal dome, vertebral column is dorsally curved, (kyphosis). The possible causes for deformities have been discussed and are most probably induced by mechanical stress causing developmental error.

Cluster Analysis of Selected Species of Family Fabaceae

Shipra Singh, Afreen Shadan, Shreya Sen Das and Jessica Rene Hansdah

Dept. of Botany, St. Xavier's College, Ranchi

Cluster analysis is a statistical tool, used to classify plants by the help of operational taxonomic units. Family Fabaceae was earlier known as Family Leguminosae. Recent molecular and morphological evidence supports the fact that the Fabaceae is a single monophyletic family. The study deals with the cluster analysis to find out the closely related species.

Plant Diversity of Meghraj Range Forest District Arvalli, Gujarat, India

Manisha Desai

Dept. of Botany, Sheth R. A. Bhavan's College, Ahmedabad, Gujarat, India

The present work has been done to collect the Information about different plant species of Megharj range forest during winter 2016 to 2018. The data obtained from these studies have botanical importance of the particular zone Meghraj range forest. During the field work we have consisted of total 67 Agiospermic families are belonging 220 genera and 324 species were collected and recorded. Herbs are dominated. Herbs 128 and 90 shrubs, 32 climbers and 74 trees. We have also noted 4 ptreidophytes and 3 bryophytes. The dominant species are *Prosopis chilensis*, *Holarrhena antidysenterica*, *Tactona grandis*, *Lantana camara* etc.

Keywords: Floristic composition, dominant species, Megharj.

Floristic Diversity Study of Raigadh Range Forest, District: Sabarkantha, Gujarat, India

Sanjay Vediya

Dept. of Botany, Sir P.T. Science College, Modasa, Gujarat, India

The investigation was carried out in order to explore the existing floristic composition in Raigadh range forest Monsoon 2016 to 2018. Raigadh range Forest is biologically diverse systems, representing some of the richest biological areas. They offer a variety of habitats for plant. The forests are mostly confined in the northern and eastern hilly regions of the district. Raigadh forest is situated in Himatnagar Taluka. Wide range of plant diversity found here. In this forest, more than 55 families of flowering plant are there. Many plants are medicinally important and local people are using it.

Keywords: Raigadh range forest, Plant diversity, Natural habitat, Ecological balance.

New Report of *Isoetespanchganiesis* Srivastava, Pant and Shukla from Kolhapur, Maharashtra

Brij BhanYadav and Amrita Singh

Dept. of Botony, SGS Auto. PG College Sidhi, Madhya Pradesh

Srivastava et. Al. (1993) reported *IPanchganiesis* var. *panchganiesis* from Panchgani table land, Satara District of Maharashtra State and *I.panchganiesis* var. *kemagundiensis* from kemengindi, Chickmnglur District of Karnataka State. Both varieties are widely distributed. During present survey of the genus *Isoetes* L. in other regions of Maharashtra, we collected the plants *I. panchgsaniesis* for the species reported only from panchgani table land. This indicates that the species is wide spread in Maharashtra and has a better adaptive potentiality.

The first hand comparison of plants, has shown that basic organization of the plants of both places are same. However, the closer examination of the plant has revealed that the plants of Kolhapur are more robust, sturdy and have large number of leaves. The average height of plants and size of megaspore are more than that of the panchgani table lands.

Keywords: *spore, megaspore, sporangia.*

Seasonal Diversity of Algal Flora of Pond Water in CMP Degree College (Allahabad)

Kirti Raje Singh, Amita Pandey and Archana Das

Dept. of Botany, C. M. P College, Allahabad

In the water sample of CMP College, diversity of algal species was found which showed seasonal variations. *Diatoms* are exotic species of pond water CMP College. The other alga which was found is *Oscillatoria*, *Hydrodictyon*, *Chlorella*, *Spirogyra*, *Cladophora*, *Ulothrix Clostridium*. Abundance of Phytoplankton were found in March is greater than in February. The genus *Hydrodictyon* and *Chlorella* was very common throughout the study period. A single moderate peak however occurred in month of March. Most of the chlorophycean members forming prominent peak in the March and April (2018).

Aquatic Macrophyte Diversity and its Role in The Wetland Ecosystem Dynamics of Govindgarh Lake Dist Rewa (M.P.)

Suman Singh

Dept. of Zoology, Govt Model Science College, Rewa, Madhya Pradesh

This study was for Govindgarh lake (24° 24'N and 81° 15'E), a water body of small reservoir category with 285 ha spread area of Dist. Rewa (M.P.) India for finding status of eutrophication in the lake which is source of fisheries and easement of local people. Species composition of aquatic macrophytes and its seasonal distribution and abundance was recorded. It as found that the free floating species *Eichornia crassipes*, submerged species *Vallisneria spiralis*, *Ceratophyllum demursum*, *Hydrilla verticillata*, rooted floating category *Ipomoea aquatica* occurs throughout the year. Growth of emergents becomes very dense and floating leaf species get replaced by emergent macrophytes which indicate eutrophication in the lake. Differences in the number of species and the identity of genera in this study indicate that macrophyte assemblages are still changing and are dynamic in the reservoir. Abundance of *Chara spp*, *Hydrilla spp.*, *Ipomoea spp*. *Azolla Spp*. *Eichornia crassipes* *Ceratophyllum spp*. has caused severe problem in fishing. Change in Fish species composition has been recorded and loss of *L. calbasu*, *Puntius spp*, *Notopteus spp.*, decrease in yield of major carps due to obstruction in fishing and increase in weed fishes *Glossogobiusgiuris*, *Xenentodon cancilla*, has been recorded.

Keywords: *Aquatic Macrophytes, Diversity, Eutrophication, Govindgarh Lake, Major carps, Weed Fishes.*

Antioxidant Evaluation of *Bougainvillea spectabilis* Willd. using Assay of Peroxidase

Jessica Rene Hansdah

Dept. of Botany, St. Xavier's College, Ranchi

Bougainvillea spectabilis Willd., a member of family Nyctaginaceae, is a well known shrub with cosmopolitan distribution. It has been known to have great medicinal values which may be attributed to the phytoconstituents such as oxalates, flavanoids, glycosides etc. Assay of peroxidase is an enzymatic assay used to evaluate antioxidant activity of plants.

Keywords: *Bougainvillea spectabilis* Willd., *antioxidant activity, assay of peroxidase.*

Ken-Betwa Inter-linkage Project: Shrinkage of Vulture Home in Panna Tiger Reserve, Bundelkhand Region, Madhya Pradesh

¹ Ruby Yadav and ² Amita Kanaujia

¹ Dept. of Zoology, University of Lucknow, Lucknow

² Institute for Wildlife Sciences, ONGC Center for Advanced Studies, University of Lucknow, Lucknow, Uttar Pradesh, India

The Panna Tiger Reserve is the home of vultures situated in Bundelkhand region, India. This region is flourishing with vulture's population and species diversity, due to availability of nesting trees, cliffs. Panna provide good resources for vultures to breed. Vultures always select their breeding habitat near water body. They use waterbody for drinking and bathing purpose. Ken-Betwa river interlinking project is the joining project of two rivers Ken and Betwa. The purpose of the project is to construction of dam storing and transferring waters to the Betwa River. The dam will be at the height of 73.80m. It will submerge about 34 breeding territory of vulture population which includes 515 breeding pairs, total 1034 adults and 400 nests which are located on the rocks on the bank of Ken River. The Ken-Betwa linking project will also submerged 30 feeding grounds, 12 roosting places, 9 bathing sites as well as 400 nests from nesting cliffs and hence pose a great threat to this vulture paradise on India. By the joining of kn-betwa River about 60% habitat will be submerged by the water. "In the proposed KB link project, when water reaches a height of 288 metres (Full reservoir level), 60% nests of endangered species of vultures will be affected". About 90 square km forest of Panna Tiger Reserve will be affected by this project. Panna Tiger reserve is a paradise for vultures. They live their around 12 years, potential site for vulture. Therefore, ken betwa link project is a big concern to protect habitat of vulture globally that is need of future to maintain balance between ecosystems.

Keywords: Panna Tiger Reserve, Ken-betwa link project, Vultures, Habitat.

Water Quality and Macrophytic Species Diversity of Beehar River, Rewa (M.P.), India

¹ Srishti Singh and ² Vinita Kashyap

¹ A.P.S. University, Rewa, (M.P.), India

² Model Science Collage, Rewa, (M.P.), India

All life of earth depends on water. Fresh Water is a critical, finite, vulnerable, renewable natural Resource on the earth and plays as important role in our living environment. A Macrophyte is an aquatic plant that grows in or near water and is either emergent, submerged or floating and includes helophytes (a plant that grows in marsh, partly submerged in water so that it regrows from buds below the water surface. Aquatic macrophytes play a pivotal role in maintaining primary productivity of water ecosystem. The present study deals with the water quality and macrophytic species diversity of Beehar River, Rewa ,(M.P.), India. Study was done during the year December 2018 to November 2019. During the present study 3different sampling stations were selected. In this study we are analyzed to water quality parameters like Temperature, pH, DO, BOD, COD, Hardness. And total 72 species of plants were recoreded from Beehar River. Species among plant, indicative of organic enrichment as Eichornia crassipes, Pistia stratiotes, Alternanthera sessilis, Persicaria glabra, Cyprus compressus were found in large population at sampling stations at Beehar River. Eichornia crassipes and Pistia stratiotes as weed was predominant at sampling stations which are the most tolrent and can be used as biological indicator for water pollution. It indicates that aquatic macrophytes species are specific to the environmental quality and therefore can be used as agent in bioremediation.

Keywords: *Water Quality, Macrophytes, Species diversity, Beehar River.*

Competitive Interactions within and between Scavenger Avian Species: A Case Study of Egyptian Vulture in Uttar Pradesh, India

¹ Shivangi Mishra, ^{1,2} Adesh Kumar, ¹ Ankit Sinha, and ^{1,2} Amita Kanaujia

¹ Dept. of Zoology, University of Lucknow, Lucknow, Uttar Pradesh, India

² University of Lucknow, Lucknow, Uttar Pradesh, India

Searching for food is an important concern of survival for every species on earth. Social interactions may provide information about the position of food. Some birds feed alone while others in group. Egyptian Vultures follow conspecifics as well as other species to find the location of the food; hence there is high probability of social feeding. In this study, the social feeding habit of Egyptian vultures has been observed and it was found that the four of the most common commensally and socially feeding species with Egyptian vultures are Black Kite, House Crow, Cattle Egret and Dog. The observations were made for the time duration of two years, from January 2014- January 2016 in Unnao district of Uttar Pradesh, India. The monitoring of the most prominent site has been done in all the seasons (summer, winter, monsoon). A total count of the Adult Egyptian Vulture population and associated species was conducted. During the study period the maximum number of Egyptian vultures was found in winter season (287.66 ± 12.33) and minimum in rainy season (175 ± 65.0). Egyptian vultures were observed to be feeding along with Black Kite (*Milvus migrans*), House Crow (*Corvus splendens*), Cattle Egret (*Bubulcus ibis*) and Dog (*Canis sp.*). Correlation analysis showed that population size of adult Egyptian Vulture was positively correlated with population of Black Kite, House Crow, and Dog; while negatively correlated ($R^2 = -0.262$) with Cattle Egret population. Only house crow population was significantly correlated ($R^2 = 0.998$, $p = 0.036$) with Egyptian vulture. It was found that four of the most common commensally and socially feeding species with Egyptian vultures are Black Kite (*Milvus migrans*), House Crow (*Corvus splendens*), Cattle Egret (*Bubulcus ibis*) and Dog (*Canis sp.*) (Figure 1). At the study area, the population of Cattle egret was found in maximum followed by Black Kite, House Crow and Dog population. Correlation analysis shows Egyptian Vulture forage socially and interact with other species and the population size is positively correlated with population of Black Kite, House Crow, and Dog; while negatively correlated ($R^2 = -0.262$) with Cattle Egret population. Positive correlation between Egyptian vulture, house crow, and dog was expected as all of them feed on carcass. The site harboring the maximum number of Egyptian Vultures must be declared as the Important Feeding Site. The present scenario in Unnao offers possibilities to study about Egyptian Vulture biology and ecology at various levels, highlighting their importance and the need of conservation. Further studies are being taken up to study the interaction level and feeding success of Egyptian Vulture and hence to plan for conservation strategies.

Keywords: Egyptian Vulture, Population, Species, Social foraging, Interaction

A Study of Avian Diversity of Kopra Reservoir, Bilaspur: A Potential Bird Sanctuary

Alok Kumar Chandrakar and S. S. Dhuria

*Dept. of Forestry, Wildlife & Environmental Sciences, Guru Ghasidas Vishwavidyalaya,
Bilaspur, Chhattisgarh, India*

Kopra reservoir located geographically 22°4'2.6616"N, 82°2'34.026"E, and lies 13 km East to the Bilaspur city. The dam was constructed as a part of irrigation project by Government of Chhattisgarh, India, as well as a primary source for drinking water supply to Kopra village. This region provide rich food sources viz., variety of nectar and seed flora, fruits, insects, beetles, grubs, molluscs, shrimps, crustaceans, tadpoles, fishes, amphibians and reptiles etc. Such fascinating conditions of an ecosystem attract most of the resident and migratory species of bird for feeding as well as nesting. A total of 161 species belonging to 19 orders and 50 families were documented in our survey work since the year 2015. In which 103 resident and 58 migratory species were recorded including one Endangered (EN) species Egyptian Vulture (*Neophron percnopterus*); three Vulnerable (VU) species Common Pochard (*Aythya ferina*), Woolly-necked Stork (*Ciconia episcopus*), Lesser Adjutant Stork (*Leptoptilos javanicus*) and three Near Threatened (NT) species Painted Stork (*Mycteria leucocephala*), Black-headed Ibis (*Threskiornis melanocephalus*), Black-tailed Godwit (*Limosa limosa*). At present Chhattisgarh has no bird Sanctuary, so this wetland is ideal to develop as one, as it has such a rich avifaunal diversity and due to plenty of food materials and availability of better water and atmosphere the area has become a safe haven for the resident and migratory birds. In this paper, it has endeavoured to bring to the fore the virtuous features of this unique place for bird watching and its linking in a fruitful way with ecotourism and sustainable development.

Keywords: *Kopra, wetland, avifauna diversity, ecotourism, conservation.*

Biodiversity Loss by Blue-green Algae

¹ Richa Tandon and ² G.L. Tiwari

¹ Dept. of Botany, S.S. Khanna Girls Degree College, University of Allahabad, Allahabad, India

² Dept. of Botany, University of Allahabad, Allahabad, India

Discussions on the loss of biodiversity with reference to general public, often include species of Angiosperms. Biodiversity of lower groups of plants and specially algae remains ignored. Algae are important organisms from the view point of time and space. They include organisms which evolved in Precambrian age 3.5 billion years earlier and spreaded over 70% surface of the Earth.

They add 50% oxygen to the atmosphere and thus contribute 50% in mitigating the effect of global warming by fixing of carbon-di-oxide. Algae are known to have more than 40,000 species at the global level. Most of the aquatic habitats - sea as well as inland water bodies are facing a lot of pollution problems and it resulted into obvious changes in floristic composition and various natural habitats.

The present communication deals with habitat crisis of certain Blue green Algae which are of immense economic value. The species include *Aphanothece stagnina*, *Cylindrospermum muscicola*, *Cylindrospermum licheniforme*, *Anabeana indica*, *Anabeana torulosa*, *Wolleea bharadwajae*, *Nostoc commune*, *Aulosira fertilissima*, *Microchaete uberrima*, *Gloeotrichia intermedia* and *Gloeotrichia ghosei*. All these species are well known from tropics and specially India. They grow frequently in submerged rice-fields in all over country. We have been following distribution pattern of these species during 1964 to 1975 in a specific area of Soraon about 40 km. away North from Prayagraj. Thereafter we got involved again in survey and isolation of Blue-green Algae during 1991 to 2011 sponsored by DBT, Government of India, New Delhi.

Our repeated observations for more than a decade revealed the fact that the same fields which earlier (1964-1975) contained abundant growth of above mentioned species got much reduced to almost absent in the present time. Our analysis of agronomical practices adopted by the local farmers revealed that application of chemical fertilizers and pesticides are the main factors. The drastic change in floristic composition included depletion of nitrogen fixing heterocystous species and increase in growth of non-heterocystous oscillatory forms and other chlorophycean algae.

Keywords: Biodiversity, Blue green Algae, floristic composition, *Wolleea bharadwajae*, *Aulosira fertilissima*, *Microchaete uberrima*, agronomical practices.

Impact of Environmental Acidic Ph on Oxygen Consumption in An Air Breathing Murrel Fish *Channa Gachua*

Qaisur Rahman And D N Sadhu

Dept. of Zoology, Vinoba Bhave University, Hazaribag, Jharkhand, India

Fishes are amongst the most diverse groups of fresh water in the world. Among them, several groups developed air breathing mechanisms to avoid low oxygen constraints, which are common in fresh waters. These include fishes one of the most diverse groups in the world with more than 1200 species described. Such diversity is reflected also in feeding habits, fish size, swimming performance and breathing patterns, among others. The obligatory air breathing habit in the family channidae is an adaptation to low oxygen environments. Fish of this family is capable to use its stomach as a gas exchanger. Water breathing fishes, which are more active fishes in contrast are not supposed to be hypoxia tolerant fishes but are often found in hypoxic environments. The present study was aimed to investigate the total oxygen consumption of fresh water fish *Channagachua* during exposure and acclimation to sub lethal acidic pH (5.0) medium. The oxygen consumption of fish significantly depleted in all the days of exposure to sub lethal acidic pH 5.0 starting from first day to fourteen days of exposure. The rate of total oxygen consumption depletion was higher on first day. From the second day onwards a gradual decreasing trend was observed in the depletion up to 14th day of exposure. The unit of oxygen consumption of fish depends on exposure to sub lethal pH medium exhibited significant depletion when compared to control. The rate of depletion was maximum in the initial days of exposure and was reduced gradually in twelfth and fourteenth day of exposure. But at day 14th no significant decrease was observed in both the parameters of the experimentation. This observation indicates that the fish was capable of regulating their metabolic modulations and physiological functions through acclimation process to be the possible reason for the successful survival of fish in acidifying water. The reduced oxygen consumption of fish on exposure to sub lethal acidic medium confirms the prevalence of hypoxic condition in the surrounding medium.

Keywords: Acidic pH, oxygen consumption, *Channagachua*.

Diversity and Composition of Butterfly Assemblages in Govind National Park and Wildlife Sanctuary, Gangotri Landscape, Western Himalaya

¹ Manish Bhardwaj and ² V. P. Uniyal

¹ Magadh University, Bodhgaya

² Wildlife Institute of India, Chandrabanim, Dehradun

We studied diversity and composition of butterfly assemblages in four habitat types that were sampled in Tons valley. Four butterfly habitats were sampled viz. mixed riparian and scrub forest, pine forest, broad leaved forest, conifer and alpine forest.

Butterfly species richness, vegetation and microclimatic data was collected on a total of 96 transects. A total of 8,432 individuals of butterflies were recorded representing 5 families, 92 genera and 159 species. The pooled accumulation curve reached an asymptote for all the estimators, indicating that sampling was almost complete at regional level. Using Chao1 and Jackknife2 the species richness estimate was 163 ± 4.88 (SD) and 166 species respectively, for the complete dataset. The ratio of observed to estimated (Chao1 and Jackknife2) suggested that inventory was almost complete at regional level (Inventory completeness = 96%). Comparison of different habitats showed that on average, species and composition of same habitat type was much similar within than among different habitat types.

Most differences in family composition occurred between sites of pine forest and mixed riparian and scrub forest and the family Lycaenidae and Nymphalidae contributing mostly in group differences between pine forests and mixed riparian and scrub forest. We will discuss the result of study in a frame to conserve biodiversity.

A Study of Avian Diversity of Kopra Reservoir, Bilaspur: A Potential Bird Sanctuary

Alok Kumar Chandrakar and S. S. Dhuria

Dept. of Forestry, Wildlife & Environmental Sciences,
Guru Ghasidas Vishwavidyalaya, Bilaspur, Chhattisgarh, India

Kopra reservoir located geographically 22° 4' 2.6616"N, 82° 2' 34.026"E, and lies 13 km East to the Bilaspur city. The dam was constructed as a part of irrigation project by Government of Chhattisgarh, India, as well as a primary source for drinking water supply to Kopra village. This region provide rich food sources viz., variety of nectar and seed flora, fruits, insects, beetles, grubs, molluscs, shrimps, crustaceans, tadpoles, fishes, amphibians and reptiles etc. Such fascinating conditions of an ecosystem attract most of the resident and migratory species of bird for feeding as well as nesting. A total of 161 species belonging to 19 orders and 50 families were documented in our survey work since the year 2015. In which 103 resident and 58 migratory species were recorded including one Endangered (EN) species Egyptian Vulture (*Neophron percnopterus*); three Vulnerable (VU) species Common Pochard (*Aythya ferina*), Woolly-necked Stork (*Ciconia episcopus*), Lesser Adjutant Stork (*Leptoptilos javanicus*) and three Near Threatened (NT) species Painted Stork (*Mycteria leucocephala*), Black-headed Ibis (*Threskiornis melanocephalus*), Black-tailed Godwit (*Limosa limosa*). At present Chhattisgarh has no bird Sanctuary, so this wetland is ideal to develop as one, as it has such a rich avifaunal diversity and due to plenty of food materials and availability of better water and atmosphere the area has become a safe haven for the resident and migratory birds. In this paper, it has endeavoured to bring to the fore the virtuous features of this unique place for bird watching and its linking in a fruitful way with ecotourism and sustainable development.

Keywords: Kopra, wetland, avifauna diversity, ecotourism, conservation.

**Morphology of Antennal Sensilla of Poultry Fluffs Louse,
Goniocotes Gallinae (De Geer, 1778)
(Phthiraptera: Ischnocera: Insecta)**

Aftab Ahmad

Dept. of Biology ZSI, Gopalpur-On-Sea, Ganjam, Odisha

Phthirapteran ectoparasites (lice) are very small arthropodan creature which spends their life on different mammalian and avian host body. Many morphological features of these tiny creatures are not visible under light microscopy therefore the morphology and distribution of the antennal sensilla of *Goniocotes* (de Geer, 1778), poultry fluff louse were examined using scanning electron microscopy (SEM). Antennal sensillum is also one of the special features located on anterior part of the head of the louse. The present study on the sample specimen of poultry louse, *G. gallinae* showed presence of a small, ovoid scape and pedicel (broad cup-like structure having narrower base) seen in antennal sensilla under SEM. In addition to sensory setae, sense organ was present on terminal segment.

Keywords: *Ischnocera, Phthiraptera, Insecta, Morphology, Antennal Sensilla.*

Ecology of Salt Tolerant Mangrove Forest in Sundarban (West Bengal, India)

Dipankar Bandyopadhyay

Shibpur Dinobundhoo Institution (Main), Howrah, West Bengal

India has only 2.66 % of the world's mangroves, covering an estimated area of 4827 sq. Km. The East coast is endowed with the world's largest mangrove forest, the Gangetic Sundarban in West Bengal. The Sundarban mangroves are of deltaic types. The 2109 sq. Km. Area of Sundarban has 30 out of 50 species of the true mangroves in the world. Mangroves are famous as salt tolerant ecosystems of tropical and sub-tropical intertidal coastal regions near river mouths. Between latitudes 30° N and 30° S, the shore line marsh vegetation is replaced by mangals (a community of mangroves) since the inorganic nutrients, brought in by the incoming fresh water from land run-off, are trapped to form the source of energy for many organisms. A mangrove ecosystems constitute a reservoir, refuge, feeding ground and nursery for many useful and unique plants and animals confined to this region. Through the exposable decomposable organic matter into adjacent coastal water, mangroves provide and an important nutrient input and primary energy source for many tropical estuaries. The mangrove ecosystems also protects coastal areas from sea erosion and from the violent effects of cyclones and tropical storms. The warm, calm water ways of mangroves provides shelter and rich food for juveniles and larvae of fin fish, shellfish, etc. Mangrove is one of the most extraordinary ecological formations. Like the tropical rainforest, the mangroves have also played a very important role in the economy of our coastal population for thousands of years, providing a wide variety of goods and services including wood production, support for commercial and subsistence fisheries, aquaculture, salt production, shoreline and coastal erosion control.

