

BOOK OF ABSTRACTS

7th International Conference on Environment and Ecology (7th ICEE 2021)

Theme:
Make India Clean as well as
Cleaning up Technologies

Jointly Organised By:



*International Foundation for
Environment and Ecology,
Kolkata, West Bengal*



*Dept. of Environmental
Science, Bharathiar
University, Tamil Nadu*



*Dept. of Zoology, Govt.
Degree College, Bhadarwah,
Jammu & Kashmir*



*Dept. of Zoology,
Mahishadal Raj
College, West Bengal*

Date: 26, 27, 28 November 2021

 **Google Meet**

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International Conference on Environment and Ecology

Man's capability to transform his environment can bring the benefits of economic development and an opportunity to enhance the quality of life. But this same power incorrectly applied for a long span of time has led to depletion of resources and at the same time caused immense harm to the natural environment and consequently to human life. Delayed remedial action will cost considerably more and the damage will become irreversible. The need of the hour is to plan a balanced system giving due importance to socio-economic, technological and ecological factors for the proper allocation of resources in order to fulfill the needs and aspirations of present and future generations without degrading the environment.

The International Conference on Environment and Ecology (ICEE 2021) will provide an opportunity to discuss current environmental issues, promote greater collaboration and strengthen the connection among scientists, policymakers and activists. The conference will further help in developing a strong network among scientists, academicians, voluntary organizations, youths including students and teachers along with community people to share their expertise in order to find integrated and comprehensive solutions for different environmental issues affecting the planet earth.

History of ICEE

The inception of ICEE took place at Science City, Kolkata in the year of 2015 which was attended by many delegates and research scholars of different parts of India as well as out of India.

The 2nd ICEE, was held at Bharathiar University, Coimbatore, Tamil Nadu in 2016 organized by the Department of Environmental science under the dynamic leadership of Prof. Manimekalan Arunachalam, HoD of Environmental Science.

The 3rd ICEE was in 2017 at St. Xavier's College, Ranchi which is a premier institution of the State of Jharkhand, imparting quality education and has remained a centre of excellence till date. Dr Ajay Srivastava, HoD of Botany coordinated the whole event.

The 4th ICEE was hosted by Department of Zoology, Gauhati University, Guwahati, Assam in the year 2018 and *the 5th ICEE* was held at Christ College, Pune, Maharashtra. *The 6th ICEE* was organized by Department of Botany and Centre of Environmental studies, University of Allahabad in the year 2020.

Due to COVID 19 national lockdown was imposed, hence the Organisers decided to host the event in online mode.

Conference Goals

- To generate new knowledge related to understanding the background and causes of different ecological and environmental events at the local and global level.
- To bring together the world's leading scientists, economists, and policy experts to explain the often-neglected debate on environmental and ecological issues.
- To share the results of the conference with policymakers, civic and business leaders, and the interested public in order to arrive at constructive and progressive approaches to abate environmental problems and ensure sustainability.
- To set the groundwork for future conferences and publications on environmental and ecological issues.

International Foundation for Environment and Ecology

International Foundation for Environment and Ecology (IFEE) 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 headquartered in Kolkata. Established with the main objective of locating avenues for alternative employment creation beside designing a neological as well as neocratic approach to research and entrepreneurship in the field of environment and ecology among the younger generation all over the world in general and India in particular with a view to bringing peace on earth by having country wise appropriate solution for the burning problems like pollution, poverty, over population, unemployment, faulty educational system, training methodologies, etc., International Foundation for Environment and Ecology (IFEE) has decided to design a master plan paradigm (2015-25) for a new world order.

The activities of IFEE will include the strategies for creating more researchers besides dissemination of appropriate technologies among the nations for ensuring a balanced and a sustainable growth in all countries of the world by application of clean as well as cleaning-up technologies for climate change management, environmental and disaster education, geriatric care, waste management, green business and technologies besides strengthening of diplomatic relations among nations for protecting our Mother Earth.

The idea is also to promote entrepreneurial educational leadership among the school and the college going boys and girls by "Catching Them Young" and for designing appropriate messages for the educators to see that they produce a greater number of job givers rather than job seekers.



Bharathiar University, Coimbatore, Tamil Nadu

The Bharathiar University was established at Coimbatore by the Government of Tamilnadu in February 1982 under the Bharathiar University Act, 1981 (Act 1 of 1982). The erstwhile Postgraduate Centre of the University of Madras formed the core of the Bharathiar University, which was functioning at Coimbatore before 1982. University Grants Commission (UGC) recognized Bharathiar University in 1985 for grants.

The University has 39 Departments, offering 54 post-graduate programs besides offering M.Phil and Ph.D. programs. The University is an affiliating University. The jurisdiction of the University covers the districts of Coimbatore, Erode, Tirupur, and The Nilgiris with 133 affiliated colleges.

The National Assessment and Accreditation Council have accredited the University with an 'A' Grade in the third cycle assessment. Bharathiar University is marching towards becoming a World Class University by garnering ranking in the International arena. Times Higher Education Young Universities World Ranking ranked our University in the range of 201 to 250. We stand at 13th rank under the category of University and 21st among the top 100 institutions in the MoE's National Institute Ranking Framework's (NIRF) ranking. In 2021, Bharathiar University secured a ranking in the range of 801-1000 in the Times Higher Education World University Rankings.

The state-of-the-art facilities available for faculty members and scholars nurture a culture of research in cutting-edge areas. Industry infusion into the curriculum is given prominence by involving industry experts - R&D managers, product development managers, technical managers in the curriculum development as special invitees in the Board of Studies.

Our University is a partner in the MHRD National Knowledge Network. Through UGC - Infonet, and Inlibnet a collection of physical and electronic resources is available. The Intellectual Property Rights Cell of Bharathiar University protects the rights of inventions of faculty and young researchers in the University. The DRDO-BU-Center

for Life Sciences was established in Bharathiar University as a joint venture by DRDO, Ministry of Defence, Government of India, as an autonomous research institute to pursue basic and applied research.

Bharathiar University Centre for International Affairs (BU-CIA) facilitates admission of international students through study in India (MoU) and Indian Council for Cultural Relations (MEA). BU-CIA operates in liaison with the Association of Indian Universities, the Association of Commonwealth Universities, and Shastri Indo Canadian Institute.

With a dedicated team of faculty with vast experience in teaching and research and dedicated and experienced administrative members, the University has emerged as one of the strong pillars of higher education in this region.

Department of Environmental Sciences

The Department of Environmental Sciences was started in 1986 as one of the new departments when Bharathiar University was formed in 1982. The Department of Environmental Sciences was started with nature-based Solution (NBS) objectives and addressing the solution for Regional, National and Global Environmental and Ecological related issues. From the beginning onwards the Department has been promoting excellent teaching, commendable research, and society-based extension activities in Environmental Sciences as part of the state and national attributes.

The Department has three Professors, six Assistant Professors, one technical officer, one Gardner and one administrative staff. The Department has the following specialization, Biodiversity and Aquatic Ecology, Bioresource Technology, Environmental Microbiology, Environmental Ecology, Bioremediation, Environmental Biotechnology, Environmental Toxicology, Green technology and Marine Ecology and Conservation.

The Department has conducted many National and International Seminars and Refresher Courses for college teachers sponsored by UGC. The Department is also periodically conducting different training programme for the University and College teachers, Scientists, school children and publics with related to Environmental issues. Both faculty and students have published several papers in National and International journals. Faculty members are operating projects funded by various central agencies. Collaborative research schemes are also being operated in the department. Participation in the National and International conferences and presenting the research contribution are regular features of the department. Faculty members are also deputed to attend International conferences conducted by the University other Research Institutions and Government of India.

We also offer extension services along with field/industrial visit, which include Vermicomposting/Bio composting Technology, Solid Waste and Agro Waste Management, Conservation of Threatened /Endangered Plant and animal Sources, Indigenous Rainwater Harvesting techniques, Urban Greening, Plastic Eradication, Phyto and Microbial remediation, Water and Soil Quality Monitoring, Neglected Crop Sources and Environmental Food Security, Marine Ecology, Pollution and Environmental Toxicology, Environmental Education, Remote Sensing, Ecological Tourism, Natural Disaster Management. The Department is also having enough lab facilities and are being provided to Post-Doctoral Fellows (PDFs) to carry out the proposed thrust area of research work.

The Department Research focuses on Freshwater Fish Morphological and Molecular Taxonomy, Biodiversity and Conservation River Ecology; Remote sensing and GIS, Microplastic pollution and their characterization in sewage wastewater and soil and their impact on plant and animal growth performance; Bioremediation, Plant-metal-microbe interaction, Climate change biology; Impact of Climate Change on Plants; Plant Carbon Stock Assessment; Ecology of Tufted Grey Langur; Documentation of Traditional Knowledge; Environmental Monitoring, Bioremediation; Environmental Biotechnology, Industrial Biotechnology, Agricultural Biotechnology, Green Biotechnology; Environmental Health, Systems Biology and Toxicology, Exposomics; Algal Cultivation for Climate Mitigation and Environmental Clean-up, Utilization of Seaweed for industrial applications, Microbial technology; Marine and Coastal Ecology and Monitoring, Marine Pollution, Marine and Coastal benthic biodiversity.



Government Degree College Bhadarwah (GDCB)

Jammu & Kashmir

Govt. Degree College Bhaderwah was established in the year 1955 when Mr. Bakshi Ghulam Mohammed, the then Prime Minister of the J&K state laid the foundation of the College. The College was started with few subjects of Science and Arts. It got recognized by the U.G.C in August 1955 under section 2F & 12B of U.G.C act, when U.G.C itself was established. Initially the College started with 52 students on its roll and now its strength has risen to 1200. The Govt. Degree College Bhaderwah is managed by the department of Higher education, Govt. of J&K. At present the College is imparting education in the subjects like Science, Arts, Commerce, Economics, Computer Sciences, Electronics and Literature. Apart from this the College has been upgraded in the year 2004 to level of P.G and is offering Master Degree in Chemistry and Urdu.

Presently the College has a limited intake capacity and the admission is open to both male and female students. In fact College has the honour of being the nodal College for other institutions of two hilly districts Doda and Kishtwar. Since its establishment college has been an epitome of academic excellence, adhering to the ever-changing demands, quality and needs of the students.

The College is situated in the lap of the Himalayas in a beautiful cup shaped valley of bhaderwah surrounded on one side by Kaplas and on the other side by Ashapati Mountains- a tall range separating this beautiful valley from District Chamba of Himachal Pardesh. The College is spread over an area of 61.6 kanals with lush green lawns. The College has well equipped laboratories of Computer Science, Chemistry, Botany, Zoology, Physics, Geography and Electronics with spacious classroom, a central library with 40,000 books including some rare collections and a multipurpose hall. Besides this, the College is equipped and latest teaching audio visual aids, state of the art information technology labs with all the gadgets, EDUSAT lab-A Government of India initiative for imparting trainings through satellite transmission. The College has one mini stadium and another playground. There are two hostels one for boys and one for girls. The College has two buildings having four independent flats each meant for the teaching staff.

Mission:

Our Mission is to provide the world class quality education to the learners and training in multiple skills, inculcating in them the scientific temper, scholastic inquest, national, human and spiritual values to keep them inspired and motivated in pursuit of knowledge.

Vision:

To evolve into a premier institute of higher learning and to produce the quality graduates who have the quest for excellence and the capability to serve the society with their intellectual capacity and young talent preserving the national, human and spiritual values



Mahishadal Raj College

Mahishadal Raj College is the third oldest college in the undivided district of Midnapore and fiftieth one under University of Calcutta. The college was founded on August 1, 1946 by Kumar Debaprasad Gagra Bahadur, the then “Raja” of Mahishadal and a celebrity in the field of music and fine arts. Now the College is affiliated to Vidyasagar University since 01.06.1985, vide letter no. 983-Edn (U) dt. 23.05.1985. It is situated only twenty kilometers from both Haldia (a potential Industrial Town of W. B.) and Tamluk (the District Headquarter Purba Medinipur). The College has immensely benefited from its location in a lush green and unspoiled countryside. The result is a pleasant, placid campus which is free from all baneful influences unifies mofussit simplicity and urban refinement.

The College was established at a period when Quit India Movement got its momentum at Mahishadal. Scores of lives were sacrificed here. The first National Government during the British colonial rule was formed and headed by Sri Satish Chandra Samanta, the beloved son of Mahishadal. Gandhiji came here and stayed for five days and extended full support to the Patriotic Congressman who indulged in some violent attacks against the British Raj. Nirala (Surya Kanta Tripathi), the famous Hindi Poet got his schooling here.

The foundation stone of main building was laid by Sir Federick John Burrows, Hon’ble Governor of Bengal. The College Building was inaugurated by Sri Kailash Nath Katzu, Hon’ble Governor of West Bengal on 3rd January, 1949. The Science Block was inaugurated by Prof. Satyendra Nath Bose, the famous Scientist and National professor on March 2, 1959. On February 3, 1996, Sri K. V. Raghunath Reddy, Hon’ble Governor of West Bengal inaugurated the Lib-Lab Building. The foundation stone of Diamond Jubilee Memorial Building was laid by Sri Gopal Krishna Gandhi, Hon’ble Governor, West Bengal on August 1, 2005.

MISSION & OBJECTIVES

The logo of the college properly reflects its missions. They are Wisdom, Values and Progress. Founded by the Mahishadal Raj during the days of fierce freedom movement at Mahishadal to enable the poor mofussil boys and girls to promote their higher

studies at a very low cost (“after matriculation they had to give up higher studies due to prohibitive cost of education in the metropolis”) and to bring prosperity in the area by diffusing the light of education and to inculcate high moral values, the college to-day is also committed to providing excellence in education at the undergraduate level in order to empower the rural youth with breadth of knowledge and depth of experience that provide meaningful contribution to their career and also to the community. For this purpose, during the last six decades, the college geared all its academic and extension activities in this direction. To achieve the goals stated in the mission statement the college faithfully follows the following basic objectives:

1. To provide qualitative and useful teaching in order to prepare the students for higher education.
2. To develop personality, quality of leadership and good citizenship in students.
3. To inculcate ethical and moral values.
4. To create teachers for the future generation.
5. To prepare the students for entering into a bright career, meeting the social, economic and other challenges, and contributing to peace, human unity and universal welfare.
6. To enhance creative skills.
7. To develop sense of social services and patriotism through community services.
8. To ensure the commitment to the society as a COMMUNITY COLLEGE.

International Foundation for Environment and Ecology

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Abstracts

Food Security, Food Safety & Climate Variables - India

Tridib Bandopadhyay

Scientific and Environmental Research Institute

Food is a human right, not just 'a commodity to be traded' said Guterres, UN Secretary General. Food systems support 3.2 billion people's livelihoods and comprises all food products, from crop and livestock production to forestry and aquaculture. It encompasses economic, social activities - processing, packaging, transportation, storage, retail, consumption, process-losses, wastages and the natural environmental impacts. As for India, the food production continues to rise from 217 million tonne in 2006-07 to the present 308.65 million tonne in 2020-21. As per Govt. records, the country is now self-sufficient in foodgrains. But that notwithstanding, an estimated 821 million people remain undernourished even now. Another 613 million women and girls, aged between 15 to 50, suffer from iron deficiency and 151 million children under five face stunted growth. But increased production could not ensure accessibility for all sections of population for purchase-power parity. Other reason is with income growth in middle-class population resulting alteration of food-system, higher demand for animal products. Also, there are most severe impacts of climate variables. Swathes of India increasingly battles deadly floods and landslides with changing monsoon patterns every year. In the first seven months of 2021 alone the impoverished nation of 1.3 billion people experienced two cyclones, deadly glacier collapses in the Himalayas, sweltering heatwave and killer floods. The UN Food and Agriculture Organization (FAO) estimated, there is need to produce 50% more food by 2050 to ensure feeding the increasing population. There is a growing concern about non-judicious use of chemical fertilizers and unregulated animal products. COVID-19 pandemic has given the world the 'One-Health' vision. According to FAO's estimates, inferior quality of diets is linked to eleven million deaths per year. As per Living Planet Report 2020 by WWF, earmarking increasingly more land for agriculture to produce more has caused 70% of global biodiversity loss and 50% of all tree cover. Intense agriculture, processing and food-production/distribution chain account for 25% of all anthropogenic GHG emissions. But India has to pursue intensive agriculture for its sustenance. The share of agriculture in GDP has reached almost 20% for the first time during 2020-21, according to the Economic Survey. The resilience of farming community in the face of adversities made agriculture the only sector to have clocked growth of 3.4% while other sectors slid under COVID impacts. The Government's commitments in IPCC COP26 to bring down emissions overall shall be even harder due to emissions from agriculture.

Keywords: Food systems, Food security, Human right, Livelihoods, Agricultural emissions

Fish Diversity of Ramgarh and Bakhira Lake: Comparison of Present Status with Pristine Data for Conservation and Sustainable Utilization

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Surveys of Ramgarh (Gorakhpur) and Bakhira Lake (Sant Kabir Nagar) conducted during March 2013-February 2015 revealed the presence of 42 native and 5 exotic species of finfishes (total 47) belonging to 9 orders, 17 families and 33 genera. Cypriniformes dominated with 17 species, followed by Siluriformes 12, Perciformes 7, Clupeiformes 3, Synbranchiformes 3, Osteoglossiformes 2, Mugiliformes 1, Beloniformes 1 and Tetradontiformes 1 in the former. Present conservation status of these taxa being 1 DD (Data deficient), 2 Endangered (EN), 37 Least concerned (LC), 5 Lower risk-near threatened (LR-nt), 1 Not evaluated (NE), 01 Vulnerable (VU) in Ramgarh Lake. The existence of 54 native species of teleosts belonging to 9 orders, 20 families and 40 genera were recorded in Bakhira Lake while none of the exotic species was encountered in the lake. Cypriniformes dominated with 21 species, followed by Siluriformes 11, Perciformes 9, Clupeiformes 3, Synbranchiformes 2, Osteoglossiformes 2, Mugiliformes 1, Beloniformes 1 and Tetradontiformes 1. Present conservation status of these taxa being 2 species Data deficient (DD), 1 Endangered (EN), 44 Least concerned (LC), 4 Lower risk-near threatened (LR-nt), 2 Not evaluated (NE) and 1 Vulnerable (VU) in this water body. Both the lakes harbour good quantities of small indigenous freshwater fishes (SIFs) contributing towards nutritional security of the local communities.

Physico-chemical parameters such as temperature, pH, DO, DCO_2 , BOD, COD, conductivity, total dissolved solids (TDS), total solids (TS), dissolved solids (DS), suspended solids (SS), fixed solids (FS), volatile solids (VS), chlorides, sulphate, fluoride and oil and grease contents of Ramgarh Lake were significantly higher as compared to those recorded for Bakhira Lake. Conductivity of Ramgarh Lake water was high as compared to those recorded for Bakhira Lake pointing to heavy metal load in the water. The physico-chemical characteristics of Bakhira Lake were within the optimal range for fish life.

Histo-pathological studies of gill of the air-breathing fishes living near N.E.R. Railway Colony sewage discharge point (Mohaddipur) of Ramgarh Lake depicted varying degrees of pathological changes including oedematous separation of epithelial lining cells from pillar/pilaster cells, telengactasis and filling of interlamellar spaces while liver, kidney and intestine depicted mild cyto-architectural alterations. Interestingly, these tissues of the fishes inhabiting Bakhira Lake did not exhibit such degenerative changes suggesting better water quality.

Socio-economic status of fishermen belonging to Fisheries Co-operative Society of Meharva-ki-Bari and Sorahia Tola (Gorakhpur) and Mehdawal (Sant Kabir Nagar), depending on Ramgarh and Bakhira lakes, respectively, showed that occupation, income, fish eating habit, communication facility, situational variables together with seven variables such as age, category, family type, house type, education, contact with extension agency and culture practices were significantly correlated with knowledge of adoption of the available fisheries technologies.

Biodiversity Status and Conservation of Sundarban Mangrove Ecosystem

Binay Kumar Chakraborty

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The Sundarban have been covered about one million ha in the delta of the Ganga, Brahmaputra and Meghna rivers is shared between Bangladesh (60%) and India (40%). The area experiences a subtropical monsoonal climate with an annual rainfall of 1,600-1,800 mm and severe cyclonic storms. Huge amounts of sediments carried by the rivers contribute to its expansion and dynamics. Salinity gradients change over a wide range of spatial and temporal scales. The biodiversity includes about 350 species of vascular plants, 250 fishes and 300 birds, besides numerous species of phytoplankton, fungi, bacteria, zooplankton, benthic invertebrates, molluscs, reptiles, amphibians and mammals. Sundarban is the habitat of many rare and endangered animals (*Batagurbaska*, *Pelochelysbibroni*, *Cheloniamydas*), especially the Royal Bengal tiger (*Pantheratigris*). Javan rhino, wild buffalo, hog deer, and barking deer are now extinct from the area. Large areas of the Sundarban mangroves have been converted into paddy fields over the past two centuries, and more recently into shrimp farms. The Sundarban has been extensively exploited for timber, fish, prawns and fodder. The regulation of river flows by a series of dams, barrages and embankments for diverting water upstream for various human needs and for flood control has caused large reduction in freshwater inflow and seriously affected the biodiversity because of an increase in salinity and changes in sedimentation. *Heritierafomes* (locally called Sundari), *Nypafruticans* and *Phoenix paludosa* are declining rapidly. Presently large parts of the remaining Sundarban have been protected for wildlife, particularly tiger, through the creation of several sanctuaries. Parts of the Sundarban in both India and Bangladesh have been declared World Heritage sites. However, its biodiversity continues to be threatened by a growing human population that not only places pressure on its biological resources, but also impacts on the freshwater inflows from upstream areas. Oil exploration in coastal areas is also emerging as a new threat. Further threats arise from global climate change, especially sea level rise. So, the future of the Sundarban will be protected on the management of fresh and coastal water resources and the conservation of its biological resources.

Role of Maize (*Zea mays* L.) for Food Security Under Changing Environment

**Manigopa Chakraborty, Priyanka Kumari, Mukesh Kumar Mahto
and Shweta Singh**

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Maize (*Zea mays* L.) is a major cereal crop which plays a very important role in human and animal nutrition in a number of developed and developing countries, world wide. Maize is the third important cereal in India after rice and wheat. Among all the cereals, maize recorded higher growth rate with respect to area, production and productivity in India. The screening of crop for their performance in variable environmental conditions has become the major concern over decades to cope with the several biotic and abiotic stresses prevailing due to global climate change. Superiority in yield and yield stability throughout the variable environment condition are the major criteria for crop improvement and food security in india. Due to the strong demand for maize as livestock feed, it is expected that the demand for maize will grow faster than that for wheat forecast that the demand for maize in the developing world will double between 2010 and 2050. Food security is affected by diverse climate to huge extents in india. While most environmental aspects have negative impacts on especially the availability and stability of food security in our country, the adoption of modern breeding technology and some policy approaches are expected to result in positive outcomes. Changing demand- and supply-side factors will impact on maize prices. It is forecast that maize prices will rise by 34% up to 100% between 2010 and 2050. Increasing prices of maize grain make it less affordable for poor consumers in several regions of the india. Many poor people across the india as well as in world still facing challenges in terms of securing caloric intake and/or securing a diverse quality diet. Maize crops in India suffer from many newly emerging and invading biotic stresses, i.e. insect pests/ diseases/weeds. For sustainable maize crop production, it will be worthwhile to switch into breeding programme to develop resistant and tolerant variety measures rather than protecting the crops by traditional methods of pest management which are now outdated and incompetent. Emphasis must be laid on the identification of maize genotypes with respect to biotic and abiotic stress resistant based upon conventional breeding techniques, advance breeding tool by using molecular markers, tissue culture etc.

Potential Modules of Integrated Farming Systems and Ancillary Activities in Karnataka

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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.

Methodology

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

Results and Conclusion

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.

Conservation of Biodiversity and Its Role in Rural Livelihood of Jharkhand

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Biodiversity underpins ecosystem services, productivity and resilience ecosystem processes such as tree growth, Carbon sequestration, seed dispersal and nutrient depending upon biodiversity. 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 Singbhum, West Singbhum, Gumla, Hazaribagh and Chatra districts. Tribes living in and around the forests of these districts are much dependent upon forests for their livelihood. 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 is a sustainable source of livelihood and also influence cultural religious aspects of our country. But 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. 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* spp.), 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.*

**Evaluation of Native Isolate of *Metarhizium rileyi*
(Deuteromycotina: Hypomycetes) Against Maize Fall
Armyworm (FAW) *Spodoptera frugiperda*
(J. E. Smith), Raichur, Karnataka, India**

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Twelve native entomofungal strains of *M. rileyi* were evaluated against 3rd instar larvae of the maize fall armyworm (FAW) *Spodoptera frugiperda* (J. E. Smith) in a laboratory bioassay. Among the six strains tested, *M. rileyi* UASRBC-Mr19 showed LC₅₀ of 6.00 x 10⁸ spores/ml and UASRBC-Mr2 showed LC₅₀ of 2.00 x 10⁶ spores/ml. Field evaluation with these twelve promising strains were conducted against maize fall armyworm during 2021 at UAS Raichur, Karnataka, India. Field trial results indicated that highest per cent reduction was recorded in *M. rileyi*, UASRBC-Mr19 (91.34 per cent) followed by *M. rileyi* UASRBC-Mr2 (89.50) on 20 days after spraying and increase in yield were observed in the plots treated with these twelve entomofungal pathogen. Maximum yield recorded in *M. rileyi*, UASRBC-Mr19 (9656.52 Kg/ha) treated plot followed by *M. rileyi* UASRBC-Mr2 (8726.67 Kg/ha). The results revealed that the strain UASRBC-Mr19 was found to be very effective in suppressing the fall army worm.