Keywords: *Gangetic Sundarban, deltaic types, shore line marsh vegetation, reservoir, refuge, feeding grounds, tropical estuaries, coastal population, ecological formations, aquaculture.*

Floristic Composition of A Grassland Community of Gangraj in Mayurbhanj District, Odisha

T. Devalaxmi, A.K. Biswal and K.L. Barik

Dept. of Botany, North Orissa University, Takatpur, Baripada, Odisha, India

The floristic composition of a grassland community of Gangraj village was studied during August 2019 to December 2019, with a view to assess the phytodiversity of a grassland community of Mayurbhanj district in the state of Odisha. The experimental site is about 9 kms from North Orissa University and near about 4 kms from Baripada, the district head quarter of Mayurbhanj, Odisha. The climate of the locality was monsoonal with three distinct seasons i.e. summer (March to June), rainy (July to October) and winter (November to February). All the plant specimens encountered from the experimental grassland community were collected in flowering/fruitlet stage and identified taxonomically with the help of flora (Hooker, 1872-1897; Haines, 1921-25; Mooney, 1950; Saxena & Brahmam, 1994-96; Panigrahi & Murti, 1989; Murti & Panigrahi, 1999; Verma **et al.** 1993; Mudgal **et al.** 1997 and Singh **et al.** 2001). The community comprised of 23 species of which 9 species were grasses and 14 species were non-grasses. They belong to 9 families i.e. Asteraceae, Convolvulaceae, Cyperaceae, Fabaceae, Malvaceae, Onagraceae, Phyllanthaceae, Poaceae and Rubiaceae. Among them, the members of the family Poaceae showed high percentage contribution (39.13%) followed by Cyperaceae (13.04%), Asteraceae, Fabaceae, Malvaceae and Rubiaceae (8.69% each) whereas the rest three families i.e. Convolvulaceae, Onagraceae and Phyllanthaceae shared 4.35% each during the study period. This variation in floristic composition in the experimental site might be due to the topography, geographical distribution, soil characteristics, climatic conditions and biotic interference of the locality.

Keywords: *Phytodiversity, Grassland, Community, Mayurbhanj.*

Study of Visceral Leishmaniasis in Supaul District, Bihar (India)

Brajesh Kumar Singh

Dept. of Zoology, S.N.S.R.K.S. College, Saharsa, Bihar

Visceral Leishmaniasis is a Group of Vector-borne disease caused by Leishmania genus parasites and transmitted by phlebotomine sand flies Leishmania Organisms are endemic in more than 80 Countries and 350 Million People at risk in Bihar also District Supaul is worst effected and 68,358 VL Cases were reported in Supaul from 2000 to 2017 were studied. The monthly average of cases ranged from 149 to 309, highest pic in march to April and another one in July. Monthly VL Incidence was associated positively to rain fall and negatively to relative humidity and the number of VL cases in the previous month reported to the public health sector, Private Practices and NGOs showed be encouraged to control measures applied in the district. In present study we studied VL Seasonality and its relationship to basic metrological variable also as like temperature, rain fall and humidity.

Keywords: *Visceral Leishmaniasis, Incidence, Temperature, Rain Fall and Humidity.*

Perspectives and Disagreement of Biodiversity

Deepak Singh

Dept. of Zoology, Tilak Dhari Post Graduate College Jaunpur

The Fossil record amply shows that spatial fabric of extinction has profoundly shaped the biosphere, this is spatial dimension provides a powerful context for integration of Paleontological and neonatological approaches. Biodiversity provides to humankind enormous direct economic benefits, an array of indirect essential services through natural ecosystems, and plays a prominent role in modulating ecosystem function and stability. Biodiversity is not uniformly distributed on the earth, and could comprise 5 to more than 50 million species. Crisis of biodiversity is defined as, The crisis of biodiversity is the accelerated loss of genetic variability of species of ecosystem. Biodiversity is disappearing at an unprecedented rate much faster than the rate with which we can afford to study and monitor hn threathed populations. Approximately one quarter of the 87967 animal, plant and fungi assessed by the International Union for conservation of Nature (IUCN) are classified as threatened with extinction and another 10% are Data Deficient. Data deficiency is prevalent for Fishes, Invertebrates Plants and Fungi. Conserving these data limited species is a challenge for scientists and policy makers because they lack the information needed to apply standardized criteria for decline.

Elemental Assessment of the Leaf and Flower of *Datura* and *Calotropis* by Direct Current arc Optical Emission Spectroscopy

Sadanand

Dept. of Environmental Science, University of Allahabad, Allahabad

Medicinal plants are used for health care purpose throughout the world since preliminary days and are still widely used. Plants are important for pharmacological research and drug development. However, the integration of herbal medicine into modern medicinal practices must contemplate the related issue of quality, safety and efficacy. Plants produce chemical as part of their normal metabolic activities. These metabolites are the source of active principles capable of curing health ailments. In the current era, medicinal plants are the major resources of indigenous medicines in traditional medicine system. The leaf and flower of medicinal plants used by the local people *Datura metal* (Jimson weed) and *Calotropis procera* (milkweeds) belong to family Solanaceae and Apocynaceae respectively have been used since long time for the formulation of several drug.

The emission spectrum of powder sample of the leaf and flower of *Calotropis* and *Datura* has been recorded in the spectral region of 300 – 750 nm under optimised experimental conditions. The scrutiny of the recorded spectra reveals the presence of persistent lines of the iron, calcium, potassium, magnesium, titanium, manganese, vanadium, zinc, copper, chromium, nickel, aluminium, molybdenum, potassium, and cadmium thus confirming their presence of these elements in the flower and leaf *Calotropis* and *Datura*.

The objective of this study is, investigating the elemental composition of flower and leaf *Calotropis* and *Datura* by extraction free, rapid, sensitive, simultaneous multi-element detection technique such as direct current arc optical emission spectroscopy.

For the determination of elements present in the flower and leaves of the plant *Datura* and *Calotropis*, d c arc excitation source together with fibre optic spectrometer is used. The method involves excitation of the specimen by d c source and glow is recorded with the help of spectrometer. The excited specimen emits radiation which consists of atomic lines of the various elements present in the specimen. These radiations can be recorded using spectrometer. The recorded spectrum gives the presence of a number of atomic lines of the elements present in the sample. From the reference data one can detect presence of the elements. The intensity of the atomic lines is an indicative of the concentration of the element present in the sample.

The fresh leaf and flower of *Calotropis procera* and *Datura metal* were procured from the campus of Allahabad University, Prayagraj, India. The collected samples were washed

with tap water followed by distilled water then dried at room temperature. samples were burnt in a hot air oven at a temperature of 80? C for 2 days to remove water. Then they were powdered in a mortar and pestle arrangement to make homogeneous. This powder samples were used for the experimental purpose. Small amount of sample (0.5 gm) of the sample was kept inside the cavity of carbon electrode. The characteristic radiation was produced between two carbon electrodes separated by 0.5 cm gap connected with d c source. The emitted radiations were recorded with the help of fibre optic optical spectrometer equipped with Ava-soft software in the spectral region of 300 – 750 nm. The recorded spectra were processed with the help of origin 8.0 software package. The peak positions were measured and identified with the help of standard table.

The emission spectrum of the leaf and flower powder of *Datura* and *Calotropis* has been recorded. The spectrum shows number of peaks of varying intensity of the different atomic species present in the leaf and flower of the *Datura* and *Calotropis*. The peak position of different spectral signatures corresponds to elements present in the sample. The spectrum of leaf of *Calotropis* shows persistent atomic line of titanium, aluminium, potassium, magnesium, copper, molybdenum, sodium, calcium, along with line of iron, nickel, chromium, vanadium and manganese. The spectrum of leaf of *Datura* shows persistent atomic line of chromium, titanium, nickel, iron, aluminium, magnesium, copper, molybdenum, sodium, vanadium, calcium along with potassium and manganese. The flower of *Datura* shows the persistent atomic lines of titanium, copper, sodium, calcium along with lines of vanadium, potassium, iron, chromium, molybdenum. The flower of *Calotropis* shows persistent atomic line of titanium, calcium, aluminium, vanadium, Sodium along with iron, manganese, and chromium.

The study of *Datura* and *Calotropis* by d c arc optical emission spectroscopy technique yielded valuable information in terms of the elements present in leaf and flower of the plant. The elemental investigation of flower and leaf of *Datura* and *Calotropis* reveals that they are rich in iron, calcium, potassium, magnesium, titanium, manganese, vanadium, zinc, copper, chromium, nickel, aluminium, molybdenum, potassium, and cadmium. The various curative and therapeutic properties of these plants are because of the presence of number of trace elements. The content of trace element is sufficiently high. However, the presence of toxic element limits the direct use of these medicinal plants for the treatment of the disease. Due care must be taken while using these plants for curative and therapeutic purposes. The supremacy of the d c arc optical spectroscopy over the other techniques such as its simplicity, accuracy, sensitivity and rapidness, handling, less sample preparation, low cost, powerful, low contamination makes it a powerful probe for the determination of elements in the bio-samples and concentrated liquid samples.

Keywords: Spectrometer, contamination, Therapeutic, Homogeneous, Persistent.

Environmental Suitability of Indian Sarus Crane, *Grus antigone antigone* in and Around Alwara Lake of Kaushambi

¹ A. K. Verma and ² S. Praksh

¹ Dept. of Zoology, Government P.G. College, Saidabad Prayagraj

² Dept. of Zoology, KA PG College Prayagraj

Indian sarus crane, state bird of Uttar Pradesh, is the eternal symbol of unconditional love, devotion, good fortune and marital fidelity. This tallest flying bird is the only resident breeding crane in India. They maintain the food chain as well as food web and provide strength to wetland ecosystem. The sarus crane belongs to phylum: Chordata, class: Aves, order: Gruiformes and family: Gruidae. As such the authors have initiated a public awareness campaign since 2011 to save and conserve this species from becoming extinct. The awareness programme was carried out with the help of local people residing around the lake and district authorities. It helped to restore its exploited habitat and conserve the said species. The successful awareness programme tends this vulnerable species towards an increasing trend in and around the said perennial wetland. As a result, the habitat concerned has been proved safer for sarus crane population growth due to reduction in anthropogenic activities. This wetland has multiple climatic suitability to support the growth and survival of vulnerable Indian sarus crane, *Grus antigone antigone*. In general, the population of sarus crane is decreasing at global level but mainly due to awareness programme and climatic suitability, the author recorded its increasing trends during exploration from 2012 to 2018 in and around the Alwara lake of Kaushambi district of Uttar Pradesh (India). Ecological and environmental condition of the said lake is nicely supporting the survival and growth of this vulnerable species.

Keywords: *Climatic suitability, Sarus crane, Alwara Lake, vulnerable, conservation.*

Seasonal Variations of Plankton In Rapti River

Sadguru Prakash and Ashok Kumar

Dept. of Zoology, M.L.K.P.G. College, Balrampur

A study was carried out to examine the impact of seasonal variations in the physico-chemical variation in Rapti river water along the Balrampur stretch during a period of 12 months from July 2018 to June 2019 for this purpose three different stations, Kodhari Ghat(S1), Mathura Ghat(S2) and Siasi Ghat(S3) were selected for sampling purpose. It also deals with interrelationship between the changes in climatic factors with plankton diversity in the river. Thermometric factors showed inverse relationship with plankton diversity.

The phytoplankton population in three seasons were represented by 28 genera belonging to four different groups viz. Chlorophyceae (10 genera viz., *Ankistrodesmus*, *Chlorella*, *Chlamydomonas*, *Cledophora*, *Closterium*, *Pediastrum*, *Scenedesmus*, *Spirogyra*, *Ulothrix* and *Zygnema*), Euglenophyceae (2 genera viz. *Euglena* and *Phacus*), Bacillariophyceae (8 genera viz., *Cyclotella*, *Cymbella*, *Diatoma*, *Navicula*, *Nitzschia*, *Suriella*, *Synedra* and *Tabellaria*) and Cyanophyceae (8 genera viz., *Anabaena*, *Botryococcus*, *Chroococcus*, *Lyngbya*, *Merismopedia*, *Nostoc*, *Oscillatoria* and *Phormidium*). Among recorded phytoplankton Chlorophyceae population was dominant during entire study period.

The zooplankton population in three seasons were represented by 27 genera belonging to four different groups viz. Protozoa (6 genera viz, *Arcella*, *Centropyxis*, *Diffugia*, *Paramecium*, *Volvox* and *Vorticella* species), Copepoda (4 genera viz *Cyclops*, *Mesocyclops*, *Heliodyptomus* and *Neodyptomus* species.), Cladocera (9 genera viz *Alona*, *Bosmina*, *Ceriodaphnia*, *Coronatella*, *daphnia*, *diaphanosoma*, *Indialona* *Mmacrothrix* and *Monia* species) and Rotifera (8 genera viz *Asplanchna* *Brachionus* *Euchlanis* *Filinia* *Keratella* *Philodina* *Polyarthra* and *Trichocera* species). In the present investigation maximum density was recorded in summer season followed by winter season and rainy season. Among recorded zooplankton Rotifer's population was dominant during entire study period.

Keywords: Seasonal distribution, planktonic diversity, Rapti river.

Defensive Mechanisms of Lungs to Overcome The Problems of Pulmonary Fibrosis in Rat

Sonker Manish and Mishra Dev Brat

Dept. of Zoology, T.D.P.G. College, Jaunpur

Lungs readily exposed from environmental factors, microbes, viruses and many other antigen which harms them. One of the major challenging problems in which alveolar tissue become scar's is a pulmonary fibrosis, in which probably excessive deposition of collagen in matrix so animals suffering from many challenging problems. To overcome this problems lungs follows many defensive mechanisms this includes both innate and adaptive immunity. Innate immunity responses immediately and followed by adaptive immunity to overcome the problems.

Innate immunity comprises macrophages, NK cells, TLRs, eosinophils, neutrophils etc. Adaptive immunity comprises of both cell mediated and humoral. In cell mediated mainly T- cells are responsible and in humoral immunity antibody which is formed by activated B-cells i.e. plasma cells performs this function.

Immune system also comprises bronchus- associated lymphoid tissue (BALT), Non-BALT nodules and epithelial cells etc. Normally BALT is not recognised in human but present in Rat and few other mammals however several reports of BALT in the lungs patients with different diseases such as panbronchitis, recurrent pneumonia and lower frequency in smokers. It is a hope for the future research. Few reports suggest that the induction of BALT depends on administration of antigens in Intratracheal system, resulting in development of BALT. BALT uptake antigen from the airways and local production of antigen specific IgA and IgG, working as an inductive tissue for local immunity.

Keywords: *TLRs, BALT, Intratracheal, Inductive, Innate and Adaptive.*

Effect of Cerebral Ganglia Ablation and Injection of Its Extracts on Gametogenesis During Monsoon Season in Freshwater Bivalve Molluscs: *Lamellidens Corrianus* (Lea)

¹N.G. Shinde, ²D.M. Gaikwad and ³A.N. Vedpathak

¹K.J. Somaiya College, Kopergaon, Dist. Ahmednagar, Maharashtra

²Rajashri Shahu College, Pathri, Tal. Fulambri, Dist. Aurangabad, Maharashtra

³Dept. of Zoology, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, Maharashtra

In freshwater bivalve molluscs *Lamellidens corrianus* there are seasonal changes in the reproductive behavior. Present investigation deals with the alteration in gametogenic activity due to removal of Cerebral Ganglia (CG) and injection of Cerebral Ganglionic extract during monsoon season. These molluscs are bottom dweller and filter feeder, in which CG plays a key role in gametogenic activity. Based on earlier report and present study in the region, it is concluded that gametogenesis occur in complete monsoon which include pre and post monsoon. In monsoon season effect of CG ablation and its extract injection was observed which revealed that, removal of CG accelerated the growth of gametes and injection of their extract gradually increases the growth. In this season lipid globules from the follicle of lumen in experimental group considerably diminished in quantity showing enhanced maturation of gametes as compared to the control. It is likely that the cerebral ganglia in *Lamellidens corrianus* may produce inhibitory principle since removal of cerebral ganglia even in immature gonads showed rapid development of gametes leading to lysis before they are released.

Keywords: Cerebral ganglia ablation, cerebral ganglia injection, Freshwater bivalve, *Lamellidens corrianus*, Monsoon season.

Study of Zooplanktonic Communities Present in The Water of River Karamnasa at Buxar, Bihar

Govind Kumar, Ravinish Prasad, Shobha Kumari and Dr. M.L.Srivastava

Dept. of Zoology, V.K.S.U., Ara, Bihar

Dept. of Zoology, M.V.College, Buxar, Bihar

Zooplanktons are the heterotrophic, floating plankton that range from microscopic to large species. The zooplanktonic communities occupy an important place in food web of an aquatic ecosystem. It is also an integral part of the lentic aquatic ecosystem and significantly contributes in the productivity of a fresh water ecosystem. The diversity of zooplanktons is highly influenced by variation in season as well as physico-chemical parameters.

The present paper deals with the zooplanktonic communities found in the water of river Karamnasa at Buxar, Bihar. For this purpose, the physico-chemical parameters of river Karamnasa were studied and the zooplanktonic samples were collected from the different sampling sites from the period January 2018 to December 2018. Quantitative analysis was done by dropping method of APHA (2005). The result of this finding conclude that 12 species of zooplanktonic communities have been found in the water of river Karamnasa. All the species belong to four major groups as Rotifera, Cladocera, Copepoda and Ostracoda. Cladocera was most dominant group while Ostracoda constitute the smallest group of zooplankton during the whole period of investigation.

Keywords: *Zooplanktons, Physico-chemical parameters, Karamnasa river, Buxar, Bihar.*



GROUP - D

Air, Water, Soil and Noise Pollution and Control Strategies



The Studies on Helium Gas in South Ganga Basin, Sagar Division. M.P. India

Arun K. Shandilya, Anupam Shandilya and P.L. Chandrakar

Dept. of Applied Geology, Dr. HSG University, SAGAR M.P.

A rare Discovery of the Helium and Petroleum Gas in more than 54 Tube wells in and around Sagar Town in Sagar Division (1993 to 20015 period) in the rocks of Upper Rewa sandstone of the Vindhyan Super group .The discovery of the Rare Gas Helium in hydrocarbon rich zone in the tube wells in agricultural field in the Villages in Sagar division of M.P. is a unique finding in rocks of the Vindhyan Super Group, in the history of Earth Science in India. The depth of tube wells are varying in 300 feet to 1000 feet. On the basis of Geochemical & Stable Isotopic analyses of the soil, water and gas samples held at Geochemical Lab of KDM IPE, ONGC, Dehradun and National Geophysical Research Institute(NGRI) Hyderabad, it is remarkable to note that average values of rare gas helium contents varies from 0.34 % to 0.732 % along with the 72% to 99 % of methane and ethane, and minor amount of oxygen, nitrogen and CO₂ gases in the hydrocarbon rich zone are recorded .In the west central part of the Vindhyan Basin around sagar area is charatcerised by the presence of the Helium along with hydrocarbon gas in Upper Sandstone rocks of Rewa group, which was overlain by the Deccan trap Basaltic lawa flow, it6 is acting as trap or cover rocks over theses gaseous sandstone. The occurrence of the various inlier of the Vindhyan rocks are containg the Helium and hydrocarbon gases.In variably we do not get the gas during the mansoon period , after the mansson period, after Nov. every year there is leakages of both the gases coming from the tube wells.. The part of the Vindhyan basin which is not covered with the Deccan trap basalt, do not have any chances of storing these gases/rare gases. During the intrusion of the Dome structure of Jabera area in Damoh Distt, about 140km east of the study are, must be responsible for the generation of these gases by the fractionation under high temp. & pressure condition. These gase were formed in the later phase of folding in the Lower, Middle and Upper Vidhyan rocks. In the gently folded rocks around Sagar area also containing these gases. The stable Isotopic analysis suggests the stable isotope $\delta^{13}C$ value the values for the methane is - 43.6 per mil w. r. t. to - 54.9 per mil w.r.t. PDB and for the Ethane gas is —24.9 to —26.4 per mil w. r. t. PDB in the gas samples collected in the saturated sodium chloride solution in the glass bottles at various sites in Sagar & Damoh District. The occurrence of rare helium gas in the Hydrocarbon rich zone is reported first time in Jan, 2007 from the tube wells of Sagar Distt, which were geochemically and stable isotopically analyzed in the labs of KDMIPE Dehradun & NGRI Hydrabad. The gaseous hydrocarbon analysis show the presence of moderate to low concentration of methane (C₁) 1 to 104 ppb, Ethane(C₂)-1 to 14 ppb, Propane(C₃) 1 to 10 ppb, i- Butane (i C₄) 1 to 9 ppb and n Butane (n C₄) 1 to 8 ppb in the soil samples collected from

different locations. The isotopic composition of the hydrocarbon gases are governed by their source of characteristic. In case of the thermogenic gases the maturity of the parent kerogen at the time of gas generation also affect the isotopic composition of the gas. The migration does not appear to affect the isotopic signature of the hydrocarbon gases, although due to diffusion through imperfect seals in a reservoir, isotopically lighter ^{12}C methane may preferentially escape leaving behind isotopically heavier gas in a reservoir. Biogenic and Thermogenic gas can be distinguished based on molecular and isotopic composition. The Biogenic gases are depleted in higher hydrocarbon gas, like ethane, propane, butane etc. The methane is biogenic gas if the isotopic value of the $\delta^{13}\text{C}$ is -55% . The helium gas in the Upper Sandstone of Rewa group of rocks of the Vindhyan Super Group are generated from thermal cracking of U^{238} ($\text{U}^{238} - \text{Pb}^{206} + \text{He}$) and Kerogen. No mixing with any biogenic gas taken place after the generation of thermogenic gases. The Result of the soil gas and stable isotopic analysis of Ethane gas in these samples $\delta^{13}\text{C}$ value are ranging from -24.9 per mill w.r.t. PDB and -26.9 per mill w.r.t. PDB are indicative that this gas is of thermogenic origin, which must have been formed at very high temperature & pressure condition in the deeper horizon of the Great Vindhyan sedimentary basin of late Proterozoic (> 600 m.y.) period.

Solid Waste Management in Bhojpur Region of Bihar

¹ Sunita Kumari Sharma and ² Pushpa Kumari

¹ Dept. of Zoology, Maharaja College, Ara, Bihar

² Veer Kumwar Singh University, Ara, Bihar

Solid Waste Management is one of the most essential services for maintaining the quality of life specially in the urban areas. In the area of Bhojpur, there is an absolute unspecified method of Solid Waste Disposal without considering the environmental impact. The collected wastes are dumped in the low lying areas in the Gangi Regions of Bhojpur without compliance of Municipal Solid Waste Management Rules, 2000. The dumped wastes are mixed with biomedical wastes making it more hazardous. It not only effect the air quality of that area rather it also effect ground water quality and deteriorate the fertility of the soil. A simple study of physical and chemical characteristics of the ground water has been tested. The study reveals exceedingly very high total alkalinity and total hardness. So there is an immediate need of Solid Waste segregation at source and their proper disposal for zero level land fill in this area.

Water Quality Index Assessment of Ground Water in Agra and Aligarh City, Uttar Pradesh, India

¹ Harit Priyadarshi, ² Sarv Priya, ³ P.K. Goyal and ⁴ Ashish Jain

^{1,4} Dept. of Civil Engineering, Mangalayatan University, Beswan, Aligarh, Uttar Pradesh, India

² Dept. of Civil Engineering, KIET, Murad Nagar, Ghaziabad, Uttar Pradesh, India

³ Dept. of Civil Engineering, Delhi Technological University, Delhi, India

Nowadays groundwater pollution has become one of the most exceptionally problems throughout the world. Urbanization, industrialization and agricultural activity affecting groundwater quantity and quality. An effort has been made to comprehend the groundwater quality of Agra and Aligarh city for drinking purpose utilizing Water Quality Index (WQI). Assessment of groundwater quality is necessary as it controls its usability for drinking purpose. The study was carried out by the physico-chemical and WQI analysis of groundwater to assess the suitability of groundwater for drinking. In the present study, groundwater samples were collected from 20 sample locations in the Agra and Aligarh city. Water samples are collected from bore wells of sample locations and is analyzed for concentrations. The concentrations of physical and chemicals parameters in groundwater samples were compared with the Bureau of Indian Standards (BIS) and World Health Organization (WHO), and observed that the water quality parameters were exceeding the permissible limits in some places of the study area. The water quality index is determined using weighted arithmetic index method. The conclusion of the analysis is that the groundwater in some places of study area is good for drinking and many areas have poor water quality. However the quality can be improved after undergoing the treatment processes Agra city area is basically a water-scarce region, dependent upon surface water resources from outside its boundaries for its water supply. The total water demand for Agra city for domestic, industrial, firefighting and irrigation purposes, increased during the past decade, is likely to increase, because of various factors such as growth of population, rapid urbanization, an upward-looking economy and rising standards of living. This paper discusses the findings that have emerged from the research work. The physicochemical assessment of groundwater samples belonging to Taj-city Agra and Aligarh city was used to test the suitability of groundwater for drinking, industrial and agricultural purposes. A sensitivity analysis showed that now day's groundwater quality deteriorated. WQI characterized as a method of rating that gives the composite impact of individual water quality parameters on the general quality of water for human utilization assessment of groundwater quality characteristics and Water Quality Index (WQI) of Agra and Aligarh city its industrial area, Uttar Pradesh state. For calculating the WQI, we have considered the following 13 parameters: The study area has a mean of pH (6.75 - 9.4) Total alkalinity (750 mg/l-1500 ml/l), Electrical Conductivity (1.70 μ s -4.76 μ s), Total Dissolved Solids (301 ml/l-1025 ml/l), BOD (0.4 ml/l-1.4 mg/l), Chemical Oxygen Demand

(50 mg/l-150 mg/l) and Fluoride (0.6 mg/l-1.0 mg/l), Fe (0.098 - 0.334), Cu (0.044- 0.005), Ni (0.751- 2.003), Mn (0.047- 0.014), Pb (0.086- 0.477) and Zn (0.292 - 1.265). The geochemical study shows that groundwater is an alkaline (pH >7). The WQI analysis Sikandra, Taj Mahal area, Dodhpur and Sasni gate shows the water unsuitable for drinking and Irrigation. The physicochemical results show that water quality in most parts of the study area is unsuitable for drinking and irrigation. We need government and common man's concern to save water for the future.

Keywords: Surface water, Groundwater Quality, Assessments, Physicochemical parameters, Water Quality Index.

Physico-Chemical Assessment Study of Godavari River Water along the Kopargaon Region, Ahmednagar District, (MS), India

¹ D. A Rayate and ² M. U. Patil

¹ Dept. of Zoology, K. J. Somaiya College, Kopargaon, Ahmednagar, India

² Dept. of Zoology, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, India

Contemporary study deals with the assessment of some physico- chemical parameters of Godavari river water along the Kopargaon region, Ahmednagar district in the period July 2016 – May 2018. During present work total 10 parameters were studied. During the study period, mean **P^H** was 8.01 ± 0.13 , mean **temperature** was $20.02 \pm 0.21^{\circ}$ C, mean **alkalinity** was 141.71 ± 1.13 mg/l, mean **DO** was 7.37 ± 0.14 mg/l, mean **Hardness** was 161.24 ± 1.18 mg/l, mean **calcium** was 6.73 ± 0.78 mg/l, mean **Total Dissolved Solids** was 612.76 ± 52.3 mg/l, mean **chloride** was 104.19 ± 2.48 mg/l, mean **salinity** was 2.32 ± 0.22 mg/l, mean **bicarbonate** was 5.62 ± 0.07 mg/l. The Pearson's correlation coefficient relationship between selected parameters was also calculated. The results showed that on variable truly causes changes in another variable. This work surely helpful in monitoring the water pollution index of Godavari River.

How Big is Your Carbon Foot Print and its Solution for Sustainable Development

¹ Mahima Chaurasia and ² Sanjeev Kumar Srivastava

¹ Institute of Engineering & Technology, Dr. Rammanohar Lohia Avadh University, Ayodhya, UP

² Shri Ram Murti Smarak College of Engineering & Technology, Bareilly, UP

A carbon footprint measures the total greenhouse gas emissions caused directly and indirectly by a person, organization, event or product. A carbon footprint is measured in tones of carbon dioxide equivalent (CO₂).

Global experts call for a target limit of approximately 2 tones per person per year. Currently, the global average is 4 tones per person, with wide variation between countries. Approximate national average for the United States of America is 20, United Kingdom 9, China 3, and India 1.2. Individual activities are estimated to contribute around 45% of your “footprint”. The rest is your “allocation” of system-generated emissions related to services provided to you or on your behalf. While both system-level and individual actions will be required to help reach agreed targets, there is much everyone can do to reduce their own carbon footprints.

Climate change and global warming are internationally recognized as current issues, driving negative effects on humanity, and being mainly caused by GHG emissions generated both from industrial activities, and from other anthropogenic activities. Restoring the ecological balance requires urgent action to reduce GHG emissions. In this respect, the European Union has set the target to reduce the GHG emissions by 20% until 2020, compared to 1990 level. This paper presents a methodology to develop a model for carbon footprint calculation, for assessing and reducing GHG emissions generated by European funds financed projects.

Carbon footprint estimates the climate change impact of each activity ranging from making a product, living a lifestyle or running a company. Broadly, a carbon footprint takes into account not just the CO₂ emissions of a particular activity, but also emissions of all other greenhouse gases such as methane and nitrous oxide. Not excluded are other types of climate impacts such as vapour trails from aeroplanes. If we personally want to contribute to stop global warming, the calculation and constant monitoring of our personal carbon footprint is essential. The present paper states that by keeping personal carbon footprint to the minimum, the earth can be saved from the outbreak of climate change.

Keywords: *Global warming, transportation, environmental benefits, energy use, etc.*

Quality of Water During Kumbh 2019

Kriti Varma and Pawan Kumar Jha

Dept. of Environmental Science, University of Allahabad, Uttar Pradesh, India

Water, being the life-sustaining substance, holds utmost importance for all forms of life. Water quality is one of the rising concerns of the modern world and activities like mass bathing play a significant role in determining the river water quality. Kumbh is one of the major spiritual events that take place in Prayagraj, where millions of devotees gather from all over the world in order to take a holy dip at Sangam (the confluence of the Ganga, the Yamuna and the Saraswati). This study provides an insight into the Kumbh Mela 2019, which was carried out in three temporal segments, viz. pre-Kumbh, during-Kumbh and post-Kumbh. The water quality parameters were analysed in terms of physicochemical properties, nutrient richness, presence of ions and microbiological properties. All these parameters play a significant role in the determination of quality of water. The analysed parameters showed a prominent change during the course of Kumbh. The most significant changes were observed in the physicochemical parameters like COD, nutrient like PO_4^{3-} and microbiological parameter like MPN. Such result clearly indicates that the process of bathing and other spiritual activities during Kumbh has affected the quality of the river water. Such alteration in water quality needs the urgent attention of both, the people and the government, as the river water serves as lifeline for the people and its deterioration in any way is bound to have some direct or indirect impact on the health of people.

Keywords: *Kumbh, Chemical Oxygen Demand, MPN, Water Quality, Health of people.*

Evaluation of total Suspended Particulate Matter (SPM) in Air at Different Sites in Ranchi City

Surbhi Pandya, Ankita Munda, Sunidhi Verma, Pragati Raj
and Jessica Rene Hansdah

Dept. of Botany, St. Xavier's College, Ranchi

Environmental pollution is probably the greatest problem of humans still it is paid very little heed. The research deals with the evaluation of total Suspended Particulate Matter (SPM) in air in Ranchi city, the capital of Jharkhand, India.

Keywords: *Air pollution, Suspended Particulate Matter (SPM).*

Groundwater Fluoride Contamination: Current Situation in Indian Contexts

Piyush Tripathi and Pawan Kumar Jha

Dept. of Environmental Science, University of Allahabad, Uttar Pradesh, India

Groundwater accounts for 80% potable water supplies in India. Excessive fluoride in groundwater makes water unsuitable for drinking and domestic use as human health is vulnerable to toxicity and persistency and accumulation of fluoride. Earth's crust accounts for 85 million tons, and India alone 12 million tons of fluoride in the form of minerals like fluor spar, fluorite, rock phosphate and mica. Geochemical processes like weathering rate, ion exchange reactions, redox reaction, residence time and leaching are the major factors accountable for high fluoride concentration in groundwater. Geologic and climatic conditions of India make favourable conditions for fluoride dissolution in groundwater. Atmospheric deposition through anthropogenic activities also contribute to excessive fluoride in different parts of India. In Indian context, the states falling in arid and semi-arid regions are most affected with high fluoride concentration in groundwater. Several studies have reported excessive fluoride concentrations of 1.5 mg/l (WHO) in the states of Rajasthan, Gujarat, Andhra Pradesh, Punjab, Telangana, Tamil Nadu, Bihar and Uttar Pradesh. Excessive fluoride can cause dental and skeletal fluorosis, which can affect millions of people. Total 19 states and 184 districts were reported with fluoride concentration above permissible limits in 2017 (CWGB). About 66 million people are at threat of dental and skeletal fluorosis and frequency is increasing day by day. Different adsorbents like sawdust, wheat straw, activated carbon of sugarcane bagasse, modified bauxite are used in removal of fluoride from the groundwater.

Keywords: *Groundwater Contamination, Groundwater, Fluoride, Hydro geochemistry, Sustainable Development, Human Health.*

Spherules as a Marker for Anthropogenic Pollution in Urban Areas

Ambalika Niyogi and J.K. Pati

Dept. of Earth and Planetary Sciences, University of Allahabad, Allahabad, India

The minute sized particle having spherical shape is generally termed as spherules. The particulate ranging in size from micron to millimetre size is of special interest in the environment. Although, it has been seen that spherules can be generated from various biogenic, geogenic and cosmogenic processes, but those originated from the anthropogenic process can be used as a proxy to trace pollution. The urban environment is known for its pronounced pollution as a result of vehicular and industrial emissions. Since spherules deposited on soils, sediments and surface dust cannot be decomposed by any physical, chemical or biological mechanism and therefore have long persistence having harmful consequences. The fly ash generated from thermal power plants are known marker for air pollution covering larger dimension. With the release of noxious elements, fly ash are also known to release fine particles or particulate matter in the form spherical glass ash particles (spherules) which gets deposited on the soil and leaf surface. With the release of toxic elements (like Cr, Zn, Cd, Pb and Ni) from fly ash it is known to release fine particles including spherical glass ash particles (spherules) which remains suspended in the air and ultimately gets deposited on the soil, water and leaf surface. The study has been carried out in Allahabad (the vicinity areas Phulpur and Bara power plant, Allahabad). The spherules identified are both glassy and dark with amorphous particles. Glassy spherules are silica-rich while dark spherules are iron-rich. The magnetic susceptibility study varies from 25.38 to 307.43 $\times 10^{-8} \text{ m}^3 \text{ kg}^{-1}$ over Phulpur while in Bara it ranges from 35.26 to 466.91 $\times 10^{-8} \text{ m}^3 \text{ kg}^{-1}$ suggesting presence of high magnetic grains over Bara power plant. In addition to magnetic, various analytical techniques like microscopy, geochemistry, spectroscopy, grain size and XRD studies were also employed to detect the load of anthropogenic pollution over the area. Silica being a carcinogenic agent (I) and the fly ash silica-rich spherules are potent carcinogen which has deleterious effect to the environment. It can lead to harmful consequences on human health too. Thus, proper monitoring and management is required for proper disposal and safe utilization of fly ash.

Keywords: *Spherule, fly ash, pollution, particulate matter, magnetic susceptibility.*

Groundwater Quality Analysis using Water Quality Indices

Pallavi Das and Bhairu Prasad Ahivhar

Dept. of Environmental Science, Indira Gandhi National Tribal University Amarkantak

Water is a precious and fundamental substance for living beings of Earth. Contamination of surface and groundwater is a major issue in the present scenario. Water quality is getting deteriorated by the indiscriminate discharge of pollutants into the water bodies from various sources. Water pollution is a key issue that causes deaths and various diseases worldwide. Moreover, progressive pollution of the river and groundwater are critical as these are an important source of drinking water. Water quality indices (WQIs) are a useful tool to evaluate water quality which provides overall information about the quality of water bodies. Water quality indices (WQIs) are an approach by which the various variables associated with water quality can be integrated into a single scale. Therefore many researchers, water professionals have adopted a variety of indices. Water pollution indices are a comparatively simple and convenient approach for the evaluation of the overall source of water pollution of any water resource. Horton proposed WQI in early 1965, to assess the water quality of water bodies with a simple and dimensionless form. The famous and significant water quality indices are National Sanitation Foundation (NSF) Index, Oregon Index, Bascaron Index, Weight Arithmetic Water Quality Index, Bhargava Index, etc. Water Quality Index (WQI) is a well-organized method for evaluating water quality in terms of qualitative and quantitative measures. The primary goals of the water quality index are to safeguard, maintain and assess the water quality status for drinking, farming, household and industrial purposes.

The objective of the present study is to evaluate the groundwater quality of Anuppur district of Madhya Pradesh by using water quality indices (WQIs).

In the current research, the water quality of groundwater of **Anuppur district of Madhya Pradesh** is assessed. The total area of Anuppur district is 3,701 km². A total of 30 groundwater samples were collected from December 2018 to March 2019 from Anuppur district. The hand pumps were pumped to remove the remaining water for at least 10 minutes to guarantee minimum oxygen interference. Samples of Groundwater were gathered for anion and cation assessment in 250 ml polypropylene bottles. The samples have persevered in 4^o C in the refrigerator. pH, DO, temperature, EC and TDS were calculated *in situ* using a multi-parameter probe (Multi-Parameter PCSTestr 35), while alkalinity (HCO₃⁻) was measured *in-situ* by titrimetric method using 0.1 N H₂SO₄. Three WQIs namely weight arithmetic water quality index (WAWQI), the overall index of pollution (OIP) and entropy weighted water quality index (EIWQI) were calculated of groundwater quality parameters. Apart from that 35 studies of water quality indices (WQIs) from worldwide have been reviewed.

The pH of the water samples ranges from 6.1 to 8.16 with an average of 6.96 and stdev. 0.62. The value of electric conductivity ranges from 97 to 861 $\mu\text{S}/\text{cm}$. Rao et al. (2002) classified EC as 3 types based on salt enrichment in the sample. First type when the value of EC is $< 1500 \mu\text{S}/\text{cm}$, type-II when the value of EC is between 1500-3000 $\mu\text{S}/\text{cm}$ and type-III when the EC value exceeds $> 3000 \mu\text{S}/\text{cm}$. According to the above classification of EC, the entire groundwater sample comes under the type-I (low salt enrichment). Total dissolved solids (TDS) represent the soluble salt concentration groundwater. The value of TDS ranges from 94 to 542 mg/l. The Calcium concentration varied from 15 to 124 mg/l, which is slightly higher than the BIS drinking water standard. The higher concentration of calcium denotes the dissolution of carbonates and its minerals e.g. calcite, dolomite, gypsum, and anhydrite. The magnesium ion ranges from 45 to 206 mg/l which may be due to the high dissolution of dolomite rocks and minerals. The concentration of sodium ranges from 0.03 to 11.36 mg/l. The potassium concentration ranges between 0.65-2.25 mg/l. The concentration of chloride ranges between 24-198 mg/l. The sulfate concentration in samples varied from 18-61 mg/l. The nitrate concentration in groundwater of study area ranges from 0.22 to 8.33 mg/l and finally, the bicarbonate concentration ranges from 64 to 210 mg/l. The present study on groundwater quality of Anuppur district, Madhya Pradesh by using weight arithmetic water quality index (WAWQI) shows that 13.33% of the sample is in excellent quality and remaining 86.66% samples in good quality. Another water quality index, entropy irrigation water quality index (EIWQI) is also applied on the groundwater samples and which shows that the overall value of EIWQI is 20 which is in the excellent category according to EIWQI classification of water quality. The third WQI is an overall index of pollution (OIP) is used which shows that groundwater quality is in excellent and class 1(C1) category according to the classification of water quality of OIP. The overall quality of groundwater of Anuppur district is in good quality for drinking as well as irrigation purposes. Three WQIs applied on the groundwater quality of Anuppur reveals that the groundwater quality is in good condition. In the present study, 35 studies from worldwide on WQIs have been reviewed. From the review, it is observed that the Weight arithmetic water quality index (WAWQI) is the most frequent WQI which is applied in both surface and groundwater quality evaluations due to easy in calculations and parameter selection. Ground Water Quality Index (GWQI) and The National Sanitation Foundation Water Quality Index (NSFWQI) have applied mostly for the assessment of the groundwater quality.

Keywords: WQI, Groundwater, Water quality parameter, Pollution index, Anuppur.

Bioremediation: An Effective Management Tool to Limit Environmental Pollution

Kantisree Goswami

Dept. of Zoology, Charuchandra College, Lake Road, Kolkata

Intensification of agriculture and manufacturing industries has resulted in increased release of a wide range of xenobiotic compounds to the environment. Excess loading of hazardous waste has led to scarcity of clean water and disturbances of soil thus limiting crop production. Bioremediation can be considered as the most effective solution of these problems. By definition, bioremediation is the use of living organisms, primarily microorganisms, to degrade the environmental contaminants into less toxic forms. It uses naturally occurring bacteria and fungi or plants to degrade or detoxify substances hazardous to human health and/or the environment. The microorganisms may be indigenous to a contaminated area or they may be isolated from elsewhere and brought to the contaminated site. Contaminant compounds are transformed by living organisms through reactions that take place as a part of their metabolic processes. Microorganisms restore the original natural surroundings and thus, prevent further pollution. There are different strategies under bioremediation processes. Few basic bioremediation methods are: Bio-stimulation, attenuation, augmentation, venting, piles etc. Bioremediation is not a new technique, but as our knowledge of the underlying microbial reactions grow, our ability to use them to our advantage increases. Furthermore, bioremediation requires fewer resources and less energy than conventional technology, and doesn't accumulate hazardous by-products as waste. Bioremediation has technical and cost advantages, although it can often take more time to carry out than traditional methods. Bioremediation can be tailored to the needs of the polluted site in question and the specific microbes needed to break down the pollutant are encouraged by selecting the limiting factor needed to promote their growth. This tailoring may be further improved by using synthetic biology tools to pre-adapt microbes to the pollution in the environment to which they are to be added. Nowadays, pollution has become a great threat to our health and damages the environment, affecting wildlife and the sustainability of our planet. Bioremediation can help to reduce and remove the pollution we produce, to provide clean water, air and healthy soils for future generations.

Keywords: *Environment, Bioremediation, Microorganisms, Pollution, Contaminants*

Environmental Degradation with Special Reference to Water Pollution and Its Impact on Human Health: A Case Study of Ara Town

¹ Ashok Ram and ² Munna Kumar Jyoti

¹ Dept. of Geography, S. N. Sinha College, Warisaliganj, Nawada

² Dept. of Geography, Veer Kunwar Singh University, Ara, Bihar

In our solar system the Earth is the only planet where life is in existence. Environment of the Earth is its real cause. But unfortunately the quality of environment is deteriorating day by day. Human activities are behind this deterioration which brings about many problems like pollution, global warming, climate change, different hazards, and health problems with it.

“Environmental degradation poses a great threat to the human society. Nature is generous and tolerant, but when the limits are overstepped, it retaliates with vigor many times more destructive than the initial assault upon it, we are all concerned with the problems of environmental degradation.” This scenario leads to selection of the topic “Environmental degradation and its impact on human health.” Basically, there are two types of problems in research: the first is concerned with the increasing knowledge regarding the environmental world and second is to make human life better. This research work is concerned with both.

There are various types of Environmental degradation like air, water, soil, noise and nuclear etc. discussed above affecting various spheres of human life like health & hygiene, economically and social issues etc. The research work is confined to a particular area i.e, Ara town. Ara derives its name from the Sanskrit word ‘Aranya’, which means forest. It suggests that the entire area around modern Ara was heavily forested in old days. Ara is the administrative headquarter of Bhojpur district which is lying in the western part of Bihar in India. It is situated at 25⁰34’N latitude and 84⁰40’E longitude.

The area of study is divided into 45 wards. Ara town is surrounded by villages- Dumra in the north, Badkagaon in the south, Kayam Nagar in the East and Ekawana in the west.

The types and the impacts of environmental degradation are many but here in this research the focus is drawn only to the water pollution and its impact of human health with special reference to Ara town.

The undesirable change in physical, chemical and biological characteristics of water is called water pollution. The real cause of water pollution is basically human activities. These are affecting various arena of human life specially human health. As for example-many diseases are spread by drinking water, which has contaminated by human excreta.

Keywords: Health parameters, Turbidity, PH, Hardness, Ca & Mg, Chloride, Iron, NO₃ & SO₄, TDS, Alk, EC & TDS, Arsenic, F.

Importance of Water-Ethics and Revival of Indigenous Knowledge with Regard to the Traditional Water-Resources: An Analysis of Rural Areas of Bundelkhand Region

Priya Singh

Dept. of Sociology, University of Allahabad, Uttar Pradesh

It is necessary here to understand the peculiarities of Bundelkhand region because of it one can't understand that how much important in this region is to follow the water-ethics to maintain the ecological balance in this region. Bundelkhand is a region spread over southern Uttar Pradesh and North Madhya Pradesh. Since longtime this region is highlighted not only at national level but also at international level because of frequent occurring drought here. In comparison to the eastern Uttar Pradesh, cultivators of this region produce only two seasonal crops in a year i.e. Rabi & Kharif. In some places, at the waterside, Zaid also produced but ratio to overall produce is very less in comparison to other seasonal crops. Since a long time, this region becomes a symbol of 'insecurity' and 'migration', because of the failure of agriculture in most seasons.

At 2016, in news papers, national and international level, this area is shadowed in the headlines, because administration has to arrange water and sent through rail in terrible summer at the month of May & June. In 2016 only United Nations had put the theme 'WATER & JOBS' of *World Water Development Report*, Bundelkhand forced to face same constraints badly with in this region. One side the problems related with water is spread here like drought, flood, water scarcity in some regions and other side migration, unemployment and other everyday lives' problem related with agriculture directly or indirectly affected people adversely and their day to day basic needs also. However to understand the basic problems of this area, it is necessary to understand the geographical specifications of this region although many studies have found that for prevailing water-crisis many social and cultural factors are also responsible rather only geographical conditions.

Topography of Bundelkhand is such as that sufficient water of rainfall cannot utilize fruitfully because more than 20% of this region is plateau area and formed with granite rocks creates obstacles for ground water recharging. Most of the rain falls here within four months only i.e. June, July, August, and September. Most of the rain falls within few hours can't get enough time to penetrate into soil. The major problem of this region is not just insufficient rainfall but the lack of proper arrangement of water-harvesting systems. Except this degradation of ancient rich environment and traditional water-harvesting resources is another major cause of the water related problems lies in this region.

This region is very rich in terms of water-resources. The main problem exists when monsoon fails and in summer tanks/ponds, rivers became dry. The only means left here for water-use whether for everyday use or agricultural use is groundwater not only in rural areas but in urban areas also. Due to availability of multiple high pressure pumps in market without any restriction the depletion of groundwater table increase very rapidly. Another specificity of

this region is that after a frequent gap, flood necessarily covers the most part of this region here in which far-flung villages of this region submerged. In spite of that ground water depletion and availability of water in everyday life are two major problems affect the agriculture as well as livelihood of the villagers.

To analyze the importance of water-ethics and role of indigenous knowledge to maintain the ecological balance in this region in context of water issue.

This paper is based on secondary sources of literature and data through which this paper trying to analyze that how the journey of traditional water resources becoming worsen with increased orientation toward modern farming methods.

The true potential and solution of this region lies in the revival of traditional ethical principles of this region followed by people religiously at that time before adaptation of western production system. In fulfillment of greed that exist behind this motive to get the more and more production from land we pushed in that path where we forget about the environmental needs of the specific regions and just involved blindly exploited these environmental resources (like water, land, tress etc). One should immediately awake and take initiative to avoid the imitation of these false models which are not suitable for the local environmental needs and also local peoples' needs. The people of this region can't come out with this problem easily but slowly can push off themselves with this crisis situation but with the adaptation of participatory and responsible approach with in their community. This paper is an attempt to focus on the issue of water scarcity in Banda district of Bundelkhand region and how with the help of implementation of water-ethics in everyday life, to revive the indigenous cultural values regarding water-resources, the regional population of this area can be able to tackle this problem easily. But for making this dream come true a proper awareness among these regional populations is necessary, with the help of voluntary organizations and NGOs, this goal can be achieved.

To complete this task, one has to be more careful about those ethics are practiced by people in everyday life and has evaluative approach so that they can able to do favorable change in these practices. This awareness can bring among peoples with the help of media, mass communication, policy formulations and with the help of local/regional voluntary organizations or NGOs. Voluntary organizations able to deeply understand the priorities and needs of regional people they can help far better in this task, to spread awareness of traditional cultures of themselves. In recent conference of "ICFFM" Kisans at national level presented a 18 points demand letter and raise their voices to include these points in 2019's election manifesto by every political party, in which they include this point also that "provide electricity to the farmers free of cost". I totally disagree with this point because it will create negative consequence more than positive consequence that free of cost electricity means "more and more exploitation of groundwater".

Keywords: *indigenous water-harvesting system, western system of production, agriculture, Water-scarcity, water-ethics.*

Adsorption of Methylene Blue by *Azadirachta indica* A. Juss Derived Biochar: Kinetic and Thermodynamic Study

Anushree Srivastava, Shivesh Kumar Azad and Kumar Suranjit Prasad

University of Allahabad, Prayagraj, Allahabad, Uttar Pradesh

Methylene blue is a cationic dye which has a wide range of application and its presence in waste water has become a serious concern for humans and environment. The potential use of the biochar obtained from *Azadirachta indica* A. Juss to remove methylene blue from aqueous solution was evaluated. The adsorption study was optimized at various parameters such as pH, biomass doses, contact time and temperature. The maximum removal efficiency was found to be 98% at acidic pH. The biosorption data was well fitted on Langmuir isotherm with better R^2 value in comparison to Freundlich isotherm supporting monolayer adsorption at the surface of biochar. The chemisorptions nature of the sorption study was confirmed by pseudo second order kinetics. The negative value of ΔG° revealed the feasible and spontaneous nature of the adsorption. The positive ΔH value indicated the endothermic nature of sorption while positive ΔS value showed the increase in randomness at solid liquid interface. The biochar thus found to be an efficient adsorbent for the removal of methylene blue.