Keywords: *Spodoptera frugiperda*, *Metarhizium anisopliae*, *Metarhizium rileyi*, maize.

Unravelling of Ethno-medico-botanical knowledge for Drug discovery - Relevance of Ethnopharmacological Approach

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The common global challenges we face today are ending poverty, achieving zero hunger, improving the nutritional status of the people, promoting sustainable agriculture, improving the health status of the people, providing affordable health care services, and combating climate change. Ethno-medico-botany has a potential role in overcoming one of the most important challenges i.e. improvement of health status of the people. An integrated approach involving a blend of traditional knowledge and modern advancements in science can contribute to achieving the Sustainable Developed goals if planned and implemented properly. India, especially Kerala is sitting on a gold mine of traditionally well-practiced knowledge of herbal medicine. The usage of plants for various purposes by indigenous and local communities which includes traditional /ethno- medico-botanical knowledge, which is not well documented by indigenous people, but has been orally and vertically transmitted from generation to generation. However, ethnobotanists have played an important role in unravelling and documenting these plant-people interactions and unlocked the knowledge by conducting various types of interviews and surveys. The proper identification, utilization, and conservation of medicinal plants can assist in providing better alternative healthcare services in rural areas, especially in developing countries. Linking ethnobotany with other disciplines such as, pharmacology, pharmacognosy, phytochemistry and molecular biology can aid in the identification and screening of important plants for their significant role in treating diseases. Ethnopharmacology and natural product drug discovery remains a significant hope in the current scenario and provides a divergent approach involving indigenous knowledge with current technology for drug development using new approaches. Random screening of plants used traditionally by pharmaceutical industries to discover new leads or drugs is expensive and time consuming but the ethno- directed approach to traditional knowledge has been extremely useful in screening and identification of bioactive compounds with valuable application in drug development. A recent example of model research in ethnopharmacology is discovery of Artemisinin from the plant *Artemisia annua* L., for the treatment of malaria and represents one of the significant contributions of China to global health and the 2015 Nobel Prize in Physiology or Medicine. The application of ethnobotanic botany has expanded considerably and ethnopharmacological research has been applied to practical areas of bioprospecting of drugs. Disclosure of scientific values from local knowledge and local wisdom is expected to support the efforts of “sustainable improvement” by applying the principles of “economically feasible, environmentally feasible, socially acceptable, technologically appropriate and beneficial to the lives of the local communities. The role of ethnobotanical knowledge, indigenous communities, ethnobotanists, ethnopharmacologist etc has to be recognized on an urgent basis in realizing sustainable development goals. The ethnopharmacology knowledge, its holistic approach supported by experiential base can serve as an innovative and powerful discovery engine for newer, safer and affordable medicines for the benefit of mankind in the future.

Effect of Distillery Effluent on Soil Characteristics

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The distillery effluent contains appreciable amount of organic matter and its application significantly alter the physical properties of soil. Hydraulic conductivity of soil is reduced by effluent irrigations due to accumulation of solids at the soil surface. Infiltration rate of the soil was significantly reduced with effluent irrigation. It was found that there was an improvement in saturated hydraulic conductivity and reduction in bulk density of the soil with effluent amendment. Addition of distillery effluent raise the soil pH owing to increase in soil K, Ca, Mg and Na levels and also by the organic matter oxidation brought by microbial activity was responsible for increased pH. Since the distillery effluent is a plant extract, it contains high organic load. Application of effluent increased the available N, P and K status of soil. The exchangeable Ca and Mg content of the soil also significantly increased. Available micronutrient were progressively increased by the graded levels of distillery effluent and the availability being maximum with the application of distillery effluent @ 2.5 lakh liters per acre. As this distillery effluent contains highly biodegradable organic matter with high content of dissolve salts of essential plant nutrients, it is expected to alter soil biological health as well as enzymatic process. Distillery application shorter the period of soil sampling, the smaller was the magnitude of increased in urease activities. Thus scientific utilization of distillery effluent in agriculture would save cost on fertilizers and facilitate reduction in pollution load on the environment and also improve the overall soil health.

Keywords: *Distillery effluent, Soil properties, Sustainability*

Improving Soil Fertility and Crop Productivity through Nuclear Techniques

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Advancing food security and environmental sustainability in farming system require an integrated soil fertility management approach that maximize crop production while minimizing the mining of soil nutrient reserve and the degradation of the physical and chemical properties of soil that can lead to land degradation. Such soil fertility management practices include the use of fertilizers, organic manure, crop rotation with legumes and the use of improved germplasm combined with the knowledge on how to adopt these practices to local condition. The FAO / IAEA division assist in developing and adopting nuclear based technologies for improving soil fertility practices. The isotopes of N¹⁵ and P³² are used to trace the movement of labeled nitrogen and phosphorus fertilizers in soils, crops and water, providing quantity data on the efficacy of use, movement, residual effects and transformation of these fertilizers. Such information is valuable in the design of improved fertilizer application strategies. These N¹⁵ isotopic technique is also used to quantify the amount of nitrogen fixed from the atmosphere through biological nitrogen fixation by leguminous crops. The C¹³ isotope signature helps quantify crop residue incorporation for soil stabilization and fertility enhancement. This techniques can also assess the effect of conservation measures, such as crop residue incorporation of on soil moisture and soil quality. This information allows the identification of the origin and relative contribution of different types of crop to soil organic matter. Nuclear techniques provide data that enhances soil fertility and crop production while minimizing the environment impact.

Keywords: *Soil fertility, Crop productivity, Nuclear techniques.*

Impact of Green Chemistry : From Natural Products to Sanitary Products

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Natural product chemistry is a promising trend in biochemistry, so it was challenged why they wouldn't become a great option in health care products and developed as major constituents of a personal care products. Encouraged by the concept of green chemistry, sanitary health care products such as 'Saathi,' 'Jani,' and 'Suvidha' were created using bio-derived resources. A variety of advantages of natural ingredient derived hygiene products were mentioned, ranging from antibacterial activity to biodegradability. The natural products used have been the most widely used materials found in the surrounding area, varying from wool to cotton, lemon peels, and cane waste. The primary component of building sand Silicon (Si), was engineered in the lab with polymer modification to create low-cost, biocompatible, and ecofriendly menstrual cups. The sustainability is simple to obtain through the virtue of recyclability, where tampons and menstrual cups are the best options. Tampons, as absorbers, are easily made from low-cost and environmentally friendly basic material wool, which also has an antimicrobial texture. Not only should sanitary napkins provide comfort and safety, but they should also improve a woman's health and hygiene. Because of personal hygiene and environmental protection, this technology has potential in the future.

Keywords: *natural product, biodegradability, ecofriendly, personal hygiene.*

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Environmental Issues during the COVID 19 period in Present Scenario

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COVID-19 is a huge tragedy for the world community. Everything in the world is affected due to this pandemic right from economy to resources where the economy of major countries of the world are facing recession and resources are surplus with no takers at all. The measures to contain COVID-19 pandemic include lockdown, social distancing, isolation, and home quarantine. Lockdown adopted by the different governments which involve non-functioning of all the industry and manufacturing units. However, as a blessing in disguise, these measures have a positive effect on the environment in terms of reduction in toxic gasses like nitrogen dioxide, aerosols, atmosphere ozone, particulate matter, and improvement in air quality. In this paper, the effect on various environmental parameters like aerosol, ozone, particulate matter, nitrogen dioxide, sulfur dioxide, carbon monoxide, and temperature and water quality on India by lockdown due to COVID-19 as a preventive measure has been analyzed. The work involves the refining and preprocessing of raw data of this year and last year of various harmful pollutants present in the environment along with satellite images from National Aeronautics and Space Administration for comparison of different parameters. It has been observed that with the above adopted measures temperature has been reduced to near about 15 degree Celsius, there is also reduction in humidity i.e. it is reduced to 40%, particulate matter (PM2.5) reaches near about normal i.e. 40 g/m³ and carbon monoxide levels has also been reduced to 10 ppm. The main idea is to emphasize the fact that how the environment is self-healing during the lockdown. And this study will be beneficial to environmentalists and industry professionals to make the future strategy for improving the environment.

Keywords: *Covid-19, Lockdown, environmental parameters, Air quality index, improving the environment.*

Environmental Ethics and Education- A Necessity to Inculcate Environmental Awareness

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Humanitarian disaster is increasingly disturbing the human life as well as natural environment. The environmental crisis that hits the global world has threatened the future of the human being and that demands the mitigation of the problems through local action at the individual level. It necessitates the review of the environmental education with respect to its goal as well as its pedagogical approaches. The need of the hour is to move beyond emphasis on mere sensitization towards environmental issues for developing practical capacities among the individuals, to analyse the ethical aspects of the environmental issues and take decisions for actions. Thus, the present paper deals with what environmental ethics mean and also attempts to provide the need for environmental ethics education and its inculcation towards creating environmental awareness.

Keywords: *Environmental Ethics, Environmental Education, Anthropocentrism, Biocentrism, Egocentrism, Environmental Awareness.*

Diversity and Ethnomedicinal Importance of The Woody Climbers (Lianas) in The District of Purba Medinipur, West Bengal, India

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The woody climbers also known as lianas, because of having poor mechanical strength climbs up a support to compete for their survival and reach the canopy of the tree. The present study deals with the documentation of the diversity of woody climbers in the district of Purba Medinipur, which lies between the latitude 21.9373°N and longitude 87.7763°E. The district of Purba Medinipur faces the Bay of Bengal on its South-Eastern end. The sandy soil along the coast and comparatively less fertile soil than Paschim Medinipur makes the district sparse in biodiversity if compared with the district of Paschim Medinipur. Despite of all these factors, the tribals and local people residing there depends on the plants for various ethnomedicinal purposes. The conclusion of the present study revealed the presence of 15 liana species and documenting their ethnomedicinal uses by the local inhabitants of the district of Purba Medinipur.

Keywords: *Woody climbers, Biodiversity, Ethnomedicine, Purba Medinipur, Fertile, Sandy.*

Structure and Function of Gill Epithelium on Pollutants in an Air Breathing Fish *Channa Gachua*

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The gill epithelium is the site of gas exchange for the ionic regulation of acid base balance and nitrogenous waste excretion by fishes. The last three processes are controlled by passive and active transport of various solutes across the epithelium. Various environmental pollutants such as heavy metals acid rain and organic xenobiotics have been found to affect the morphology of the gill epithelium in fishes. Associated with the morphological pathologies one finds alterations in blood ionic levels as well as gill $\text{Na}^+ \text{K}$ activated ATPase activity and ionic fluxes. Such physiological disturbances may undergo the toxicities of these pollutants. In addition the epithelial transport steps which are affected in the fish gill model resemble to those described in the gut and kidney sites of action of the variety of environmental toxins. Detergents represent another class of xenobiotic compounds that produce gills structural pathologies. The diffusion in flow of water across perfused fish gills was enhanced when linear alkylate sulfonate (LAS) was added to irrigate at concentration of less than 100 ppm exclusive of vascular effects. However other studies have shown that major site of action of pollutants may be adreno receptors on vessels controlling the perfusion of various regions of the gill epithelium rather than on cellular ionic transport. The changes in the pattern of blood flow increased lamellar perfusion or increased flow into the central venous sinus which underlies the majority of the chloride cells could have profound secondary effects on gill transport in *Channagachua*. The fish *Channagachua* gill is covered by complex epithelium whose function is too controlled by perfusion through rather intricate vascular system. In addition of being the site of gas exchange for these aquatic animals the gill epithelium possesses transporting steps which mediate to active and passive movements of ions counteracting the dissipative movements down of electro chemical gradients between the fish's blood and either fresh water or sea water. It is clear that variety of aquatic pollutants produce gross histopathology of the gill epithelium which is often associated with osmo-regulatory acid base or hemodynamic malfunction. It is proposed that such symptoms are secondary to toxic interaction with specific transport steps or membrane bound receptors. Since similar pathways and receptors are common to the variety of human issues which are affected by environmental pollutants and the fish *Channagachua* gill presents model system which may be used to more carefully to investigate general epithelial pathologies produced by toxic substances in fishes.

Keywords: Function, Gill Epithelium, Pollutants, *Channagachua*.

Effect of profenofos on Oxygen Consumption and Gill Histopathology of an Air Breathing Fish *Channa Gachua*

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The environment is currently polluted by thousands of chemicals and xenobiotic introduced into the environment by man to meet the demands of the modern era. The pollution is continuous and alarming in flux to aquatic environment world-wide from both naturally occurring and anthropogenic sources. The polluted water may lead to the destruction of the beneficial species either directly effecting aquatic forms of life and in directly through breaking the biological food chain such as *Channagachua* and their habitat and behavioral pattern. The fish *Channagachua* as a bio indicator of aquatic medium plays an important role in the monitoring of water pollution because of the sudden death of fish indicates heavy pollution and the effects of exposure to sub lethal levels can be measured in terms of biochemical physiological and histological responses of the fishes. As aquatic organisms have their outer bodies and important organs such as gills almost entirely exposed to water the effect of toxicants on the respiration is more pronounced. Pesticides enter into the fish mainly through gills and with the onset of symptoms of poisoning profenofos a well-known organophosphate pesticide has been in agricultural use over the last two decades for controlling pests of paddy fields. In the present study an attempt has been made to study the effect of profenofos on oxygen consumption and gill histopathology of an air breathing fish *Channagachua*. The fishes were exposed to sublethal concentration (1/10th and 1/20th of 96 h LC50) for a period of 15 days. The treatment of these profenofos brought about significant decrease in oxygen consumption as compared to control. Exposure was found to result in several alterations in the histo-architecture of the gills of *Channagachua*. The alterations included curved secondary gill filaments necrosis of gill filaments and congestion of secondary lamellae. The significance of this study as a bio-indicator for assessing the toxicity and economic importance of the fish is discussed. Behavioral alterations like irregular movements erratic swimming convulsions excess mucus secretion decreased opercular movement loss of balance drowning and change in body pigmentation became more apparent with increase in duration of exposure at all test concentration. The results of the water quality of the tap water used in the bio-assay are in the normal range and suggest that parameters of the test water were not the cause of fish mortality.

Keywords: Profenofos, Histopathology, *Channagachua*.

Comparative Phyto-Sociological Estimation And Ethno-Medicinal Importance Of Plants In Kuldiha And Hadagarh Wildlife Sanctuary Under Similipal Biosphere Reserve, Odisha, India

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This paper reflects the comparative analysis of Phyto-sociological data of kuldiha and Hadagarh Wildlife Sanctuary, Odisha, India along with the ethno-medicinal importance of the plants found in both the sanctuaries. The main objectives of our study are to identify and classify the vegetation of both the sanctuaries under the Similipal Biosphere Reserve. The study was done following the standard methods which is widely adopted for the phyto-sociological study like quadrat method. The present study concluded with the fact that despite sharing the common vegetation which is the tropical moist deciduous forest, the dominant species of the sanctuaries differ. The dominant tree species of Kuldiha was found *Terminalia tomentosa* (IVI- 290.75) and at Hadagarh it was *Shorearobusta* (IVI- 285.12). The dominant shrub and herb species of Kuldiha was found *shorearobusta* (RVI- 51.75) and *Croton roxburghii* (RVI- 19.11) and at Hadagarh they were *Ageratum conyzoides* (RVI- 41.25) and *Mimosa pudica* (RVI- 45.25). The potential anthropogenic factors influence of cattle and herbivores and the demon fire are rapidly engulfing the density of the vegetation and its aesthetic beauty. Prompt and effective actions are needed to be implemented to preserve both the sanctuaries from biodiversity loss.

Keywords: *Kuldiha, Hadagarh, Biodiversity, Phytosociological study, Ethno-medicinal.*

Arsenic-induced Carcinogenesis: A Review with Special Reference to Gene Instability in Mammalian Cells

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Inorganic arsenic (As) to be the more toxic form of organic arsenic and greatest threat to public health. People are exposed to arsenic through the consumption of contaminated drinking water or through diet. Long-term exposure to arsenic from can cause cancer of the skin, bladder, renal pelvis, ureter, kidney, liver, and lung. It has also been associated with cardiovascular disease and diabetes. In utero and early childhood exposure has been linked to negative impacts on cognitive development and increased deaths in young adults. In the human body, inorganic arsenic is methylated to more toxic mono- and dimethylated arsenicals using S-adenosylmethionine (SAM) as the methyl donor. Inorganic arsenic associated with DNA methylation, histone modifications, and expression of miRNAs and lncRNAs. These alterations may contribute to the toxicity of arsenic including carcinogenesis. Arsenic suppresses the DNA methyltransferases (DNMTs) in a dose-dependent manner. Therefore, both SAM depletion and reduced DNMT enzyme activity may cause global DNA hypomethylation. DNA methylation can either activate oncogene expression or silence tumor suppressor genes. DNA hypermethylation of tumor suppressor genes p53 and p16 promoters has been observed in A/J mice, human lung adenocarcinoma cell lines, and human subjects after exposure to arsenic. The promoter methylation of tumor suppressor protease serine 3 (PRSS3) in urothelial carcinomas, Ras association domain family member 1 (RASSF1A) in A/J mice, and death-associated protein kinase 1 (DAPK1) in humans have all been correlated with arsenic exposure. In addition to DNA methylation, arsenic also leads to histone modifications, including acetylation, methylation, and phosphorylation. Risks of health problem appear to be modified by smoking, folate and selenium status, genetic traits (such as ability to methylate arsenic), and other factors. The most important action in affected communities is the prevention of further exposure to arsenic by the provision of a safe water supply for drinking, food preparation and irrigation of food crops. Low-arsenic water can be used for drinking, cooking and irrigation purposes. Install arsenic removal systems and ensure the appropriate disposal of the removed arsenic. The current recommended limit of arsenic in drinking-water is 10µg/L, although this guideline value is designated as provisional because of practical difficulties in removing arsenic from drinking-water. The WHO/UNICEF Joint Monitoring Programme for Water Supply, Sanitation and Hygiene monitors progress towards global targets on drinking water. Under the new 2030 Agenda for Sustainable Development, the indicator of “safely managed drinking water services” calls for tracking the population accessing drinking water which is free of faecal contamination and priority chemical contaminants, including arsenic. Additional studies are needed to mechanism of arsenic induced cancer and need to more evidence about the extent to which effective and low-cost options for removing arsenic from small or household supplies are used effectively over sustained periods of time.

Keywords: *cardiovascular disease, s-adenosylmethionine, methylation, tumor suppressor genes, adenocarcinoma.*

Rethinking Eco-dystopia: A Critical Study of *The Great Empty* project by New York Times

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The thrust area of World Environment Day 2021 is Ecosystem restoration, which is carved out of the theme of “Reimagine. Recreate. Restore”. The year 2021 also marks the beginning of the enterprise of United Nations Decade on Ecosystem restoration (2021-2030) and serves as an agent of invoking the memory of the first celebration of World Environment Day in 1974 bearing the theme “Only One Earth”. The 26th UN Climate Change Conference of the Parties (COP26) organised at Glasgow from October 31, 2021 to November 12, 2021 is a strong reminder to gain impetus towards the goals of the Paris Agreement and the UN Framework Convention on Climate Change. The precarious lives that human beings live amidst their continuous interaction with the environment and any of its inextricable elements has been proved by the invasion of the deadly Coronavirus that has played a crucial role in re-shaping the relationship of human beings with their environment, especially in the matter of considering spaces. The representation of lives of humans in contemporary cultural constructs has undergone a massive shift. The advent of Covid-19 pandemic has proved to be an inadvertently deciding factor in problematising the narratives of human intervention and interaction. The worldwide lockdown, and consequent stringency in movement have created new dimensions in the understanding of the already existing concepts of post-apocalypse and dystopian vision. The monstrosity of the microscopic entity has opened new vistas of thought in the areas of eco-precarity and eco-dystopia. Eco-justice has also emerged as a reiterated field of thought with new boundaries. With clearer skies, cleaner waters and purer air, the worldwide lockdown for Covid-19 pictured uncanny, fictional spaces, dystopian and apocalyptic, with empty spaces haunting human existence. The present paper aims to study “The great empty”, a project by New York Times, where dozens of photographers captured images of places that once bubbled with human interaction, but remained empty due to Covid-19 restrictions. The images would be studied as stark reminders of the necessity of action towards re-thinking the anthropocene.

Keywords: *Eco-Precarity, Covid-19, Images, Apocalypse, Emptiness.*

Disaster Profile of Kashmir: Management of Disaster through Awareness

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The present study is conducted to highlight the Disaster Profile of Kashmir and Management of Disaster through Awareness. The state of Jammu and Kashmir has a unique geographical personality. It is well endowed in renewable natural resources. The valley of Kashmir is famous for its beauty and natural scenery throughout the world. Its high snow-clad mountains, scenic posts, beautiful valleys, rivers with ice-cold water, attractive lakes and springs and ever-green fields, dense forests and beautiful health resorts, enhance its grandeur and are a source of great attraction for tourists. Hazards are part of our lives. It is impossible to live in a totally risk free environment. Besides all this, the state is a multi-hazard prone region of the country. Natural hazards are indeed geophysical events, such as earthquakes, landslides, volcanic activity and floods, high velocity winds, hail storms and forest fires. Which strike causing a devastating impact on human life, economy and environment? Various disasters like earthquake, landslides, volcanic eruptions, fires and flood are natural hazards that kill thousands of people and destroy billions of dollars of habitat and property each year. The rapid growth of the world's population and its increased concentration often in hazardous environment has escalated both the frequency and severity of natural disasters. Education is thought to be the most important and empowered way of social and behavioral change, therefore, disaster management must be included in the educational academic world as an integral part of the education system. Disaster management education is the kind of education dealing with the education of not only cultivating the understanding of disasters but also to cultivate the capabilities to take the precautionary measures to the prevention of the disasters. Disaster management education is very much concerned with the idea of reducing or mitigating disaster induced damages in place of controlling the occurrence of the disasters. The study aims to analyze the disaster profile of Kashmir and management of disaster through awareness in Kashmir valley, Jammu and Kashmir.

Keywords: *Disaster, Disaster Profile, Awareness, Natural hazards, etc.*

Effect of Eutrophication on Water Quality of Bhaisahwaghat Pul of Kuwana Forest

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Eutrophication causes an influx of excess nutrients and detritus in fresh aquatic bodies and is known to detrimentally affect the water quality. By analyzing the effects of eutrophication on a water body and its water quality through a span of 40 years, the effect it has on water quality can be quantified and found. Due to increase in anthropogenic activities day by day causes nitrate level has almost twofold from 234 million lb N/yr to 452 million lb N/yr. This increase in nitrates in aquatic bodies causes eutrophication to occur, and as a result, the quality of water decreases. Measured oxygen levels, pH, and turbidity in specific bodies of water are used to represent the quality of water and are compared to nitrate levels to calculate the effect of nitrates on water quality. To minimize outside factors, forestry data from different district wise throughout the kuwana forest range from Gonda to Balrampur district from where this kuwana river flows were compared and used to see how results differed based on forestry management and anthropogenic activities nearby areas. The rise of nitrates in aquatic body shows a direct relation to the decrease of water quality, and actions to reduce major factors of eutrophication should be used to mitigate significant decreases in water quality.

Keywords: *Eutrophication, Water quality, Forestry, Aquatic bodies, Anthropogenic activities.*

Assessment of Genetic Diversity among Veldt Grape (*Cissusquadrangularis*) Ecotypes for Morphological Characterization

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Cissusquadrangularis is one of the medicinally important perennial, climbing succulent, widely distributed in Africa, the Arabian Peninsula, Northern India, and Southeast Asia. The plant extract serves as rich source of calcium ions and is known to accelerate healing of fracture, increase the bone strength and stimulate the production of osteoblasts, the cells in the body responsible for bone growth. Investigation on assessment of genetic diversity of fifty veldt grape ecotypes collected from different geographical locations of Tamil Nadu was conducted at Department of Medicinal and Aromatics Crops, Horticultural College and Research Institute, TNAU, Coimbatore from 2019 -2020. The experiment was laid out in a Randomized block design (RBD) with three replications. Among the fifty ecotypes evaluated, majority of ecotypes (64%) exhibited moderate green coloured petiole, 23 ecotypes (46%) produced kidney shaped leaves, 16 ecotypes (32%) with cordate leaves, 7 ecotypes (14%) with circular shaped leaves and 4 ecotypes (8%) with pentagonal shaped leaves. Flowering was observed only in 5 ecotypes (TNCq7, TNCq8, TNCq28, TNCq32, TNCq34) with greenish pink - coloured flowers and the rest remained in vegetative stage only. Variations were observed for seventeen morphological traits of *Cissusecotypes*. The ecotype TNCq32 recorded increased values for plant height (216.4cm), internodal length (10.82cm), stem yield (275.6g), root weight (8.03g), root length (16.70 cm) and number of lateral roots per plant (8.66). Likewise the ecotype TNCq23 registered increased petiole length (2 cm), leaf width (5.76 cm) and ecotype TNCq31 with enhanced number of twiners per plant (18.30) and number of main roots per plant (2.66). Among the morphological traits, highest GCV and PCV were observed for number of matured leaves, number of twiners per plant, number of primary roots per plant, plant height and petiole length. The genetic divergence analysis done by using Mahalanobis D^2 statistics indicated that the cluster IX with one ecotype (TNCq32) was found to be superior among rest of the collection with highest values for root weight (8.03), root length (16.70), root girth (3.52), number of secondary roots per plant (8.66), internode length (10.82), plant height (216.4), stem yield (275.60) and minimum value for days taken for rooting (4.66). The maximum inter-cluster distance of 207.55 was observed between cluster1 and cluster 9, followed by cluster 2 and cluster 9 (178.87).

Keywords: *Cissusquadrangularis*, ecotypes, genetic diversity, PCV, GCV, cluster analysis

Studies on Integrated Nutrient Management under Shaded Condition for Sustainable Production of Turmeric (*Curcuma longa* L.)

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Turmeric (*Curcuma longa* L.) is an important spice cum medicinal plant belonging to the family Zingiberaceae commands a major share in foreign exchange. Being a tropical rain forest crop, turmeric can be acknowledged as a shade loving/tolerant crop (pseophyte) with extensive nutrient requirement in the form of organic maures responsible for sustainable production through years. The present investigation was carried out at the College Orchard, Department of Spices and Plantation Crops, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore. The experiment was laid out in split plot design consisting of two main plots, namely open and shade (running shade (sesban and castor) and the sub plot treatments consisted of different doses of inorganic fertilizers, organic manures (FYM, vermicompost, digested coir compost), biofertilizers (azospirillum, phosphobacteria) and growth stimulants (panchakavya, humic acid and Manchurian mushroom) constituting to about 40 different treatment combinations. Various growth characters were recorded at 45 days interval from 90 to 225 days after planting and the yield components were recorded at the time of harvest. The earlier sprouting, greater height of the plant (96.24 cm), greater (23.80), lengthier (55.99 cm) and wider (21.24 cm) leaves, increased rates of NAR ($0.2575 \text{ g m}^{-2} \text{ day}^{-1}$), RGR (0.100 g day^{-1}) and CGR ($1.52 \text{ g m}^{-2} \text{ day}^{-1}$) were expressed in the treatment combination, M_2S_8 (shade + 100 per cent NPK + 50 per cent FYM (15 t ha^{-1}) + coir compost (10 t ha^{-1}) + Azospirillum (10 kg ha^{-1}) + phosphobacteria (10 kg ha^{-1}) + 3 per cent panchakavya). The same treatment combination exhibited the highest yield ($32,422 \text{ kg ha}^{-1}$) and post harvest soil fertility with the increased available nitrogen ($242.53 \text{ kg ha}^{-1}$), available phosphorous (32.15 kg ha^{-1}) and available potassium ($471.35 \text{ kg ha}^{-1}$) contents. The quality parameters like curcumin (5.570 per cent), oleoresin (10.220 per cent) and essential oil (5.68 per cent) content was found to be the highest by the application of shade + 50 per cent FYM + coir compost + Azospirillum (10 kg ha^{-1}) + phosphobacteria (10 kg ha^{-1}) + 3 per cent panchakavya (M_2S_{18}). From the above experiment it is evident that provision of integrated nutrient management under shaded condition increased the yield upto 35 percent over normal farmers practise which is mainly contributed to the increased availability and uptake of essential nutrients without affecting the soil ecosystem.

Keywords: Turmeric- shade- organic amendmets, biofertilizers, growth, yield and quality parameters.

Plasma Arc Gasification- A New Sustainable Waste Management Technology

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Handling of waste management including municipal solid waste, industrial and biomedical waste, solid hydrocarbons and hazardous materials has become one of the most pressing environmental issues. The global volume of plastic waste is another big challenge. Despite having multiple plastic recycling processes, our planet is swimming in discarded plastic.

The time is now to think beyond the present waste management practices like reuse, reduce, recycling, burning and landfill of waste. The age-old concept of burning trash for fuel emits various toxic chemicals that cause air pollution and also lead to ozone depletion. Using land to dump and pile garbage is not an environmentally sound practice. Land plays a vital role in nature's ecosystem. Landfills can and have leaked causing contamination of surface and ground water, soil contamination and greenhouse gas emissions. So we have to focus on stretching goals to deal with sustainable waste management practices.

Plasma Arc Gasification, an environment friendly waste treatment technology uses electricity and high temperatures (3600 -25,000°F) to turn municipal solid waste, biomedical waste, industrial waste, solid hydrocarbons, hazardous materials and plastic waste into usable by-products without combustion. In this process an electrical arc gasifier passes a very high voltage electrical current through two electrodes, creating an arc between them. Inert gas under high pressure then passes through the arc into a plasma converter of waste materials. When exposed to high temperatures, waste is vaporized into gas consisting of basic elements, while complex molecules are broken down into individual atoms. Plasma Arc Gasification converts the organic waste into a synthetic gas called syngas and inorganic waste into an inert vitrified non-hazardous slag containing glass, ceramics, and various metals. Syngas predominantly consists of carbon monoxide (CO) and hydrogen (H₂) and can be used for electrical power; methanol or liquid fuels such as jet fuel, diesel; synthetic natural gas generation and others. The syngas created by this process can be reintroduced into the overall system. Metals can be recovered from the slag and eventually sold as a commodity. Inert slag produced from some processes is granulated and can be used in construction and tool industry.

Plasma Arc Gasification is the most effective treatment to reduce landfill waste, converting garbage into useful and environmentally safe products with no harmful emissions of toxic waste and also generate renewable energy. Thus plasma Arc gasification may be a safe and improved waste management process to cope up present challenges and create a pathway towards a better future.

Keywords: *Electrical power, plasma, renewable energy, syngas, sustainable, waste treatment.*

Appetite of Earthworm's Endosymbiont for Polyethylene and Polypropylene: A Step Ahead Towards Soil Restoration

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Civilians and Fast-Moving Consumer Goods (FMCG) Industries of various countries have been increasing Low-Density Polyethylene (LDPE) and Polypropylene (PP) wastes many folds and plastic wastes could be weighted 1.3 billion tonnes by 2040, as reported by World Economic Forum. Sum 91% of plastic is not recycled till date and a fact of bit happiness is that the production of plastic, in 2020, decreased by roughly 0.3 percent due to the COVID-19's impacts on the industry. This gigantic volume of plastic wastes causes soil pollution that results lack of porosity, infertility of agricultural fields etc. Thermal decomposition and gasification of energy recovery methods from LDPE and PP produces syngas and thereby pollutes air as well. To get rid of this environment- hazardous methods we designed multiple experiments to study biodegradation of LDPE, PP with the help of field earthworm *Glyphidrilustuberosus*, native to West Bengal. Equal number of earthworms in three different closed containers have been provided, in 1st 'Closed Chamber Experiment', with LDPE and PP strips separately for 30 days and revealed that dry-weight of LDPE and PP was reduced by 1.69% and 1.43% respectively. The 2nd 'Open Choice Experiment' leaved all provided strips smeared with sticky bacterio-enzymatic secretion and some physical as well as and weight change of LDPE and PP were recorded. Further experiments were carried forward to study role of gut bacteria and its secreted enzyme(s) in degradation of LDPE and PP. In-vitro experiment showed significant change in optical density ranging from 49% to 66% approximate in 30 days for various experimental set-ups in varying pH and temperature when we spare treated LDPE and PP strips as food for those bacteria reside as endosymbiont inside earthworm-gut. Bacterial colonies are observed distinctly on surfaces on plastic strips. Beside controlled production and usage of synthetic plasticsenzymatic, bacterial and earthworm-aided industrial level plastic-biodegradation can be recommended significantly near future to prevent soil pollution and augment restoration of soil health to keep our society and planet healthy, fair and heavenly.

Keywords: *bacteria, biodegradation, earthworm, Glyphidrilus, LDPE, PP, plastic waste, soil.*

Studies on Seasonal Fluctuation of Different Indices Related To Filarial Vector, *Culex Quinquefasciatus* around Agricultural and Industrial Areas of Burdwan, West Bengal, India

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The goal of this study was to gather data on filarial vector activity in agricultural (Hatgobindapur and Memari) and industrial areas (Jamuria and Pandaveswar) of Burdwan, West Bengal, India.

Indoor-resting mosquitoes were gathered from human habitations in four slums, two agricultural areas, and two industrial sites in Burdwan, West Bengal. The World Health Organization and pioneer workers advocated standard methods for identifying and examining collected mosquitoes for various characteristics.

Overall infection rate, infectivity rate, and daily mortality rate of the vector were assessed as 5.42%, 1.09%, and 22%, respectively, which were 15.13%, 3.15% and 17.00%, respectively in the rainy season. Average load of microfilaria, 1st stage, 2nd stage and 3rd stage larvae of *Wuchereria bancrofti* in infected vectors were 4.10, 3.04, 2.19 and 1.20 respectively, which were 4.60, 2.00, 2.21 and 1.09, respectively in rainy. Among the searched shelters 17.71% and 1.88% were found to be invaded by infected vector and infective vector, respectively, which were 26.56% and 3.13%, respectively in rainy.

Different vector-related indicators were substantially higher in the rainy season, indicating that the rainy season is the most opportune season for lymphatic filariasis transmission in the research area. Data will aid in the formulation of an effective vector control strategy.

Keywords: *Seasonal fluctuations, Culex quinquefasciatus, indices, vector control.*

Air Pollution and Its Control Strategies

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Air pollution is basically the foreign material in the air – can be man-made or occur naturally. Pollution is injurious to health and its prevention places an economic burden on the citizens. Major primary pollutants such as nitrogen oxide, carbon mono-oxide as well as chlorofluorocarbons cause excessive amount of air pollution by causing harm to the ozone layer. In addition, radioactive pollutants produced by nuclear explosion, nuclear events as well as natural processes such as radioactive decay of radon. Apart from these, there are so many secondary pollutants out there like ground level ozone formed from NO and volatile organic compounds. As we know ozone is a key constituent of troposphere.

As a result of severe air pollution, not only the health of human being got hampered but also other animals like birds, insects are affected a lot. Even now-a-days Ozone Layer depletion and Global Warming are a worldwide problem because the average temperature of earth simply has been changed due to air pollution that's why the life cycle of several organisms has been changed in a major way. Not only that, several important endemic species got wiped out, as a result our biodiversity is severely affected in a negative way as an indirect effect of this kind of pollution.

As for the controlling measures there are lots of procedures out there like: Biofiltration is one of the effective type to control air pollution because it uses microorganisms, often bacteria and fungi to dissolve pollutants.

Nuclear power plants are relatively pollution free when compared to the coal fired power plants.

The scrubbing or flue gas desulphurization processes can be classified as (i) regenerative processes and (ii) wet and dry processes. In addition, use of oil with low ash content or natural gas for a dryer at an asphalt plant to reduce particulate matter.

So as to conclude, we can say that though air pollution causes major problems in animal lives even indirectly to plant lives but there are several ways out there to reduce air pollution as discussed above.

Keywords: *Oil spillage, power plants, carbon particle emission.*

El-Nino and It's Varied Impacts

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El-Nino is a periodic flow of warm Pacific equatorial waters southward, usually around Christmas time. El-Nino is linked to the Southern Oscillation & it affects the atmosphere, disrupting weather condition of the world. Its disastrous effects have resulted in drought in Australia and Papua New Guinea, a delayed monsoon in South-East Asia leading to massive forest fires choking smog, storms on the Pacific coast of South and Central America, drought in Southern Africa, and threat of flood in Peru and California.

Its increasing sensitivity and frequency through the 1980s and 1990s, suggests that El-Nino is affected by an increase of heat trapping greenhouse gases in the upper atmosphere. Global Warming could make the El-Nino a permanent feature of world's weather system. El-Nino and Southern Oscillation largely affect developing countries that are largely depend upon fishery and agriculture for employment, foreign exchange, and food supply. Global warming increases severity and frequency of El-Nino which has great socio-economic impact on these countries.

Keywords: *Southern Oscillation, Smog, Greenhouse gas, Global warming, Forest fires, Flood.*

Current Status of Global Soil Biodiversity: Challenges and Potentialities

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Soil is the most complex and bio diverse ecosystem on earth. Rough estimates of soil biodiversity indicate several thousand invertebrate species per site, as well as the relatively unknown levels of microbial and protozoan diversity. A typical soil community is comprised of several organisms like nematodes, microarthropods such as mites and Collembola, Symphyla, Chilopoda, Pauropoda, enchytraeids and earthworms. This highly diverse community plays a variety of different ecosystem services essential for agricultural sustainability. They regulate the ecological processes through influences on decomposition of dead organic material, nutrient cycling, and formation and maintenance of the soil structure. Many of them are highly sensitive to different edaphic perturbations so the soil biodiversity is facing multiple threats due to various anthropogenic activities. According to FAO the loss of biodiversity has already crossed the thresholds and the extinction rate of species to be estimated to be between 100 to 1,000 times higher than what could be considered natural due to rapid climate change and other anthropogenic activities. Protection of existing natural areas, restoration of the degraded habitats, employment of sustainable agricultural practices, are some methods that fortify and sustain diverse soil communities and the functions and services they provide across all ecosystems.

Keywords: *Soil diversity, Community, Ecosystem, Restoration, Sustainability.*

Water Quality Survey Near An Industrial Site of Damodar River, India

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During the year 2019–2021, an assessment of the water quality parameters coliform and bacterial abundance from a point source of river Damodar in West Bengal, India was conducted. The site received waste materials from the collieries and factories. The presence of the coliform bacteria *Escherichia coli* and *Streptococcus* sp., between 2,600 and 20,000 colony-forming unit/100 ml, was found in water samples collected on a monthly basis during the study period, with maximal abundance during the post-monsoon months of September to December. The relative abundance of the two bacterial species was determined to be $Y(E. coli) = 1.41X (Streptococcus) 8.07$, with a positive correlation ($r = +0.868$, $df = 34$). Three factors emerged from principal component analysis to explain the observed variance of the environmental variables. The mean values of physicochemical parameters in river water at sample sites were consistently higher than WHO and other regulatory agencies' standards, indicating that the water was polluted. The presence of coliform bacteria in these water samples necessitates appropriate measures to limit pollution at the point of origin, as well as appropriate remediation procedures to counteract contamination in residential water usage from the Damodar River downstream from this site.

Keywords: *Damodar river, Industrial effluents, Bacterial loads, Physicochemical parameters, PCA.*

Global Environmental Challenges in COVID 19 Pandemic

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Though the preliminary impact of COVID-19 catastrophe depicted a positive impact on the environment, both pandemic and post-pandemic periods have posed negative impacts on the environment. The increased use of plastics and disposable items has increased manifold imparting serious threat to environment and diversity. Plastics in vivid forms, like macroplastics and microplastics cause hazardous and toxic effect to organisms. Among those, the personal protective equipment (PPE) uses has increased manifold, such as face masks, face shield, and gloves. The expansion of municipal solid wastes and biomedical wastes are further endangering the habitats and organisms. Hospitals, nursing homes, blood banks, clinics, pathological labs, and research labs are generating biomedical wastes which are hazardous and infectious if not treated within time. Moreover, the burden of untreated waste is going to endanger the environment. Since face masks are the primary line of defence against COVID-19, its worldwide production and utility has increased manifold. Its improper management causes environmental pollution and decline of environmental health. According to a report published in Environmental Science and Technology, a peer-reviewed scientific journal by American Chemical Society, there is an estimated global use of 129 billion face masks and 65 billion gloves every month due to pandemic. Due to lack of proper space dumping of solid waste in many cities and towns has become an emerging problem in India and all over the world. In most cities and metropolis of India, the roads are being found littered with various plastic bags and bottles. According to a latest report by PlasticsEurope (2020), plastic production has increased from 359 million tons in 2018 to 368 million tons in 2019. Hence, there is prime necessity to develop innovative management strategies to reduce their negative impacts on the environment.

Keywords: *COVID-19, pandemic, challenges face mask, plastics.*

Morphometric and Meristic Analysis of *Tor tor* (*Hamilton buchanan*) From Ujh River, Kathua (J&K)

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The morphology of fishes has been the major source of information for taxonomic and evolutionary studies. The morphological characters are generally divided into two major categories, Morphometric and Meristic. The study on the morphometric and meristic count of *Tor tor* was conducted in the section of Ujh River, a tributary of river Ravi in District Kathua (Jammu and Kashmir). The present study is designed with objective to resolve the taxonomic ambiguities of *Tor tor* using morphometric and meristic characters. Morphometric characters are measureable characters. Collection of sample on monthly basis was conducted for the study of morphological characters of *Tor tor*. The specimens were preserved in 10% formalin solution on the spot and were brought to the laboratory for further analysis. The meristic counts and morphometric measurements were recorded. For morphometric studies the parameters considered were: the total length, standard length, head length, pre-dorsal length, pre-ventral length, pre-anal length, caudal length, snout length, eye diameter and maximum body depth. These (pre-dorsal length, pre-ventral length, pre-anal length, caudal length, snout length, eye diameter and maximum body depth) variables were studied in relation to total length, standard length and head length separately as per taxonomy requirement. Meristic counts are countable characters like fin rays and fin spines etc. were also studied. Present study shows some deviations with respect to few morphometric characters and meristic counts in *Tor tor* that have been aptly discussed. The positive correlation has been observed between total length and external body parts. The highly strong correlated body parameter in relation to total length is standard length ($r = 0.98$) and least correlated with eye diameter ($r = 0.32$) and the highly correlated external body part in relation to standard length is caudal length ($r = 0.96$) and least correlated part is eye diameter ($r = 0.35$) and also strong correlation was observed between head length and maximum body depth ($r = 0.93$) and least correlation between head length and eye diameter ($r = 0.23$). The correlation analysis shows that all the morphometric characters change proportionally with increase in the total length. The above study concludes that the morphometric and meristic characters shows linear regression relationship and confirmed that the test specimen is *Tor tor* and there is single stock of population. These results act as baseline data on morphometric of *Tor tor* which helps in easy identification and will be beneficial for the development of conservational strategies of the natural stocks of *Tor tor* in river Ujh, Kathua (J&K).

Keywords: *Tor tor*, Morphometric analysis, Meristic analysis, morphometric board, needle, net, 10% formaline solution.

***Ficus* Species Diversity of Pakke Wildlife Sanctuary, Eastern Indian Himalayas, with Reference to Conservation of Dependent Frugivores**

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Fig plant (*Ficus* species) is one of the most important plant genera, considered as a key candidate to wildlife conservation in tropical rainforest for its potency on its microhabitat and most preferred food resources of frugivores throughout the year. Being a part of the Eastern Himalayas, state of Arunachal Pradesh is the most biologically diverse among the northeast states and ranks 2nd largest forest cover state after Madhya Pradesh and 4th in terms of percentage of forest cover in India. Various forest types like deciduous, evergreen, pine, temperate, alpine and grassland enrich the state, harbouring variety of flora and fauna. The present study was aimed to estimate fig plant diversity in Pakke Wildlife Sanctuary (PWS) (861.95 km²) of Pakke Kessang district of Arunachal Pradesh. The survey was done following 20m X 20m quadrats (41 nos.), laid randomly within the sanctuary. A total of 21 *Ficus* species and 481 individuals are documented so far. The highest density is recorded that of *Ficus auriculata* and *F. heteropleura* and lowest of *F. religiosa*; while abundance is highest for *F. squamosa* and lowest for *F. religiosa*. The species with highest percentage frequency is of *F. benghalensis*. The Shannon Weiner index of the study area was calculated to be 1.9 and Simpson Index is calculated as 0.92. *F. religiosa* and *F. hispida* are mostly found in the fringes of sanctuary area. So far a total of 55 species of frugivores were recorded utilizing these *Ficus* species for sustaining their life. Thus, fig plants are considered as a significant forest resource for conservation of frugivores in PWS.

Climate Change in Odisha: An Analysis of Direct Impact on Human Health

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Background: Odisha is known as the Disaster Capital of India as it witnesses frequent Climate Induced Natural Disaster (CIND). Flood and cyclones are the main feature of CIND that wreaks havoc the state almost every year. Between 2000 to 2020 almost every year the state has experienced flood, cyclone, and cyclonic depression resulting heavy rainfall. Cyclones have become the common feature during the pre-monsoon and post-monsoon period with the rising trend of rainfall during these two periods while monsoon rainfall has declined but with increasing intensity. Human health in Odisha is very much vulnerable to climate change with temperature and rainfall variability leading to more frequent and intensified CIND leading to human mortality. Both the average annual maximum and minimum temperature and the average temperature during the heat wave period have increased contributing to rise in heat wave mortality in the state. CIND have become the inevitable part of the state and its catastrophic effects pose the more dynamic health burden. However, appropriate adaptation mechanism can lessen the potential direct health threat posed by climate change.

Methods: vulnerability and adaptive index were calculated by taking annual temperature, rainfall, frequency of flood and cyclone and GHG emission as vulnerability parameter and early warning system, evacuation, literacy and climate fund as adaptation parameter through normalization method used in the multiple regression analysis to show the significant association between the human mortality with the vulnerability status and adaptive approaches of the state for the period of 20 years from 2000 to 2020. Also the regression analysis was done to show the association between rising temperature and heat wave mortality.

Results and Conclusion: Significant association exists between human mortality as a consequence of CIND with the vulnerability status and adaptive approaches. Temperature rise scores the most to contribute towards the climate change vulnerability aggravating its direct impact on health with the vulnerability score of 0.7853 followed by annual rainfall with index score of 0.7677 then frequency of flood and cyclone and GHG emission with index value of 0.4421 and 0.3435 respectively. Literacy rate is the most adaptive component with the highest index value of 0.6298 to cope with the changing climate. More literacy represents more awareness among people to combat with the unavoidable disastrous effect of climate change. Then comes the EWS as adaptive factor followed by evacuation with index value of 0.5811 and 0.5167 respectively. Climate fund stands at the bottom as

the least adaptive factor with a very low index score of 0.1917 for the state. The regression analysis showed a statistically significant positive association of health impact of climate change with the vulnerability parameter and negative association with the adaptive parameter. However comparing the vulnerability and adaptive index, Odisha is more vulnerable with more than 60% vulnerability for maximum years than its adaptive mechanism to cope the impact of climate change. Need for policy attention particularly towards climate funding as the lag remains here to reduce the vulnerability and make the state resilient of the direct impact of climate change.

Keywords: CIND, vulnerability, Adaptation, EWS, Heat Wave, Human Mortality
JEL Classification: H75, I18 and Q54.

Effect of Fly Ash Amendment on Physiological And Yield Attributes of Faba Beans (*Vicia faba*.)

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Fly ash is coal combustion by-product, produced from thermal power plant during power generation. A enormous quantity of fly ash is generated in thermal power plants which in turn leads to massive environmental problems and health hazards. Fly ash contains oxides, hydroxides, carbonates, silicates, and sulfates of Ca, Fe and Al along with other metals in trace amount. The present study was conducted to analyze the impact of fly ash on chlorophyll content and yield of faba beans. Experiments were conducted in earthen pots having various concentrations of fly ash (0 %, 10%, 15%, 20% and 25%). The result showed that 15% fly-ash caused significant increase in yield production and physiological attributes. It may be concluded from the present study that *Vicia faba* was an ideal crop for growing in fly-ash-contaminated areas for the revegetation of fly-ash landfills.

Keywords: Fly ash, environmental problems, various concentrations, ameliorant, revegetation.

An Analysis of The Bio-Remedial Capacity of *Bacillus pumilus* in Removing Phenol

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Huge quantity of wastewater generated from human settlement and industrial sectors accompany the disposal system either as municipal wastewater or industrial wastewater. Both organic and inorganic materials are present in effluents, some of them may be harmful and some may not. Water pollution occurs when pollutants are directly or indirectly discharged into water bodies without adequate treatment to remove harmful compounds.

Phenol and other organic compounds are among the most common pollutants present in effluents from chemical process industries. They are found in the effluent of petroleum, hydrocarbon refinery and in the industries manufacturing disinfectants, fumigants, synthetic resins and explosives. These compounds are highly toxic to human beings and other animals and affect several biochemical reactions including health hazards. They are relatively soluble in water and accumulate in soil, resulting in extensive surface water, ground water and soil contamination owing to its severe toxicity.

Phenolics are resistant to biodegradation or are partially degraded leading to accumulation of the toxic end products. The conventional methods of treatment of phenolic and nitrate-nitrogen wastewater are largely physical and chemical processes but these processes lead to secondary effluent problems due to the formation of toxic materials such as cyanates, hydrocarbons, chlorinated phenols etc.

Many microorganisms are capable of utilizing phenol as the sole carbon and energy source. However the use of free bacterial cells for industrial waste water treatment sometime creates problem due to wash out of the cells. Entrapment of the cells is one of the means to create non-growth condition under which the production of secondary metabolites can be avoided. Immobilized microorganisms have been shown to be effective to treat phenol-containing wastewater.