Keywords: Biochar, *Azadirachta indica* A. Juss, Methylene blue, Adsorption, Langmuir isotherm, Freundlich isotherm

Process Selection for Treatment of Industrial Wastes

Devashish Singh, Alok Kumar Singh and U P Gupta

Dept. of Botany, Harish Chandra PG College, Varanasi

Industrial wastes, particularly those from mineral, chemical and metallurgical industries, are generating a lot of polluting materials in our environment. Most of these wastes are hazardous in nature and, at the same time, contain a lot of valuable materials. In order to protect our environment, it has been essential to properly treat these wastes for their safe disposal. In this process, toxic and valuable byproduct can be recovered and utilized in various ways. In this paper, an account of different types of wastes generated in chemical and metallurgical industries and the criteria for selection of processes to treat these have been discussed with typical examples.

Indoor Environmental Impact of ^{220}Rn (Thoron) in India

¹L. A. Sathish and ²T. V. Ramachandran

¹Dept. of Physics, Government Science College, Bangalore, India

² Dept. of Environment, Bhabha Atomic Research Center, Mumbai

Topic on background radiation has evoked concern between scientist and layman alike in recent years due to the shift in focus of health effects from exposure of radiation from acute high to chronic low level. Globally many locations have higher levels of natural background radiation due to elevated levels of primordial radio nuclides in the soil and their decay products like ^{222}Rn and ^{220}Rn in the environment. Of late, technologically enhanced naturally occurring radioactive material has also contributed to the burden of background radiation. It is estimated that inhalation of ^{222}Rn , ^{220}Rn and their short lived progenies contribute more than 54% of the total natural background radiation dose received by the general population. Due to this it was necessary to supplement the external component with inhalation component. This component is not adequately estimated for any country so far on a national level. In this context, data for Thoron (^{220}Rn) in indoor environment and workplace is typical due to the general perception that its levels are negligible due to shorter half life (55 s) and subsequently its contribution to the total inhalation dose is ignored, in the presence of other significant sources of natural radiation. The Bhabha Atomic Research Center (BARC), Mumbai, India has completed a countrywide monitoring program of thoron (^{220}Rn) along with (radon) ^{222}Rn in the dwellings using $^{222}\text{Rn}/^{220}\text{Rn}$ discriminating Solid State Nuclear Track Detector (SSNTD) based dosimeter systems with large participation of research groups from different parts of the country. Details about the methods of measurement, standardization of dosimeters and evaluation of the inhalation dose is given. Results are compared with the values reported in literature for dwellings as well as in high background radiation areas.

Keywords: India, indoor, inhalation dose, SSNTD, Thoron.

Ecological Integration in the River Water Quality at Prayagraj City, India

¹ Brajesh K. Dwivedi and ² A. K. Srivastava

¹ Dept. of Botany, University of Allahabad, Prayagraj, Uttar Pradesh

² Dept. of Zoology, Dr. SPM Govt. Degree College, Bhadohi, Uttar Pradesh

Around the globe shows that climate change is likely to impact significantly upon fresh water resources availability. In India, demand/ supply for potable water has already increased manifold and they have modified the hydrological pattern in many climate regions and rivers basins. Municipal wastewater and urban storm water are potential pollution sources to downstream running waterways and may seriously impact ecological aquatic ecosystem health in rivers. Continuous influx of untreated sewage in the urban river site carry enormous amount of pollutants, leading to profuse growth of invasive phytoplankton and affecting algal photosynthesis. Phytoplankton encountered in the water body reflects the average ecological condition and they may be used as indicator of water quality assessing the degree of pollution. However, there are no such studies from this region and therefore present work was conducted to evaluate the ecological integration in the river water quality along with toxin producing algal species (TPAsp.) and their interaction with biomass, chlorophyll-a and nutrient influx. Sterilized poly-propylene jar and standard water sampler were used to collect water sample on a weekly basis for months during June 2018 to May, 2019 of Ganga, Yamuna and their confluence, Sangam. The sample (three from each site) were collected at a uniform depth of 10-20 cm and two feet from the river bank, at the confluence. Physico-chemical factors i.e. Temperature (air & surface), pH, turbidity, conductivity, DO, BOD, hardness, Ammonia, N, P of the sample were done as per standard methods. The nutrient status, algal community/ growth and extent with references to hydrological parameters of the running water were also dynamically influenced. Quantitative and qualitative analysis of cyanotoxin (microcystin), nutrient/ nutrient transport, and their interaction with phytoplankton/ TPAsp. were great influx. The amount of nutrient and water flow were dynamically influenced with time factor and water availability. Measurement of photosynthetic or primary productivity is important in food chain studies in aquatic reservoir, the daily and seasonal carbon flow of a system forms the basis for the structure of the annual pyramid and can be used to assess the ecological-integrity of running water (rivers). Correlation-coefficient was done between TPAsp. and their chl-a and biomass for the reality and significance of the result. Although ecological integrity is and must remain a holistic concept, a number of key components of the assessment procedure can be feasibility investigated and evaluated. The result showed the value for turbidity, ammonia, BOD, were high at Sangam. The high Turbidity at Sangam followed by Yamuna and Ganga, it is due to sand particle and heavy phyto bloom, respectively. The ph value to be with in limit of the standard at all the sampling point.

However maximum value was recorded at Sangam. The diurnal variations of DO with BOD showed that the maximum bathing took place. The organic load and Faecal coliform density was directly proportional and that had was maximum at Sangam in comparison to Ganga and Yamna because of intense bathing activity is confined area. Total hardness was also positively correlated with turbidity and chloride, conductivity. In the study high value of nitrate and phosphate were recorded in Yamuna followed by Ganga and Yamuna, which gradually decline in efficient water flow. Due to a greater level in organic loading at the confluence and localizes human interference maximum activity is reported from the confluence which also has highest microbial count therefore, indicating a great degree of pollution via organic loading at this site. High nutrient influx and toxin producing algal species have been observed as complexive terrain during study period. In Yamuna river at Prayagraj city (before Sangam) *Microcystis* species (*Microcystis protocystis*, *M. aeruginosa*, *M. lotoralis*, *M. incerta*, *M. princeps*) constitute > 50 % of the biomass and in Sangam toxin producing algal species share of the biomass rose towards the end of summer season < 50%. The highest inumeration of TPAsp.s was highly correlated with the Chl-a. The maximum Chl-a concentration, toxin producing algal species biomass were found to be 425.88 and 315,00 in Ganga and Sangam, while 280.50 in Yamuna, respectively in the case of *Microcystis aeruginosa*. Ecological parameters to evaluate GPP, NPP and CR were found to be 297.00, 134.00 and 182.99 mg Cm³/h in summer season in Yamuna which is higher than sangam and Ganga. The ratio of NPP and GPP never exceeded 0.66 in all site. The percentage of respiration rate to GPP ranged from 0.51-0.65 in all site. It always remained above 50%, the level which has been suggested for polluted water bodies. These running water ecological integrity are being incorporated into the urban critical deficits water supply/ treatment infrastructure in view of their religious importance and also emphasis the importance of catchment management to reduce nutrient inputs, in addition to in-water reservoir (possibly through sediments reduction) in general and river water at Prayagraj city.

Keywords: Fresh water, Organic load, TPAsp., Hydrological status, Ecological-integrity

Implication of Wqi and Benthos Based Indices for Pollution Assessment of River Narmada in Jabalpur (M.P.)

Arjun Shukla

Dept. of Zoology, Govt. M.H. College of Home Science, Jabalpur (M.P.), India

Water is the most important natural resource in the world, has the unique property of dissolving & carrying in suspension a huge variety of chemical and hence water can easily become contaminated. Traditionally physico chemical analysis of water will help to know the water quality at the time of sample collection. For river systems, the biomonitoring of aquatic invertebrates, such as insects, is recognized as an important tool for determining a rivers health and, with proper background data, identifying changes in that health. The benthic macroinvertebrates fauna of river is most suitable biological parameter of water quality evaluation in relation to biotic indices and diversity of species richness. Physico-chemical monitoring and biological parameter indicates the health of river. Benthic macro invertebrates bottom dwelling retained by a sieve or mesh with pore size of 0.2mm to 0.5mm included Arthropoda, Annelida, Mollusca. The present research has been focused on Narmada river basin and specifically in three selected sampling sites in Jabalpur region: Bargi Dam, Gwarighat and Bhedaghat. Total 24 sampling have been done in the duration of 2 years (2015-2017). Water samples and biological samples were collected as per standard sampling technique during morning time between 8-9 am and evening time 5-6 pm. Samples were collected from different methods for physico-chemical analysis (Temperature, pH, Turbidity, Conductivity, BOD, DO, COD, TDS, Total Hardness and Chloride) as well as biological monitoring. Biological samples were identified using keys and books by ZSI. Indices were calculated namely WQI for abiotic factor and saprobic index, HBI, B-IBI for biotic factors. In the present study many of the physico-chemical parameters were showing highest value in Gwarighat while minimum in other stations. WQI value was found to be 64.106 and 59.674 in 1st and 2nd year respectively in all seasons at all sampling sites. WQI value was decreased in 2nd year which shows water in 1st year was of poor quality than 2nd year study. It may be due to start of "Clean Narmada Abhiyan" and "Swachchhta Abhiyan" in Jabalpur as well as throughout the India. A total of 758 individuals of 55 families belong to 18 orders and 4 phylum. Further abundance status of identified families was categorized under four categories, very rare, rare, common and very common and those were 20%, 20%, 47% and 13% respectively. To compared 4 biotic indices used to evaluate water quality *via.*, benthic macro-invertebrates in order to determine health of river Narmada. The saprobic index, B-IBI and EPT% revealed the fair water quality. The calculation results for Hilsenhoff biotic index revealed very poor to good biological condition of water, in all the study Sites, slightly divergent from least disturbed condition.

Keywords: *Narmada, Water Quality Index, Benthic Macroinvertebrates, Family, Pollution.*

Microbiological Aspects of Drinking Water at Varanasi City

Alok Kumar Singh, Deepak Kumar Gond and Yashwant Kumar

Dept. of Botany, C M P.P.G. College, Allahabad, University of Allahabad

Faecal bacterial contamination from human and animal waste is a major cause of deteriorating water quality in receiving waters. The possible sources of faecal contamination are point sources, such as industrial and municipal effluents, or non-point sources, such as runoff, direct animal and human input, failing and inadequate septic systems, and sewer overflows.

Out of 400 samples of water from various sites, 160 samples from river Ganges, 60 each from wells, municipal water supply, storage tank and hand pump were subjected to monthly bacteriological analysis. The samples were processed by membrane filtration technique and MPN indices of total coliform, faecal coliform and viable count by multiple tube method. *Escherichia coli* and *Pseudomonas* were isolated in all the samples in each month. *Salmonella typhi* and *Vibrio cholerae* were isolated in eight samples of river water. *Klebsiella*, *Alkaligenes*, *Aeromonas*, *Proteus* and *Plesiomonas* were recorded in regular manner from river and well water.

The results indicated that there was an increased bacterial pollution load at the river and well water followed by municipal water, storage tank and hand pump. A significant correlation was recorded between MPN of total coliform and presence and absence of pathogenic bacteria. Thus, the water from all natural resources was unfit for human consumption.

Waste to Value-added Products: An Ecofriendly Approach

Durgesh Singh

Dept. of Zoology, S.S Khanna Girls' Degree College, Prayagraj

Food waste is very often generated waste both at domestic as well as at industrial level and is a major part of municipal solid waste. Proper disposal of these wastes is of prime concern as it can pose serious impact on environment and human health. Dumping of these wastes in open space produces different gases on decomposition by microorganisms. These produced gases like methane and carbon dioxide contribute to the greenhouse effect leading to global warming. Therefore, management of food waste is very important. It can be done by conversion of these wastes to different value-added products such as phytochemicals, bioactive compounds, food supplements, livestock feed, biopreservatives, biofertilizers, biofuels etc. These food wastes contain many reusable substances of high value and moreover these value-added products from food waste are very eco-friendly. Efficient and feasible utilization of these waste material for productivity process is both economical and environmentfriendly.

The potential of vegetable wastes for production of value added products and for the generation of biofuels is an efficient mode of food waste management. *Musca domestica* larva are used for bioconversion of food waste to maggot protein, oil and organic fertilizers. Similarly, discarded carrot, onion, pea, tomato and sugar beet can be used for production of mushroom, biomethane, biohydrogen, biogas, bioethanol, organic acids, oligomers, fertilizers, glycoalkaloids, animal feeds, etc. Therefore this approach can be promoted for better future.

Keywords: *Value-added products, food waste, environment, eco-friendly.*

Components of Antioxidants in Plants: Exposed to Heavy Metals

Gitanjali Mishra

Dept. of Botany, Government Degree College Baluwakote, Pithoragarh, Uttarakhand

The metals are redistributed in biosphere and dispersed through biogeochemical cycle. The balance of metal ratio is disrupted by interference of human being since long back due to rapid industrialization, urbanization; mining activities and also modern agricultural practice etc. are results into facing the problem of metal toxicity to living entities. The plants have ability to combat negative consequence of heavy metals(HMs) stress. Many metals such as Cr, Fe, and Cu showed that expose to elevated level results in decrease actively of antioxidant enzymes and other metabolic activities. Growth with excess of these metals results in production of excess amount of reactive oxygen species (ROS). It is found that plants exposed to toxic concentration of HMs can suffer from oxidative stress leading to disruption of its cellular functions and structure. Exposures of HMs at different concentrations can initiate the process of lipid peroxidation in plants. Lipid peroxidation is considered to be an indication of oxidation damage by which the integrity and functionality of the membrane is lost. Heavy metals initiate the process of lipid peroxidation via free radical generation. Free radicals and oxidants play a dual role as both toxic and beneficial compounds, since they can be either harmful or helpful to the plants. They are produced either from normal cell metabolisms or from external sources (pollutants). When an overload of free radicals cannot gradually be destroyed, their accumulation in the plants generates a phenomenon called oxidative stress.

Climate Change and Global Warming: The Toughest Phase for Future

Umesh Kumar Mishra and Praveen Kumar

Dept. of Zoology, Bipin Bihari (P.G.) College, Bundelkhand University, Jhansi, (UP). India

The climate change and global warming are two most challenging environmental issue. Today the whole globalised world now is facing an accelerated rate of climate change and global warming concerns due to the huge interference of humanity. Further evidence shows that most of the warming (of 0.1 °C per decade) observed over the last 50years, is attributable to human activities. Human beings are now regarded as major consumer of biodiversity and responsible for environmental changes. The role of forests as carbon sinks to reduce the effects of carbon dioxide in the atmosphere, thereby helping to contain global warming. However, research over the last few decades has identified other gases such as nitrous oxide, methane; chlorofluorocarbons and troposphere ozone are also regarded as potential greenhouse gases.

The task of predicting future climate change is extremely complex. Deforestation and degradation of forest have many negative consequences. This unprecedented increase is expected to have severe impacts on the global hydrological system, ecosystems, sea level, crop production and related processes. The toughest phases for this serious concern issues are habitat-loss, overexploitation and undesirable pollutants in air, water and soil. All these viral factors badly impact on aerial, aquatic and terrestrial eco-panel of biosphere. Eutrophication and biomagnifications are two other major evil for victim of aquatic-diversity. So it is our ethical and moral duty that we did not sniffs out the universal rule of global nature and stay alert to the sign of nature bloom.

Keywords: *Global warming, Climate change, Eutrophication and Biomagnifications.*

Heavy Metals Load in Yamuna River of Brij Region become a Big Threat to Aquatic Biota

¹ Praveen Kumar, ² Vijay Kumar Yadav, ³ Praveen Ojha, ⁴ Umesh Kumar Mishra

^{1,2,4} Dept. of Zoology, Bipin Bihari PG College, Jhansi, U.P.

³ Dept. of Zoology, KR PG College, Mathura, U.P.

Holy River Yamuna is heavily polluted in the country. Major cause of pollution is domestic waste, industrial waste such as tannery, tap, and anklet factories. The sampling site Gokul barrage ghat is located at 7 km downstream to Mathura headquarters is became functional at 2003. Water samples were taken at pre and post monsoon seasons and were analyzed for determination of heavy metals. Tests for Heavy metals determination such as Lead (Pb), Copper (Cu), Cadmium (Cd), Zinc (Zn) and Nickel (Ni) were done by AAS method. The results shows the heavy metals were found much more than the tolerable limits to ichthyofaunal diversity. The average heavy metals concentration were found in river water in the order of Pb>Cu> Cd>Ni>Zn. The highest value of Lead was found 120-220 with mean 170.50 ($\mu\text{g/L}$). Based on heavy metal pollution index value (1491.15), we concluded that our study area as a whole is critically polluted with heavy metals under study due to pollutant load from various human activities. The River water is not fit for aquatic life as well as irrigation purpose.

Keywords: Heavy Metals, Lead Nitrate, AAS, Pollutant.

Effect of Variable Supplemental Durations of UV-B on Root Meristems of *Artemisia annua* L. with special Reference to Morphology and Biochemical Aspects

Girjesh Kumar and Rajani Singh

Dept. of Botany, University of Allahabad, Prayagraj, Uttar Pradesh

In the alternating environment, plants are exposed to many factors but the problem of enhanced UV-B radiation is created by the anthropogenic activities resulted in ozone layer depletion. To investigate the feasibility of UV-B radiation seeds of *Artemisia annua* L. were exposed to four different duration i.e. 20min, 40min, 60min and 80min along with control for determining the effectiveness of cellular behavior. Mitotic cells were found to be normal in control plants. TAB%(Total abnormality) was recorded high at higher doses of UV-B radiation i.e. UV 60min & 80min. AMI% (Active Mitotic Cells) and TAB% shows inverse relationship to each other. Different chromosomal anomalies were induced through UV-B rays were stickiness, scattering, laggard, unorientation and bridges etc. Majority portion of chromosomal abnormalities occupied by stickiness in UV irradiated sets. Survival rate and plant height was decreased as the exposure of UV light increases. Plants are performing well to cope up with such anomalies by enhancing the proline content. The data of proline estimation depicted that proline percentage was significantly enhanced by UV-B rays. Focusing on this the main objective of this study is to summarize the influence of variable duration of UV-B rays on the qualitative and quantitative trait responses of plants.

Keywords: *Artemisia annua* L., AMI%, Chromosomal anomalies, UV rays, TAB%.

Population Growth and Climate Change on Sustainable Development

Pradeep Kumar

Dept. of Zoology, S.G.N Govt. P.G College Muhammadabad, Gohna, Mau (U.P), India

Ecology and biodiversity of the planet in the decades to come will be global climate disruption due to different activity of human societies like deforestation, urbanization, industrializations etc. Due to emissions of carbon from different resources, global temperature have warm by 1°C temperature above pre industrial levels. World that just 1°C warmer has resulted in wildfires in different countries. The last five year has been the warmest on record from different resources; the 20 warmest years occurred in the past twenty. Our planate is not just warming; it is heating up day by day. The arctic is warming at 2-3 times than the global average. The global ocean has absorbed 90% of the world's excess heat since 1970. This means more extreme weather events, from a rise in the number of cyclones to devastated fish populations, from the death of coral reefs to collapsing different ecosystem. It is a bioindicators which indicates about climate. Modern activities of populations generated greenhouse gases and different pollutants in the atmosphere. Different modern technology generated by human which reducing their carbon footprint through less consumption and better technology. The relationship between population growth and global warming determined that the green house gases level in the atmosphere because population and production of pollutants like green house gases directly proposal to each other. There are major green house gases day by day increasing due to production of motor vehicles, industries etc. Therefore, it is necessary that all the development and population growth should be sustainable development.

Keywords: *Population; Climate change; Global warming; Green house gases.*

GROUP - E

**Environmental Toxicology
and
Human Health Issues**



Mosquito Larvicidal Efficacy of *Annona Reticulata* Linn. Leaf Extracts Against Japanese Encephalities Vector, *Culex Vishnui* Group

^{1,2}Subrata Mallick and ¹Goutam Chandra

¹Dept. of Zoology, The University of Burdwan, West Bengal, India

²Dept. of Zoology, Maharajadhiraj Uday Chand Women's College, Burdwan, West Bengal, India

Mosquitoes are the vector of many diseases. Japanese Encephalitis (JE) disease is caused by Japanese Encephalitis virus, a flavivirus and this virus is transmitted by *Culex vishnui* group. Japanese Encephalitis disease is prevalent in many countries of Asia with an estimated 68000 clinical cases every year. Botanical insecticides are safe to use for controlling mosquito population because of biodegradable in nature. The present study was an aim to investigate the larvicidal efficacy of leaf extracts of *Annona reticulata* Linn. against *Culex vishnui* group.

2, 4, 6, 8 and 10 ppm doses of crude and 10, 15, 20 and 25 ppm doses of petroleum ether leaf extracts of *Annona reticulata* were used to investigate the larvicidal efficacy against 1st – 4th instars larvae of *Cx. vishnui* group. Percent mortalities were noted after 24, 48 and 72 hours of post exposure. Data of percent mortality was subjected to Log-Probit and Regression analyses and respective LC₅₀, LC₉₀ values, Regression equations and R² values were calculated. Bio-active bands were isolated through Thin Layer Chromatography (TLC).

All instars larvae showed 100% mortality with crude leaf extract of the plant at very low concentrations. Negative control treatments did not exhibit any mortality. First instar larvae were most susceptible to petroleum ether leaf extract with LC₅₀ value, 20.6995 ppm after 24 hours of exposure. LC₅₀ and LC₉₀ values gradually decreased with increased exposure periods and R² values close to one in all cases, so there were strong correlations between concentrations of the extract and percent mortalities for crude as well as petroleum ether leaf extracts. Control treatments did not show any mortality on the tested larvae. Non-target organisms were not susceptible to petroleum ether leaf extract. Statistical significance was done through ANOVA analyses. Three bio-active spots from petroleum ether leaf extract were detected from TLC plate which have great efficacy in larvicidal activity.

So, crude and petroleum ether leaf extracts of *Annona reticulata* plant can be used effectively to control *Culex vishnui* group mosquitoes. Non target organisms were not susceptible to petroleum ether leaf extracts. So its use is also eco-friendly for the environment.

Keywords: Petroleum ether, mortality, Log-Probit, Regression equations, non-target organisms

Environmental Toxicology and Human Health Issues

Vijai Kumar Srivastav “Chitravanshi”

*Dept. of Botany, Maakunti Devi Shikshan Prashikshan Post Graduate College,
Raniganj, Pratapgarh, Uttar Pradesh*

It is concerned primarily with the harmful effects of chemicals that are encountered by man either directly or indirectly because they are in the atmosphere, hydrosphere, lithosphere or biosphere, or by contact during occupational or recreational activities or by ingestion as food additives or food residues. Environmental toxicology includes several specialized areas such as pollutants having toxic effect on man, pollution disturbing the ecological balance of the biosphere i.e. biodiversity, or pollution affecting the aesthetics of the environment. One can also distinguish in environmental toxicology, areas like chemical pollution, physical pollution, thermal pollution, radioactive pollution, solid wastes pollution, biological pollution (pollen grains and other allergens) etc. depending on the nature of the toxic agent released in the environment.

Industrialization, population growth and the resulting waste materials lead to pollution of the environment air, water, soil and living organisms. The chief sources of waste matter are automobile emissions, smoke and gases from industry and fire, excreta and detergents, household chemicals released into sewage system and enormous quantity of packing and throwaway articles.

The massive use of drugs, even without prescription, cigarette smoking, alcohol consumption, extensive use of cosmetics, increasing use of household chemicals in aerosols, such as deodorants, air refreshers and cleaners are chief source of chemical pollution of the environment. To sum up, environmental toxicology refers to the toxic effects of chemical, physical and biological factors of the environment.

Toxicology is one of the several multidisciplinary fields of environmental science. Many of these fields are overlapping as many of the things that they derive from other disciplines are common to them.

Keywords: *Pollution, Toxicology, Environment, Chemicals.*

Role of *Aloe vera* Extract (a natural resource) on Streptozotocin Induced Diabetes in Mice

Sushma Sharma and Anita Thakur

Dept. of Biosciences, Himachal Pradesh University, Summer Hill, Shimla

Diabetes mellitus is a complex and a multifarious group of disorders that disturbs the metabolism of carbohydrates, proteins and fats. Streptozotocin (STZ), is a naturally occurring nitrosourea and is widely used to induce insulin dependent *Diabetes mellitus* in experimental animals because of its toxic effects on islet beta cells. The drug was discovered in a strain of the soil microbe *Streptomyces achromogenes*. The effect of STZ on different organs has been extensively studied. *Aloe (Aloe barbadensis)* is a perennial succulent plant that grows in hot, dry climates. *Aloe vera* gel also showed hypoglycemic activity on insulin-dependent *Diabetes mellitus* and non-insulin dependent *Diabetes mellitus* in rats, though it was found to be more effective in non-insulin dependent *Diabetes mellitus*.