A bacterial strain was isolated capable of withstanding high concentration of phenol and phenolic compound from the effluents of Dankuni coal complex, West Bengal. After performing various morphological, biochemical tests and 16s RNA analysis the organism was identified as *Bacillus pumilus* strain SCH2JF914985. The present investigation made an attempt to analyse the bio-removal capability of *Bacillus pumilus* strain SCH2JF914985 in removing phenol, by immobilized cells under batch culture and recycling condition. *B.pumilus* was immobilized on a suitable gel matrix and the removal capabilities of the beads were studied under different environmental conditions. Bioremoval studies were conducted with immobilized cells at various phenol concentrations ranging from 50ppm to 700ppm and it was observed that better removal could be achieved with immobilized cells under recycling conditions. Hence, recycling methodology in packed bed column reactor can be recommended for the removal of phenol.

Keywords: Phenol, *Bacillus pumilus* strain SCH2JF914985, packed bed column reactor.

A Brief Study on General Avianmigration With A Glimpse of Someseasonal Migratory Birds in A Boro Bhagar Jhil at Kuchut, Purba Barddhaman, W.B

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Birds are the most mobile creatures on earth. Birds are habituated in the air. Different parts of their body such as wings, tails, bones etc. play important role in this field. Bird migration involve these structures to cope with the changes in food availability, habitat, or weather. Before discussing the phenomenon of bird migration, we should know the methodology as well as the collection of datas from different sources. Many new procedured have been used in the study of bird migration like radar. Butthe oldest method is the simplest one and most frequently used method. I used to go **BoroBhagarJhil**, Kuchut, to watch different types of migratory birds for last winters. Bird migration is the seasonal movement that occurs between breeding and wintering grounds and very often east to west and north to south and vise versa. The migration of birds brings to mind the image of birds winging their way on the sky, in their V-shaped flocks. Indian subcontinent plays host to a number of migratory birds in winter over a hundred species of migratory birds fly to India, either in search of feeding grounds of to get rod off the tremendous cold of their real habitat. Usually, Kingfisher, Rosy, Pelican, Wood Sandpiper, Starling Blue throat, long billed Pipit birds start migrating towards other areas when the winter starts to come. A large proportion of the breeding birds make seasonal movements. The main reason for this is that many bird species cannot overwinter in the areas where they breed as their food supply becomes reduced or disappears entirely due to competition with the other birds species as well as the other species. Due to their sufficient foods, they can migrate a lot for obtaining their winter habitats. Migrants use several different methods of orientation. During day time Birds fly over miles using the sun as a compass, while night migrants use the stars. In overcast weather birds can make use of a magnetic compass which can register the Earth's magnetic field. Birds take the help of the lands as well as the valleys for guidelines. I got a chance to see different types of migratory birds like little grebe, Cotton Pygmy geese, Eurasian Wigeon, Red crested pochard, Marsh sandpiper, Eurasian coot, Great egret, Grey headed, Wood sandpiper.

Keywords: *Metabolic ability, BoroBhagarJhil, migratory birds, seasonal movements, V-shaped flock.*

Influence of Mutagens in Tuberose

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An investigation was carried out at the Department of Floriculture and Landscaping, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore during 2014-2016 on the improvement of tuberose (*Polianthes tuberosa* L.) var. Prajwal through mutation breeding. Mutation was induced by treating the bulb with 0.5, 1.0, 1.5, 2.0 and 2.5 kR of gamma rays, 15, 20, 25, 30 mM of DES and 30, 45, 60 and 75 mM of EMS. Untreated bulbs served as the control. The plant height in all the gamma treated plants exhibited reduction compared to the control. In M_1V_1 generation, the treatment T_6 (2.5 kR) had a reduced plant height of 37.54 cm for gamma ray, T_{10} (30 mM) with 43.78 cm for DES and T_{14} (75 mM) with 35.76 cm for EMS while in control it was 47.23 cm. The maximum number of leaves 80.71 was recorded in T_2 (0.5 kR) for gamma rays, in T_9 (25 mM - 107.85 nos.) for DES and in T_{11} 100.15 nos. for EMS whereas in control it was 98.14 nos. Among the physical and chemical mutagens, the maximum number of spikes per plant (3.40) was noticed in T_2 (0.5 kR) for gamma rays, in T_9 (25 mM - 5.71 nos.) for DES and in T_{11} (30 mM - 8.05 nos.) for EMS, while in control it was 3.12 nos. The three types chlorophyll mutants were noticed, viz. 'xantha', 'chlorina' and 'striata'. T_2 (0.5 kR) recorded maximum number of chlorophyll mutants followed by T_3 and T_4 . Dwarf types were observed in T_3 (1.0 kR). Broad leafed mutant was noticed in T_4 (1.5 kR) and broader leaved mutants (leaf width of 2.55 cm) were obtained in T_5 , T_{10} and T_{12} . In T_3 treatment, three branched spike and in treatments T_3 and T_4 two branched spikes were produced whereas in control branched spike was not observed. Non flowering spike was observed in T_{10} (30 mM of DES). In the treatments T_2 , T_3 , T_4 , T_5 , T_7 , T_8 , T_9 and T_{10} florets with four tepals were recorded. In the treatments T_2 to T_{10} and T_{14} florets with five tepals were observed. In the treatments T_2 to T_4 , T_7 to T_{10} and T_{13} florets with seven tepals were recorded. Eight tepalled florets were observed in the treatments T_2 to T_5 , T_7 to T_{10} and T_{13} . Ten tepalled floret was observed in T_7 as against six tepal floret in control. Various kinds of morphological abnormalities were observed in many of the mutagen treated population.

Keywords: *Polianthes tuberosa*, Gamma ray, EMS, DES, Morphological and Floral variations.

Evaluation of Physico-Chemical Characteristics of Pond Water Affected By The Effluent From Handloom Textile Industries in Santipur–Fulia Region of West Bengal, India

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Handloom textile factories are very popular all over the India. But these sectors of textile industries are majorly distributed in rural side of Bengal and play an important role in people's livelihood. It is found that these sectors discharge huge amount of effluent to nearby waterbodies. The present study is an approach to analyze the physico-chemical characteristics of pond water near textile factories collected from Santipur- Fulia region which is massively popular for its Handloom textile products. For this assessment of water quality, samples were collected from ponds (P 1, P 2) which are mixed up with effluent of nearby textile factories. Another pond (P 3) has been chosen which was free from this textile waste water. After collecting samples, Temperature, Alkalinity, BOD, COD, DO, TDS, Phosphate and Nitrate were measured by standard APHA method. At the end of this study, it is noticed that average Temperature (30 °C), Alkalinity (110.2 ppm), BOD, COD and TDS (85, 52 and 1480 ppm respectively) are higher and DO level of water (4 mg/L) is lower in P1 and P 2 than P 3 which may exert stressed conditions. And it is also found that the flora and fauna of this pond are almost in dying stage may be due to toxic pollutants of textile industries. So it can also cause a serious health hazard of human being who are directly involved with these water resources for their lifestyle. In order to achieve the standards it is suggested to import Effluent treatment plant by small scale industries.

Keywords: *Handloom textile factories, Physico-chemical characteristics, water quality, Health hazard, Effluent treatment plant.*

An Outlook towards the Bio-invasion of *Alternanthera philoxeroides* with Its Repercussions on Native Biodiversity of Freshwater Ecosystems

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Bio-invasion by an organism at the ecosystems is one of the ramifications of treacherous global atmospheric changes. Among all, alligator weed *Alternanthera philoxeroides* (Mart.) Griseb. (Amaranthaceae) is an alien and invasive aquatic weed of freshwater ecosystems which has already outstretched to the tropical and sub-tropical regions of every continent in this world except Antarctica. Despite its invasion potential, not all the countries have declared it as an invasive species, the seriousness of invading *A. philoxeroides* can be a substantial affair in the forthcoming years just like water hyacinth. The freshwater ecosystems (ponds, bogs, ditches, streams, creeks, canals, and rivers) with their stagnant or flowing water are an effortless receptacle for the inconsiderate people utilizing those as scrapyards from every corner including industrial areas, agricultural lands, and residential places. It enhances the discrepancy among the components' concentrations of the ecosystem deftly. Expeditious adaptation with the altering environmental gradients of the habitat along with their plasticity and greater growth and reproductive rate ameliorates their population at a highly principled state than other flora and fauna of this ecosystem. The positive coupling association between this particular plant and variegated biotic and abiotic factors and their cumulative endeavours – morphological, physiological, and molecular, bolster their establishment worldwide engendering tyrannical impacts on the indigenous biodiversity of the freshwaters. The invasion in aquatics not only encumbers the food web dynamics and diversity, but also distinct economic prospects of human society. Here, we are trying to uncover the probability of disparate risks ecologically and economically as well for the bio-invasion of the alligator weed in the freshwater ecosystems and to signify the multi-dimensional characteristics of atmospheric determinants in which they are proliferating globally in such a vigorous way. Divergent management approaches like mechanical (manually, with cutting instruments), chemicals (2-4, D, Tricolpyr and others), biological (*Agasicles hygrophila*), and integrative ought to be applied beforehand to conserve the equilibrium of both the ecological and economical society.

Phytoremediation of Heavy Metals: A Strategy for the Removal of Toxic Metals from the Environment Using Plants

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Heavy metals constitute a heterogeneous group of elements; a relatively high density of approximately 6 g cm^{-3} is their common characteristic with atomic weight more than that of iron (Alloway, 1997). Sources of heavy metal contaminants in soils include metaliferous mining and smelting, metallurgical industries, sewage sludge treatment, warfare and military training, waste disposal sites, agricultural fertilizers and electronic industries (Alloway 1995). Toxic heavy metals cause DNA damage, and their carcinogenic effects in animals and humans are probably caused by their mutagenic ability (Knasmulleret al., 1998; Baudouin et al., 2002). Metal-contaminated soil can be remediated by chemical, physical or biological techniques (McEldowney et al., 1993). Chemical and physical treatments irreversibly affect soil properties, destroy biodiversity and may render the soil useless as a medium for plant growth. Phytoremediation involves the use of plants to remove, transfer, stabilize and/or degrade contaminants in soil, sediment and water (Hughes et al., 1997). This plant based technology has gained acceptance in the past ten years as a cheap, efficient and environment friendly technology especially for removing toxic metals. Plant based technologies for metal decontamination are extraction, volatilization, stabilization and rhizofiltration. Various soil and plant factors such as soil's physical and chemical properties, plant and microbial exudates, metal bioavailability, plant's ability to uptake, accumulate, translocate, sequester and detoxify metal amounts for phytoremediation efficiency. Use of transgenic to enhance phytoremediation potential seems promising. Despite several advantages, phytoremediation has not yet become a commercially available technology. Progress in the field is hindered by lack of understanding of complex interactions in the rhizosphere and plant based mechanisms which allow metal translocation and accumulation in plants.

Keywords: *Phytoremediation, heavy metals, strategy, removal, toxic metals, environment.*

Global Warming and Household Carbon Footprint: A Case Study

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Global warming is a situation of increasing earth surface temperature due to over existence of Green House Gases (GHGs) in the atmosphere. Green House Gasses comes from both household sectors as well as from industrial sector. About 40% of the GHGs come from the household sector. Household emission is measured in terms of Per Capita Carbon Footprint. **Carbon Footprint** can be defined as the total amount of greenhouse gases produced directly and indirectly by any individual or organization from its activities and it is expressed in equivalent tons of carbon dioxide (CO₂e). From the latest report of JRC, 2020 per capita global average of CO₂ emission in 2019 was 4.93 tCO₂ tonne/Per Year and in India it was 1.9 tCO₂ tonne/Per Year. In this backdrop the objectives of the article are: i) To study the existing GHGs emission scenario in India, ii) To study the effects of Global Warming on the environment, and iii) to measure the activity wise household carbon footprint of the households, Household Per Capita Carbon Footprint has been calculated using the emission factors of different components. From the study it is observed that maximum amount of emission generates from cooking activities for rural households and from food activities for urban households. Per Capita Carbon Footprint of rural household is 0.5981 tCO₂e tonne/Per Year and 0.4919 tCO₂e tonne/Per Year for urban household.

Keywords: *Global warming, Green House Gases, Carbon footprint, household emission, emission factor etc.*

Socio-Cultural and Environmental Impact Assessment of Tourism: A Case Study of Historical Temple Town Bishnupur, in Bankura District, West Bengal

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Tourism is considered as one of the largest and fastest developing sectors of the world. Its high growth and development rates bring considerable volumes of foreign currency inflows, infrastructure development, employment generation, regional development, economic multiplier effects and introduction of new management and educational experience actively affect various sectors of economy, which will be positively affected to the social and economic development of the country. The quality of the environment, both natural and man-made, is essential to tourism. However, the relationship of tourism with the environment is complex. It involves many activities that can have adverse environment effects. Many of those impacts are linked with the construction of general infrastructure such as road of tourism facilities, including resorts, hotels, restaurants, shops. The negative impacts of tourism develop can gradually destroy environmental resources on which it depends. On the other hand, tourism has the potential to create beneficial effects on the environment by contributing to environmental protection and conservation. It is a way to raise awareness of environmental values and it can serve as a tool to finance protection of a natural areas and increase their economic importance. Now, tourism becomes the leading industries of the world (Sarhan et al. 2004) and largest service-oriented industry that contribute 6.37% of national gross domestic products. In 2010 total foreign tourist arrival in India was 5.78 million and India has generated about 200 billion US Dollar in 2008. In this paper it is trying to focus upon negative role of tourism in Bishnupur temple town on its socio-cultural environment. Bishnupur in Bankura district has internationally recognized as one of the cultural heritages for its renowned terracotta made temple, expressing the exotic sculptural beauty and architect of Malla dynasty. This temple town not only famous for its religious significance but it adorns its sculptural beauty, handmade Terracotta craft, conch shells, Baluchari Sari (clothing) and other cultural heritage that makes it as an attractive recreational spot in this district. An Environmental Impact Assessment survey was conducted through sample survey method at major tourist spots in this town to analyze the tourism impact on the livelihood and socio-economic conditions of the local inhabitants. Based on the statistical results of the survey data, recommendations can be made for this tourist area, tourism can be implemented in this temple town, sustainable and profitable way without destroying environmental health and local cultural ethics and tradition. On the other hand, if a proper tourism management policy, decision making abilities of the community may not receive and accepted the control over tourism will completely beyond of manageable level. It is suggested that to have more community awareness and education programs in order to obtain positive benefits and to minimize the negative impacts of tourism. Community empowerment and their capacity building is highly important in this context.

Keywords: *tourism, livelihood, environment, empowerment, temple town, recreational spot, terracotta, sculpture beauty.*

***Acinetobacter* Sp. Tmku-4, An Arsenite Oxidising Soil Bacteria And Its Possible Implication In Gradientdependent Arsenite Biotransformation**

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Arsenic (As) is a toxic metalloid and it predominantly exists in the arsenite [As(III)] and arsenate [As(V)] forms in the nature. The magnitude of As contamination is severe in lower Gangetic plain of West Bengal and Bangladesh, where more than 150 million people are at risk of As exposure. Arsenic contamination of soil and ground water has been considered as one of the major environmental issues, and hence is a topic for research worldwide. Arsenite-oxidizing bacteria play a key role in the biogeochemical cycle of As, and thus are being explored as potential candidates for As decontamination of soil and groundwater. In this present study, an arsenite-oxidizing bacterium was isolated from As-contaminated low land paddy field of Nadia district, West Bengal, India. Based on biochemical and 16S rRNA gene sequencing (GenBank Accession number-MT742757), the strain was identified as *Acinetobacter* sp. It is a gram negative, cocco-bacillary bacterium, amylase and catalase positive, exhibiting citrate utilization and Methyl red positive in IMViC test. The strain *Acinetobacter* sp. TMKU-4 could resist As with a minimum inhibitory concentration (MIC) for As(III) and As(V) in minimal media of 12.5mM and 90mM, respectively, whereas in complex nutrient broth, the same were found to be 25mM and 350mM. The MIC of other selected heavy metals, Cd, Pb, and Zn were found to be 12mM, 10mM and 12mM respectively. The bacterium grew at a wide range of pH 6 to 9, however, most favourable being at pH 7. *Acinetobacter* sp. TMKU-4 when grown in presence of different concentrations of As(III), oxidized more than 77% of it and transformed to As(V) within 16 h of incubation in minimal salt medium. Various plant growth promoting (PGPR) traits were assessed in the isolate. It could solubilize phosphate, produce siderophore and could fix atmospheric nitrogen. Arsenite has little impact on the expression of such traits under *in vitro* culture conditions. Thus, this novel bacterial strain showing PGPR traits could be an effective candidate for potential application in sustainable agriculture in As-contaminated crop field.

Keywords: Heavy metal, Arsenic, Arsenic toxicity, Bacteria, Bioremediation, Arsenite oxidase, Eco-friendly.

Nature and Environmental Ethics in India

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**“The Earth does not belongs to us
We belongs to the Earth”**

Environmental pollution is a big problem of today's world. It includes all that is below and around us. There are mainly two types of environmental problems in India. First is arising as negative effects of the process of development and modernisation .second is arising from poverty and underdevelopment. Through this paper we want to discuss about the efforts for the protection of environmental inour History. It's a continue process in our India and we can observe many examples during the Mauryan period where so many provisions related to the protection of the nature. In Vedas also so many trees were considered as holy trees and there were provisions of worship the nature .It was the Dharma of each person to protect the nature. The five elements knows as panchaboothas were divine conservations. Rivers enjoyed high status in society. During the Mughal period also Babur and Akbar also laid down the stress on the protection of nature. Many provisions were laid down for this purpose. In British India also so many laws were enacted for the control of environmentpollution . Shore Nuisance act of 1853and Gas oriental Gas CompanyAct of 1857. Indian Penal Code of 1860 also make provisions of fine any person who founds polluted any natural source of water or reservationsthere were also laws related to air pollution control Acts like Bengal smoke Nuisance act 1905 and Bombay Nuisance Act of 1912.After independence also so many laws are enacted and enforced but man's most destructive enemy is man himself because he pollute the environment in which he lives. But now the need of time is to organise a mass movement to protect the environment.covid-19 pandemic also has positive impact on the environment .It reduced air pollution level. Air quality improved because of reduction in road traffic ,air traffic and factory emissions .So due to COVID lock downs we also find a new way to control the pollution.

Keywords: *introduction of efforts in History, Types of Pollution, Causes of environmental pollution, Effects, Remedies and suggestions.*

Impact of Heavy Metal, Cadmium (II) on Glycogen Content of the Freshwater Bivalve, *Lamellidens marginalis* in Monsoon Season

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Aquatic environment gets polluted by heavy metals because of their environmental persistence and ability to bioaccumulate in aquatic organisms. Cadmium is a ubiquitous toxic heavy metal, biologically non-essential element, it is not biodegradable and has a very long biological half-life. The aim of the present study was to assess the glycogen content in different body parts i.e. Mantle, gill, gonad, hepatopancreas, siphon, foot, anterior adductor muscle and posterior adductor muscle of freshwater bivalve molluscs *Lamellidens marginalis* exposed to lethal concentrations of cadmium chloride after 96 hrs acute toxicity of exposure. The results clearly showed In LC0 group compared with control group the content significantly increased from gill (67.62% $P < 0.01$) followed by hepatopancreas (51.89% $P < 0.01$) and gonad (21.14% $P < 0.01$) and Decreased significantly from siphon (47.87% $P < 0.01$), Anterior adductor muscle (42.73% $P < 0.01$), posterior adductor muscle (40.33% $P < 0.01$), mantle (4.24% $P < 0.01$) and foot (3.28% $P < 0.01$). In LC50 group compared with control content showed increase significantly from mantle (41.08% $P < 0.01$) and Decreased significantly from foot (63.27% $P < 0.01$), siphon (46.89% $P < 0.01$), gonad (45.45% $P < 0.01$), hepatopancreas (29.70% $P < 0.01$), gill (21.75% $P < 0.05$) anterior adductor muscle (17.65%) and Posterior adductor muscle (7.40% $P < 0.01$) showed non significant. The influence of toxicant cadmium chloride in selected tissues of freshwater bivalve molluscs *Lamellidens marginalis* was taken into account in evaluating to response against stressor. Hence, we can use glycogen content as biomarker of cadmium stress in bivalve mollusks.

Keywords: Cadmium, different body parts, glycogen, *Lamellidens marginalis*.

Impact of climate change on Weed Biological Control and Ecological Interactions in Aquatic Ecosystem

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Invasive species are the non-native species introduced into a new region causing adverse ecological and environmental impacts world-wide. Climate change is known to compound the impact of biological invasions hence both the most persistent ongoing challenges today. Prediction of climate change impacts on ecosystem and its functioning becomes a challenging problem due to scientific uncertainties. These uncertainties arise as climate change and biological invasions interact with other existing stressors to shape the distribution, spread, diversity and abundance of species, substantially altering biodiversity, causing changes in phenology, genetic composition, species ranges, species interactions and ecosystem processes. Invasive aquatic plants, such as water hyacinth, alligator weed, giant salvinia, etc., often grow aggressively causing significant ecological and socio-economic impacts. Biological control of invasive species with host specific insects and plant pathogens is considered a cost-effective, permanent and environmentally friendly method. But on one hand where climate change is anticipated to benefit the invasive plant species, on the other hand how this will impact the biological control agents and the control mechanism is less known. Biological control in an aquatic ecosystem is largely influenced by highly eutrophic waters, cooler climates that slow the build-up of the biological control agent populations, frost, floods and inappropriate application of other control methods such as herbicide application that affect the agents or cause a reduction in the weed population thereby decimating the agent population. Elevated CO₂ and temperature, together with phytopathogenic infection or arthropod herbivory, can significantly modify plant biochemistry and hence plant defense responses. Similarly, the field performance of a microbial herbicide in terms of virulence, host-range, etc, depends on several biological traits of the organism and its environmental conditions. There is a greater need to examine approaches for predicting the invasiveness of non-native plants and their biocontrol agents, under changing environmental conditions and their ecological interactions and impacts. There is also a critical need for a wider study of ecological, behavioural, physiological and life-history responses to be addressed across a greater range of geographic locations, particularly in areas of high human population growth and habitat modification, like India. This paper reviews how modified interactions, between mutually interacting species, like spatial or phenological decoupling of herbivore-predator, host-parasite or plant-pollinator populations, etc, may have ecological and economic consequences globally in aquatic invasive species and their biocontrol agents under changing climatic conditions.

Keywords: *biological control; fresh water ecosystem, invasive plants; insects; phytopathogens; species interactions.*

A Laminarin Induced Changes In Reactive Oxygen Species and Antioxidant Enzymes Against *Alternaria Solani* Infection In *Solanum Lycopersicum* Linn.

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Organic approaches for controlling plant diseases using biopolymers are increasing attention in recent years because of their non-toxic nature to the environment. Elicitor-induced defense response against potential plant pathogens has been widely reported in several crop plants. The present study elucidates the potency of a laminarin, as an inducer of reactive oxygen species (ROS) and antioxidant enzymes such as Guaiacol peroxidase (GPOX), Polyphenol oxidase (PPO) and Superoxide dismutase (SOD) against early blight disease in *Solanum lycopersicum* (tomato) plant. Tomato leaves were sprayed with different concentrations of laminarin such as 0.01%, 0.03% and 0.05% which was followed by pathogen (*Alternaria solani*) infection. The experimental leaves were harvested at various time points (12, 24, 36 and 48 hrs) and assayed for reactive oxygen species (H_2O_2 and O_2^-) and antioxidant enzymes. Laminarin (0.03%) pre-treated followed by pathogen infected leaves showed higher accumulation of H_2O_2 at 36 and 48 hrs. A higher accumulation of O_2^- was observed in laminarin (0.05%) pre-treated followed by pathogen infected leaves at 24 hrs. A time course study of antioxidant enzyme such as guaiacol peroxidase (soluble) activity in pathogen infected leaves resulted in decreased activity compared to the tomato leaves pre-treated with laminarin and laminarin pre-treatment followed by pathogen infection at 12 hrs. Native-PAGE analysis of GPOX showed an induction of a new isoform of peroxidase in tomato leaves pretreated with laminarin (0.01%, 0.03%, 0.05%) followed by pathogen infection at 12 and 24 hrs. An increased activity of PPO was observed laminarin pre-treated (0.05%) and Pathogen alone at 12 hrs and decrease in activity at of SOD was observed at 48 hrs in leaves pre-treated with laminarin alone. A quantitative increase in PPO and SOD activity was evident in leaves pretreated with laminarin in 12, 24, 36, and 48 hrs by Native-PAGE. Interestingly laminarin (0.03%) pre-treated leaves showed reduced cell death when compared to control and pathogen alone infected leaves. Results of the present investigation revealed that the laminarin activates antioxidant defense response in tomato plants against early blight disease caused by *Alternaria solani*.

Keywords: *Solanum lycopersicum*; Laminarin; Early Blight Disease; *Alternaria solani*; Guaiacol peroxidase; Polyphenol oxidase; Superoxide dismutase.

Pathogenic Microorganism And Biocontrol Agent: Importance And Utilities In Agricultural Aspects

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In plant system, there are many plants are severely infected by a number of bacterial and fungal pathogens. A number of economically important crop plants and medicinal plants are damaged by many fungal attacks which causes a huge loss. *Alternaria* sp., *Fusarium* sp., *Pythium* sp., *Rhizoctinia* sp., *Aspergillus* sp. are some common pathogenic fungi which invade many crop plants and vegetables. There are some beneficial microorganisms which antagonize the actions of pathogenic fungi and these are commonly termed as 'biocontrol agent'. *Pseudomonas* sp., *Trichoderma* sp., and *Saccharomyces* are several biocontrol organisms which inhibit the detrimental actions of pathogens and thereby protect the plants. The study of host-pathogen-biocontrol agent has immense importance in relation to agricultural aspects. Here attempts have been made by highlighting several examples of biocontrol organism and their antagonizing actions.