Objectives of the paper:

- To assess the extent of histopathological damage caused by streptozotocin to mice liver.
- To check the efficacy of *Aloe vera* extract in combating the damaging effects of drug (STZ).

Immediately after sacrificing the animals, tissues were excised and cut into small pieces of 4-5 mm thickness. Tissue was fixed in aqueous Bouin's fixative for 24 hours. Tissues were then washed thoroughly in running tap water till excess of fixative got washed away. Tissues were dehydrated finally in different grades of alcohol (30%, 50%, 70%, 90% and 100% for 30 min. each) and cleared in xylene. These were then embedded in paraffin wax (58-60°C). Sections of 5-6 μ thickness were cut on the rotary microtome and subjected to Haematoxylin-eosin staining.

Ribbons of tissue sections were cut and stretched on albumenized coated slides. These were subjected to dewaxing in xylene at 37°C over night followed by dehydration in descending grades of alcohol (100%, 90%, 70%, 50% and 30% for 30 min. each). Sections were then finally kept in distilled water and subjected to Haematoxylin eosin stain for 20-40 minutes. Sections were passed through acid water (0.1% of HCl in distilled water) and alkali water (1% NH_3 in distilled water). Tissues were again washed in distilled water and dehydrated in ascending grades of alcohol (30%, 50%, 70%, 90% and 100%) for 30 minutes each. Counterstaining was done in 2% alcoholic eosin for 2-3 minutes. Excess of stain was removed in 90% alcohol. Sections were then dehydrated completely in absolute alcohol. These were cleared in xylene and mounted in DPX for permanent storage. The permanent slides were dried, tissue sections examined, important observations noted and sections were photographed.

Keywords: *Diabetes mellitus, Streptozotocin, Aloe vera, Liver, Hepatocytes*

Role of Phytohormone 28-homobrassinolide to Reduce Cadmium Toxicity Invegetable Crops: Solution to An Environmental Issue

Shikha Singh and Sheo Mohan Prasad

Dept. of Botany, University of Allahabad, Allahabad India

The applications of brassinosteroids (BRs), the plant steroidal hormones, results in an increased tolerance towards stress and thus help improving the yield of crop plants. The present study was carried out to investigate the effect of 28-homobrassinolide (28-HBL) on generation of reactive oxygen species (superoxide radical and H_2O_2) as well as activities of antioxidative enzymes viz. superoxide dismutase (SOD), guaiacol peroxidase (POD) and catalase (CAT) in vegetable seedling grown under cadmium (Cd) metal stress.

Heavy metal toxicity is nowadays a major concern and it leads to hazardous effect on soil and plants system that ultimately risks human health through food chain contamination. Among different metals, cadmium (Cd) has attracted most due to its biodegradable and toxic nature that can be easily taken up by plants through the same plasma membrane transporters/channels used for nutrients (Ca^{2+} , Fe^{2+} and Zn^{2+}) and enter the food chain. So, as to reduce health risk arising due to Cd contamination, it becomes necessary to reduce its accumulation in food crops. In order to take off the situation various protective measurements are being adapted and application of phytohormone is one of them. Recent reports on exogenous application of brassinosteroids (BRs) to plants strongly suggest that these steroidal hormones have the ability to modify antioxidant enzymes system under stress conditions. Hence, the present study was undertaken with view to study the ameliorating effects of phytohormone i.e. 28-homobrassinolide (28-HBL) on *Solanum melongena* L. and *Solanum lycopersicum* L. seedlings exposed to Cd.

The seedlings were pretreated with two doses (3 mg Cd kg^{-1} sand: Cd₁; and 9 mg Cd kg^{-1} sand: Cd₂) of Cd and CdCl₂ was used as the source of Cd. The seedlings were grown in controlled plant growth chamber and alternately wetted with Hoagland and Arnon's half strength nutrient medium and sterilized double distilled water. After foliar application of 28-HBL, 30 days-old seedlings were used to analyze the various parameters.

The results show that Cd declined the growth and photosynthetic pigment contents in its concentration dependent manner when compared with control seedlings. HBL application alleviated growth suppression and a decrease in chlorophyll content caused by the Cd stress. In addition, the oxidative stress markers such as superoxide radical and malondialdehyde (lipid peroxidation) contents were enhanced by both the doses of Cd; however, together with 28-HBL these oxidative indices were diminished significantly. Cadmium treatment increased antioxidative enzymes: superoxide dismutase, peroxidase

and catalase activity as compared to control, and phytohormone application further enhanced the antioxidant capacity in Cd treated and even untreated seedlings. The results of the present study suggest that exogenous HBL could improve growth and regulate the antioxidant defence system in test seedlings efficiently, hence alleviated Cd induced toxicity.

In the present investigation, the activity of antioxidative enzymes was found to increase due to metal stress and a further increase was noticed in plants given both metal and 28-HBL treatment, suggesting the stress protective role of 28-HBL via modulating the antioxidative enzymes.

Keywords: 28-Homobrassinolide; Antioxidants; Cadmium; Oxidative stress.

Spatial Distribution of Fluoride and Assessment of Human Health Risk in Ground Water of a South Western District in Odisha, India

¹Saroja Kumar Barik, ¹Madhusmita Behera, ²Subashis Pradhan, ¹Prasanta Rath, ¹Dibakar Behera, ³Sunil Kumar Sahoo and ¹Tapan Kumar Bastia

¹ Dept. of Chemistry, School of Applied Sciences, KIIT University, Odisha, India

² WRTC, Chilika Development Authority, Bhubaneswar, Odisha, India

³ Health Physics Division, Bhabha Atomic Research Centre, Trombay, Mumbai, Maharashtra, India

The peoples of Kalahandi district, southern Odisha largely depends on groundwater as a source for drinking water. Sixty six groundwater samples were collected from eleven blocks of the Kalahandi district and analysed for fluoride (F⁻) and other water quality parameters (pH, Electrical conductivity (EC), Total dissolved solid (TDS), Cl⁻, HCO₃⁻, SO₄²⁻, NO₃⁻, Ca²⁺, Mg²⁺, Na⁺, K⁺, and total hardness) to assess its suitability for drinking purpose. The fluoride concentration varied in between 0.22 and 2.45 mg/L with an average of 1.15 ± 0.65 mg/L. Fluoride concentration is about 53 % of the groundwater samples exceeded the acceptable level of 1.0 mg/L, while in 29 % samples it exceeded the maximum permissible limit of 1.5 mg/L. Fluoride is positively correlated with EC suggesting higher ionic strength, leading higher solubility of fluoride bearing minerals.

Keywords: Fluoride; groundwater; human health risk, Kalahandi.

Role of Nitric Oxide in Cytokinin Mediated Alleviation of Insecticide Toxicity in *Nostoc Muscorum*: Regulation of PS II Photochemistry and Reactive Oxygen Species Homeostasis

Santwana Tiwari and Sheo Mohan Prasad

Dept. of Botany, University of Allahabad, Prayagraj, India

Frequent application of pest killing chemicals in a wide range became an important tool of agricultural in developing countries to increase the crop production. Haphazard use of pesticide for the betterment of crop gives rise to sever adverse effects on environment, ecological component, edible food etc. Cypermethrin is one of the majorly used pesticides for crop field and also known to produce various ROS species that affect the growth of targeted as well as non-targeted organisms. Excessive amount of pesticides diminishing the growth of cyanobacteria by altering their physiological and biochemical attributes (Anees et al., 2014). Hastroudi et al. (2013) reported that by producing phytohormones they protect themselves from several abiotic stresses. Kinetin (KN), a synthetic cytokinin has been reported for the improvement of the growth of plants under various abiotic stress conditions such as salinity (Wu et al., 2012) and metal stress (Bashri and Prasad, 2015). On the other hand nitric oxide (NO), a reactive nitrogen species (RNS), multifunctioning and diffusible gas molecule, are reported to acts as a secondary messenger and chiefly regulates various metabolic activities in favorable as well as unfavorable conditions (Asgher et al., 2017; Singh et al., 2017; Begara-Morales et al., 2018; Tiwari et al., 2019). A report of Pan et al. (2017) clarifies that NO enhanced the antioxidant system including SOD and CAT activity and decreased the toxicity caused by cellular ROS. Individual role of both kinetin and NO are well documented for ameliorating several toxicities in plants as well as cyanobacteria but their interactive role is still lacking. Thus, this study reveals the interconnection between NO and kinetin under cypermethrin stress. And to prove the signaling role of NO, an inhibitor of nitric oxide synthase (NG-nitro-L-arginine methyl ester; L-NAME) and scavenger of NO (2-4-carboxyphenyl-4,4,5,5 tetramethylimidazoline- 1-oxyl-3-oxide; c-PTIO) have been used under the respective stress.

Growth in terms of dry weight, Chl *a*, carotenoids and phycocyanin contents was measured by Tiwari et al. (2019), photosynthesis as well as PS II activity and oxidative biomarkers (SOR and H₂O₂) along with enzymatic activity (SOD and CAT) was evaluated by following the method of Tiwari and Prasad, (2020).

Cypermethrin decreased growth of *Nostoc muscorum* which was accompanied by decreased pigment contents and altered PS II photochemistry resulting in failure of photosynthetic process but kinetin ameliorated cypermethrin toxicity significantly.

Cypermethrin induced oxidative radical production (*in-vivo* and *in-vitro*) and weakening of enzymatic defense mechanism (SOD and CAT) demolished the entire metabolic processes. Further, results revealed that NG-nitro-L-arginine methyl ester (L-NAME, an inhibitor of enzyme nitric oxide synthase) worsened the effect of cypermethrin toxicity even in the presence of kinetin while 2-4-carboxyphenyl-4,4,5,5-tetramethylimidazole-1-oxyl-3-oxide (c-PTIO, a scavenger of NO) reverses kinetin-mediated amelioration even in the presence of SNP (NO donor), suggesting that endogenous NO is required for KN mediated mitigation of cypermethrin toxicity. Overall, our results first time show that endogenous NO is essential for kinetin-mediated mitigation of cypermethrin toxicity in the *Nostoc muscorum*.

Ageing Gracefully with Ayurveda

¹ B.C. Jana, ² Ajay K Srivastava, ² Madhulika Singh,
² Arshi N Afsana and ² Swarnima Jha, ² Jessica R Hansdah,
² Aroma A Barla and ² Mansi M Priya

¹ Dept. of Ayurvedic, S.V.S.P. Hospital, Kolkata

² Dept. of Botany, St Xavier's College, Ranchi, Jharkhand, India

Aging is a very vital issue and a challenging problem of 21st century. India is the second largest country dealing with the population above the age of 60 years (8.3 %) after China in the world. Old age is a chronic progressive impairment of functions of organ systems, loss of adaptability to stress, susceptibility to age related disease and disability, and increasing living cost. On an average, elderly people consume about 30 % of drugs of the world. Ayurveda, the most ancient sea of medical knowledge of the world deals with graceful aging under a specialized branch known as *Jara chikitsa* or *Rasayana Tantra*. *Ayurvedic approach to graceful / successful aging consists of Prana – Bala –Marma paripalan, Stri – Garbhini - paricharya, Swasthavritta & sadavritta, Sattvika diet, Vyama, Pranayama, Meditation, Selective Panchakarma. and Rasayana therapy.*

Keywords: Ageing, Ayurveda, diet, therapy.

Medicinal Plants Used To Cure Tuberculosis in Raghuraj Ngar Tehsil Satna

¹ Sadhana Chaurasia and ² Mateswary Choudhary

¹ Dept. of Energy & Env, MGCGV. Chitrakoot Satna M.P.

² Dept. of Sci. & Env. MGCGV. Chitrakoot Satna M.P.

Tuberculosis (TB) is principally a disease of poverty, with 95 per cent of cases and 98 per cent of deaths occurring in developing countries. Tuberculosis is a bacterial infection caused mainly by *Mycobacterium tuberculosis* (MTB). TB is the most common cause of death due to a single infectious agent worldwide in adults. It is a disease that has affected mankind since ancient times. It is contagious disease tuberculosis from very ancient times. Anti-TB allopathic medications have been prescribed to control symptoms of this disease but results into side effects like hepatitis, hypersensitivity reactions, nausea, vomiting etc. The use of herbal medicine becoming popular due to toxicity and side effects of allopathic medicines. Medicinal plants from Ayurveda (Indian traditional medicine system) and from foreign origin have been successfully used to treat TB. The aim of this study is to highlight the work on anti-tubercular plants. The present paper involves various plant used in drugs responsible for anti-tubercular activity.

Keywords: Ethnomedicine, Tuberculosis, Natural, Ayurveda.

Ameliorating Effects of Silicon on Chromium Stress in *Pisum sativum* L. Seedlings

Nishat Parveen and Devendra Kumar Chauhan

Dept. of Botany, University of Allahabad, Allahabad, India

The current experiment has been done in a semi-hydroponic manner on seedlings of *Pisum sativum* L. to observe the alleviating impact of silicon against the chromium toxicity. The morphological traits of pea seedlings shows reduction in case of chromium (100 µM) application where as silicon (20µM) application alone as well as in combination with chromium restores the reduction in morphological traits. The histochemical studies demonstrate the negative effect of chromium by elevating the level of reactive oxygen species (ROS) because antioxidant defence system remains unsuccessful in scavenging ROS. However silicon application decreases chromium toxicity by enhancing the antioxidant defence system.

Keywords: Chromium, Silicon, Histochemical, Morphological, *Pisum sativum* L.

Phosphorus Mediated Amelioration of ZnONPs Toxicity in Wheat (*Triticum aestivum* L.) Seedlings

Vaishali Yadav and Devendra Kumar Chauhan

Dept. of Botany, University of Allahabad, Prayagraj, India

Experiment was set up under a control lab condition to examine the impact of Phosphorus on ZnO nanoparticles in hydroponically grown wheat seedlings. Plants were treated with ZnONPs of 0.5mM and 1mM concentration without or with 2mM Phosphorus. ZnONPs treated seedlings shows detrimental effects on the growth and development of wheat seedlings by decreasing the shoot length, root length and biomass of plants. Histochemical staining of wheat root tip shows that nanoparticles also induce oxidative stress which further leads to cell death. Whereas, phosphorus shows shielding effect on nanoparticle treated wheat seedlings in combined treatment. Phosphorus supplementation in the media decline the nanoparticle toxicity and rapidly aggravates the antioxidant defense system that ultimately increases the plant growth and development.

Keywords: *Phosphorus, ZnONPs, Histochemical staining, Oxidative stress, Antioxidant defense.*

Impact Assesment of Metacercarians on Catfish: *Heteropneustes Fossilis*

¹Md. Mansoor Alam, ²S.B. Shashi and ¹N.K. Dubey

¹ *Dept. of Zoology, L.N. Mithila University, Kameshwarnagar, Darbhanga, Bihar*

² *Dept. of Zoology, M.K.S. College, Trimuhan Chandanua, Darbhanga, Bihar*

Heteropneustes fossilis is one of the most economically valuable fish species in India. However its production is often hindered by parasite-induced mortality. The present study reports the intensity of parasitic infestation in *H.fossilis* collected from different ponds of Darbhanga town & Keoti Block with the help of local fishman. *Diplostomulum Singhi* is a digenean parasite was reconered from skin, liver & eye of host fish. The highest level of infection was observed in viscera for the host fish. The result also revealed that the intensity of parasite infection in different organs of *H.fossilis* varied with the season. In particular the highest level of infection were recorded during winter period, when fish are almost susecptable to parasite. The findings of study will help in the management and conservation of *H.fossilis*.

Keywords: *Parasite, Diplostomulum, Disease, Darbhanga, H.fossilis.*

Phytotoxicity Assessment of Silver Nitrate (AgNO_3) and Zinc Sulphate (ZnSO_4) Metal and their Nanoparticles (AgNPs and ZnONPs) in Marigold (*Tagetes erecta*) and Zinnia (*Zinnia sp.*)

¹Yashwant Singh, ¹Shweta, ²Jitendra Kumar, ³Dharmendra Kumar
and ¹Devendra Kumar Chauhan

¹Dept. of Botany, University of Allahabad, Prayagraj, U. P., India

²Dept. of Engineering and Technology, Dr. Shakuntla Mishra National Rehabilitation University,
Mohan Road, Lucknow, U. P., India

³Dept. of Environmental Science, Iswar Saran Degree College, Prayagraj, U.P., India

The study was aimed to assess the phytotoxicity behavior of heavy metals viz. silver (AgNO_3) and zinc (ZnSO_4) metals, and their nanoparticles (AgNPs and ZnONPs) in the seedlings of marigold and zinnia. Results revealed that heavy metals were more toxic as compared to their nanoparticles, which were authenticated by significant ($P < 0.05$) reduction in growth parameters (root-shoot length, fresh and dry mass), photosynthetic pigments, oxidative stress markers viz. SOR, H_2O_2 , MDA etc. In order to increase the validation of the experiment, histochemical analysis was also performed through various dyes like NBT (Nitro blue Tetrazolium Chloride), which helps in localization of oxygen free radicals DAB (3,3'-Diaminobenzidine) that localized hydrogen peroxide (H_2O_2); Evans blue helps in detection of electrolyte leakage and Schiff's reagent that traces the accumulation of MDA content in the root and leaf of test seedlings. In addition to this, various antioxidant enzymes such as SOD, POD, CAT, GST were also found to be increased significantly. Moreover, some non-enzymatic antioxidants viz. NP-SH, cysteine and proline were also enhanced. Furthermore, as compared to the heavy metals, their nanoparticles, leaf and root anatomy of marigold and zinnia seedlings were showed severe alterations from the treatments of heavy metals as compared to the nanoparticles and control one. Their epiblema, cortical cells, mesophyll cells as well as their vascular bundles also have been severely affected. Overall the study add one more stone in establishing the fact that nanoparticles has beneficial role or sometimes less damage as compared to their metals form.

Keywords: Antioxidants, Anatomy, Histochemical analysis, Marigold, Nanoparticles, Zinnia

Concern of Sanitation with Respect to Ecological and Health Issues

Bhagyashree Ojha

Dept. of Sociology, University of Allahabad

Sanitation refers to public health conditions related to clean drinking water and adequate treatment and disposal of human excreta and sewage preventing human contact with feces is the part of sanitation. Sanitation system aim to protect human health by providing a clean environment that will stop the transmission of disease especially through the fecal oral route. According to WHO "Sanitation Generally refers to the provisions of facilities and services for the safe disposal of urine human feces. The word sanitation also refers to the maintenance of hygiene conditions through the services such as garbage collection and wastewater disposal". UNDP defines "Safe disposal of solid and liquid waste and clean the environment which promotes the health".

Sanitation encompasses the control of environmental factors Human activities and ecosystems are closely related to each other. Unsanitary practices causes environmental degradation and degraded or polluted ecosystem causes many disease among human beings which negatively or badly affects health of people. An attempt to defend the relationship between human society and ecosystem was made by odum in 1963. He said that the effects of enormous modification in the environment initiated by human population at local levels gradually became regional problems as soon resulted to irreversible changes in environmental conditions environmental Ramchandra Guha gave the concept of ecological socialism and said that socialist is that environmental degradation is by no means restricted to industrialized world. He said that the third world environmentalism is qualitatively difference from its western counterpart one is on environmentation of survival and subsistence, the other of access to clean and beautiful environment of the enhancement of quality of lives, Robert E Park (July 1936) also told that human society is a consequence of human society and affects the limitations. of symbiotic (i.e. biotic rather cultural) social order by the cultural. The limitation of the natural or ecological social orders assumes on (a) the economic (b) the political and (c) the moral level.

Ecological sanitation promotes the health of community by providing the clean environment and breaking the cycle of disease it depends on the hygiene status of the people, resources available, appropriate technologies according to the requirements of community socio-economic development of the community. India is still lagging for lagging for behind many countries in the field of environmental sanitation.

Health as defined by the WHO is a state of complete physical mental and social well being and not merely the absence of disease or infirmity. This definition has been subject

to controversy, as it may have limited value for implementation health may be defined as the ability to adopt and manage physical mental and social challenges throughout life for any social and economic development adequate sanitation confunction with good hygiene and safe water are essential to good health lack of proper sanitation causes diseases most of the diseases resulting from sanitation have a direct relation to the poverty lack of clean water and proper sanitation causes many diseases. This situation present substantial public health risks as the waste could contaminate drinking water and cause life threading forms of diarrhea to infants sanitation is observed as an overall reform of any society. It encompasses all spheres of human life which directly or indirectly affects the degree of freedom and well being of the members of the society.

Thus sanitation, ecology and health all are closely related to one another lack of sanitation negatively affects the environment by different type of pollution and by which health is also badly affected because unclean or degraded environment causes many diseases among human beings. Thus sanitation is necessary for cleaned environment and good health for the idea of clean India maintaining sanitation is a big challenge. Thus for the attainment of state of clean India we should focus on sanitation with respect to ecological and health issues.

Objectives of the study :

1. To know the inter connectedness among the sanitation, environment and health and also to know how sanitation system affects environment and finally how it affects health of people.
2. To know the role of government and NGO's in maintaining sanitation and what more efforts should be done in this direction?

In the above study first of all a lot of literatures have been reviewed for related to study after that all of them were analyzed and conclusion is presented as well as recommendation are also given.

Sanitation, environment and health all are interrelated to one another lack of sanitation affects environment negatively or badly and polluted or degraded environment negatively affects the health of people by spreading different type of disease. Sanitation is a big challenge to the idea of clean India. Attainment of state of clean India, sanitation is an unavoidable condition. So for the achievement of clean environment and good health we should focus on the matter of sanitation. Government on legal level has played a crucial role in maintaining sanitation. At constitutional level sanitation has been recognized as a human right in 2010 and further on a lot of laws have been made in this direction at state level different policies have been made such as Swachh Bharat Abhiyan and they also have been implemented. Not only the government but the NGO's have also contributed significantly in maintaining nevertheless looking at today's situation it can be said that

more efforts are yet to be done in this direction some recommendation can be made regarding this.

- The problem related to sanitation can not be solved only by Law but people also need to be aware of these. More awareness programmes should be run in this direction.
- In ancient time sanitation was a part of religion. So for spreading practices of sanitation there was need for any related to sanitation now there is a great need to connect sanitation with culture because sanitary practices can be easily about by socialization of mere brought practices more effectively.
- In equality towards sanitation system should be removed in this regard there should be assurance of access to sanitation system for different categories of the society based on caste, class, gender, disability and old age also. In this regard Madhu Nagla conducted a study to explore the community understanding of hygiene and sanitation and their practices perceived risk factors and their view on possible improvement the conducted focus group discussion (FGD) with people from difference, caste, class, gender, category between April 10 to June 2006 and he founded that most of the households in the Dhandelan village strain water throw a cloth outside defecation and collecting water from distant place is a difficult task and it becomes more in the cases of physical, mental disabilities and in old age.
- For the maintenance of this system in long term and for the sustainability of water and sanitation services such developing strategies should be developed which addressing different aspects such as environment, culture and economics also in a holistic sense. MAGGIEA, MONTGOMERY & MENACHEM ELIMELECH discussed three main themes about water sanitation and health in developing regions and they conclude that there is the requirement of greater collaboration among water sanitation and education sectors and said that these services should be local managed and maintained.
- There should be co-ordination of Government, NGO and people at large is required for the water and sanitation projects sustainability Aditya Kumar Patra's in his article "clean drinking water and sanitation people's responsibility" concluded that provision of safe drinking water on a sustainable basis entails co-ordination of Government, NGO and people at large because in most cases the state would provide a source of water but end up with a failure for want of proper operation and maintenance since the policies address the nitty-gritty of the issues concerned which are eminently important to discern the ground realities.
- For improving pattern of domestic use of sanitation and water their is a need for health education H.I. Karunadas (1982) described the behavioral pattern related to domestic water use and sanitation of low income groups in two Sri Lankan villages attitudes believes and practices are discussed and the need for health education is emphasized.

Keywords: Sanitation, Drinking Water, Ecological Sanitation, Health, Government.

Exogenous Application of Silicon Alleviating the Copper Oxide Nanoparticle Induced Toxicity on Morphological and Biochemical Parameters of *Vigna radiata* L. (Mung bean)

¹ Shweta, ² Jitendra Kumar, ³ Durgesh Kumar Tripathi
and ¹ Devendra Kumar Chauhan

¹ Dept. of Botany, University of Allahabad, Prayagraj, India

² Dept. of Engineering and Technology, Dr. Shakuntla Mishra National Rehabilitation
University, Mohan Road, Lucknow, India

³ Dept. of Organic Agriculture, Amity University, Noida, India

Vigna radiata L. seedlings were germinated hydroponically in plant growth chamber at controlled conditions. After the screening experiments, dose of copper oxide nanoparticles was selected to determine the morphological and biochemical changes in test seedlings under the supplementation of silicon. As compared to the control, CuONPs treated seedlings significantly declined the whole biomass along with root and shoot length of the test seedlings. Conversely to it, seedlings treated with silicon individually showed positive response in morphological attributes. In the mean time, histochemical analyses were also performed to determine the biochemical status of *Vigna radiata* seedlings. The staining of reactive oxygen species viz. SOR and H₂O₂ was also exhibited the intense colour as dose dependent manner. However, the simultaneous supplement of Si to CuONPs treated seedlings found significant to alleviate the phytotoxicity as it shows less percent decline in the morphological parameters as well as biochemical parameters of the test seedlings. The overall result suggested that exogenous application of silicon reduced the copper oxide nanoparticles induced toxicity in *Vigna radiata* L. seedlings.