Keywords: *Fusarium, pathogen, Trichoderma, antagonism.*

Biodiversity, Challenges and COVID 19 Pandemic: A Way Forward

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Biodiversity can be defined as the variability among the living organism from all sources, including terrestrial, marine and other aquatic ecosystems and ecological complexes of which they are part, this includes diversity within species, between species and of ecosystem. The growing awareness that biodiversity is a precious global asset to present and future generation and that species survival and the integrity of habitats and ecosystems are at serious risk, has increased significantly the importance of biodiversity related research. The loss of biodiversity is a global crisis, there is hardly any region on the earth that is not facing ecological catastrophes .Of the 1.7 million species known to inhabit the earth (Human is just one of them), one third to one fourth of species is likely to extinct within the next few decades. Therefore onus of safeguarding biodiversity is not just on government or indigenous communities but on all of us as this is one common heritage.

Keywords: *Biodiversity, Ecosystem, species, government, Global.*

A Study on Knowledge, Health Benefits and Determinants of Fruit and Vegetable Consumption among Married People in Kashmir Valley

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The World Health Organization (WHO) recommends that a person should consume at least 400g of Fruit and Vegetable (FV) daily to prevent chronic disease risk. The current study carried out in Kashmir valley aims to understand knowledge and attitude of married people towards fruit and vegetable consumption. Fruits and vegetables are very important source of protein and other elements for the maintenance of healthy body, as it is one of the most important sources of plant protein, vitamins, and minerals. The main aim of present study conducted in Kashmir valley was to assess the fruit and vegetable consumption pattern among the married people of Kashmir.

In the present study carried out in 2020-21 using simple random sampling design, 400 married people were chosen for our study. A well developed validated questionnaire was used to collect the information from the population under study. The data collected was analysed and interpreted statistically using appropriate statistical tools.

The study revealed that majority of the respondents reported that the consumption of fruits and vegetables increased after marriage. Further, the respondents revealed that they consume fruits and vegetables for taste, freshness, nutrition purpose and for reproductive health benefits. The majority of the respondents revealed that they had no preference of fresh fruits and the consumption pattern of fruits as well as vegetables was associated with family status. The scarcity of fruits, lack of retail units in neighborhood, and high price were main constraints, fruit consumer face in the study area.

In the current study we observe that respondents possess poor knowledge on daily fruit vegetable consumption based on the WHO guideline and furthermore the few knowledgeable participants tended to consume below the recommended levels. Importantly,

the absence of desired choice of fruit vegetable impacted negatively on consumption. Adequate fruit vegetable intake depends on consumer preference and availability regardless of health expert's advice. This suggests individual home based fruit vegetable cultivation is relevant for availability of preferred choice. The health professional, religious guidance, parents, teachers and scholars can help to understand the importance of fruits and vegetables for reproductive health system. It is concluded from our study that there is a need of providing accurate scientific information concerning reproductive health to the respondents.

Keywords: *Kashmir, Married people, Fruits, Vegetables, Marketing, Consumer preference.*

Indoor Air Pollution: A Health Threat to Life; Challenge Before Population Growth: Case Study on Rajpur-Sonarpur Municipality, West Bengal, India

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The very fast growing process in the fields of economy and urbanization in India in the last decades has caused a commensurate rise in atmospheric as well as indoor air pollution which has had an impact on both the environment and health. Since 2010, SO₂, CO₂ and nitrogen oxide levels have reached a level that may cause climate change and have adverse effects on the health of the local residents. Past environmental efficiency analyses have rarely examined indoor pollution, and economic developments as interacting systems; therefore, this study used a new two-stage DEA model, the Modified Undesirable EBM Two Stage DEA (Epsilon-Based Measure) to explore the environmental, economic and health efficiencies in Rajpur-Sonarpur city of India. The primary causes to improve air quality is to achieve better health condition, such as reducing instances of bronchitis, asthma, and premature mortality etc. It is also possible that improving indoor air quality may affect the economic performance of a local area, by improving the health of the workforce, contributing to overall quality of life. Indoor air pollution (IAP) caused by biomass fuel use and traditional cooking stoves is a global health threat, particularly for women and young children. The WHO World Health Report 2002 estimates that IAP is responsible for 2.7% of the loss of disability adjusted life years (DALYs) worldwide and 3.7% in high-mortality developing countries. In this research paper provide a survey report on the current literature and Rajpur-Sonarpur Municipality households on the relationship between indoor air pollution, various health issues and economic well-being.

Keywords: *economic well-being, health threat, indoor air pollution, quality of life.*

Insects as Bioindicators of Ecosystem Health

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To study ecology means to study a suite of interacting factors. Ecological bioindicators have widespread appeal to scientists, environmental managers, and the general public. Bioindicators are important in ecology because often times they indicate connections that would be difficult to recognize, test, or measure directly. Insects are an integral part of ecosystem and different insects respond differently to different ecological condition. They are increasingly being used as ecological indicators because of their responsiveness to certain ecological conditions, as well as their diversity and abundance. This paper aims an analysis of insects as bioindicator species of the impact caused by disturbance in nature.

Keywords: *Bioindicators, Insecta, Pollution, Monitoring.*

Impact of Arsenic Pollution on Human Health in Hariharpara Block, Murshidabad District, West Bengal

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Arsenic is a major Environmental pollutant and exposure take place via Environment, Professional, medicinal sources. The Contamination of drinking water is the main source of exposure and affected various countries like India specially Hariharpara block in West Bengal. Arsenic exposure to human and results in degenerative, irritant and neoplastic changes of skin, respiratory method, bloodshed, lymphatic method, nerval system and generative system. There is no special inhibitory act for refractory arsenic poisoning. Subordinate socio-economic status and innutrition may raise the risk of chronic toxicology. Speedily intervention and forbearance can give the alleviation to the affected people.

Keywords: *Arsenic, Environmental pollutant, Socio-economic, Intervention , Chronic toxicology.*

Effect of Plant Growth Promoting Bacteria and Biochar on The Growth and Physiological Response of *Ricinus communis* in Heavy Metal Contaminated Soils

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Heavy metal contamination of soil is one of the major environmental issues, resulting to decreases in soil fertility, plant growth and crop productivity. In this context, the plant growth promoting bacteria (PGPB) have been extensively used because they can improve the plant growth, stress tolerance, crop productivity and/or phytoremediation process even under various environmental stress conditions. Though such PGPB show the beneficial effects on plant growth and survival in laboratory conditions, most of the PGPB do not work in metal polluted marginal lands due to their poor survival, activity and colonization with host plants. Thus, in recent years the carrier materials including agro-waste biomass, vermiculite, etc have been widely used to enhance the growth, activity and shelf-life of inoculated PGPB.

The present study was carried out with an objective to assess the combined effect of PGPB and biochar on the plant growth and ecophysiological response of *Ricinus communis* in metal contaminated soils. The PGPB namely *Enterobacter hormaechei* and *Bacillus thuringiensis* isolated from the rhizosphere soil of *Catharanthus roseus* grown in Magnesite mining area, Selam, Tamilnadu were selected based on their metal resistance (Ni and Zn) and *in vitro* plant growth promoting activity in roll towel assay. These isolates were further characterized for the production of various plant growth-promoting (PGP) metabolites and the showed the potential to produce indole-3-acetic acid, siderophore and ammonia. Further a pot experiment was conducted to examine the effect of PGPB and Coconut husk biochar (2.5% and 5%) on the growth and physiological response of *Ricinus communis* in Ni and Zn polluted soils. Both PGPB were found to be effective in improving the shoot length, root length, fresh weight, dry weight, chlorophyll, protein content of plants, irrespective of heavy metal stress. However, under heavy metal stress, the inoculation of PGPB with biochar showed maximum increase in plant growth, chlorophyll, protein content, superoxide dismutase activities and decrease in the concentrations of proline and malondialdehydeas compared with PGPB or biochar treated alone.

Our results indicate that the biochar amendment might protect the plants from heavy metal stress by favouring the growth of both PGPB and hence stimulate the production of PGP metabolites, which may improve the plant growth and heavy metal stress tolerance. Further studies including the analysis of the combined effects of PGPB and biochar on heavy metal uptake and translocation in plants are under progress.

Keywords: *indole-3-acetic acid, Coconut husk biochar, siderophore, heavy metal stress, proline.*

The Digital Revolution in Wireless Technologies: General Features, Advantages and Disadvantages

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Mobiles have become very essential part of our everyday life. Their current developments are the outcome of various generations. The history of wireless mobile communication shows, attempt has been made to reduce a number of technologies to a single global standard. The first generation has fulfilled the basic mobile voice, while second generation has introduced capacity and coverage. The third generation technology has quest for data at higher speeds to open the gates for truly mobile broadband experience. This will be further realized by the fourth generation technology. The 4G systems are full IP based wireless internet technology, which provides access to the wide range of telecommunication services. This technology provides advanced mobile services, supported by mobile and fixed networks. This technology is packet based and supports for low to high mobility applications. It provides wide range of data rates, in accordance with service demands in multiuser environment. This network technology encompass all systems from public to private, operator driven broadband networks to personal areas and ad hoc networks. It is observed that some problems like unending problems of communications with poor coverage, bad interconnectivity and poor quality of service are still unable to solve. The advent of 5G technology will change the field of communication domain bringing wireless experience to a completely new level. This technology has more processing power and more memory on board. This technology helps to promote stronger links between people working in the different fields and environments. This will become a reality in the fifth generation wireless communication technology. In this review research paper, the evaluation and development of various generations of wireless communication technologies, speed and effective network connection for communication devices along with their general features, advantages and disadvantages of one over the other were discussed.

Keywords: *Wireless communication, 1G to 5G Technologies, Advantages, Disadvantages*

Assessment of Antibacterial Activity of Flower Extract of *Callistemon linearis* – an *in-vitro* Study

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Plants are rich source of various secondary metabolites having various activities. Researchers are interested to investigate new drugs from herbal source because, plant derived products are less harmful in compare to chemically derived drugs. *Callistemon linearis* (Narrow leaf bottlebrush) is a medium size evergreen tree under the Myrtaceae family. The aim of the present study was to evaluate the antibacterial potentials of the methanolextract fraction of flower of *C. linearis*, of different extract fractions (Petroleum ether extract fraction, Ethyl acetate extract fraction, Acetone extract fraction and methanolic extract fraction) against various Gram-positive and Gram-negative bacteria. For detecting antibacterial activity Agar well diffusion method was used against some human and fish pathogenic bacteria. Preliminary phytochemical analysis and Fourier Transform Infrared (FTIR) analysis were conducted to determine the functional groups responsible for antibacterial activity. Different extract fractions showed varied degree of antibacterial activity in different bacteria. Among the four extract fractions best antibacterial potentiality were found in petroleum ether fraction against Gram-positive bacteria *Bacillus subtilis* followed by *Staphylococcus aureus*. Among Gram-negative bacteria *Escherichia coli* showed good result followed by *Pseudomonas putida*. Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC) were done for establishing the antibacterial activity of each extract fractions. FTIR analysis revealed the presence of alcohol, aromatics, esters, etc. In summary, *in-vitro* antibacterial activity of flower extract fractions of *C. linearis* were established and petroleum ether fractions was identified as much potential antibacterial compound which may be used as an antibacterial to treat infectious disease.

Keywords: *Callistemon linearis*, Antibacterial activity, MIC, MBC, FTIR.

Glycosmis pentaphylla* Fruit Extract as A Potential Mosquito Larvicide Against *Culex quinquefasciatus

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Mosquitoes are infamous insects that belong to Family *Culicidae*, Class *Insecta* and Phylum *Arthropoda*. Mosquitoes are responsible for spreading various deadly diseases by acting as vectors. *Culexquinquefasciatus* spreads diseases like filariasis, St. Louis encephalitis, West Nile fever, Western equine encephalitis etc. The increased mortality due to mosquito borne diseases is the reason to think about strict and efficient mosquito control mechanism. Conventional mosquito control approaches include: physical control, biological control, genetic control and chemical control. However, in India physical control and biological control approaches have limited efficiency. Chemical control, though is an effective method, should be avoided as it also have hazardous side effects. Hence it is high time we should look for alternative environment friendly method for mosquito control. Plant products will control mosquitoes selectively and will not have harsh effect on environment. Also, it is economic as not much processing is required. In this study we propose the potentiality of *GlycosmisPentaphylla* fruit extract as green larvicide against *Culexquinquefasciatus*. Standard protocol of WHO has been followed to set up the experiments and measure the larval mortality. Graded concentrations of both Crude (0.6% to 1.0%) and water extracts (20-200 ppm) of *GlycosmisPentaphylla* fruit were prepared. All four larval instars of *Culexquinquefasciatus* were treated with the graded concentrations of this extracts (both Crude and water) for 24, 48 and 72 hours. Cent percent larval mortality was observed at 0.8% concentration of the crude extract and 150 ppm of water extract against 2nd and 3rd instar larvae after 72 hours of exposure. *Chironomus* larvae were treated with the same extracts to see the effects of the same on non target organisms. No harsh effect observed. Hence our finding suggests extracts of *GlycosmisPentaphylla* fruits to be a potent green larvicide against *Culexquinquefasciatus* larvae.

Keywords: *GlycosmisPentaphylla*, *Culexquinquefasciatus*, *Chironomus*, non-target organisms, Green larvicide.

Environmental Pollution with Reference to COVID-19 Pandemic

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Environmental pollution directly leads to the augmentation of environmental problems, which lead the intricacy in human life. World is already facing various environmental challenges like Global warming and Ozone layer depletion. Presently one biggest challenge for the world is COVID-19. The outbreak of Corona virus disease affects the life of people. It has not only affected the human health and economy of the world but it also affected the environment in the various ways. COVID-19 pandemic has changed our way of lifestyle with several safety restrictions. The lockdown strategy has been taken by the various country worldwide to control and slowdown the effect of coronavirus which shows the significant effects on the environment. Therefore, the present study helps to know about the effect of COVID-19 on environmental, by revising the numerous scientific literatures. The study also reveals the positive and negative effect of the COVID-19 on environment. Due to lockdown several industrial and economic activities has slowdown everywhere, which improves the air quality of polluted cities, reduces the GHGs emission and also reduces the water pollution. Although, beside this positive impact of COVID-19 on environment, some negative impact also has been observed like increase in biomedical waste and haphazard disposal. The positive impact is not permanent impact as the world gradually returns to its pre pandemic status but some new challenges the biological pollutants and non degradable wastes are exist with us.

Keywords: *COVID-19, Environmental pollution, lockdown, pandemic, Climate change, Waste.*

Lineament Analysis for Sustainable Water Resource Management in Hard Rock Hydrogeological Environment Amaravati River Basin Using RS & GIS

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Amravati River basin is characterized by drought-prone area, access to sufficient water resources becomes a difficult activity, because of climate change and by human activities. Lineament regions on the surface are vital elements in understanding the dynamics of the subsurface water flow. However, good exposures of these groundwater resources are always lacking in some areas in the Amravati River basin due to thick hard rock terrain. This research work emphasizes developing the remote sensing and GIS methodology for targeting regional groundwater potential extraction. The objectives of this study are to (i) produce a regional structural lineament map of the study area from remotely sensed data, (ii) determine the hydrogeological inference of the lineaments by integrating them with the available ancillary data, (iii) analyze the lineament trend distribution of the study area using rose diagrams, lineament density maps, and lineament intersection maps. The results from the study show that the remote sensing and GIS technique is proficient in extracting lineament trends in hard rock terrain. The study has led to the demarcation of areas where groundwater occurrences are most auspicious for sustainable supply. It is therefore suggested that the high lineament intersection and density zones should be examined for quantitative evaluation of the groundwater potential of the study area. Appropriately sited wells in drought-stricken areas could change the lives of many and the remote-sensing analysts and lineament interpreters in the study area are without doubt important in this process.

Keywords: *Lineament Analysis, Hard Rock Hydrogeology, Remote sensing, GIS.*

Understanding The Menace of Noise Pollution: A Study With Reference to Its Legislative Provisions and Judicial Decisions in India

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Environmental pollution in the present world is considered as a global threat not only for the existing generation but also for future generations. Increasing obnoxious and distasteful noises released during gradually increased ceremonies and public gatherings of human beings, which has cost the Communities a lot and thereby directly and indirectly affects the health and wellbeing of the mass population. Also, pollution amounting to the creation of artificial or man-made noise is affecting the peace and tranquillity of the people residing within the society at large. Emanating high-density noise through multiple sources can be considered as a threat to human life, which is unconstitutional in nature and as a result, violating the fundamental rights as mentioned under Article 21 of the Constitution of India. The present paper analyses the legislative provisions enacted in relation to Noise Pollution and its effect on the conservation of such pollution. Also, the paper further analyses the major source of the outbreak of noise pollutants and their contribution in damaging the peaceful environment and hence going through certain control strategies and guidelines provided by Central Pollution Control Board and State Pollution Control Board authorities with reference to various judicial decisions directed by the Indian judiciary.

Keywords: *Environment Law, Noise Pollution, Pollutants, Ceremonies, Public Gatherings, Central Pollution Control Board, State Pollution Control Board, Legislative Provisions, Judicial Decisions etc.*

Water Quality Assessment and Impact of Uncontrolled Urbanisation of Selected Wetland Areas of Kolkata and Howrah

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Urban growth and consequential change of wetland environment is a worldwide issue and commonly persisting in Southern part of West Bengal in and around Kolkata and Howrah cities. Kolkata along the East Kolkata Wetlands (EKW) have witnessed unregulated urbanization involving profound transformation of the wetland ecological environment. Encroachment of the wetlands profoundly changed natural land-cover to urban land-use. The same situation also persists in industrial city of Howrah with over utilization of Santragachi wetland. The municipal limits fast engulf into the wetlands and change the characteristics of soil, water bodies and biodiversity of the area. Even agricultural land, fisheries which are integral parts of the socio-economic environment of the wetlands are experiencing drastic changes.

The EKW area originally formed as spillover basin of the presently inactive Bidyadhari River. There is no catchment for these water bodies and perched aquifer occurs below at depth greater than 400 ft. The tropical climate is favourable for originating the wetlands with rich biodiversity. Good correlation between bio-chemical and phenotypic behaviour of organisms along with cultivable soil bacteria make the zone more fertile. 97% of Kolkata's waste is being disposed by the Kolkata Municipal Corporation in Dhapa mouza. Local farmers and fishermen make best sustainable use of the wetlands creating buffer between land and water and using garbage as fertilizer. The wetland was the habitat of approximately 20 mammals, snakes and over 40 species of birds. On the other hand the Santraganchi Wetland was famous for the abode of migratory birds in winter and now is dwindling in the pressure of urbanization.

This article will assess how Bengal wetlands are at stake and a Ramsar site getting ruined by analyzing comparative changes of land-use pattern, impact of urbanisation and industrial zone especially the Bamtola Leather Complex, and consequent impact on water quality. Methodology involved sample collection and quality testing, WQI calculation based on selected parameters and weightage assigning, preparation of LULC maps and water quality maps in GIS platform. The study concludes with depicting the degradation of wetland water quality and environment along with urban encroachment scenario.

Keywords: *ecological environment, spillover basin, perched aquifer, encroachment, transformation, land-cover, land-use, biodiversity, sustainable, buffer.*

Pesticide Production and Consumption in India with Global Comparison

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Global environmental degradation and soil pollution due to pressures from the growing demands of agri-food and industrial systems, responding to a rising world population, is one of the major global challenges facing humanity. Agriculture is an important source of pollution in Asian countries. Asia utilizes more than half of the globally used pesticides alone. Modern agriculture is highly dependent on synthetic pesticides and fertilizers. Pesticides that are commonly used include insecticides, fungicides, and herbicides for the management of uncontrolled weeds and pests on agricultural sites. However, in total pesticide consumption, insecticides occupy the highest share in India. India's pesticide use globally about 1%. India has utilized around 58160 metric tons of pesticide in 2018 as per the data of FAO. The use of pesticides per hectare area of cropland was only 0.34 kg in 2018. While China consumed 13.07 kg/ha, Japan 1.76 kg/ha, and America consumed 3.57 kg/ha of pesticides respectively. In spite of the less amount of pesticides used per hectare of cropland area, uncontrolled, non-scientific application of pesticides in India, is responsible for the presence of high pesticide residues in both natural and physical environments. In the present manuscript, the global pesticides usage pattern, as well as the data of different types of pesticide consumption and toxicity all over the world and in India have been reviewed and summarized.

Keywords: Pesticides, Pesticide production & consumption, Risk of pesticides, Bio-pesticides, India.

Food Production and Food Security Through Changing Cropping Pattern: A Case Study of Climate Change of West Bengal, India

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The prime objective of this paper is to explain the production of foods and food security of West Bengal after green revolution through changing cropping pattern based on climate change. Food security is the key to the overall development of any country. Food production needs to be increased to ensure food security. It is possible to ensure food security by increasing food production through changes in agricultural practices and cropping pattern. West Bengal in India is famous as a major agricultural region. In particular, West Bengal plays a leading role in the production of paddy, maize, wheat, oilseeds, potatoes, nuts and vegetables and a variety of fruits. According to a report (Ministry of Statistics and Programme Implementation on May 31, 2021) from 2020-21, West Bengal accounted for only 8% of India's total GDP growth (20.2%), while agriculture's GDP growth accounted for about 21% of West Bengal's total GDP. Out of total food grain production of India (305.44 million tonnes), West Bengal (16508 thousand. Tones) is the 7th largest producer of food grains (Source: Ministry of Agriculture and Farmers Welfare, Principal Crops 2020-21). Although West Bengal is rich in food grain production, it has failed to ensure food security in terms of total population and population growth. Because Ensuring food security is truly challenging for those people, who living below the poverty line in developing countries. As of 2020-21, the proportion of people living below the poverty line in West Bengal is about 19.98% (source: west-bengal-budget-analysis-2021-22). As West Bengal belongs to the lower Gangetic plain, it is very convenient to produce agricultural crops with the help of silty fertile loam soils and plenty of water for irrigation. According to the Ministry of Agriculture and Farmer Welfare, West Bengal is one of the chief producer of food grains (including Rabi and Kharif) in India, In 2016-17, West Bengal was the maximum rice producing state in India, producing 15.9 million tons of rice. And the total rice production in 2017-18 was about 16.9 million tons. At present, due to various hazard and disasters created by environmental pollution, agriculture is being severely disrupted. Climatic hazard and disasters disrupt the production of food grains in some years due to heavy rains and in some years due to drought. As a result, food security is weakened. But, through changing cropping patterns it is possible to increase food production as well as proper use of land. I want to show through this study how it is possible to increase the production of food grains by changing the cropping pattern according to the topography, land suitability, soil nature and mainly based on climate change and how to ensure food security.

Keywords: *changing cropping pattern, Environmental hazard, land suitability, food grains production, food security.*

Aboveground Biomass Stockpile of Trees in *Prosopis juliflora* (SW.) DC Dominated Tree Stands, Carnatic Umbrella Thorn Forest, Peninsular India

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Information on biomass and carbon stockpile of vegetation and their components are essential to estimate the quantum of ecosystem services it offers. Exotic invasive species have been defined as organisms that colonize areas outside their normal ranges with or without human interference. The introduction of exotic species into new habitats has been a global phenomenon with serious consequences on ecological, economic and social systems. The tropical dry forest occupied about 60% of geographical forest cover of Tamil Nadu.

To estimate density, species richness, diversity and aboveground biomass (AGB) of trees (>5cm DBH) in *Prosopis juliflora* dominated tree stands in Therikadu Reserve Forest (TRF) located at Thoothukudi district.

A quantitative study was conducted in *P. juliflora* dominated tree stands at TRF to record density, species richness, diversity and AGB of trees. A sum of 125 20m×20m sub-plots laid randomly across *P. juliflora* dominated areas. All trees >5 cm diameter at breast height (DBH) measured with tree caliper and recorded. Density, species richness, basal area and diversity indices were estimated. A widely accepted allometric formula for the estimation of AGB of dry forest trees used.

A sum of eight species belonged to eight genera and six families found in 5 ha study area. The abundance of woody plants in the five study sites totaled 3368 individuals. More than half of the tree community constituted by exotic species *Prosopis juliflora* (2649 of 3668) followed by *Acacia planifrons* (558), *Borassus flabellifer* (222), *Tecomella undulata* (128), *Azadirachta indica* (95), *Morinda coriaria* (6), while *Cassia siamea* and *Tamarindus indica* represented by just one individual each. The total tree stand basal area is 239.77 m². Shannon-Weiner (H') and equitability (E_{max}) indices were computed as 1.5703 and 0.38, respectively. The study area predominantly occupied by *P. juliflora* which also showed the highest contribution to the tree AGB stockpile, i.e. 1474 Mg (78.62%).

Keywords: Aboveground biomass; diversity; dry forest; species richness; Tamil Nadu; tree density.