Keywords: Copper oxide nanoparticles, Histochemical, Morphology, ROS, Silicon.

Antioxidant Potential of *Phyllanthus fraternus* L., A Medicinally Important Indian Herb

Umesh Kumar, Indrajeet Kumar and Rajesh Kumar Sharma

*Dept. of Botany, Institute of Science, Banaras Hindu University,
Varanasi, Uttar Pradesh*

In the present study, an *In-vitro* analysis of antioxidant properties, total phenolics and flavonoids in the methanol extracts of roots, stems, leaves and fruits of *Phyllanthus fraternus* L., a medicinally important Indian herb was carried out. The samples of *P. fraternus* plants were collected from rural, suburban and urban areas of Varanasi, India during the months of September, 2018. The samples were washed under running tap water, dried using blotting paper and were separated into roots, stems, leaves and fruits for further analysis. The extract of roots, stems, leaves and fruits were prepared using 80% of aqueous methanol (v/v) and stored at 4 °C in refrigerator for further analysis. Phenolics and flavonoids in *P. fraternus* plants were found from maximum to minimum as fruit> leaves> stems>roots. Phenolics and flavonoids content in different parts of *P. fraternus* plants ranged between 3.6 mgGAE/g fw - 92.9mgGAE/g fw and 0.07mgQE/g fw-0.52 mgQE/g fw, respectively. DPPH, ABTS and FRAP activities in methanol extracts of roots stems, leaves and fruits were 47%, 60%, 51% and 65%; 92%, 89%, 79% and 86%; 16.9µgFe(II)/g fw, 67.1µgFe(II)/g fw, 46.3µgFe(II)/g fw, and 20.9µgFe(II)/g fw, respectively. Antioxidant activities, phenolics and flavonoids content in different parts of *P. fraternus* plants also varied significantly among the sampling locations (p<0.05). The present investigation suggests that all the parts of *P. fraternus* plants specially fruits may be a good source of natural antioxidants and can be exploited for different industrial purposes. Conservation and management of *P. fraternus* should also be promoted for their sustainable utilization.

Keywords: *Phyllanthus fraternus*, Methanol extracts, *In-vitro* assay, total phenolics, Natural antioxidants.

Music Therapy: A Devise to Fight Against Psychological Disaster

Archan Bhattacharya

Dept. of Botany, Darjeeling Govt College, Richmond Hill, Darjeeling, West Bengal

Disaster management is the skillful treatment, arrangement, administration and utilization of resources and responsibilities to fight against a disastrous situation, this management consists of five phases: prevention, mitigation, preparedness, response and recovery. In general, after a physical disaster, a psychological disaster i.e. a mass trauma event comes in the form of anxiety, depression, hypertension, insomnia, tension, stress, mind related problem, nerve related problem, pathos, phobia, etc. To cope up with the psychological consequences, there are two ways – psychological first aid for short term problems and psychotherapy for short term as well as long term problems. In both cases, i.e. psychological first aid and psychotherapy, music therapy i.e. 'specialized use of music for treatment' holds an essential place, especially in trauma works.

Music therapy is the use of music by a trained professional to achieve therapeutic goals. In recent years situations where music therapy has been exploited for benefit include *terrorist attack in New York City, war torn Bosnia, school shooting even in Columbia etc.* Now-a-days utility of music therapy is being studied with help of so many branches such as *bioacoustics, biomusicology, neuroacoustics, neuroaesthetics, neurophysiology, neuromusicology, psychoacoustics, psychoneuroimmunology, vibroacoustics etc.* It is seen that the **Indo-classical music has tremendous potential as a tool for therapy. If proper and sufficient research work and clinical studies are performed in this direction, soon it can be established as a complimentary therapy.**

Keywords: *disaster, disaster management, psychological disaster, psychological first aid, psychotherapy, music therapy, trauma works, Indo-classical music.*

Assessment of Cerium Oxide Nanoparticles on Vegetative Plant Growth and Development of *Vignaradiata*

¹ Nirdesh Kumar Ravi, ² Ajey Singh, ¹ Pawan Kumar Jha, ² N B Singh

¹ Dept. of Environmental Science, University of Allahabad, Prayagraj, Uttar Pradesh

² Dept. of Botany, University of Allahabad, Prayagraj, Uttar Pradesh

Nanoparticles are regarded as a material with at least <100 nm in one dimension. Nanoparticles are much beneficial due to their unique physiochemical properties. They are being used in the fields of biotechnology and agriculture. They facilitate site targeted delivery of various nutrients needed for better growth and high productivity of plants. The impact of cerium oxide nanoparticles on seedling growth and development of mung bean (*Vignaradiata*) of Fabaceae family was investigated. Plants were cultivated in pots with sterilized soil using modified Hoagland solutions supplemented with cerium oxide at 50, 100, 150 and 200 mg L⁻¹. The experiment was conducted in sets of three. High dose of cerium oxide affects adversely on root and shoot growth whereas at moderate concentration of 50 and 100 mg L⁻¹ increased root length of mung bean. In stress condition the cerium oxide also affected root and shoot length adversely. Root and shoot ratio decreased with stress. Plants treated with CeO₂-nanoparticles exhibited higher plant biomass and increased efficiency of the photosynthetic apparatus. Cerium oxide acts as an outbid substance of plant growth and development in mung bean to increased biomass and ability to survive in salt stress.

Keywords: CeO₂, Nanoparticles, stress, outbid substance, Fabaceae.

Removal of Crystal Violet from Aqueous Solution using Biochar: Equilibrium and Kinetic Study

Kavita Singh and Kumar Suranjit prasad

Dept. of Environmental Studies, University of Allahabad, Prayagraj, Uttar Pradesh

Crystal violet, a toxic cationic dye easily interacts with negatively charged cell membrane surfaces and can enter into cells and concentrate into cytoplasm. It is a triarylmethane dye, has been extensively used in textile dyeing, paper printing, biological staining and dermatological staining but it persists in environment for a long period and imposes toxic effects in environment. It acts as a mitotic poison and potent carcinogen. Various treatment technologies described for the removal of crystal violet but adsorption onto biochar material is an effective method for the treatment of dye-bearing effluents because it offers various advantages. In the present study, a biochar obtained from *ficus religiosa L.* was examined for the removal of crystal violet from aqueous solutions. The batch adsorption study was performed at various conditions including pH, biomass dose and contact time. The isothermal data was described by Langmuir and Freundlich isotherm model. Langmuir study was found to be well fitted for the adsorption of crystal violet with maximum adsorption capacity of 10.18 mg/g and R^2 value 0.9894. The kinetic data were better described by the pseudo second order which suggests the chemisorption nature of adsorption. The maximum absorption value of crystal violet 570nm ($\lambda_{max} = 570 \text{ nm}$). The results indicate that biochar could be employed as a good and effective adsorbent for the removal of crystal violet.

Keywords: Biochar, *ficus religiosa L.*, crystal violet, adsorption, mitotic, carcinogenic.

Ameliorating Potential of Zinc Oxide Nanoparticles Against Cadmium Toxicity

¹ Ravi Kumar Yadav, ² N.B. Singh, and ² Zeba Azim

¹ Dept. of Botany, Govt. P.G. College Satna, M.P.

² Dept. of Botany, University of Allahabad, Allahabad, India

Cadmium toxicity is one of the major global concerns for environment caused by different sources, like commercial fertilizers, sewage sludge, manure and lime. It is not only harmful to humans and animals but also affects plant growth. Cadmium adversely affects growth and development of plants and induces oxidative damage to the plants by production of reactive oxygen species (ROS). ROS damages nucleic acids, proteins, and lipids leading to the formation of toxic products like malondialdehyde (MDA). Cadmium often accumulates in edible parts of the plants thus imperils the agricultural yield. Cadmium toxicity causes various physiological changes in plants like inhibition of seed germination, reduction in plant growth, photosynthesis, respiration and transpiration. Nanotechnology is one of the new branches in the field of technology and it has wide applications in various fields like food, medicine, therapeutics, solar cells, cosmetics, space, etc. Zinc oxide nanoparticles (NPs) have greatly influenced productivity and quality of crop plants. Remarkable enhancement can be reported in seedling growth, photosynthetic pigments and total soluble protein by the addition of zinc oxide nanoparticles (ZnO NPs) under cadmium (Cd) stress. Antioxidative enzymes such as peroxidase (POX), catalase (CAT) and superoxide dismutase (SOD) activities were, in turn, enhanced in seedlings exposed to cadmium toxicity. ZnO NP supplementation helps in reducing oxidative stress caused due to cadmium (Cd) toxicity in seedlings.

Keywords: *Cadmium toxicity; Nanotechnology; Zinc oxide nanoparticles; Antioxidant enzymes; oxidative stress*

Effects of Heavy Metals on Behaviour and Respiratory Responses in An Air Breathing Murrel Fish *Channa Gachua*

Qaisur Rahman and D N Sadhu

Dept. of Zoology, Vinoba Bhave University, Hazaribag, Jharkhand, India

Heavy metals are being introduced into aquatic environment through industrial process, sewage disposal, soil leaching and rainfall. These metals are relatively toxic even at fairly low concentration and affect the survival of fishes and other aquatic organisms. Sublethal effects of Copper, Zinc and Cadmium on behaviour and respiratory responses of *Channagachua* were studied individually and in combinations. The fishes exposed to Cu + Zn and Cu + Cd combinations exhibited the strange phenomenon of behavioural changes than the animals exposed to Copper, Zinc or Cadmium individually. The rates of oxygen consumption and opercular movements were increased when the fish were exposed to chosen metals individually and in combinations on first day while it was declined on 15th days respectively. The behavioural changes of *Channagachua* were found to be different on lethal and sublethal treatments of chosen metals individually and in combinations. Animals exposed to sublethal concentration of metals were trying to adjust with their ambient medium for regaining their normal activity and sometimes they showed their avoidance response against the toxicant media. It is observed that *Channagachua* have exhibited an avoidance response to low concentrations of certain pollutants. At lethal concentrations, they tried to avoid the toxicant by irregular erratic swimming, jerk movements, rapid opercular movements, restlessness, frequent surfacing, gulping of air upside down surface movement, revolving, convulsions and extension of fins. An important local effect was the abundant discharge of mucus at the gills and on the skin. The details will be discussed in this paper.

Keywords: Heavy metal, Behaviour, Respiratory movements, *Channagachua*.

Chlorpyrifos Induced Histological Changes in The liver of An Air Breathing Fish *Channa Gachua*

D N Sadhu and Qaisur Rahman

Dept. of Zoology, Vinoba Bhave University, Hazaribag, Jharkhand, India

Pesticides have been one of the most effective weapons discovered by man to protect agricultural products from pests. However, they are the major cause of concern for aquatic environment due to their toxicity, persistency and tendency to accumulate in the organisms and it is difficult to remove them from any aquatic ecosystem. A bioassay was conducted to determine the lethal toxicity (LC50) of commercial grade organophosphate insecticide chlorpyrifos (20% EC) on *Channagachua*. The 96 hours LC50 for chlorpyrifos (20% EC) was found to be 0.022 ppm. For sublethal toxicity study the fishes *Channagachua* were exposed to two sublethal concentrations such as 1/5th of LC 50 and 1/10th of LC 50 for 21 days respectively. The histopathological changes in liver ranged from vacuolization, necrosis, aggregation of melanomacrophage, increase in number of kuffer cells at different time of exposure such as 7, 14 and 21 days respectively. There are some basic pathologies that pollutants in general may cause to fish *Channagachua* liver like swelling, disorganization of hepatic cords, increased level of mitosis in liver parenchyma cells, changes in nuclear size and shape, nuclear migration of nuclei and focal necrosis. The liver of pesticide treated fish showed dilation of blood sinusoids, vacuolization, disintegration of cell boundaries and necrosis. The details will be dealt in this paper.

Keywords: *Histology, Chlorpyrifos, Lethal toxicity, Channagachua.*

Acute Toxicity Effects of an Organophosphorus Pesticide (Dimethoate 30%EC) on Air Breathing Fish: *Anabas testudineus*

Amrita Sharma and Asish Kumar Panigrahi

Dept. of Zoology, University of Kalyani, Kalyani, Nadia, West Bengal

Organophosphorus pesticides are used extensively in the agricultural fields due to their rapid biodegradability and Non-persistence to control the pest but their broad spectrum of harmful effects extends far beyond the pest. Toxicity tests are experiments designed to predict the concentrations of toxicant and its duration of exposure required to produce an effect. Acute toxicity is the severe effect suffered by an organism from short term exposure to toxic chemicals. The present study was conducted to evaluate the toxic effects of acute concentrations of Dimethoate 30% EC on biochemical parameters of air breathing fish *Anabas testudineus*. Healthy individual fish were exposed to dimethoate for short term (96hr). 96hr LC₅₀ is calculated by Probit Analysis. Significant dose dependent decrease in total liver protein and liver glycogen and increase in blood glucose were observed in exposed fish as compared to the control. Thus, the results revealed that Dimethoate(30%EC) is toxic to air breathing fish *Anabas testudineus* and impart negative effects on fish in terms of biochemical parameters.

Keywords: acute toxicity, organophosphate pesticide, Dimethoate 30% EC, Air breathing fish *Anabas testudineus*.

DNA Gene Polymorphism and Cytogenetic e Effect of Deltamethrin and Isopoturon on Human Lymphocytes

Munish Kumar

Dept. of Biochemistry, University of Allahabad, Prayagraj, Uttar Pradesh

Insecticides and herbicides are widely used in modern agriculture. The combined presence of these chemicals in human populations, occupationally associated with manufacturing, spraying, can cause deleterious effects than the individual compounds alone. The synthetic pyrethroid insecticide, deltamethrin (DEL), and the substituted urea herbicide, isoproturon (ISO), are commonly used worldwide. Synthetic pyrethroid insecticides, due to their environmental compatibility with organochlorines and low toxicity to mammals, account for 60–70% of the total use of insecticides for agricultural and house hold pest control. The concurrent presence and synergistic interactions of these chemicals in humans may cause serious health hazards. Genotoxicity assessment of pesticides based on gene polymorphism, alone or in mixtures, is very important, particularly when the independent toxicity/ genotoxicity of these chemicals has been reported in several in vitro and in vivo test systems and large populations are exposed through dietary or occupational means. In the present study, the independent and combined cytogenetic effects of DEL and ISO were examined in peripheral human lymphocytes with specific genetic polymorphisms. Individuals were genotyped and whole blood culture was done followed by exposure to DEL and ISO was done. Chromosomal Aberrations (CA) and Cytokinesis-Block Micronucleus Assay (MN) were assessed to evaluate the genotoxic potential of DEL and ISO. Lymphocytes exposed to combined doses of DEL and ISO showed modest frequencies of CA that were not statistically different than the control groups. Combined treatment of DEL + ISO at 5 + 50 μ M also induced a significant ($P < 0.01$) frequency of MN, whereas lower concentrations of this combination did not show any effect. CBPI were observed to decrease with increasing concentrations.

Physico-Chemical Characteristic of Distillery Effluent and its Impact on Morphology and Behaviour of Fresh Water Fish, *Heteropnestues fossilis*

Ashok Kumar and Sadguru Prakash

Dept. of Zoology, M.L.K.P.G. College, Balrampur

The aim of the present study to evaluate the physico-chemical characteristic of distillery effluent and their toxic impact on morphology and behavior of fresh water cat fish, *Heteropnestues fossilis*. The pH, electrical conductivity and phenol were found within the desirable limits and colour, order, BOD, COD and chloride were higher the desirable limits of Central Pollution Control Board of India. During the study period, the colour of the experimental fish become progressively darker with increasing concentrations and was directly proportional to the concentrations of the test solution unlike those in the control. The opercular beat (number of beat / min) and surface activity of fish increase with increasing the concentrations of effluent and duration of exposure. Thus from the present study it may be concluded that air breathing catfish, *Heteropnestues fossilis* is sensitive to distillery effluent and can be used as indicators of effluent related stress in the water as it is evident from behavioural responses and morphological changes.

Keywords: *distillery effluent, Clarias batrachus, morphology, behaviour*

Effect of Environmental Toxicants on Neurons

Sippy Singh

Dept. of Zoology, S.S. Khanna Girls' Degree College, Prayagraj, Uttar Pradesh

Environmental toxicants are substances present or introduced in environment which exhibit toxic effects. The environmental toxins can adversely affect or retard brain development, since the developing brain is very sensitive and vulnerable therefore, it exhibits severe deleterious effects specifically on neurons. Some of the highly toxic elements such as mercury, lead, methyl mercury, arsenic etc. have been reported to cause brain deficits by targeting the neurons. Mercury exposure leads to mental retardation as it promotes neuronal cell death and affects cell migration and proliferation. On the other hand, Lead has been reported to alter the synaptic structure, myelination and neuronal impulse firing as it decreases the formation of synapse. Similarly Methyl mercury also affects neuronal migration and proliferation. Polychlorinated biphenyls (PCBs), a group of manmade chemicals are known to affect synaptogenesis. Arsenic toxicity is exposed to through drinking water and it results in neurological and cognitive dysfunction like learning and memory disabilities. It also leads to reduction in number of neurons and glia as well as alterations in neurotransmitter and neuronal differentiation. All these environmental toxicants pose risk on cognition by altering the structure and function of neurons.

Keywords: *Environmental toxicants, Neurons, Brain, toxic.*



GROUP - F

Environmental Impact Assessment



The Effect of Foliar Spray of Humic Acid 15 % L on Root Growth, Biochemical and Yield Attributes of Redgram (*Cajanus cajan*) at Pre & Post Flowering Stage

¹ Meena, M.K., ² Desai, B.K., ³ Dhanoji, M.M and ⁴ Amaregouda, A

¹ Dept. of Crop Physiology, UAS, Raichur,

² Dept. of Agronomy, UAS, Raichur

^{3,4} Dept. of Crop Physiology, UAS, Raichur

Tur as one of the most important plant resources are full of protein and after grains are considered as the second most important source of food for human being. The rate of protein in tur grains is twice or three times more than that of grain cereals. Humic acid is consistent with nature and is not dangerous for the plant and environment. Among legume family plants, humic acid foliar spray has remarkable effects on vegetative growth of plant and increases photosynthetic activity and avoid the flower drops. So, an experiment was conducted to study the effect of foliar spray of humic acid 15 % L on root growth, biochemical and yield attributes of redgram (*Cajanus cajan*) at Pre & Post flowering stage.

The study was conducted during Kharif 2013-14 at MARS, UAS, Raichur by using randomized block design. The effectiveness of humic acid was studied with different levels as T₁ Humic acid liquid 15% @ 1.0 ml/l of water, T₂ Humic acid liquid 15% @ 1.5 ml/l of water, T₃ Humic acid liquid 15% @ 2.5 ml/l of water, T₄ Humic acid liquid 15% @ 4.0 ml/l of water, T₅ Planofix 4.5 % @ 20ppm and T₆ as a control. The observation for root growth and yield were recorded.

Results of the study revealed the root length (24.25 cm), root fresh & dry weight (27.12 & 9.93 g), SPAD meter values (32.08), macronutrient viz., N,P,K (4.92, 0.952, 3.80 %) and micro nutrient Cu, Fe & Zn (2.98, 10.60 & 5.59 ppm) and yield components viz., Number of pods/plant (126.88), pod weights (75.45 g), test weight (9.78 g) & yield (1426.12 kg/ha) has significantly improved compared to control, respectively. Based on this study data, the foliar application T₄ Humic acid liquid 15% @ 4.0 ml/l of water at pre and post flowering stage may be recommended for effectively flower drop management & improving the growth physiology and yield components of redgram. These findings are good agreement with results of Delfine et al. (2005) in Wheat, Morard et al. (2011) in pulses Tarun et al., (2011) in maize and Hussein and Hassan (2011) in cereals.

Application of humic acid substances at the start of the growing season induced an overall positive effect on growth, development and dry matter yield of redgram. The seeds/plant analysis indicated significantly higher content of macro (N, P,K) and micronutrients (Cu,

Zn, and Fe) compared to the control. The application of Humic acid Liquid 15% @ 4.0ml/L at pre & post flowering stage may increased root growth and quality of redgram in the present study. Based on the present study findings Humic acid Liquid 15% @ 4.0ml/l foliar application at pre & post flowering to may be recommended for better growth and improved the seed yield of redgram.

Keywords: Humic acid 15 % L, SPAD meter values, micronutrient , macronutrient , number of pods and yield.

Indoor Environmental Impact Of ^{220}Rn (Thoron) in India

¹L.A.Sathish and ²T.V.Ramachandran

¹ Dept. of Physics, Government Science College, Bangalore, India

² Dept. of Environment, Bhabha Atomic Research Center, Mumbai, India

Topic on background radiation has evoke concern between scientist and layman alike in recent years due to the shift in focus of health effects from exposure of radiation from acute high to chronic low level. Globally many locations have higher levels of natural background radiation due to elevated levels of primordial radionuclides in the soil and their decay products like ^{222}Rn (Radon) and ^{220}Rn (Thoron) in the environment. Of late, technologically enhanced naturally occurring radioactive material has also contributed to the burden of background radiation. It is estimated that inhalation of ^{222}Rn , ^{220}Rn and their short lived progenies contribute more than 54% of the total natural background radiation dose received by the general population. Due to this it was necessary to supplement the external component with inhalation component. This component is not adequately estimated for any country so far on a national level. In this context, data for ^{220}Rn (Thoron) in indoor environment and workplace is typical, due to the general perception, that, its levels are negligible due to shorter half life (55 s) and subsequently its contribution to the total inhalation dose is ignored, in the presence of other significant sources of natural radiation. The Bhabha Atomic Research Center (BARC), Mumbai, India has completed a countrywide monitoring program of ^{220}Rn along with ^{222}Rn in the dwellings using $^{222}\text{Rn}/^{220}\text{Rn}$ discriminating Solid State Nuclear Track Detector (SSNTD) based dosimeter systems with large participation of research groups from different parts of the country. Details about methods of measurement, standardization of dosimeters and evaluation of the inhalation dose is presented in detail. Results are compared with the values reported in literature for dwellings as well as in high background radiation areas across the globe to assess the environmental impact of thoron for Indian dwellings.

Keywords: India, indoor, inhalation dose, SSNTD, Thoron.

Impact of Climate and Land use/land Cover Change on Evapotranspiration over the Indian Region

Subhadeep Halder and Garima Singh

Dept. of Atmospheric and Ocean Studies, University of Allahabad, Prayagraj, Uttar Pradesh

Evapotranspiration(or ET), a component of the global hydrologic cycle is an important source of moisture and also constitutes a major component of the surface energy balance over land. ET is comprised of three components namely, bare soil or ground evaporation, transpiration from vegetation and evaporation of plant canopy water. Needless to say, both vegetation and soil characteristics such as leaf and stem area indices, stomatal conductance, rooting depth and soil hydraulic properties are strongly associated with the process of ET over land. However, availability of soil water or moisture that is in turn dependent on precipitation characteristics over land, surface net radiation and wind speed are the major climatic factors that together determine the magnitude of ET. This in turn controls the availability of moisture in the lower troposphere and hence stability characteristics, chances of cloud formation and precipitation. The study of ET is important for determining agricultural water consumption and analyzing drought.

So far, very few studies have investigated the characteristics and causes of changes in global ET or that over India. One of the major factors for that is the lack of accurate data and high uncertainty in the estimation of ET. Land use/land cover changes (LULCC) occurring over the Indian region in the form of conversion of forest cover into agriculture or bare land have been found to affect the characteristics of low to moderate rainfall events and surface temperature extremes (Halder et al. 2016). Furthermore, changes in the hydrological cycle under a global warming scenario and the impact of various anthropogenic factors have also necessitated an urge to understand the factors that control ET characteristics over India. On this premise, we intend to investigate the impact of climate and LULCC on changes in ET over the Indian region and its implications.

Following are the objectives of the present study.

- (i) To analyze the long-term mean and interannual variation of vegetation cover and ET components over the Indian region and their relationship;
- (ii) To understand the impact of changes in LULC and climate (precipitation, temperature) on ET and its relationship with food grain production.