A Case Study of Soil Erosion and Soil Problem in Garbeta District of West Medinipur

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Soil erosion is a gradual process of movement and transportation of the large portion of land losses by the different geomorphic agents at the surface of the earth. soil erosion is peremptory environmental degradation that leads to the heavier impact on the soil sculpture and its quality. Present research work is concerned with the study of the problem of soil erosion and its impact of Garbeta block on westMedinipur district. Ground investigation and gis software and statistical package are used to find out the supremacy and similarity of a particular physical and human activity over the region according to the relief. Garbeta block are composed and associated with badland topographical structure. Badland are barren area of land where the vegetation cover is destroyed and extremely rugged terrain, geomorphologically badlands are desertic landscape and water resistance sediment are exposed due to fluvial erosion. Development of Badland morphological structure influence with the rapid soil erosion. The Garbeta badland locally name is ganganir danga. In this block influenced with the high drainage density with rill and gully erosion. A step of escarpment is found in concave slope of silai river. scarp retreat is the main process of escarpment retreat. this object is identified with high rate of soil erosion and also some management with soil conservation. The geographical co-ordinate of Garbeta district 22.8631 degree north and 87.3538 degree east. this area covering with Pleistocene lateritic upland. the thickness of lateritic crapping varying gradually in between 6 to 25 meters. surficial erosion starts from the middle of June at the monsoon rain. This kind of erosion are depending on the intensity of the rainfall, high intensity of rainfall and poor vegetation growth enhance the detachment of soil surface layer and the sheet erosion of soil upper layer. After study the hydraulic characteristic overland flow amplify the rill erosion. Rill erosion is the removal of soil through the cutting of small channel. It's a intermediate between rill and gully erosion. Landsat 8 data and land use land cover is a important tool for policymaker to sustained and prevented the soil degradation of top soil. this paper is centrally focused on the soil erodibility of surface layer and some management strategy implement for soil conservation.

Keywords: *gradual process, environmental degradation, rugged terrain, soil sculpture, lateritic upland, sheet erosion, Rill erosion.*

Waste to Wealth — A Novel Way to Make Better Potential Opportunities

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Waste is seen as undesirable or unusable material that has been arranged or disposed of after essential use. Human in their everyday life makes an unlimited pile of misuse of incalculable assortment. Vegetable and organic product peel, tissue paper, polyethylene packs, wrapping & packaging, and so on are disposed of as waste after essential use. It has become a significant issue in our general public somewhat recently that influences everybody similarly. Waste has a solid monetary effect and influences the climate, including the general ozone-depleting substance discharge. The call for maintainable improvement both earth and monetarily is spelled for all to hear and clear. Henceforth, the current and people in the future should guarantee that all assets will be safeguarded, completely used, and very much oversaw. The practice of gathering, treating, and overseeing waste before removal has become a need in creating and current cultures. The review of research work is to make social attention to decrease wastage through estimating and showing the measure of waste and reusing the wasted utilizing innovative frameworks. One of the models is Maharashtra, which is the second-biggest producer of bananas in the country out of which area Jalgaon alone delivers 70% of banana of the state. In the wake of collecting banana packs, the Banana tree or the Pseudo-Stem is by and large tossed on the limits of the fields and consumed or tossed as horticultural waste. This has been making huge natural perils and other issues in the banana developing zones. The farmers and the society of Jalgaon have found creative approaches to change over their enormous agricultural waste into wealth.

Keywords: *Waste, Wealth, Recycle, Environment.*

A Brief Review of Traditional Food Practices of Indigenous Lodha Tribal Community and Common Health Hazards of Paschim Medinipur District, W.B, India

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The Lodha community is the largest Particularly Vulnerable Tribal Group (PVTG) of West Bengal. Actually, Lodha are the primitive tribal group and constitutes 108,707 in West Bengal (both including Kheria and Kharia) as per Census 2011 of India. The traditional food systems of this indigenous Lodha community are mainly being composed of the different items from the nature, local and also culturally grown items. The average intake of food stuff (g/CU/day) by the Lodhas both from vegetable and animal consumption are the –cereals (378.5), pulses (66.7), green –leafy vegetables (38.3), other vegetables (76.5), tubers (182.9), fat and oil (16.9) and sugar (4.7). The Principal food of the Lodhas is the rice is the form of puffed rice, boiled rice, rice flakes. Average nutrient intake (CU/day) of Lodhas are; energy (1727 Kcal), protein (43.9g), fat (18.8g), calcium (140.4mg), iron (7.1mg), vitamin C (57.7mg), etc. The Dietary pattern of the Lodha is particularly by the inclusion of local or natural resources or unconventional foods. Mainly three anthropometric observations are noticed to assess the nutritional status in childhood: underweight (low weight-for-age), stunting (low height –for-age), and wasting (low weight-for-height). The majority of death due to malnutrition mainly found in children that are marginally malnourished. The Prevalence of underweight, stunting and wasting is higher in Pre School Children than in School going Children.

Keywords: *Traditional food, malnutrition, Tribal community, Principal food, Vulnerable indigenous Community.*

An Accounting and Taxonomy of Arboreal Species of Anacardiaceae Family in Poonch District, Jammu and Kashmir, India

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The Poonch district is part of the Pir-Panchal region of Jammu and Kashmir, which is home to a distinct landscape and a variety of climates. Even with these significant variations, this region has been able to maintain a high level of biodiversity. There are certain groups of flora that have eluded researchers' attention, including the Anacardiaceae family, which is one of those groups. The purpose of this study was to investigate the current occurrence as well as taxonomical studies of the arboreal members of the Anacardiaceae family. For several decades, the district has been observing the occurrence of these plant species both in sub-tropical and temperate zones. This angiospermic arboreal flora group found at an altitude between 988 and 3004 m is composed of eight species in five genera, including one shrub and seven trees, one evergreen, and seven deciduous species, as well as two indigenous and six exotic species.

Among the plant genera, Pistacia and Rhus recorded 2 and 3 species, respectively, while Cotinus, Lannea, and Mangifera recorded one species each.

Keywords: *Accounting, arboreal, taxonomy, Anacardiaceae, Poonch district.*

An Approach towards Building Green Smart Campus

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The paper deals with the smart campus system. In the paper we broadly focus on the designing of smart classroom, smart bathroom management system and the smart self study room. The smart bathroom management system using sustainable resources. Further implemented in three parts occupancy of bathrooms, auto flush control and water management. Here we deal with the smart appliance control in the smart classroom management, in the smart self study room we deal with the occupancy management system. To implement the same have used the Arduino Uno board as the core unit and certain other peripherals like the HC-SR04 ultrasonic sensor, IR sensor, HC05 Bluetooth module, servo motor, Relay module, CFL lamp and LED.

Keywords: *Arduino Uno: Micro controller, IR sensor: infrared sensor, CFL:compact fluorescent lamp, LED: light emitting diode.*

Environmental Impact of Solar Energy Technologies

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The global demand of energy increases, the production of energy and its effect on environment also increases. Today the whole world is facing undesirable phenomena like global warming, climate change, ozone layer depletion, acid rain etc., these phenomena are closely related to uses of fossil fuels or conventional energy sources. To reduce environmental impact, solar energy is best replacement of conventional energy sources as it can be collected, stored and to be used for generating clean and sustainable electricity without pollution and global emission. The various technologies are developed for solar power generation like Solar Concentrating power, Solar Photovoltaic (SPV) technology, Dye Sensitized Solar Cell (DSSC) technology, Photogalvanic cell etc. These technologies have covered wide range of application over the last few years but even introduce some level of environmental effect. The Present study offers an overview of benefits and challenges that are associated with the application of solar energy technologies and discuss the suitable condition to avoided the environmental effects.

Keywords: *environmental impacts, solar energy technologies, land usage, water usage*

Phytoremediation Efficiency of *Brassica Juncea* And *Nephrolepis Exaltata* In Mercury Spiked Soil

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Heavy metals and metalloids despite in trace quantities are responsible for significant toxic effects which resulted in an increased risk towards food safety, plant development and soil fertility. Mercury is considered as a potential neurotoxin and toxic in nature due to its persistence. Mercury occurs in various forms namely elemental, organic and inorganic mercury. Soil is reckoned to be a global sink for various contaminants which also ropes in mercury by means of bioaccumulation. Plant-soil interface governs the fate of mercury within the plant system, the soil and to the atmosphere. In a pot culture experiment, Indian mustard and boston fern were grown in mercury spiked soil with different concentration variants of mercury with the objective of assessing the influence of different treatments on mercury tolerance of Indian mustard and boston fern, different soil properties and its correlation with soil mercury. Soil without mercury served as control for both tested plants. The soil samples were collected at definite intervals viz., 15th, 30th and 45th days after mercury treatment and estimated for chemical parameters, total mercury and water soluble mercury. The pH ranged from 5.66 to 5.88 which is acidic in nature facilitating the mobility, uptake and translocation of mercury. The mean SOC content was lowest in P T with 1.78 per cent and the highest in P T with 2.26 per cent. Our results indicated that nutrient content at different mercury concentration exhibited insignificant difference ($p > 0.05$) compared to control. A significant difference ($p < 0.05$) was observed after 45 days of mercury treatment in soil available nitrogen. Maximum relative change of 6.06 and 5.85 per cent was observed in soil available nitrogen content of 20 mg kg⁻¹ treated soil of Indian Mustard and 10 mg kg⁻¹ treated soil of Boston fern, respectively. Parallel changes were recorded in phosphorous and potassium content. The soil under Boston Fern was found to have significantly higher sulphur content compared to Indian Mustard indicating immobilization of Hg. The concentration of total mercury in soil decreased over the period of time in both Boston fern and Indian mustard. *B.juncea*'s reported mercury removal from the spiked soil by 2 per cent higher than *N.exaltata*. Plant response towards mercury contamination altered with growth period and the nutrient content tends to descend due to their mineralization and plant uptake.

Keywords: trace chalcophile element, Soil nutrients, bioavailability, remediation potential.

Air Pollution from the Automobile Industry

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Introduction: Air pollution is the presence of harmful compounds in the air which lower its quality and damage the environment like depletion of ozone layer and simultaneously causing global warming leading to climate change. A WHO report says that nine out of ten people in the world now breathe polluted air which kills 7 million people every year. Microscopic pollutants break through our body's defense system and enmesh with our heart, brain and lungs causing them serious damage. This gives rise to heart diseases, lung cancer and deaths from stroke.

Vehicular pollution is a major contributor to air pollution. Almost all modes of transport are in some way or the other a source of air pollution from the combustion of liquid fossil fuel. The extent of pollution depends on the composition and nature of the fuel and combustion conditions.

In any industry like the automobile, there is a wide range of processes and at every stage green alternative must be preferred. Mid-level managers should be the driving force behind implementation of the environment management practices as mandated by the government of India.

Objective: The objective of our study has been to find out the role of middle managers in the greening of the automobile industry. This paper attempts to assess and report the extent of implementation of green environmental behavioural practices in Indian automobile industry, an indicator of implementation of environmental practices.

Methodology: Primary survey questionnaire has been used to assess environmental behavioral patterns of respondents from automobile industries. Multiple regression has been used as an analysis technique.

Results: Preliminary results show that the scores of levels of Employee Awareness and Attitude ranges from 84 to 103 out of a maximum score of 156 and the scores of Pro-Employee Behavior ranges from 63 to 77 out of a maximum score of 84.

Conclusion: Vehicular pollution can be reduced by using alternate fuels like hydrogen and natural gas, and using innovative technology. It is imperative to cut the emissions at source. This shall ensure a long-term health benefit to people's health. But such practices can be successful with proactive attitude of employees in this sector.

Keywords: *air pollution, vehicular pollution, automobile industries, fossil fuel, multiple regression, environment management practices*

A Retrospective Review on Scenario Based Traffic Generator

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In this paper, presented the study related to the areas of scenario based traffic generators. It also identifies different properties the suitability of traffic generators for specific evaluation scenarios. These properties cover a wide range of criteria with give detail information about LTE, LTE Attach Flow, Traffic Generators framework, brief on protocols and GTPv2 message formats. Based on the comprehensive overview highlights the peculiar of each criterion. Furthermore, this work briefly touches upon other sources we found for scenario based traffic generators. Based on these findings and requirements we created a network traffic generator built on a large data base of genuine network and findings with similar experiments and more extensive research work can be incorporate into manuals and standards. Finally, discussed the observations and provide some for use and creation of scenario based traffic generators. A retrospective review on decade of 2011 to 2021. This paper will be apt to the theme of conference "Make India Clean as well as Cleaning up Technologies".

Keywords: *Scenario, LTE, Traffic Generators, Protocols, GTPv2, Network Simulator.*

Organic Agriculture is the only Solution for Clean Environment and Rural Development

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In the present investigation experiments have been made to decompose the agricultural wastes and weeds by the use of fungal culture. Five types of fungal cultures were used as alone and in the mixture form in the pots with three replicates along with the control. They were *Trichoderma viride*, *Aspergillus flavus*, *A. niger*, *Penicillium digitatum* and *Rhizoctonia bataticola* as alone in mixture form along with weeds as *Parthenium hysterophorus* L. *Cassia tora* L. *Crotolarianotonii*, *Tephrosia hamiltoni* Drumm for the formation of compost. All green variety of spinach was cultivated on the compost and the increase in vegetation, dry matter and nitrogen kg/ha was compared with the control.

Keywords: *Weeds, compost, fungal inoculants, spinach yields.*

Projection of Climate and Landuse Landcover Changes and Their Impact on Hydrological Regime of Jhelum Basin, North-Western Himalaya

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The impact of land use land cover and climate variability on the hydrologic regime of Jhelum basin, north-western Himalayas was determined. Landsat TM and OLI/TIRS imageries were utilised to prepare the land use and land cover maps for the retrospective (2000 and 2010) and current time periods, respectively. The CA Markov (Cellular Automata and Markov Chain) model was used to project the future land use and land cover maps of 2050 and 2080. Future projections of the climatic variables from 2022- 2080, such as tasmax (maximum near surface air temperature), tasmin (minimum near surface air temperature), and pr (precipitation) under Representative Concentration Pathways (RCPs) 4.5 and 8.5 of Regional Climate Model version 4 (RegCM4) were downloaded from CORDEX site. SWAT model was implemented for simulation of river discharge of Jhelum catchment. The land use land cover change shows decrease of forest cover and increase of water, agricultural land and range land in the future time period, which may be due to enhanced anthropogenic/developmental activities. Air temperature and precipitation exhibited a rise in the future time period, due to increase in greenhouse gas (GHG) emissions. SWAT model shows increase of simulated stream flow in 2080 as compared to present time period, which could be attributed to snow/glacier melt in the upper reaches and increase in precipitation of Jhelum catchment.

Keywords: Climate variability, CA Markov, RegCM4, SWAT model, CORDEX.

Genetic Biomonitoring to Detect Abnormal Nucleation in the Peripheral Erythrocytes of Fish (*Mystus gulio* Ham. – Buch.) of River Hooghly

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The present study was attempted to detect the frequencies (%) of nuclear abnormalities (NA) such as nuclear buds as lobed nuclei (LN), MN or micronuclei (free or attached with main nucleus) as erythrocytes bearing more than a single main nucleus, blebbed nuclei (BLN), notched nuclei (NN), nuclear fragmentation (NF), bi-nucleated erythrocytes (BN), vacuolated nuclei (VN), nuclear kariolysis (NC), Dumble shaped nuclei (DSN) and Retracted nuclei (RN) and MN (micronucleation) in the peripheral erythrocytes of fish, *Mystus gulio* Ham. – Buch. inhabited in the river Hooghly. The study site was selected at Birlapur spot of river Hooghly downstream, West Bengal, India. The frequencies of different MN and NA in the peripheral erythrocytes of test fish were also evaluated. The results of MN frequencies (%) recorded 1.64 ± 0.32 while for frequencies (%) of NA such as BLN, BN, NN, LN, DSN, RN, FN and NC values were also recorded in the fishes as 1.64 ± 0.32 , 1.16 ± 0.15 , 1.02 ± 0.25 , 1.86 ± 0.45 , 3.12 ± 0.91 , 2.52 ± 0.88 , 2.61 ± 1.22 and 3.13 ± 1.21 respectively. The highest frequencies (%) of NA were obtained in case of NC followed by DSN, FN and RN. The frequency (%) of MN value was lower than above-mentioned NA values. The present results indicate alarming risk of genotoxicity through the induction of MN and NA in the peripheral erythrocytes of test fish. This study is genetic biomonitoring and causative genotoxic agents are unknown. It is suggested that regular monitoring for genotoxin(s) in the study site, as well as other sites of river Hooghly to support the present genotoxicity study.

Keywords: Genetic biomonitoring; Fish species; Aquatic ecosystem; Micronucleation; Abnormal nucleation; Peripheral erythrocytes.

A Review on Assessment of Heavy Metal Contamination on Spinach, Purslane and Amaranth Leaves Growing Near Road Side (Heavy Traffic) Vegetable Fields

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ABSTRACT: - Leafy Vegetables are important sources of many nutrients, including vitamins, dietary fibre, folate (folic acid), minerals and have beneficial antioxidative effects. Heavy metals like Pd, Cd, Ni, Cu and Zn are majorly release from vehicular exhaust and non-exhaust emissions. These heavy metals in the form of minute aerosols particles can easily penetrates through the tissues of Leafy vegetables (Spinach, Purslane and Amaranth) due to broad size of their leaves. These metal containing aerosols may lead high accumulation of heavy metals such as Pd, Cd, Ni, Cu and Zn in leafy vegetables due to atmospheric depositions. The number of vehicles in operation increasing year by year and lengthening of trips have resulted in the emissions of larger concentration of metals originating from brake, tyre, and road wear. Zn is the most abundant heavy metal from tire wear. Its high concentration resulted from the addition of ZnO to the tire during vulcanisation. The significant level of Cu in vegetables growing in road sides areas may be due to high rate of brake abrasion from the vehicles. Due to heavy metal deposition in vegetables, metal contents of leafy vegetables need not only to be determined but also estimated health risk for revealing possible health effects on humans should be properly done. Based on the carcinogenic risk assessment, evaluation of concentration of heavy metals in these road side growing leafy vegetables is very necessary. This review is an attempt to determine the effect of heavy metals coming out from non-exhaust vehicular emissions on the leafy vegetables grown near road side areas.

Keywords: *vegetables, copper, zinc, heavy metals.*

Effects of COVID 19 Pandemic Lockdown on the Environment: A Critical Review

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The global pandemic coronavirus disease 2019 (COVID-19) has imposed enormous health, psychological, environmental, economic and social challenges to the entire human population worldwide. Among the different measures to combat COVID-19 pandemic, which include lockdown, social distancing, isolation, and home quarantine, the lockdown measures particularly have appeared as a blessing in disguise for the environment during this crisis time. The lockdown measures have confined people to their homes and drastically reduced the economic and social activities, thus restricting human interactions with nature and environment. Additionally, there is a significant reduction in industrial activities, factories, constructions, schools, offices, vehicular activities, road traffic and tourism during the lockdown. This has led to a dramatic decrease in environmental pollution all across the globe. Extensive studies show that air pollutants such as nitrogen dioxide (NO₂), carbon dioxide (CO₂), carbon monoxide (CO), aerosols, ground-level atmospheric ozone, particulate matters and other oxides of nitrogen like nitrous oxide (N₂O) emissions have dropped significantly due to shutdown of heavy industries, vehicular activities and less consumption of fossil fuels in many countries. As a result, there is a sign of reduction of several severe respiratory diseases due to air pollution. Furthermore, dumping of industrial wastes into rivers was reduced during the pandemic, thus declining water pollution, which is a common disaster in most of the highly polluted countries. Likewise, there was also a sharp decrease in noise pollution and many species of wild animals and birds were spotted back in many cities all around the world. However, there have been negative impacts of COVID 19 on the environment as well. There has been a tremendous increase in amount of medical wastes such as haphazard disposal of PPE, masks and gloves in healthcare institutions during the pandemic; and these untreated wastes are continuously endangering the environment. Huge amounts of disinfectants and antiseptics applied to exterminate the coronavirus can kill non-targeted beneficial species and create ecological imbalance. Moreover, anthropogenic activities during the pandemic have resulted in illegal activities, such as deforestation and increased poaching and fishing activities and urbanization. The different protected areas were left unmonitored due to sudden shutdown of ecotourism activities and lack of park rangers. Hence, the natural ecosystems and different flora and fauna are at great risk in different countries. On one hand, the positive effects of COVID-19 has reduced the greenhouse gases (GHGs) emissions and increased reports of improved environmental conditions all over the world; on the other hand, there are also negative secondary aspects such as reduction in recycling. Thus, it is the urgency to work out in protecting and rehabilitating the world's environment, which is currently balancing

on a knife-edge. The current review work outlines the possible ways to achieve the long-term environmental benefits and proper implementation of the proposed strategies that might be helpful for the global environmental sustainability. The main aim of this study is to shed light on the possible associations between COVID-19 pandemic and the environmental factors and provide some recommendations for adequately controlling the future epidemic threats.

Keywords: *COVID-19 pandemic, lockdown, social distancing, isolation, home quarantine, environmental pollution, GHGs emission, medical waste, environmental sustainability.*

Air Pollution's Key Role Playing in Effects on Public Health: A Review

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Air pollution is a major effect of the new civilized world, which has had major toxic effects on human health and the environment. In the world, there are various emission sources, but motor vehicles and industrial processes have contributed to a large amount of air pollution. Carbon monoxide, nitrogen oxides, ground-level ozone, sulphur oxides, dust particles, and lead have been identified as the six major air pollutants by the World Health Organization. Short-term air suspended particles have different toxicological effects on human health, including cardiovascular and respiratory diseases, eye irritation, neuropsychiatric complications, skin diseases, and long-term chronic diseases such as cancer. Many reports reveal that it is exposed to low air quality that is increasing the rate of morbidity and mortality, mostly due to cardiovascular and respiratory diseases. Air pollution has significantly contributed to the environmental risk factor that has increased some diseases such as lung cancer, asthma, ventricular hypertrophy, psychological complications, Alzheimer's and Parkinson's diseases, retinopathy, autism, low birth weight, and fetal growth. The primary goal of this review paper is to discuss the toxic effects of major air pollutants, their sources of emissions, and their effects on human health.

Keywords: *Air pollution, gas emission, public health, respiratory tract diseases, toxicology.*

Theme-5 Habitat preference of *Gyps indicus* in Bundelkhand region India with special reference to their breeding

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Vultures need natural habitat to raise their offspring. They pay full attention for the growth of their fledgling from September to may till their fledgling leans to fly, though they are very curious for the selection of suitable breeding habitat for their breeding cycle. Therefore they always select their breeding habitat by keeping different criteria in mind. They select their breeding habitat in reference to various factors such as availability of food at particular distance, availability of nesting material, Distance of breeding habitat from human habitation, Water body, and forest area, height of tree, cliff and monument. For the selection of breeding habitat as tree they have to focus on some different factors such as maturity of trees, branches of trees, tree condition, and tree canopy in Bundelkhand region situated in the heart of India. The study was carried out in breeding areas of 14 districts of mixed dry deciduous forests of bundelkhand region from 2015 to 2019. Habitat selection was identified by measuring distance with the help of GPS, and direction with the help of compass. Map of study area was prepared by using Q GIS software. they select their breeding habitat on tree (31.01m) /cliff (25.44m) /monument (17.07m) away from human disturbance (max-10.47 to min-3km) and near to water body (max- 3.033 to min-0.33km). Distance of breeding territory to feeding site was 8.87km, forest at 4.14km and agricultural land at 3.53km. The breeding habitats facing the direction of sunlight towards the east are highly selected for breeding. *Gyps* vultures are colonial birds. Largest colony size was 98 and smallest colony size was 58 individuals. Most of the breeding sites situated on vertical cliffs, east-facing closed territory was highly selected by *Gyps* vultures for breeding in the Bundelkhand region. Anthropogenic habitat, unavailability of food, tourism, Electrocution, habitat loss is the major threats to the breeding site. Maintenance of forest openings, diclofenac ban, alternative to diclofenac, community education, establishment of vulture restaurants', Vulture safe zone, Giddha mitras, Nest guarding, forestry services and conservation through awareness.

Keywords: *Vulture habitat, Tree, Cliff, Monument, Threats, conservation.*

Heavy-Metal Resistance in A Bacterium Isolated from Lateritic Soil of West Bengal

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Heavy-metals are naturally occurring elements in the environment, but their widespread and uncontrolled usage for human purposes has disrupted their geochemical cycles and biological equilibrium. Thus, heavy-metals (Pb, Zn, Cd, Cu, Ag, Ni, Hg etc.) are released in excess into natural resources. Long-term exposure and greater levels of accumulation of these metals have negative health consequences for humans as well as other organisms. These heavy-metals may be oxidized, bound, immobilized, volatilized, or transformed into non-toxic forms by microorganisms in simple, eco-friendly, cost effective and sustainable manner. Many bacteria, such as, members of *Flavobacterium*, *Pseudomonas*, *Bacillus*, *Arthrobacter*, *Corynebacterium*, *Rhodococcus* etc., able to biotransform heavy-metals, have been isolated mostly from contaminated sites.

Soil serves as an excellent habitat for a wide variety of microorganisms which differ greatly in their physical and physiological requirements. Although soil bacteria have been studied extensively, microbial diversity, their ecological, environmental and economic potential remains unexplored for a wide range of soil habitats. Existence of heavy-metal resistant bacteria in undisturbed and uncontaminated lateritic soils of West Bengal and their ability of heavy-metal biotransformation is also largely unknown.

To study the extent of heavy-metal resistance of a bacterium isolated from undisturbed and uncontaminated lateritic soil of West Bengal.

Bacteria were isolated from lateritic soil sample collected from a place near Rajgram, Birbhum, West Bengal (lat. and long. 24.5253640 and 87.8422220) by serial dilution and spread-plate method on Luria-Bertani (LB)-agar plates. Plates were incubated at 37 °C for 24h. Colonies obtained were further developed into pure cultures. Temperature and pH optima for maximum growth of one such pure-isolate BiBP001 was estimated by growing the strain at a range of temperature and pH in LB-broth. Resistance of the strain BiBP001 towards heavy-metals was studied by growing it in LB-broth supplemented with different concentrations of Pb, Zn, Cd, Cu, Ag, Ni, and Hg for 18 hours at 37 °C and observing the optical density at 600nm.

The strain BiBP001 was found to be able to grow in the temperature range of 20 to 50 °C with an optimum of 37 °C and pH range of 5.5 to 9.5 with an optimum within pH 7 to 8. BiBP001 was observed to be resistant to multiple heavy-metals. Highest resistance was found to be against Pb and Ni followed by Zn, Cu and Cd. Highest concentrations of these metals at which growth of the bacterium was observed were 5.0, 3.5, 2.0, 2.0 and 1.5 mM respectively. The bacterium showed only limited resistance against Ag (highest resistance of 0.1 mM only) and no resistance against Hg.

Knowledge about the diversity of microorganisms of lateritic soil and their potential for ecological, economic and environmental purposes are scarce. The isolate BiBP001, although needs to be identified and characterized further, have been found to be a promising candidate for bioremediation of heavy-metals. This work only highlighted the strain's resistance towards some heavy-metals and further studies are necessary to explore its potential for heavy-metal bioremediation and to understand the mechanism(s) of resistance.

Keywords: *Bioremediation, Heavy-metal resistance; Microbial diversity; Heavy-metal toxicity; Biotransformation.*

Positive Impact of COVID 19 Towards Sustainability of Environment

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The Covid-19 Pandemic has a severe impact- worldwide, on economy, health, education and on environment. The growth of economy was negatively impacted due to restrictions of economic as well as commercial activities. But world-wide, people observed a positive improvement of the quality of environment. As there were restrictions in transportation sector, so international travel as well as domestic air travel and road transport was not functional for a long period of time. Hence, the level of air pollution and noise pollution reduced during this period. As there were limited use of fossil fuels like coal and oil, so emission of greenhouse gases also reduced. This helps to combat global climatic change. Overall, covid-19 pandemic was beneficial for the management of the environment. This paper proposes to study Covid-19 pandemic and its positive impact on environment for the sustainability. To complete the paper information has been collected from different research papers published in journals and maps and data have been collected from different websites.

Keywords: *Covid-19, Environmental Pollution, Sustainability, Environmental Management.*

Diversity of Important Egg Parasitoids of Paddy Yellow Stem Borer, *Scirpophaga incertulas* Wlk. at Champadanga, Hooghly, West Bengal

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Rice fields, together with their contiguous aquatic habitats and dry land comprise a rich mosaic of rapidly changing ecotones, harbouring a rich biological diversity, maintained by rapid colonization as well as by speedy reproduction and growth of organisms. Restoration of rice field natural enemy population is fundamentally required for effective pest suppression. Yellow stem borer (YSB), *Scirpophaga incertulas* Walker is distributed throughout India and is regarded as the most dominating and destructive species. Early destruction of yellow stem borer egg masses by encouraging the field parasitoid population is essential to maximize yield with least toxic synthetic insecticidal input. Study during two consecutive years (2019-2020) by randomized block design has shown that *Telonomus rowani*, Gahan (Scelionidae), *Tetrastichus schoenobii*, Ferriere (Eulophidae) and *Trichogramma chilonis*, Ishii (Trichogrammatidae) are the three important YSB egg parasitoids recorded from the paddy field at Champadanga, Hooghly, West Bengal. Activity of YSB egg parasitoids is seasonally allied; egg mass size dependent and rice plant growth stage specific. In all cases percentage of parasitization was found to be egg mass size dependent ($r = 0.746$) and was also be fitting with the standing rice growth stages, high in the early growth stages but low in late growth stages. High average parasitization at early vegetative stages (62.83%) decreased steadily and remained constant during mid-tillering stage (34.65%), and further subsumed during the ripening stage (14.67%). Maximum parasitization by all the parasitoids was noted at 40 standard meteorological weeks and minimum at 46 standard meteorological weeks.

Keywords: Rice, Pest, Growth stage, Egg mass, Parasitization, Population.

Development, Displacement and Determination with Social Capital: An Analysis of Fishermen Community in Ennore, Tamil Nadu

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Rapid urbanization and industrialization have been the most preferable planning choice and policy implementation for progressive economic growth in the Post- Colonial India (i.e. since 1947), especially at a faster rate after the Neo-liberal reforms, 1991. The above policy decisions by the Union States and Local Governments lead to drastic change in the land-use pattern in the rural-urban and peri-urban interface ending with the displacement of the local communities which, in turn, had instigated and made the realization of adverse effects on their socio-economic, health, livelihood and ecological dimensions. Apart from that, displacement paved way for the creation of informal settlements, polluting industries, middle and upper-middle class colonies, entertainment spots and the like in the acquired land. The local community which had worked for the traditional, socio-economic and ecological nourishment of the area, is only realised with costs rather than benefits due to policy outlook towards economy and the environment under the Neo-classical paradigm. With specific reference to Ennore, a Coastal Peri-urban area of Chennai, the present study has been undertaken with the objective of examining the displacement issues of fishermen community and their struggle for livelihood with a backing up of social capital. The methodology adopted to gather information and data include content Analysis, Semi-structured Interviews, Discussions with Key-informants, Fishermen Associations and Non-Government Organisations (NGOs).

A macro level picture reveals the transition in Ennore has been taken place due to four types of development projects: Port and Port expansion, Public and Private Industrial developments, Special Economic Zone (SEZ) and North Chennai Thermal Power Station (NCTPS). The NCTPS is constituted by the TANGEDCO and SIDCO as a part of State Public Sector Unit (PSU) is one of the highest polluters in the area. The pollution caused enormous damage to the Land Creek, Estuary and the Kosasthalaiyar river which led to negative externalities apart from the loss of livelihoods of the fishermen community which brings into focus the failure of both Government and the Market the two pillars of hope. In the event of such failures, the distressed communities look for another pillar of hope namely 'civil society solution'. This approach needs to be considered to solve issues related to environmental quality and sustainability. However, during the field work it has been found the gap that, to solve this contentious problem, civil organizations along with high levels of social capital of the local fishermen community and its attributing agency has to be

developed. Social capital and its attributing agency felt intertwined, elucidates that even with high levels of social capital, the agent who represents the social capital has to be strong enough. Despite the challenge in the measurement of locally present Social Capital, the paper disagrees with the influence of power from the Union to state government, and to local bodies and finally to the community, rather supports the bottom-up approach to make the social capital most effective in the forms of solidarity networks and socio-political movements.

Keywords: *Development Initiatives, Dimensions of Environmental Damage, Solidarity networks, Socio-political movements.*

Indian Crime Analysis and Forecasting on Spatial-temporal

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There is hardly any crime free society and the history of crime may be traced back to the time as old as the history of human civilization. It affects the smooth and peaceful progress of any society. There are many factors to induce crime varying from physical/environmental to socio-cultural, political, economic, historical, technological, crowding, and also family and individual as many scholars suggest. Moreover, globalization and technological advancements have also led to the changing nature of crimes as it is supposed to be influenced by the different stages of development of human society and is defined and redefined with changing context. India is a diverse country in terms of physical, ethnic, linguistic and religious features. Therefore, it is assumed that the spatial nature of crime also varies over space in India due to vast physical, socio-cultural and economic diversities. This paper attempts to study the Spatial-temporal pattern of crimes in India using state level data obtained from the National Crimes Records Bureau, Government of India for the years 1991, 2001 and 2011 with an attempt to see causality with associated factors. The results show that there are wide spatiotemporal variations but no direct and uniform associations with correlates across the states.

Keywords: *Social media Crime analysis Crime prediction Hotspot detection Crime density*

Illegal Trade of Avian Species-A Case Study from Assam

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Globally, the trade of wild species, a multi-billion dollar business, is attributed to be a major cause for the decline of numerous wild flora and fauna. Of the many wild species traded, the trafficking of avifauna is huge, with approximately 3300 species being subject to illegal trade. In India, reportedly around 450 bird species are traded in more than 900 markets, making the country the 3rd highest in global bird trade. The unlawful trade is perhaps the main reason for at least 176 bird species becoming 'threatened'. The illegal bird trade in India is greatly lucrative, relatively fail-safe and has developed into a well-organized business.

The documentation of illegal trade and trafficking has been mainly focused in the central and northern states of India, while there is a huge information lacuna on illegal avian trade, especially from North-East parts. It is speculated that northeastern states would be more vulnerable to illegal avian trade because of geographical, geopolitical, and socio-cultural reasons. Hence, Assam was chosen as the study area for the present investigation since it is a known "transitory route" for wildlife trafficking along the northeastern region. However, there is a serious dearth of systematic literature on wildlife trafficking in the state.

The market survey was undertaken in the vicinity of the IBA sites as well as protected areas across different districts of Assam. The snowball sampling method with a semi-structured questionnaire survey was conducted covering two seasons, winter and monsoon, in select markets for gaining insights on the traded avian species. In total 130 local markets from 17 districts of Assam were surveyed by interacting with 1003 respondents. A total of 82 avian species representing 33 families and 12 orders were found in the illegal trade in the region. Species belonging to the order Passeriformes (35%) and family Anatidae (13%) were highly frequent in the trade. The major reasons for the trade of avian species were as bush-meat (51%, N=62), plume-trade (14%, N=17), pet

trade (13%, N=16), superstition and black magic (12%, N=14), and cultural/traditional uses (10%, N=12). The respondents reported about nine trapping methods commonly used to collect birds from their natural habitats. Of these, the use of bait (18%) was the highest, while pitfall trap (2%) was used only for a few species. The number of traded species, according to the respondents, varied significantly ($X^2= 765.798$, $df= 81$, $p=0.001$). Our result showed that a strong correlation between the traded avian species and their market price (Pearson correlation coefficient: $r=0.60$, $p<0.001$), the price largely reflecting the demand.

Our work gives important insight into the level of illegal avian trade in Assam and the potential threat it poses to the wild avifauna in the region. The information on trapping methods, the use of the traded species and their prices can give a perception of the intensity of the ongoing illegal trade. The information provides very critical cues to the forest departments, other law enforcement agencies, and researchers to identify and execute appropriate action plans to curb the illegal wildlife trade.

Keywords: *Avifauna, Illegal Trade, Bush-meat, trapping, Plume-trade, Pet trade, Superstition and black magic, Cultural/Traditional use.*

Population Fluctuation of Soil Microarthropods in Different Parts of Junput Coast Area, Purba Medinipur, West Bengal, India

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Soil organisms, including soil microarthropods influence vital ecosystem processes and are involved in creation of soil system, which acts as an environment for organisms and within which they are adapted to live. Soil microarthropods closely interact with abiotic environmental factors. Many of them respond to changes in environmental conditions and because of that, may be used as indicators of soil quality. Microarthropods have significant influence on soil fertility but information on these ecologically important arthropods is lacking, especially in the coastal areal environments. This research was conducted to identify different microarthropods species present in the soil of supratidal zone of Junput coastal area of PurbaMedinipur coast, West Bengal, India. Soil samples were collected in three different season (Premonsoon, Monsoon, Post monsoon) over 30 months of period. Berles-Tullgren funnels were used to extract microarthropods from the soil samples.

Keywords: *Soil arthropods, population, soil fertility.*

Environmental Effects of COVID-19 Pandemic

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The environmental crisis is a global problem and only global action will resolve it. The world has changed in the last few months due to the disaster corona virus. Changes came into our life due to the lockdown, impacting our environment in various ways. Both the positive and negative effects of covid-19 are reflected on the environment. It is noticed that there is a sudden reduction of greenhouse gases (GHGs) emission as industries, transportation and campaigns have shut down. Air pollution had also decreases as the vehicles were inside the houses. It was computed that nearly 50% reduction of N_2O and CO occurred due to the shutdown of heavy industries, also emission of NO_2 from the burning of fossil fuel indicates a sign of reduction in many countries (e.g., US, Canada, China, India, Italy, Brazil etc.). In many countries worldwide flights were cancelled as international travellers are restricted to enter and depart, due to the nationwide lockdown. 96% of air travel dropped which has a tremendous impact on the environment. Water pollution is a common disaster in countries like India and Bangladesh where industrial and household wastes are dumped into rivers. But it was stopped or reduced during the pandemic as major numbers of industries were shutdown. For example, Ganga and Yamuna have reached a significant level of purity in India. Noise pollution and many beaches were cleaned around the world. On the other hand, there was also negative impacts shown in the environment. During the outbreak of covid-19, medical waste generation was increased globally, which was a threat to public health and environment. For the sample collection of suspected patients, diagnosis biochemical wastes are produced from the hospitals. It became a challenge for the local waste management authorities to tackle the solution. Due to the lack of proper knowledge, most people dump mask, hand gloves and other safety equipments in open places, causing harmful effects to the surroundings. Natural ecosystems and different flora and fauna are at great risk for the lockdown. Different protected areas including natural parks, marine conservation zones, sanctuaries etc. were left monitored as people were stuck in their homes, it increased issues like wildlife hunting, and illegal deforestation and fishing activities. Everyone must understand that covid-19 is a reminder to indicate the relations between human beings and the environment. So to prevent future outbreaks and must address the threats to ecosystem and wild life including habitat loss, illegal trade, pollution and climate change.

Keywords: *Environmental assessment, environmental sustainability, covid-19, public health, lockdown, GHGs emission, biomedical waste.*

Role of Green Chemistry in Preventing Wastage

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The goal of green chemistry is the design of products and manufacturing processes to reduce their impact on human health and environmental fundamentals to the green chemistry concept is the idea of sustainability reducing environmental impacts and conserving natural resources for future generation. Although many of the principles of green chemistry are not new, the extent to which they have been organized into a coherent approach and degree to which they are being applied have been resulted in an intensified attention on this topic among the academic, industrial and regulatory communication. Chemistry and biology constitute vast and infinite design space which can be used by scientists and engineers to generate new and ever more complex chemical molecules and other structures having new emergent properties. Green chemistry consists of chemicals and chemical processes designed to reduce or eliminate negative environmental impacts. Different forms of plastics have become omnipresent pollutants across the surface of the globe. Plastic production has increased at a rate faster than that of any other manufactured materials. The value of plastic is easily seen in its myriad uses ranging from durable to single use applications. Current information suggests that the chemical building blocks of plastics might harm people and the environment. These chemicals can be absorbed by humans and some of these building blocks have been found to alter hormones or have other potential human health effects. Wildlife can be injured or poisoned through contacts with plastics debris possibly contaminated with toxic chemicals. Our overuse of disposable plastic items is seen to be a major problem with severe environmental consequences. Increased use of disposables has challenges current resource management efforts. so we can follow certain ways by which we can reduce the use of plastics in our daily life, like use of bamboo toothbrushes, clay bottles, biodegradable bags, bamboo and wheat straws.

Keywords: *sustainability, pollutants, plastic, Wildlife, disposable plastic, biodegradable bags.*

Significance of Small Indigenous Freshwater Fish Species in Enhancing Rural Food and Conserving Biodiversity

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Importance of small indigenous freshwater fish species (SIFFS) and their role in food security, ecosystem balance, supporting livelihoods and development of rural economy have been grown up coast to coast due to the fact that the availableness has been thoroughly decreased. These fishes are considered as trash fish/weed fish/by-the-by catch and simply abdicated without catch statistics and documenting. They are not only the rich fount of animal protein but also provides adequate source of micronutrients and fatty acids. As SIFFS are swallowed entirely along with bones, serve phosphorous, calcium and vitamins to the human diet. These fishes play avital role in the poverty relieve and nutritional security of rural people. They are usually prolific breeder and inhabit in vast inland water resources ranging from rivers, tributaries, flood plains, wet lands, lakes, ponds, tanks, beels, streams, paddy fields and low land areas. Most of the species are hardy in nature and comfortably adjust in shallow water bodies without any supplementary feed. Conservation of SIFFS is essential for ecological, nutritional and socio-economic steadiness. Propagation of SIFFS in freshwater resources can considerably recover the malnutrition and health benefits of rural community. Challenging issues for sustaining aquatic biodiversity and proper management of freshwater resources are needed to evolve appropriate conservation strategies for small indigenous freshwater fish species.

Keywords: *SIFFS, Role, Rural lives, Nutritional security, Effective policies.*

Forest Rights Act 2006: A Step Towards Securing Forest Rights of the Forest Dwelling Communities in Jalpaiguri District, West Bengal

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The most striking features of India's forest were the richness of diversity that provides multidimensional resources or uses to the people of India. However, this perception about forest started changing during the advent of colonial rule in India. Since colonial period forests have been considered as the most important commodity for revenue generation. The colonial administration only emphasized on timber production and started denying the rights of the local forest dwellers those are depended on various forest resources for their survival. The other important invention of the colonial rule was scientific forest conservation, which was introduced to protect forest resources from the local forest dwellers as these people were responsible for the destruction of forest resources. Colonial Govt. curtailed the rights of the local forest dwellers over forest resources and brought the entire forest cover areas under their direct control.

The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, (FRA) 2006, is a crucial piece of forest legislation passed in India on 18 December 2006. The act is the latest initiatives taken by Government of India concerning the rights of forest-dwelling communities to land and other resources. The Act promises to give up to four hectares of forestland to tribes and other traditional forest dwellers based on the recommendation of Gram Sabha. The Act provides right to hold forest land and live in the forest under an individual or collective occupation for habitation or self-cultivation for livelihood by a member or member of a forest dwelling Scheduled Tribe or other traditional forest dwellers.

In the state of West Bengal, very few studies have been conducted in the area of FRA. This study aims to understand the issues of forest rights recognition on the ground level in Jalpaiguri district of West Bengal. The source of data will be both primary and secondary. This work is qualitative in nature where semi-structured questionnaire, in-depth interview and observation used to address the research objectives.

Many studies reveal that the Act is not implemented in a proper manner. Section 6(1) of the Act provides that the Gram Sabha which is a village assembly shall be the authority to initiate the process for determining the nature and extent of individual and community

forest rights of the forest dwelling scheduled tribes and other traditional forest dwellers those are dependent on forest for their livelihood. In many cases it is found that the implementation process was violated on the ground level. A landmark law alone cannot solve all the problems; it needs proper political will, government initiatives for its successful implementation with its letter and spirit.

Keywords: *Forest Rights, Forest dwelling-communities, Livelihood, Gram Sabha, scientific forest conservation.*

Elevation and Habitat Characteristics Determine Bird Species Richness and Diversity in a Mountainous Riparian Corridor in the Middle Himalayas

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The factors affecting the spatial distribution of birds are crucial in ecological and biogeographical studies. We used data on bird species to figure out what drives the bird species diversity in a hill stream in the lesser Himalayas. The study area was split into 14 sample locations ranging in altitude from 850 to 2100 metres. A line transect and a point count approach were used to determine the distribution of the bird population. We found 64 bird species, which were split into four categories: riverine (n=14), riparian (n=2), generalist (n=7), and forest (n=41) during investigations spanning a year. The results indicated that elevation and habitat characteristics were the critical factors influencing species richness and abundance. We investigated the distribution of river and riparian birds to various environmental criteria such as water quality, channel character, bank morphology, elements of river flow, land use, and vegetation using multivariate analysis. Riverine specialists were significantly associated with sections with rapid flows, exposed bedrock, pebbled banks, and intact riverine forests. Our data provides evidence that river birds are cost-effective indicators of human impacts on river ecosystems. This type of work serves as a roadmap for conserving watershed ecosystem services while also protecting river biodiversity.

Keywords: *Riparian, corridor, riverine, diversity, Himalayas.*

Agroforestry for Climate Change Mitigation

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Agroforestry is the process of cultivating trees and agricultural crops in intimate combination. Agroforestry system involves two or more species of plants or animals, at least one of which is a Woody perennial. Compared to traditional agriculture and forestry systems agroforestry provides a complementarity between trees and crops and effectively exploits the available resources. Agroforestry has considerable potential to improve agricultural production and maintain the overall productivity of the small upland farm, so it is becoming more popular in many parts of the world.

Agricultural lands are believed to be a major potential sink and could absorb large quantities of carbon if trees are reintroduced to these systems and judiciously managed together with crops or animals. It has been shown that agroforestry systems have three to four times more biomass than traditional treeless cropping systems. Agroforestry often contributes to climate change mitigation through enhanced carbon sequestration and microclimate and macro-climate improvement. The carbon sequestration potential of agroforestry systems is estimated between 12 and 228 Mg ha⁻¹ with a median value of 95 Mg ha⁻¹. The trees plantation in agroforestry system area may increase the precipitation by 10 % and reduce temperature up to 3 to 8 degree. It has been reported that one hectare of the close forest can filter the 50 tons of dusts and dirt. The tree ameliorate the effects of climate change by helping to stabilize soil, wind and water erosion in prone areas as well as improves water and soil quality. It also provides yields of fruit, tea, coffee, oil, fodder and medicinal products in addition to their usual harvest. Agroforestry system helps in improvement of biodiversity by permitting a synergistic improvement, by the integrated protection of crops by their association with trees, in a promising way.

Thus, agroforestry is receiving wider recognition not only in terms of agricultural productivity but also in issues related to climate change. Especially in recent years, poor smallholder farmers are turning to agroforestry as a mean to adapt to the impacts of climate change. Traditional agroforestry should be changed towards the commercialization for the poverty alleviation and climate change mitigation. Agroforestry helps in biodiversity conservation and controlling air pollution that also helps to strengthen the system's ability to cope with adverse climatic condition.

Keywords: Agroforestry, Climate Change, Mitigation.

Major Ion Chemistry and Quality Assessment of Groundwater in Some Parts of Jajpur District, Odisha

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The study was conducted for investigating chemical composition of groundwater, delineating the processes controlling the chemistry of groundwater and assessing the groundwater quality for drinking and irrigation uses. Groundwater samples collected from deep (tube well) aquifer are analyzed for several key factors like Electrical conductivity (EC), H⁺ ion concentration (pH), Total Dissolved Solid (TDS) and Alkalinity. The major cations Sodium (Na⁺), Calcium (Ca²⁺), Potassium (K⁺), Magnesium (Mg²⁺) and anions Bicarbonate (HCO⁻), Chloride (Cl⁻), Sulphate (SO²⁻) are tested. Based on the physicochemical analysis³ results different irrigation water⁴ quality parameters like Sodium Absorption Ratio (SAR), Residual Sodium Carbonate (RSC), Magnesium Hazard (MH), Permeability index (PI), Soluble Sodium Percentage (SSP), Salinity Index, %Na and Kelly's Ratio (KR) are calculated. Water Quality Index (WQI) method is treated as an important parameter to classify water quality of a region for the suitability of drinking purpose. From the USSL diagram (plot between electrical conductivity and sodium absorption ratio), the Salinity hazard in the study is classified from low to high. Wilcox diagram plotted for electrical conductivity and %Na ratio; the samples are classified from excellent to permissible category. Piper trilinear diagram evaluates the relationship between rock types and water composition while Durov diagram is advantageous over the piper diagram in revealing some geochemical processes controlling the water chemistry and to delineate variation in hydro chemical facies.

The Bureau of Indian Standards (BIS 1998) for drinking purposes have been considered for the calculation of Water Quality Index (WQI). The result indicates that the samples fall in excellent, good and poor category which is suitable for drinking purposes. From the result of different irrigation quality parameters, it is found that the samples fall in excellent to doubtful category for irrigation purposes.

Keywords: *Groundwater, Irrigation water quality, Salinity hazard, Kelley's ratio, Magnesium hazard.*

Covid-19 and Its Impact on Environment in Kashmir

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Coronavirus (Covid-19) a viral disease first emerged in the Wuhan city of China in the year 2019 and spread to the whole world like a wild fire. It caused thousands of deaths all across the globe. The worst hit countries were China, Iran and Italy, and other countries like United States of America (USA), Britain, France, North Korea, Germany, Russia and India too suffered under its threat. The viral outbreak 2019-2020 was declared Public Health Emergency of International Concern (PHEIC) on 30th January 2020 and a Pandemic on 11th March 2020 by the World Health Organisation (WHO). The Union Territory of Jammu and Kashmir witnessed its first covid-19 victim on 18th March and the first death was reported on 26th March 2020. Apart from taking a heavy toll of human lives, it paralyzed all the vital sectors of life, like trade and commerce, education, communication and transport. On the socio-cultural grounds it had created a serious trauma and has led to psychosomatic disturbances. The humans had not been the lone sufferers of this crisis as it had badly affected the animals and other living creatures. As per some reports many stray animals have died due to starvation.