In the absence of in-situ ET observations, we have used meteorological observation driven global reanalyses data on ET for this study. Monthly Normalized Difference Vegetation Index (NDVI) from the National Aeronautics and Space Administration (NASA) based on the Advanced Very High Resolution Radiometer (AVHRR) during 1981-2001 and the Moderate Resolution Imaging Spectroradiometer (MODIS) during 2002 till the recent time

have been used to understand vegetation characteristics. We have used global observed precipitation from the Climate Prediction Centre (CPC, https://www.cpc.ncep.noaa.gov/products/global_precip/html/wpage.cmap.html) and near surface temperature from the Climate Research Unit (CRU, <https://crudata.uea.ac.uk/cru/data/temperature/>) for this study.

The Grid Analysis and Display System (GrADS), an open source software and programming in Fortran have been used for performing different analyses. Long-term mean characteristics and interannual variability of the climate, vegetation and ET data have been analyzed. Correlation and regression analyses have been carried out to understand the relationship between different climatic and anthropogenic variables and ET.

The boreal summer monsoon season, comprising of the months June to September, contributes about 80% of the annual rainfall over India. Maximum rainfall during the season is received over the Western Ghats, parts of central and eastern India, foothills of the Himalayas and the northeastern region. The spatial pattern of NDVI and ET during the monsoon season also appears to follow that of rainfall, which is quite expected. However, the individual components of ET namely bare soil evaporation, transpiration and canopy evaporation follow different spatial patterns in different months. It is interesting to note that there is much difference in the spatial pattern of interannual variability of the monthly parameters over the Indian region. It can be inferred that not only vegetation characteristics (e.g. NDVI) but other climatic factors such as precipitation and air temperature also determine the variability of monthly ET over the Indian region. This has been further quantified on the basis of correlation and regression analyses.

On the contrary, precipitation received during the pre-monsoon season (March through May) is quite low except during severe thunderstorm events (Nor'westers) occurring over the eastern region. Monthly and seasonal temperature are the highest during this season. As a result, the evaporative demand of the atmosphere is very high. The relative impact of the three components on total ET is characteristically different than that observed during the summer monsoon. The relative contribution of soil evaporation to ET is stronger over the northern Indian states whereas agricultural is mainly supported by irrigation activity. Though the source of NDVI datasets prior and after the year 2000 are different, one can notice significant changes not only in the spatial distribution of NDVI but also in precipitation and temperature. Our analysis has brought out very interesting facets of the relationship of climatic variables and NDVI with ET during the decades before and after the year 2000.

An attempt has been made to investigate the impact of changes in climate and LULC on ET and its three components over the Indian region during 1981 till the present time. It is noted that there is a distinct difference in the characteristics of vegetation (and climate)

and the three components of ET and their relationship during the pre-monsoon and monsoon seasons, as brought out by detailed statistical analyses and tests of significance. With the increase in precipitation during the monsoon season, canopy evaporation is found to increase along with NDVI followed later by transpiration. Variability in surface net radiation, that is controlled by cloud cover, aerosols and surface albedo changes, also plays an important role in controlling total ET. Whereas, ground evaporation is found to be strongly correlated with precipitation. It is suggested, that further detailed study on the daily time scale with in-situ and remote sensing data can bring out more interesting insight regarding these processes. An attempt is further made to demonstrate the impact of climatic changes and ET on food grain production over the Indian region.

Keywords: *Land use/land cover change, normalized difference vegetation index, precipitation, temperature, evapotranspiration.*

Evaluation of Biorationals and Insecticides for the Management of *Spodoptera exigua* under Field Condition

Sunitha, N., Pramod Katti, Sushila Nadagouda, Sujay Hurali, Satyanarayan Rao

Dept. of Entomology, University of Agricultural Sciences, Raichur, Karnataka

Spodoptera exigua (Hubner) (Lepidoptera: Noctuidae) is emerging as an important pest of chickpea, especially in South Central India where it is an economic pest of chickpea, larvae of which feed on the vegetative and reproductive stage causing highest foliage damage (36.56 per cent) especially in Raichur district. The young larvae of *S. exigua* initially feed gregariously on the chickpea foliage. As the larvae grow, they become solitary and continue to feed on the foliage and produce large, irregular holes on the leaves. As a leaf feeder, the cutworm consumes much more chickpea tissues than the chickpea pod borer, *H. armigera*, but it has not been reported as a serious pest of pods. It is noticed particularly in chickpea during vegetative stage of the crop. It has a wide host range, occurring as a serious pest of vegetable crops viz., asparagus, bean, beet, cabbage, broccoli, eggplant, onion, lettuce, pea, cauliflower, corn, tomato, cowpea, pepper, potato, radish, spinach, turnip, and sweet potato in many parts of the world. Looking in to the severity of the pest in recent times, there is a need to manage pest at the field level, hence, an investigation on studies on the management of cutworm *Spodoptera exigua* on chickpea was under taken with following objectives

1. To evaluate some biorationals and insecticides for the management of *Spodoptera exigua*

Field experiment was laid out in the randomized complete block design with three replications at MARS, Raichur during *Rabi*, 2016-17. There were 10 treatments in the experiment and were sprayed as per the dosage indicated in the Table 1 along with other treatments. Chickpea cultivar A1 was used for the experimentation and was sown with a spacing of 60 cm x 10 cm and plot size of 3m x 3m. Crop was raised according to package of practices except for plant protection measures. Observations on number of larvae on three randomly selected meter row length were recorded one day before to spraying and later the population was recorded at 7 and 10 days after spraying. Second spray was done after 10 days of last observation of first spray and similar observations were recorded.

The results presented in Table.2 revealed that seven days after first application, the mean number of larvae per meter row length of crop was in the range of (0.51 to 4.00). Least number of larvae per meter row length was recorded in spinosad (0.51) which was on par with cypermethrin 0.57, followed by malathion 3.90, lambda cyhalothrin (1.97) which was on par with *B. thuringiensis* (2.04), *M. anisopliae* (2.10) , *N. releyi* (2.64). Highest mean

number of larvae per one meter row length of crop was recorded in pongamia oil (4.00) followed by *B. bassiana* (3.09). Similarly seven days after in second spray, the mean number of larvae per meter row length of crop was in the range of 0.50 to 4.30. Least number of larvae was recorded in spinosad (0.50) which was on par with lambda cyhalothrin (0.57) followed by cypermethrin (0.87) which was on par with malathion (4.47) and *N. releyi* (2.53). Highest mean number of larvae per meter row length of crop was recorded in pongamia oil (4.32) followed by *M. anisopliae* (3.80) (Tale. 3). Finally the results pertaining to grain yield, the highest grain yield of (12.02 q ha⁻¹) was recorded in spinosad treatment followed by cypermethrin (11.53 q ha⁻¹), lambda cyhalothrin (10.57 q ha⁻¹), malation (10.30 q ha⁻¹). Among biorationals maximum yield was recorded in *N. releyi* (10.05 q ha⁻¹) followed by *B. thuringiensis* (9.80 q ha⁻¹), *B. bassiana* (9.60 q ha⁻¹), *M. anisopliae* (9.52 q ha⁻¹). Lowest yield was recorded in pongamia oil (9.34 q ha⁻¹) (Table 3). These results are in good agreement with the study of Abdul *et al.* (2003), Agarwal *et al.* (2006), Hossain (2007) , Patil and Hegde (2009) indicated spinosad and indoxcarb as effective molecule against lepidopteran pests in chickpea.

It is evident from the studies that among biorationals and insecticides evaluated against *S. exigua*, spinosad was most effective followed by cypermethrin, lambda cyhalothrin, malathion. Among biorationals, *N. rileyi* was effective followed by *B. thuringiensis*.



GROUP - G

Green Chemistry and Technology



Progress in Green Energies, Sustainable Development and the Environment

A. Omer

Energy Research Institute (ERI), Nottingham NG7 4EU, United Kingdom

Globally, buildings are responsible for approximately 40% of the total world annual energy consumption. Most of this energy is for the provision of lighting, heating, cooling, and air conditioning. Increasing awareness of the environmental impact of CO₂, NO_x and CFCs emissions triggered a renewed interest in environmentally friendly cooling, and heating technologies. Under the 1997 Montreal Protocol, governments agreed to phase out chemicals used as refrigerants that have the potential to destroy stratospheric ozone. It was therefore considered desirable to reduce energy consumption and decrease the rate of depletion of world energy reserves and pollution of the environment. This article discusses a comprehensive review of energy sources, environment and sustainable development. This includes all the renewable energy technologies, energy efficiency systems, energy conservation scenarios, energy savings and other mitigation measures necessary to reduce climate change.

Keywords: *green energy technologies, sustainable development, mitigation measurements*

Synthesis and Characterisation of Some Ru(III) Complexes with Macrocyclic Ligands

Rahul Kanaoujiya and Shekhar Srivastava

Dept. of Chemistry, University of Allahabad, Prayagraj, India

Once ruthenium (III) complex of the type [RuCl₃L¹L²] (where L₁= Dibenzo18 crown 6 and L²= Methionine) were synthesized and characterized by elemental analysis, molar conductivity, IR, and UV-vis Spectroscopy(UV-vis), and Antibacterial activity. An octahedral geometry was established.

Keywords: *Ruthenium complex, Methionine, Macrocyclic ligand, Antibacterial activity.*



GROUP - H

Aquatic Resource Management



Aflatoxins control on Supplement with Probiotics in liver of Fresh Water Fish

S. Payani, C. Chandraprakash, C. Mamatha, B. Sujatha and M. Bhaskar

Dept. of Zoology, S.V. University, Tirupati, A.P India

The growth of aquaculture as an industry has accelerated over the past decades; however environmental damages resulted in low productivity of aquaculture and various crops. In present days, probiotics are also becoming an integral part of the aquaculture practices to obtain high production and way to provide a natural, safe and effective barrier against microbial infections, to promote growth of aquatic organisms, and to strength the feed efficiency. According to the definition by the World Health Organization (WHO), probiotics are “live microbial food supplements which, when administered in sufficient amounts present a health benefit on the host”. Aflatoxins are the toxic secondary metabolites produced by the fungal species *Aspergillus flavus* and *A. parasiticus* that affect human and animal health through cirrhosis and acute damage to liver, tumor induction, as well as immunosuppressive, mutagenic, teratogenic and carcinogenic effects and especially affects the fish through feed contamination. Among all aflatoxins, aflatoxin B1 (AFB1) is considered the most potent food-borne hepatotoxicant frequently found in animal feedstuffs and responsible agent in unforeseen outbreaks of fish mortality attributed to aflatoxicosis, well documented in freshwater species since long time.”

The objective of this study was to examine protective effect of commercial probiotics along with cheese against aflatoxin B1 (AFB1) on physical parameters such as body weight and body length and biochemical analysis in liver which includes total proteins, structural proteins, Soluble proteins, Amino acids, Ammonia, Urea, glutamine and LDH in fresh water fish *Cyprinus carpio L.*

In present experiment fish will be weighed at the beginning at 0 day and at the end of 30 days experimental period. The fish will be divided into 5 groups. First group is control and the other four groups are experimental and each group consists of 10 fish. **Group - I:** Control fish fed with pure diet. **Group – II:** Fish fed with aflatoxin contaminated diet (200ppb) **Group - III:** Fish fed with aflatoxin contaminated diet with Probiotic bacteria 2 mg/kg bw. **Group - IV:** Fish fed with aflatoxin contaminated diet with cheese 2 mg/kg. **Group - V:** Fish fed with AFB1-contaminated diet and 5 mg/kg bw (Probiotic + cheese) supplementation in 1:1 ratio respectively. The dosage of cheese and Probiotic bacteria with feed are determined through standardization studies.

The experiments reported here were conducted to evaluate the effect of these toxins on growth, and liver. The results indicated that AFB1 altered the physical parameters like body

weight, body length were decreased and Biochemical parameters like total proteins, structural proteins, soluble proteins, glutamine and amino acids were decreased in addition ammonia and urea were increased and LDH lactate dehydrogenase activity was reduced. On Supplementation of probiotics (Group- III) showed significant protective effect than cheese (Group- IV). In combination group (Group-V: Probiotic + cheese) showed more or less similar levels to that of control (Group- I).

Aflatoxins are secondary metabolites of fungi that grow on a moisture feed and food stuffs usually consumed by fish. The present study evaluates the effect of probiotics and cheese on toxicity of mycotoxin AFB1 on fishes. The results obtained clearly showed that probiotics and cheese counteract the toxic effects of AFB1. Hence, the combat supplementation of probiotic and cheese through feed may reduce the risk factors in fish industry and helps in improving the yield.

Keywords: *Aflatoxin B1 (AFB1), Probiotic, lactate dehydrogenase (LDH), Biochemical, Aquaculture and Environment.*

Biodegradation of Phenol by Species of *Bellamyia* Sp.

Lucky Nandi, Souvik Biswas and Ashis Kumar Panigrahi

Dept. of Zoology, University of Kalyani, Kalyani, Nadia, West Bengal

Phenolic compounds are dangerous pollutants with high toxicity even if present at low concentration. They are present in the effluents of various industries such as oil refining, pharmaceutical, petrochemical, paints, pulp, plastic, paper products. Discharge of these compounds without treatment lead to serious health risk to aquatic ecosystem and its organisms. Benthic gastropods in wetlands have an especially close relationship with the sediments that comprise their habitat and feeding site. For many years, gastropods are known as a potential bioindicator of various effluents contaminating the water body. So here main objective is to carry out the detailed information about how *Bellamyia bengalensis* plays an important role in biodegradation of phenol and can be used as a potential bioremediation tool in future.

Keywords: *Phenol, Bellamyia bengalensis, 4-Aminoantipyrine method.*

The Structural Organization and Functional Aspects of The Olfactory Organ in Schilbid Catfish, *Clupisoma Garua* (Hamilon, 1822)

Saroj Kumar Ghosh

Dept. of Zoology, Bejoy Narayan Mahavidyalaya, Itachuna, Hooghly, West Bengal, India

Olfaction is one of the most important senses driving the basic types of behaviour in teleosts for communication with the aquatic environment. A study of the olfactory organ, with marked observation on cellular organization of the olfactory mucosa during different reproductive phases was carried out in river catfish, *Clupisoma garua* (Siluriformes; Schilbeidae) by optical as well as scanning and transmission electron microscopy. The olfactory organ was located on the floor of the nasal cavity, dorsolaterally at the front of the snout. Each elongated rosette was composed of a series of leaflets, the olfactory lamellae radiated outwards from the linear raphe. The olfactory mucosa of a pseudostratified layer sandwiched a thin connective tissue layer, the central core. The central core which was distinguished from the epithelium by a basement membrane composed of nerve fibres, connective tissues and blood vessels. The changes in the various cells lining the olfactory epithelium were reported by considering their cytoarchitecture, staining vigour, distribution patterns and their nuclei along the thickness of the olfactory mucosa. Each morphotype of olfactory receptor cell was characterized by a cell soma in a distinct layer of the mucosa, versatile extent of dendrite and expansion of axonal process towards basement membrane. Based on surface specialization sensory receptor cells were of ciliated, microvillous and rod type, characterized with longitudinally arranged microtubules in the dendrite. Nine pairs of outer tubules and two central ones (9+2 arrangement) were distinctive in transverse section of the cilia. The rod receptor cells occurred in limited areas of epithelium. Specialized junctional complexes were observed in between the receptor and adjoining cells. Basal cells were present at the base of the epithelium, above the basement membrane. The indifferent epithelium contained secretory mucous cells, labyrinth cells, mast cells, ciliated nonsensory cells and stratified epithelial cells with a fingerprint like archetype of microridges. The functional importance of various cells on the olfactory mucosa was discussed with chemoreception of the fish interested.

Keywords: *Garua vacha, Olfactory epithelium, Chemosensory receptor neurons, Microarchitecture, Fine structure.*

Fertility Regulation in Vertebrates by the use of Bioactive Substance from Invertebrate Sources – A Unique Observation

Subhasish Bhattacharyya and Asish Kumar Panigrahi

Dept. of Zoology, University of Kalyani, Kalyani, Nadia, West Bengal

The invertebrate has been recognized as an important source of bioactive compounds of medicinal potential. The cytosol fraction of spermathecal extract obtained from species *Achatina fulica* showed encouraging results as an anti fertility-agent. This glandular extract was analyzed and found to cross react with anti-sperm antibodies developed in rabbit. This present experiment was conducted to compare the immune contraceptive potentiality of the antisera of the spermathecal extract with the crude spermathecal gland on the gonadal system of vertebrates *in vivo*. The antiserum of spermathecal extract was found to interfere in the protein and DNA content in the testis of antisera treated mice as compared with the crude spermathecal extract treated mice and control mice.

The observation that the cytosol fraction of spermatheca and or ovotestis, a complex organ of the mollusks *Achatina fulica* exhibited antifertility and immunomodulatory properties hypothetically could further be employed for many pathological conditions in general including the invention of a suitable antifertility agent which is still remains a potential area of investigation.

Keywords: *Achatina fulica*, anti fertility, *in vivo*, immunomodulatory.

A Short Survey on Bioavailability of Heavy Metals and its Relation with the Fish Food Organisms in East Kolkata Wetland

¹Souvik Biswas, ²Lucky Nandi, ³Santanu Debnath and ⁴Asish Kumar Panigrahi

^{1,2,4} Dept. of Zoology, University of Kalyani, Kalyani, Nadia, West Bengal

³Dept. of Zoology, Brahmananda Keshab Chandra College, Kolkata

East Kolkata Wetlands (A Ramsar Site), in which raw sewage water of metropolitan city Kolkata is used in many ponds (locally called bheris) for aquaculture practices. The prey and predator relationship between fish and fish food organisms can causes the major bioaccumulation of anthropogenic non degradable waste. The concentration of bioavailable heavy metals like other anthropogenic waste may effect on the aquatic organisms. Fishes which are the cheapest source of protein, directly or indirectly depending on fish food organisms like planktons (Zooplankton and Phytoplankton), mollusks, arthropods etc. The main objectives of our present study are to measure the seasonal variation of water quality parameters, concentration of heavy metals like lead, chromium etc. and also to assess the diversity and abundance of fish food organisms of selected sites of East Kolkata Wetland.

Keywords: *East Kolkata Wetland, water quality parameter, heavy metal, bioavailable, fish food organisms.*

Improvement of Fish Health by using Probiotics Feed: An Immunomodulatory Aspect

¹ M.A.Dhotre, ² S.D.Kadam and ³ V.S.Shembekar

^{1,2} Dept. of Biotechnology, Rajarshi Shahu Mahavidyalaya (Autonomous), Latur, M.S., India

³ Dept. of Zoology, Rajarshi Shahu Mahavidyalaya (Autonomous), Latur, M.S., India

The aim of the current study is to isolate and screen effective probiotic species from Indian carp and their application in feed diet as an immunomodulatory agent. Total 9 different probiotics were isolated and screened based on morphological, biochemical and 16s RNA sequencing. Out of that 4 species were identified as *Lactobacillus* sp. Innovation in aquaculture act as drivers in sustainable development, In the current work *Lactobacillus plantarum* was used to prepare different diets namely FD2, FD3, and FD4 with different cons. of probiotics and FD1 was used as control diet without probiotics and their nutritive and immunological aspects such as feed utilization efficiency, growth performance and immune response was evaluated using fingerlings of *Catla catla*. Proximate analysis was carried out for all four diets. FD4 fed fishes showed better growth significantly ($P \leq 0.05$) as compare to other diet, other parameters like highest RNA/DNA ratio, lower FCR, higher SGR, higher PER which indicate better consumption of protein for growth and metabolism was also studied and was found highest in FD4 diet. Highest carcass proteins and lipid was also observed in FD4 fed fishes as compare to other diets. Improvement of carcass quality may indicate usefulness of probiotic in improvement of enzymatic activity and better nutrition uptake. Low level of glucose and increase level of albumin, TSP, globulin and TSP show positive impact of probiotic during the study. Before and after feeding trials the nonspecific immunity level and disease resistance of fish in challenge trial were studied using *Aeromonas* sp. (10^5 CFU ml⁻¹, 1 hr. and after 7 days 10^7 CFU ml⁻¹, 1 hr) as pathogen and their Phagocytic ratio, Phagocytic index and leucocratic value were studied and found highest in diet FD4 fed fishes. In conclusion it said that *Lactobacillus plantarum* isolated from the same species and their optimum cons. in dietary supplement was recommended to improve fish health.

Keywords: *Lactobacillus plantarum*, *Catla catla*, Immunomodulatory.

GROUP - I

Environmental Geography



Natural Resources and Environmental Issues

Ajit Ram

Dept. of Geography, OPJS University, Rajasthan, India

Natural resources and environmental concerns have been prevalent not only in India, but in other countries of the world as well. In most cases, India has been the major country that has experienced the depletion of natural resources and environmental degradation. In this research manuscript, the main focus has been laid upon India; India is the most populous country in the world and with the impact of population explosion, there is exhaustion of natural resources and environmental degradation. The main areas that have been highlighted are rural poverty and environmental degradation, effects of disasters and natural hazards, assessing risks, impacts and opportunities from natural resources and the environment, precise interventions for environment, sustainability and green development, green rural development and economic growth and environmental sustainability. The issues have been taken into account and the measures also have been under scored that are essential in order to lead to preservation and sustenance of natural resources and the environment.

Keywords: *Poverty; Environmental degradation; Disasters; Natural hazards; Sustainability; Green development; Economic growth.*

Natural Resources and Environmental Issues (A Case Study Of Patna Division, Bihar)

Amit Kumar Rajan

Dept. of Geography, V.K.S. University, Ara, Bihar, India

Natural resources and environmental concerns have been prevalent not only in India, but in other countries of the world as well, but in most cases, India has been the major country that has experienced the depletion of natural resources and environmental degradation. In this research manuscript, main focus has been laid upon Patna division, Bihar; India is the most populous country in the world and with the impact of population explosion, there is exhaustion of natural resources and environmental degradation. The environment incorporates the interplay of many physical and chemical factors - a biotic factor - that different species respond to. A biotic factor can be categorized as conditions or resources conditions which include temperature (extremes of heat and cold, as well as average temperature), wind, (acidity), salinity and fire. Within aquatic systems for example, the key conditions are salinity (fresh water vs. salt water), temperature, the texture of the bottom (rocky vs. silt), the depth and turbidity (cloudiness) of the water and currents.

The degree to which each a biotic factor is present (or absent) profoundly affects the ability of organisms to survive. However, each species may be affected differently by each factor. This difference in response to environmental factors determines which species may or may not occupy a given region or a particular area within a region. In turn, the organisms that do or do not survive determine the nature of a given ecosystem.

Keywords: *Poverty; Environmental degradation; Disasters; Natural hazards; Sustainability; Green development; Economic growth.*

Changing Protection Policies at Livelihood and Disaster of Environmental Engagement in India

Prabhakar Singh

Dept. of Anthropology, University of Allahabad, Prayagraj, Uttar Pradesh

Attempts to protect nature by control of human intervention in areas demarcated for biodiversity have given rise to difficult questions of practicality and social justice. This introduction to a set of studies by anthropologists on the relationship between conservation and local community responses to protection measures, looks at the twin processes of rethinking conservation in socially inclusive ways and theoretical developments in viewing human relationships with environments that emphasise their interactive qualities. Whereas oppositional contrasts between nature and society characterised both conservation and anthropology in most of the twentieth century, more mutualistic frameworks are now emergent. Participatory conservation seeks to give voice to local concerns and indigenous perspectives, while social theory has increasingly recognised the cultural and political baggage that accompanies attempts to impose natural states on environments characterised by histories of human–environmental engagement. A central focus is given to the dynamics of place in this special issue, so that the impacts of global agendas for nature protection are viewed from the grounded positions of people’s lives and their ways of thinking about and dealing with the changes brought about by conservation measures, which reconfigure relations of community, territory and resources.

Keywords: *Livelihood, Disaster, Anthropology, environment, protected areas, community conservation, place, indigenous knowledge.*



GROUP - J

Remote Sensing and GIS



Remote Sensing and Agricultural Sustainability

Parveen Kumar, Kunzang Lamo and D. Namgyal

Dept. of Ag. Extension and Vegetable Science, KVK-Leh, SKUAST-K

Since the green revolution of 1960s, technological interventions have played a major role in increasing the productivity of the crops and enhancing the overall production in the country. Today technology has made it possible to grow crops even in a desert. The emerging technologies like the genetic engineering has enabled the scientific community to introduce desirable characteristics of one species into another with a goal of making crops resistant to cold, droughts, pests, diseases with the ultimate objective of augmenting the yield.

The Farming community in the country is also taking the benefits of such technological interventions in farm and livestock sector. One such sustainable technology now used widely and on which sustainability of agriculture depends is the Remote sensing technology. Remote sensing is the acquisition of information about an object or any phenomenon without making any physical contact with the object. This technology finds wider applications in the field of agriculture and allied sectors. There are very many applications of remote sensing in the agricultural sector. Remote sensing is used to forecast the expected crop production and yield over a given area and determine how much of the crop will be harvested under specific conditions. Through this technology an assessment of crop damage and crop progress can be made. In the event of crop damage or crop progress, remote sensing technology can be used to penetrate the farmland and determine exactly how much of a given crop has been damaged and the progress of the remaining crop in the farm.

The analysis of different cropping systems is also done using the remote sensing technology. This technology has mainly been in use in the horticulture industry where flower growth patterns can be analyzed and a prediction made out of the analysis. Remote sensing also plays an important role in crop identification especially in cases where the crop under observation is mysterious or shows some mysterious characteristics. The data from the crop is collected and taken to the labs where various aspects of the crop including the crop culture are studied. Remote sensing is also used in the estimation of the farmland on which a crop has been planted. It also has an important role in the assessment of the health condition of each crop and the extent to which the crop has withstood stress. This data is then used to determine the quality of the crop. As remote sensing is predictive in nature it is now used to observe a variety of factors including the weather patterns and the soil types to predict the planting and harvesting seasons of each crop. Remote sensing also allows farmers and experts to predict the expected crop yield from a given farm.

Fuzzy-Analytical Hierarchy Process based GIS Modelling for Groundwater Prospective Zones in Prayagraj, India

Priyamvada Singh

Dept. of Earth and Planetary Sciences, University of Allahabad, Prayagraj, India

This paper develops a model to delineate groundwater potential zones by integrating tools of remote sensing, geographical information system (GIS) and Fuzzy Analytical Hierarchy Process (FAHP) to achieve multi-attribute decision making choice among various thematic layers which affect the groundwater resources such as geology, geomorphology, lineament density, slope, soil, rainfall, drainage density, land use / land cover, NDVI and elevation in the region of Prayagraj, Uttar Pradesh, India. Using Saaty's scale, suitable weights are allotted to the physical properties and their significant features according to their relative importance in groundwater occurrence. The allotted weights of the thematic layers and their significant features were then normalized by using FAHP. Finally, the estimated ten thematic maps from satellite images and conventional data are combined in a GIS platform to yield a groundwater potential zones map. Thus, seven groundwater potential zones are identified and demarcated in the study area as: excellent, very strong to excellent, strong to very strong, moderate to strong, moderate, equal to moderate and equal. The groundwater potential zones map is finally justified using the well annual discharge data and the result is found tolerable. This study clearly provides groundwater potential zones and offers future planning, managing and forecasting of groundwater resources in the study area. Information from remote sensing analysis also reduces the expenditure, time and risk to human life during the groundwater related research work.

Keywords: *Groundwater, FAHP, Remote Sensing, GIS.*

Irrigationsystem of The Cauvery Basin in Karnataka using Geographic Information System

¹ Y.P. Rajesh and ²Smitha Rajesh

¹ Dept. of Geography, University of Mysore, Mysore

¹ H.K.V.PU Callege, Maddur, Mandiyadist

Water is most essential for human life and an absolute necessity for all varies actives like drinking, domestic purpose, agriculture, industry and transport. It is also a vital element in the development of the economy of any country or region of the world. The present research is to focus on the Water Resource Management in Cauvery basin in Karnataka state, India- through Application of Geographic Information System” The Cauvery is a perennial river, sacred to the people of south India, because it provides livelihood for a large number of people of Karnataka and Tamil Nadu. In this study has given on the distribution of water along with role of GIS for sustainable development of water resources and management. Watershed delineation, locality, accessibility and physiographic of the study area.

Keywords: *Geographic, physiographic, accessibility, delineation, perennial.*

Mapping Groundwater Quality Parameters using Inverse Distance Weighted Interpolation Method

Pawan Kumar Jha, Atul Srivastava and Swapnil

Dept. of Environmental Science, University of Allahabad, Uttar Pradesh, India

Niti Aayog report Composite Water Management Index (CWMI) reveals that 21 major cities (Delhi, Bengaluru, Chennai, Hyderabad, and others) are racing to reach zero groundwater levels by 2020, affecting access for 100 million people. Groundwater quality parameters are usually more variable in space than in time. Thus for protecting groundwater quality, the spatial and temporal distribution of data is important. The objective of this research was to prepare an interpolation map for the spatial distribution of some groundwater quality parameters. The IDW interpolation method uses a linear weighted combination set of sample points. Total 50 samples have been collected from the three wards (Phaphamau, Teliyergunj and Shivkuti) of Prayagraj city. Coordinates of every sample have been collected for preparing the Raster image. The parameter which is used for the analysis was Temperature, TDS, Conductivity, and pH, Phosphate, Nitrate, Sulphate, Sodium, Potassium, Calcium and Fluoride. Nitrate and phosphate show maximum value near the bank of the river as these areas are used for the agriculture purposes. At the corner of Teliyergunj ward sulphate value shows 954 PPM that is beyond permissible limit (200-400 PPM) while concentration of fluoride in the groundwater sample was found to be 0.33 to 0.47 PPM that is below desirable limit. All the other analysed groundwater parameter value is shown below the permissible limit as mentioned by BIS.

Keywords: *Groundwater, Interpolation, Inverse distance weighted, GIS, Coordinate.*

GROUP - K

Environment Management



Evaluation of Biodegradable Material for Transplanting Cotton Seedlings to Increase Productivity and Profitability

Siddagangamma, K. R. and A. S. Channabasavanna

Dept. of Agronomy, College of Agriculture, University of Agricultural Sciences,
Raichur, Karnataka, India

Cotton (*Gossypium hirsutum* L.), white gold, is considered as an important fibre crop of India and Karnataka. It is back bone of textile industries providing 85% of raw material to textile industry and it earns about 33 per cent of total foreign exchange. Average productivity of cotton in India, is low (443 kg lint/ha) when compared to the world average (764 kg/ha), where as in Karnataka productivity of cotton is 347 kg lint/ha (Cotton advisory board, 2018-2019). This may be attributed to fail to select appropriate genotypes and late sowing due to delayed rains or release of water in canal. So, there is much scope to increase cotton productivity through optimization and adoption of appropriate agro-techniques under late onset of monsoon.

Among different type of cotton, *Bt* cotton occupies major area in Upper Krishna project of Karnataka and **one of the major agronomic constraints for the low productivity in *Bt* cotton is the delayed sowing of seeds** due to delayed rains or release of water in canal. This could be tackled by establishing seedlings and transplanting in time. As the solution to the problem, polythene bags are being recommended where seedlings are raised for one month in advance and transplanted at 30-35 days. Presently polythene bags are banned due to its un-ecofriendly and hence, there is need to search for suitable alternative to establish cotton seedlings.

In this context, the study was initiated with an objective of exploring bio-degradable, eco-friendly and low cost materials to establish the seedlings and its performance with different *Bt* cotton genotypes and to assess its economics.

The field experiment was conducted during the *khari* season of 2018-19 at Agricultural Research Station, Malnoor, University of Agricultural Sciences, Raichur, Karnataka on vertisols. The study includes three popular *Bt* cotton genotypes *viz.*, Jaadoo BG-II (G_1), ACH 199 BG-II (G_2) and Bindass BG-II (G_3) in main plots and four methods of establishments *viz.*, seedling raised in Black Polythene bags (E_1), seedling raised in Pro trays (E_2), seedling raised in Biodegradable cup (Paper cup) (E_3) and Dibbling (E_4) in subplots. The experiment was conducted in split plot design with three replications.

Raising seedlings in the nursery well in advance and transplanting in to the main field may increase the yield and also mitigate the ill effects and compensate the yield of delayed sowing. Hence, it is necessary to adaptation of transplanting technique for *Bt* cotton

under late sown situations. Presently, polythene bags are used and as a consequence of ban the use of plastic bags, an alternate material need to be suggested. In this context, success in paper bags or use of pro trays will keep an end to the use of plastic bags. Thus, Bio-degradable, Eco-friendly and low cost technology materials will be commercialized among the farmers and it also overcome the problem of plastic pollution in the soil.

The study conducted during 2018-19 indicated that among different genotypes, performance of Jaadoo BG-II was better over other genotypes. With respects to method of establishments, raising seedling in paper cups was on par with polythene bags indicating an alternate solution for the use of polyethylene bags. This is sure to tackle the problem of pollution of soil and environment. The performance under pro trays was not encouraging to small size of cups is not sufficient to support and nourish the cotton seedlings.

A Case Study on Household Water Harvesting in Village Bhadari

Jagriti Tiwari, Pawan Kumar Jha, Jitendra Kumar Tiwari

Dept. of Environmental Science, University of Allahabad, Uttar Pradesh, India

Water harvesting is a technique of collection and storage of water in the natural reservoir or tank or infiltration of surface water into subsurface aquifers before it's loss as surface run off. In this method we can easily harvest household water of tubewell or submersible hand pump etc. In this study a small pond was constructed which was connected to water system by a drain. Firstly, in a small pond, a sand layer upto 2m thickness was raised followed by the addition of small amount of concrete and finally a pavement was constructed with bricks. The over-flown water from the tube well, submersible etc. reaches the pond by the drain where plants like lotus and small fishes were introduced for the purification of water. With the passage of time some amount of water keeps percolating down the ground enabling the groundwater recharge. The introduction of fishes and plants in the tank renders this process economically viable as well as environmentally friendly. It may prove to be one of the most beneficial and efficient method of water conservation for future generations and contribute towards reaching the goals of sustainable development.

Keywords: *Water Harvesting, Aquifers, Groundwater Recharge, Water Conservation, Sustainable Development.*

Fast Growing Trees High-Density Plantation for Industrial Uses

¹ Anita Tomar, ² Dinesh Kumar, ¹ Anubha Srivastav and ¹ Alok Yadav

¹ Dept. of Forest, Eco-rehabilitation, Prayagraj, Allahabad, Uttar Pradesh

² Dept. of Forest, Dehradun

Plantation forestry outside the forest in India is largely based on fast-growing trees. The boost to tree planting outside the forest was provided by the National Commission on Agriculture, 1976 and the National Forest Policy, 1988. *Eucalyptus*, *Casuarina*, *Populus*, *Melia* etc. are among the most popular plantation trees. Despite this, several policy interventions are adversely affecting the interests of tree growers. Difficulties in obtaining felling and transit permits, absence of a favourable minimum support price mechanism, non-availability of soft bank loans, absence of agroforestry cooperatives, Uncertainty about marketing/ sale of end produce, Small landholding, Poor technical knowhow regarding planting practices and suitable tree crop combinations, inadequate availability of superior planting material, etc., pose serious challenge to the grower. A low level of technical knowledge about tree cultivation too sometimes results in losses to growers. Insufficient research grant is also proving a handicap in technical innovations in plantation forestry. Planting high value agricultural crops is not feasible on degraded community and private lands due to soil moisture and fertility constraints. Establishing high-density woody plantation followed by intensive management serve as the key to utilizing such lands productively. This also helps in meeting the needs of the rural communities, especially in degraded land where smallwood and fuelwood are in short supply. Several fast-growing tree species can be used in such plantations. High-density plantations are not raised and managed on a significant scale for production of wood in north India. However, in Southern and Western India and in Europe and North America such plantations are commercially used for production of biomass for pulp and paper industry as well as for bioenergy. They are cut at short intervals of about four years and the wood is supplied to the industry. Wood chips are made for bioenergy production. The woodlots in India are not managed in this way and hence their productivity is quite low. This practice can be used in Northern India too for production of wood for making pulp, particle board, medium-density fibreboard and as fuelwood. Under this study two high density plantation were established in July 2019 at Prayagraj (N 25° 33' 14.0" & E 081° 54' 22.4") with an allelevation of 86.5 m and Raibareille (N 26° 06'55.5" & E 081° 23'00.0") with an allelevation of 88.2 m. The fast-growing tree species viz. *Eucalyptus*, *Casuarina junghuniana*, *Gmelina arborea* & *Melia composita* etc. is used with a three types of spacing viz. 1 m x 1 m (have 100 plants/plot), 1.2 m x 1.2 m (have 64 plants/plot), 1.5 m x 1.5 m (have 36 plants/plot).The germplasm of selected species were collected from North India. The Species are performing well in both the sites.

This high-density plantation and their intensive management can be a key for utilizing degraded land productively besides meeting needs of the rural communities, especially in degraded land and hills where wood is in short supply. The present study seeks to establish high-density plantations of mentioned species according to site, study their initial performance and develop guidelines for future maintenance. The study funded by Indian Council of Forestry Research and Education (ICFRE) also aims to develop technique for producing industrial wood and fuel wood with this method.

Keywords: *plantation, spacing, wood, fuelwood, degraded land.*

Forest Resources Value Addition at Community Level

¹ Rajbhanu Patel, ² Ajay K Singh and ³ Pushpraj Singh

¹ Dept. of Economics, Guru Ghasidas Central University, Bilaspur, Chhattisgarh

² Dept. of Forestry, Wildlife & Environmental Sciences,
Guru Ghasidas Central University, Bilaspur, Chhattisgarh

³ Dept. of Rural Technology and Social Development,
Guru Ghasidas Central University, Bilaspur, Chhattisgarh

Forest resources are source of many goods, services and amenities for the Indian communities. Forest dwellers, farmers and skilled peoples are directly or indirectly participate to generate and improve their income by value adding by forest. A variety of value-adding activities are undertaken in small scale forestry in different parts of the country. This includes production of fuel wood, charcoal, timber, furniture, non-wood forest produces and other novelty items. Value-adding encourages smallholders to plant more trees. Community forestry allows smallholders to work together to increase productivity and creates opportunities for value adding. But smallholders always lacking resources and other technical knowledge to functionalise the value adding activities with forest resources. Forest department and other related agencies have required to help smallholders in the processing of papers to make the venture legal and in establishing market linkage for the product that they will produce. This will helpful for the smallholders to promote himself to uplift in the community level and for the better use of forest resources in value adding.

Keywords: *Value-adding, Smallholder forestry, Product diversification, Fuel wood.*

Status of Demand-Supply Gap of Timber Species in Ballia District of Eastern UP

Hari Om Shukla, Anubha Srivastav, Anita Tomar,
S. D. Shukla and Amit K. Kushwaha

Forest Research Centre for Eco-rehabilitation, Prayagraj, Uttar Pradesh

The growing demand supply gap especially in meeting people's basic needs in rural area & non-involvement of stakeholders in protection and management of forests, are the main reasons for forest degradation. The gap will grow rapidly in future unless large-scale regeneration operations and plantations are taken up by adoption of agroforestry on private land of farmers and other tree growers. In Eastern U.P., majority of the farmers are marginal and depend largely on tree based products for their livelihood on timber, firewood, food, fodder and non timber forest products. In present scenario, the status of forest area including tree cover is in very challenging position in districts of Eastern UP (FSI, 2017). The report of FSI states that forest area in Ballia district is 0.74.% of the total geographic area which is far behind the national target of 33 % as per national forest policy. Therefore, an effort has been made to study the current status of demand supply gap of important timber species viz. Mango (*Mangifera indica*), Shisham (*Dalbergia sissoo*), Neem (*Azadirachta indica*), Bamboo (*Bambusa vulgaris*), Sagaun (*Tectona grandis*), Desi Babool (*Acacia nilotica*), Mahua (*Madhuca longifolia*), Eucalyptus (*Eucalyptus sp*) in Ballia district of Eastern UP. The District Ballia is divided into 6 Tahsils, 17 Development Blocks and 2372 villages. A total of (1%) villages were studied in the district on random selection basis for general information of villages, land use pattern, classification of farmers, demand supply gap for timber and choice of species in future plantations. It was found that 85.70 % farmers were marginal in the district and 79.64% land was used in agriculture. Only 12 % people were involved in agro forestry. While studying demand supply gap of timber for important species, it was found 452104 qt. /yr for Shisham, 356038 qt. /yr for Teak, 1157062 qt. /yr for Mango, 67602 qt./yr for Bamboo, 188242 qt. /yr for Babool, 201146 qt. /yr for Neem, 548407 qt./yr for Mahua and 40561 qt./yr for Eucalyptus. It was also found during survey that farmers prefer fruit yielding species as Kalmi Mango and Aonla, timber yielding species as Teak and Eucalyptus. It was concluded from the results that important traditional species as Neem, Deshi Mango, Shisham and Mahua were in very less in new plantations. In general, only old trees of these species were recorded in the district. Thus, it is suggested that plantation of these species on regular basis is required to maintain sustainability in the region. Thus, it was found that status of agroforestry in the studied zonal area of the region is in developing stage and needs to be improved by imparting technical knowledge about planting material, methods and sale of end produces of trees to the farmers and tree growers. To reduce the wide demand-supply gap, promotion of use of alternative sources of energy and plantation of these species in Afforestation projects should be promoted.

Keywords: *Agroforestry, timber species, demand –supply gap, afforestation projects, sustainable development.*

Assessment of Trees Outside Forests in Varanasi District of Eastern Uttar Pradesh

Anubha Srivastav, Hari Om Shukla, Anita Tomar,
S. D. Shukla and Amit Kumar Kushwaha

Forest Research Centre for Eco-rehabilitation, Prayagraj, Uttar Pradesh

In India, the Eastern region of Uttar Pradesh is still lacking massive tree plantations on farm lands. Insufficient knowledge of suitable tree species and their proper combination with agricultural crops, unorganized and fragmented marketing facilities of the tree produce are the major hurdles in the way to success. Thus, this study has been undertaken with a view to assess status of important tree species outside forests viz. *Tectona grandis* (Teak), *Dalbergia sissoo* (Shisham), *Mangifera indica* (Mango), *Azadirachta indica* (Neem), *Madhuca longifolia* (Mahua), *Eucalyptus sp.* (Eucalyptus), *Phyllanthus emblica* (Aonla) in Varanasi district of the region for identification of deficit tree species of the region and recommending them in future afforestation programmes. There are eight developmental blocks in the district and out of 1277 villages, 1.0 % villages were randomly selected. The status of selected tree species were assessed on the basis of classifying into different diameter classes at an interval of 10 from 0-100 cm. The existing plantations of these species showed that Mango (15.74%), Teak (49.5%), Shisham (4.34%) Neem (9.65%) and Eucalyptus (4.51%) were planted in the villages. The status of other species as Mahua (3%) and Aonla (1.5%) were lower in number and other 11.76 % plantations were covered by other important timber species. Most of the Teak trees were in diameter class 11-20 cm (46.38%), In case of Mango, mostly trees were in diameter class of 51-60 cm (16.20%). It is also worth mention here that new plantations of Mango were of 'Kalmi' variety and 'Desi' variety has become negligible in plantations. Similarly, majority of Neem trees were existing in diameter class of 31-40 cm (20.79%) and in case of Mahua most of the trees were in diameter class of 81-90 cm (15.57%). It is clear from the existing status of these tree species in Varanasi district of the region that to maintain sustainable availability of these species in future, massive plantations of these species in agroforestry/ orchards through farmers, NGOs and other plantation agencies are urgent need of time. It was concluded from the results that status of agroforestry in the studied zonal area of the region is in developing stage and needs to be improved by imparting technical knowledge about planting material, methods and sale of end produces of trees to the farmers and tree growers.

Keywords: *Tree species, diameter class, agroforestry, sustainable availability.*

Importance of Native Trees in Cyclone Management

Mahua Chatterjee

Dept. of Geography, Lady Brabourne College, Kolkata

Cyclone usually accompanied by violent storm and bad weather is one of the most dangerous and devastating natural disasters that caused severe loss to life, property and biodiversity. It is predicted that the frequency and intensity of the cyclone will likely to increase in the coming decades under climate change scenario. This study makes an attempt to understand the damage caused by the cyclonic storms particularly along the eastern coastal plain of India and potential use of indigenous plant species in reducing the vulnerability. Native plants are easier to grow and do not require any fertilizers. Social and agro-forestry with conservation and protection of natural forests are the useful means in mitigating the adverse impact of deteriorating environmental condition on human society. However, the selection of species for plantation is to be made taking into consideration local needs, soil, climate and environmental conditions. As cyclone moves from the high seas towards the coastal areas, the Casuarinas, Eucalyptus, Cashew, Bamboo and other hardy trees should be planted to act as windbreaker in coastal area against cyclone which forms the first defence. Instead of removing native species from a particular ecosystem, it is suggested therefore to plant native trees, shrubs in human dominated landscape which helps to combat natural disaster restoring the health of ecosystem. More research work is needed to focus on ecosystem based disaster risk reduction; when disaster strikes, a resilient ecosystem can help people to cope with and recover better.

Keywords: *Disaster, biodiversity, coastal area, ecosystem.*

Assessment of Forest above Ground Biomass using Earth Observation Data Over The Lakhimpur Kheri District in Uttar Pradesh, India

Anuj Kumar, V. C. Chaturvedi and Ankit Singh Gautam

Dept. of Botany University of Allahabad, Prayagraj, Uttar Pradesh

Forest Above Ground Biomass (AGB), is one among various parameters recognized as key parameter for the wellbeing of the forest. Estimation of accurate forest AGB is crucial for sustaining forest management and mitigating climate change to support REDD+ (reducing emissions from deforestation and forest degradation, plus the sustainable management of forests, and the conservation and enhancement of forest carbon stocks) processes. Recently estimation of forest biomass using Earth Observation data has received increasing attention for several reasons. The European Space Agency's (ESA) Sentinel-1 constellation provides synthetic aperture radar (SAR) images coverage with a 6-day revisit period at a high spatial resolution using C-band frequency (8 – 4 GHz or 3.8-7.5 cm). The said images are free for use and can be easily accessed. The objective of this work is to assess the capabilities of multitemporal radar images of Sentinel-1 in forest AGB retrievals. The study is carried out on multitemporal Sentinel-1 dataset acquired from Copernicus Sentinel online data hub for July 2018 to September 2018 over the Lakhimpur Kheri District in Uttar Pradesh state of India. The ground truth biomass measurements were made in the same period. The study area basically comprises of sal forests, forest plantations, grasslands, croplands, settlements, wetlands and the water bodies. To achieve the objective of our study, the Sentinel-1 data of the study area was processed against the ground measurements using SNAP / the Sentinel Toolboxes developed by ESA. A backscatter coefficient from VV (Vertical receive and Vertical transmit), VH (Vertical receive and Horizontal transmit) polarizations was estimated for biomass. Relationship between backscattering coefficients and ground truth biomass was obtained. We demonstrated that the correlation of Sentinel-1 signal to the biomass was very high in VH polarization (with Random Forest method) but still has a much lower adjusted R^2 due to the limitations of the short wavelength. This study shows that Sentinel-1 C- band SAR data could be used to produce acceptable AGB estimates in forest to compensate for the unavailability of longer wavelength SAR.

Keywords: forest; above ground biomass; Synthetic aperture radar; Sentinel-1.

Biofuel : An Alternative Source of Energy

S. Malviya

Dept. of Zoology, S.S. Khanna Girls' Degree College, Prayagraj, Uttar Pradesh

Increasing concern over rising petroleum prices and the role of fossil fuels in global warming, biofuel has been proved to be a cost-effective and environmentally safe alternative to petroleum and other fossil fuels. Biofuel term refers to any fuel that is derived from biomass i.e., plant or algae material or animal waste. Biofuels are a renewable energy source, made from organic matter and can play a valuable role in reducing carbon dioxide emissions. Now a days most biofuels are produced from agricultural crops and are called conventional biofuels but there are many new technologies and processes that produce fuels from waste, inedible crops or forestry products are being developed and these fuels are known as advanced, or second-generation biofuels. Advanced biofuels are likely to become the primary form of biofuels in the future as they can improve their sustainability. Some workers express concerns about the scope of the expansion of certain biofuels because of the economic and environmental costs associated with the refining process and the potential conversion of vast areas of agricultural land to the land for biofuel production.

Keywords: *Biofuel, Renewable energy, Fossil fuel.*



GROUP - L

Role of NGO's to Protect Environment



Role of Ngo's To Protect Environment

M.P. Singh

Dept. of Zoology, Paliwal (P.G.) College, Shikohabad, Firozabad, Utter Pradesh, India

NGO is a Non governmental organisation. These organisations are spread all over the India. These help in the society by many ways. Many policies are conducted by the help of these organisations like old age homes, Orphan Ashrams, hospitals and many other Institutions are governed by the NGO's. These help people which are poor and want co-operation really. Their concerns is focused on various areas like social issues, health issues, public issues, religious issues and environmental protection etc. Many NGOs display weekly, monthly and annual programs in favour of environment. United Nations Environment Programs(UNEP), World Wide Fund for Nature, Earth Day and Friends of the Earth are International notable environmental organisations which work for environment. Bombay Natural History Society was initiated in 1881 by 7 residents of Bombay. It was totally temporary agency which worked for wildlife. In a district level there are so many organisations which work on separate objects. The objectives of NGO's is to act as catalyst in bringing about local, national and international initiative and community participation in overall improvement in quality of life. In India there are millions of NGO's which work on different objectives like education, arrangement of health check up camps, tours on religious places on minimum amount etc. Thus we can say that NGO's play a vital role in protection of the environment. Without the help of NGOs government cannot do everything properly.





Published by:
International Foundation for Environment and Ecology
Kolkata, West Bengal
icee.contact@gmail.com
ifee.foundation@gmail.com