To curb the spread of virus many strategies prominently social distancing, stay home and lockdowns were adopted. The imposition of lockdown across the globe brought about some drastic impacts at social and economic fronts. However, it also posed some positive impacts on environment as well particularly in the context of air quality due to reduction in concentrations of particulate matter (PM), NO₂ and CO across the major cities of the globe as indicated by several research organizations. In Jammu and Kashmir particularly in the Valley which is blessed with natural resources and is a hub of tourist destinations the covid-19 lockdown was a blessing in disguise for the environment as it allowed it to restore and rejuvenate. The covid-19 lockdown reduced the pressure on tourist destinations which otherwise remain flooded with tourists. However, there are also some negative impacts of covid-19 lockdown on the ecological setup of Kashmir as we get many references of wanton cutting of forests, illegal mining and sand extraction, unchecked and uncontrolled fishing in rivers. As the traffic was off the roads and the offices locked it gave a free hand to the timber smugglers to cut forests ruthlessly. There was also seen a huge rise in poaching cases of animals by poachers at various places.

The present paper intends to explore the positive and negative environmental impacts of the COVID-19 pandemic in Kashmir, by reviewing the available literatures viz. newspapers, official reports, journals and research papers. This study indicates that, the pandemic situation significantly improved air quality, reduced Green House Gases emission, reduced water pollution and noise, and also reduced the pressure on the tourist destinations. But in addition, it also led to some negative consequences such as increase in medical waste, haphazard use and disposal of disinfectants, deforestation, illegal mining and poaching, which had an endangering impact on the environment.

Keywords: Covid-19; Deforestation; Environment; Forests; Jammu and Kashmir; Lockdown; Mining; Poaching; Rivers.

Effects of COVID-19 Pandemic on The Environment- A Review

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The corona virus (COVID-19) is a zoonotic disease. Zoonotic diseases are transmitted between animals and humans. Diseases passed from animals to humans are a significant threat to human health. The impact of Covid-19 pandemic situation has changed every sphere of human life. SARS-CoV-2 is transmitted through respiratory droplets. Different vaccines are available now. But, the vaccination process has not been completed totally. Globally, as of 19th November, 2021, 255,324,963 confirmed cases of COVID-19, including 5,127,696 deaths have been reported by WHO. As of 17th November, 2021, a total of 7,370,902,499 vaccine doses have been administered. Worldwide, lockdown was started to restrict gathering, transport and industrial activities. The present study denotes that this pandemic condition improves the air and water qualities of several metro cities across the world, reduces the green house gas emission, reduction the pressure on the tourist places which may help the restoration of the ecological system. But, there are some negative impacts due to COVID-19 outbreak viz. haphazard uses of masks, sanitizers, and gloves, disposal of disinfectants and burden of untreated waste products. This review also outlines the possible ways to achieve the environmental benefits, lasted for long-term. The proper implementation of the proposed strategies may be helpful for the creation of sustainable environmental condition globally.

Keywords: *disease, lockdown, tourists, sustainable, zoonotic.*

The global outbreak of coronavirus disease 2019 (COVID-19) is affecting every part of human lives, including the physical world. The measures taken to control the spread of the virus and the slowdown of economic activities have significant effects on the environment. Therefore, this study intends to explore the positive and negative environmental impacts of the COVID-19 pandemic, by reviewing the available scientific literatures. This study indicates that, the pandemic situation significantly improves air quality in different cities across the world, reduces GHGs emission, lessens water pollution and noise, and reduces the pressure on the tourist destinations, which may assist with the restoration of the ecological system. In addition, there are also some negative consequences of COVID-19, such as increase of medical waste, haphazard use and disposal of disinfectants, mask, and gloves; and burden of untreated wastes continuously endangering the environment. It seems that, economic activities will return soon after the pandemic, and the situation might change. Hence, this study also outlines possible ways to achieve long-term environmental benefits. It is expected that the proper implementation of the proposed strategies might be helpful for the global environmental sustainability.

Keywords: *Environmental assessment, Environmental pollution, Environmental management, Environmental sustainability,*

COVID-19, Public health, Lockdown, GHGs emission, Biomedical waste

The coronavirus disease (COVID-19), a variant of Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) originated in Wuhan city of China and has now transmitted over the world. Till the April 24, 2020, nearly 144,367,284 confirmed positive cases with 3,066,270 deaths worldwide. The recent studies have reported that SARS-CoV-2 is transmitted through respiratory droplets. Several vaccines are available now. However, the vaccination process has not completed yet. Worldwide lockdown was initiated to restrict gathering, transport and industrial activities. Lockdown due to COVID-19 showed reduction in environmental pollution. The quality of air and water improved in metro cities and in rivers during COVID-19. This review not only provides the updated information related to impact of COVID-19 on air, water and noise pollution, generation of biomedical waste and global environmental sustainable development but also it covers the basic mechanism of COVID-19 transmission.

Fish Medicated Plankton Community Dynamics at Sewage Fed Fishery

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Sewage is water- borne human waste with combination of water and waste removed from residences, institutions, commercial and industrial establishments together with ground water, surface water and storm water. With increasing population in the country, the quantity of waste water generated has been increasing beyond the treatment capacities and created pollution in aquatic ecosystem. Sewage-fed aquaculture is unique system and has manifold advantages in developing tropical countries acting as a major source of nutrients for crop farming and aquaculture, economical for sustainable production and helps to combat environmental pollution. Sewage fed aquaculture system reduces the cost of chemical fertilizer and costly feeds because it is rich in nutrients like nitrogen and phosphorous which help to growth of plankton population. Production by the phytoplankton, the primary synthesis, is the most important phenomenon and reflects the nature and degree of productivity in aquatic ecosystem. Phytoplankton are the producers in the aquatic food chain and plankton are used as food by a large number of aquatic organisms including fish. Various types of phytoplankton and zooplankton are found in sewage water which can enhance the growth of fish production.

Sustainable Development Goals: A Sub-National Analysis of India

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Meeting the demands of a growing population of about 9.7 billion people by 2050 (UN, 2019) in terms of employment, income, energy, food, water, minerals, and other resources will be a huge worldwide problem in the coming decades. To overcome this situation, over the last decade, governments all over the world have emphasised the need to achieve the UN SDG 2030 targets in order to make a sustainable world. According to Niti Aayog, India's overall SDG score increased from 57 to 66 (2018–2020), although it still needs to reach 100 by 2030. As a result, the focus of this research is on a state-by-state analysis of SDG scores, which will assist India in evaluating and enhancing its total SDG score. To put it another way, this research will aid in the promotion of scientific knowledge and science-based approaches to achieving Sustainable Development Goals. This report evaluated India's progress toward each of the subnational SDGs (2018-20) in a timely, thorough, relevant, and professional manner. Our research looks at states' and UTs' existing SDG scores, their existing trajectories, possible future projections to achieve the goals, as well as how much progress per year is required to fulfil the 2030 target. The database of the Niti Aayog was used for this. Based on the 17 SDGs, our research shows that certain states, such as Uttarakhand, Chandigarh, and Tamil Nadu, are close to attaining the 2030 SDG goal, while others, such as Bihar, Rajasthan, and Chhattisgarh, are far behind. According to the Sustainable development report, 2021, India ranks 120th among all countries and has an overall SDG score of 60. That is, India needs to adopt some important sustainable development strategies to reach 100 in the next 9 years. The outcomes of this study include causes for low scores of some states, as well as conclusions and recommendations for the future that could be incorporated into India's long-term sustainable development strategy. Taking into account local government regions and targets, in addition to state-by-state and goal-by-goal analyses, will provide a full picture of what changes need to be implemented to enhance India's overall SDG score.

Keywords: *sustainable development goals; gap analysis; future projections; sub-national scale; India.*

Microbial Bioremediation of Textile Dyes

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Synthetic dyes belong to an important class of organic compounds extensively used in textile, paper printing, color photography, leather, plastics, food, cosmetic, and pharmaceutical industries. More than 11 % of these compounds produced annually is lost to effluents during application processes. The presence of even small amounts of dyes in water (<1 ppm) is visible. It affects the aesthetic value, causes loss in luminosity, decreases oxygen solubility in water and blocks the passage of light to the lower depths of aquatic systems. Therefore, it is mandatory to remove the xenobiotics from the environment. Bioremediation exploiting a variety of microorganisms for the degradation of recalcitrant organics appears as an eco-friendly solution to the problem of environmental pollution. Microbes have been talented by nature with the ability of degrading a wide variety of environmental pollutants competently with minimum amount of sludge production. In this work, we have investigated the decolorization and degradation of a mixture of triphenylmethane dyes, Malachite green, Crystal Violet and Basic Fuchsin by a bacterial consortium separately and in a mixed solution. Decolorization studies were carried out with single dye solution as well as mix dye solution with respect to pH, temperature and initial dye concentration. Decolorized products were analyzed with UV-visible spectroscopy, Thin Layer Chromatography and FT-IR studies, which indicates the process of decolorization in this case, is biodegradation. The decolorized products were also checked for level of COD, wherefrom it was found that the decolorized products were comparatively safer than the original dyes.

Keywords: *Triphenylmethane dyes; COD; Microbes; Biodegradation.*

Green Chemistry and Technologies

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Green Chemistry (GC) or Sustainable Chemistry aims, under greater societal expectations, for a sustainable global future of the planet Earth, for the design of chemical products that eliminate the use of hazardous substances for man and the environment. GC offers enhanced chemical process economics, concomitant with a reduced environmental burden. GC can be applied to design environmentally benign synthetic protocols, to produce life-saving medicines, environmentally friendly agrochemicals, new enzymes for biocatalytic chemical processes, innovative renewable energy sources, energy efficiency in chemical reactions, and innovative materials while minimizing environmental impact. Biocatalysts employed on large scale in the pharmaceutical synthesis delivering low cost and high quality intermediates and drugs. Biodegradable polymers and polymers from carbon dioxide have been advanced by many chemical companies. The use of “green” solvents and industrial reactions in water have been applied in the last decade to numerous industrial processes. Vegetable oils have been used in numerous applications, including oil-based paints. The replacement of oil with biomass as raw material for fuel and chemical production is an interesting option for the development of biorefinery complexes. Green Chemistry envisaged technological interventions for traditional farming practices that will reduce environmental pollution and increased yields of many crops. There is intensive research on renewable energy sources for sustainable storage technologies (batteries).

Keywords: *Environment, Green Chemistry, Sustainable Chemistry, Technologies.*

An Emerging Adsorption Technology for Wastewater Treatment: A Review

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Wastewater pollution and its treatment is an ever-increasing concern in the century because of the higher industrialization and urbanization. An expansion of industries is main cause to pollute the water resources. Discharges from industries contains various organic and inorganic pollutants. Among this pollutants are the heavy metals which can be toxic and/or carcinogenic and which are harmful to human and other living organisms. The heavy metals which mostly discharges from the industries includes lead (Pb), zinc (Zn), copper (Cu), arsenic (As), cadmium (Cd), chromium (Cr), nickel (Ni), and mercury (Hg). Water is an important natural resource which reserve important flora and fauna on the earth. Therefore, it is necessary to prevent from contamination of water (from organic and inorganic pollutants). Various treatment technologies used for the removal of heavy metals includes ion exchange, reverse osmosis, chemical oxidation, reduction, chemical precipitation ultrafiltration, adsorption and electrolysis. Among these methods, adsorption (mostly physical adsorption) is the most efficient technique which used for removal of water pollutants. This review surveys the various natural bioadsorbents used for removal of water pollutants. Natural bioadsorbents are most applicable and low cost effective adsorbents types in which plant residual (leaves, stems, roots, straw etc.) are used for as a bioadsorbent.

Keywords: *Natural biosorbent, heavy metals, water pollutants, plants, adsorption, wastewater.*

Low-cost Micro-rainwater Harvesting Technology (*Jalkund*) for New Livelihood of Rural North East Hill Farmers

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The amount of rainfall received is one of the influential factors of socio-economic activities like agriculture, forestry and bio-diversity, water resources management, industry and tourism of particular region. As rainfall is the main source of surface water and its conservation is essential. Rainwater harvesting is one of the most promising techniques for the collection of excess runoff and stored in physical structures for productive purposes like vegetable and horticultural crop, fodder, pasture or trees and fruit production, livestock and domestic water consumption. The North Eastern Region (NER) of India is characterized by varying topology which is largely affected by high seepage flow and flash runoff. Heavy rainfall during monsoon season and scarcity of water during post monsoon is severe in this region and this constraint is the keys for storage of water for its further application. The existing traditional farm ponds of NER region of India are exposed to potential losses like infiltration, percolation, seepage flow and evaporation to great extent. Due to its high evaporation and seepage losses, new interventions were taken up to popularize lowcost rainwater harvesting structures called "*Jalkund*". A '*Jalkund*' is a silpaulin lining dug out micro rain water harvesting structure having a storage capacity ranges from 6,000 to 40,000 liters suitable for the hill farmers having small scale agricultural activities. A dimension of 5 m x 4 m x 1.5 m having storage capacity of 30,000l water has been found optimum for hills.

Keywords: *NER, rainwater, jalkund, silpaulin, pond & topology.*

“WATER” in COVID 19 Pandemic – A Review

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Some views that lockdown was favouring Nature, may be considered a myopic vision of the scenario, as no disease or crisis, specially of this huge dimension, can ethically be seen as a favour. More so, as there can be cross infection to animals too. However, looking at this crisis from a different angle how it affects the most precious resource, The Water. As already known, only 3% of earth's surface-water is fresh; rest 97% is in ocean. Of fresh water too only 30% is underground, and less than 1% is located in lakes, rivers, and swamps. Anthropological interference has already created water scarcity, stress and crisis. Studies estimate nearly 1.1 billion people worldwide lack access to water, many more under scarcity, nearly 785 million people lack access to clean drinking water. On top of it comes the deadly Pandemic of Covid 19 killing millions across globe. Unknown nature of this novel virus led some studies to suggest that they can survive on various surfaces, including currency notes, glasses, plastic and stainless steel. All national and international institutes like WHO, UN, governments, doctors, scientists and several others stressed sanitation that include hand hygiene, washing clothes, utensils, vegetables and even currency notes. **OBJECTIVE:** To understand the status of water use in face of this pandemic and future of already overstretched water resource in post-covid days. **METHOD:** Some personal interviews and contemporary news and research articles indicates the following. **RESULT:** Some habits of citizens are modified across the globe, handwashing with soap remains one of our best defences against the virus, Global Handwashing Day observed annually on October 15 to raise awareness. Duration of handwash also increased in post-covid times. People are also washing vegetables, cleaning clothes, utensils. Socioeconomically lower strata rely on washing with soap-water rather than using sanitizer, even heard of washing currency notes in water in India. Domestic water demand during lockdown increased and same decreased in non-domestic (i.e., commercial, industrial, and institutional) sectors. The net effect varied from place to place. There is also important behavioural change of residents, like, on arriving at home, citizens clean themselves as well as of all objects they carried outside. Again, people with ample water-supply overused to maintain proper hygiene but some others in water-scarce areas or in lower social strata suffered lack of water required. Also, lockdown affected proper supply in different sectors. **CONCLUSION:** Water has been largely overused globally, hygiene behaviour of people changed, inequity in water distribution more felt as water is the need of the hour and importance of good water-supply across all social strata to prevent spread of diseases. In such circumstance, where health and life become priority, which necessitates use of water, environment naturally takes the back step to even any environment-conscious person. Thus, the need to save water is deprioritised in this crisis. How much water-scarcity is increased by this pandemic to an already depleting groundwater resources, and the projection in future needs more detailed research.

Keywords: *Water-scarcity, Covid-19, behaviour-change, washing, cleaning, inequity in water.*

Impact of COVID 19 on Our Environment

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Within a span of ten months, the world has been changed totally. Several million people expired already, and several lakhs are infected, and the numbers are growing nonstop worldwide. Reason behind all these, is COVID-19 pandemic and spread of Corona virus. Along with human, our environment has also changed a lot during these months. The rate of pollution of air, water, soil, noise has reduced to a great extent.

Brief Introduction: Effect of COVID-19 pandemic on our environment is highly significant. As per the experimental analysis and evidences, release of various greenhouse gases like CO₂, CH₄, CFCs have come down to a significant quantity worldwide during the lockdown phase [1]. Activities in more than 200 countries around the world have become standstill due to the outbreak of Corona Virus in last few months which resulted in some good outcome for Mother Nature.

Impact on the environment: Factories, institutes, automobiles, refineries, recyclers, agricultural machineries, power plants, mining activities were stopped during lockdown phase against COVID-19 outbreak. Number of vehicles plying on the road came to almost zero in number. All these resulted in the extraordinary downfall of the atmospheric concentrations of CO₂, CO, NO_x, SO_x, Particulate Matters throughout the most populous and most polluted towns of the world. The nationwide lockdown policy and implementation of law and order to maintain social distancing have resulted in developing waste free roads especially beach areas. As there were no vehicles, aircrafts, trains, buses, commercial and public vehicles on the road, noise level has also been reduced to a great extent especially in COVID-19 infected nations. Cities in China, Italy, England, France, USA, Spain, India was completely locked down after the first wave of COVID-19 spread out and appearance of Corona virus pandemic. Countrywide lockdown has resulted in extreme conditions among countrymen.

Objective:

- To find out the status of environment during COVID-19 pandemic
- To analyse the impact of corona virus on environment
- To identify specific reasons behind sudden increase in environmental pollution
- To recommend approach towards sustainable socio-economic development

Methodology & Discussion: The lockdown phase resulted in downfall of pollution level into almost 50% than the previous year concentration at the same time. Due to suspension of waterways during lockdown phase, neither fishing nor pleasure trips, the water has become clean and in some places crystal clear. In case for Ganga river in India near Haridwar in Uttarakhand water became clean and clear. Animals have been spotted roaming around freely and visiting areas they were not in normal cases. Endangered wildlife was viewed in many places worldwide. Millions of turtles visited land for hatching eggs. Dolphins were viewed in water where they were not seen for decades.

COVID-19 and outbreak of corona virus has developed negative effects on our environment. All the affected nations have stopped the waste recycling activities due to safety and security of the workers and employees during the outbreak. Hence, sustainable waste management has not been done at all. Online shopping, packaged drinking water bottles, plastic wrapped food items, groceries, online foods all coupled together to enhance the wastes in and around us during this lockdown phase. Due to COVID-19, biomedical wastes have increased into several folds. Doctors, nurses, health staffs, patients, COVID suspects, health department officials, police, workers in health centres everybody has generated umpteen number of plastic wastes in the form of gloves, PPE, face shields, masks, shoe cover, head cover, eyeglass etc.

Result & Conclusion: The global COVID-19 lockdowns made fossil CO₂ emissions reduced by 2.4 billion tonnes approximately during 2020. According to the study done by University of East Anglia. It can be concluded by saying that there has been some positive impact observed during the lockdown phase worldwide. These positive impacts of COVID-19 were definitely in terms of nature and environment. Be it decrease in air pollution, reduction in greenhouse gas emission or lowering concentration of particulate matters in the atmosphere. Most populous and most polluted cities in the world situated in India, Italy, France, Spain, England, China, USA, Russia, Germany have observed decrease in the contamination level of air pollutants. India's capital Delhi's PM_{2.5} level fell 48% during 2020 lockdown. Overall decrease of NO_x was 18% and CO₂ was 10% during lockdown phase. On the other hand, quality of water has improved into several fold during the lockdown phase. Several rivers passing through Industrial belts have become clear and clean after the pandemic COVID-19 appeared worldwide. Noise level has been decreased and betterment of coastal beach areas were observed as positive impacts during lockdown phase. On the other hand, among the negative indirect effects, the increase in domestic and medical waste was mentioned. It is important to mention that although the emissions of some greenhouse gases (GHGs) have lowered down as a result of the pandemic, this reduction could have little impact on the total concentrations of GHGs that have accumulated in the atmosphere for years. There is requirement of long-term constructive planning on the basis of sustainable socio economic development. There will be disaster if biomedical wastes like used gloves, masks, shoe cover, heal cover, face shields, aprons, PPE kits are not properly disposed and get mixed with other waste products. At the end, it can be mentioned that that COVID-19 will generate some positive and some negative effects on our environment. Lowering concentration of greenhouse gases for a short time period is not going to be a solution. Corona virus will stay for some more time, and during the unlocking phase of restrictions situation might get worse again in terms of increase in toxicity level of air, water and land. Proper management and long-term planning is the need of the hour.

Keywords: *Pandemic, Pollution, Waste, Corona, Nature, Sustainable.*

Assessment of Heavy Metals in Vaigai Reservoir at Theni District, Tamil Nadu, India

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The present investigation was aimed to analyse the water quality by estimating heavy metals from Vaigai reservoir during 2017-2018. Heavy metals such as aluminum, cadmium, chromium, cobalt, copper, iron, nickel, lead and zinc were analysed in Vaigai Reservoir using Atomic Absorption Spectroscopy. AAS is one of the most widely used methods for quantitative metal analysis. In all the seasons at the sampling station, iron showed high followed by nickel and chromium. The lowest metals present here was zinc followed by lead. The average value also showed the maximum in iron followed by chromium. In the all the four seasons, aluminium was beyond the acceptable and permissible limits. The permissible limit is 0.2 mg/L but the recorded value was 0.4 mg/L which is higher than the permissible limit. Cadmium was beyond the acceptable and permissible limits where the permissible limit is 0.03 mg/L but the recorded value fell above 0.3 mg/L. Cobalt was recorded as beyond the acceptable limit but within the permissible limit. Whereas chromium was beyond the acceptable and permissible limits as it varied in the values from 0.17 to 0.94 mg/L. Copper level was beyond the acceptable limit but within the permissible limit, while iron was beyond acceptable and permissible limits, as well as it had the highest value among the metals. Nickel also lounded beyond the acceptable and permissible limits as well as highest value next to iron. Lead content was beyond the acceptable and permissible limits, where the permissible limit was 0.01 and the recorded value was from 0.2 mg/L to 0.25 mg/L. Zinc at Vaigai Reservoir showed the value reclined within the acceptable and permissible limits. The lowest metal found in this site was zinc. Hence this water should not be used directly without proper treatment like ion exchange, reverse osmosis, distillation etc.

Keywords: *Vaigai Reservoir, Water, Heavy metals and AAS.*

Implication of WQI and Benthic Macro-invertebrates Based Indices for Pollution Assessment of River Narmada in Jabalpur Region

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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. The benthic macroinvertebrates fauna of river is most suitable biological parameter of water quality. 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 (2017-2019). Samples were collected as per standard sampling technique during morning between 8-9 am and evening 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 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. 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.

Noise Pollution and Its Control Strategies

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The word noise is derived from a Latin word 'Nausea' which means sickness in which one feels the need to vomit. It is the unpleasant and undesirable sound which leads to discomfort in human being. Some of its major causes are vehicles, aircraft, industrial machines, loudspeaker, crackers etc.

There are mainly three types of noise pollution out there: (i) transport noise (ii) neighbourhood noise and (iii) industrial noise.

Transport noise mainly consists of traffic noise which has increased in recent years with the increase in the number of vehicles. Neighbourhood noise usually arise from gadgets, household utensils etc. whereas industrial noise is the high intensity sound which is caused by heavy industrial machine.

Main causes and sources of noise pollution are: a. industrialisation- it has led to an increase in noise pollution as the use of heavy machinery such as generators, huge exhaust fans etc. b. vehicles- increased number of vehicles on the road are the second reason for noise pollution, c. events- public gatherings involve loud speakers to play music resulting in the production of unwanted noise in the neighbourhood.

There are some examples of noise pollution like: unnecessary usage of horns, using loud speakers for political purpose, industrial noise, construction noise etc.

Noise pollution can be hazardous to human health because it can cause hypertension, hearing loss, sleeping disorders as well as cardiovascular diseases.

But we can still prevent noise pollution by: honking in public places should be banned, in commercial, hospital adequate soundproof systems should be installed, musical instrument sound should be controlled to desirable limits and dense tree cover is useful to prevent noise pollution.

Keywords: *industrial noise, honking of horns, human health.*

Development, Displacement and Determination with Social Capital: An Analysis of Fishermen Community in Ennore, Tamil Nadu

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Rapid urbanization and industrialization have been the most preferable planning choice and policy implementation for progressive economic growth in the Post- Colonial India (i.e., since 1947), especially at a faster rate after the Neo-liberal reforms, 1991. The above policy decisions by the Union States and Local Governments lead to drastic change in the land-use pattern in the rural-urban and peri-urban interface ending with the displacement of the local communities which, in turn, had instigated and made the realization of adverse effects on their socio-economic, health, livelihood and ecological dimensions. Apart from that, displacement paved way for the creation of informal settlements, polluting industries, middle and upper-middle class colonies, entertainment spots and the like in the acquired land. Being the local community, which had worked for the traditional, socio-economic and ecological nourishment of the area, is only realised with costs rather than benefits due to policy outlook towards economy and the environment under the Neo-classical paradigm. With specific reference to Ennore, a Coastal Peri-urban area of Chennai, the present study has been undertaken with the objective of examining the displacement issues of fishermen community and their struggle for livelihood with a backing up of social capital. The methodology adopted to gather information and data include content Analysis, Semi-structured Interviews, Discussions with Key-informants, Fishermen Associations and Non-Government Organisations (NGOs).

A macro level picture reveals the transition in Ennore has been taken place due to four types of development projects: Port and Port expansion, Public and Private Industrial developments, Special Economic Zone (SEZ) and North Chennai Thermal Power Station (NCTPS). The NCTPS is constituted by the TANGEDCO and SIDCO as a part of State Public Sector Unit (PSU) is one of the highest polluters in the area. The pollution caused enormous damage to the Land, Kosasthalaiyar river, Estuary and Creek, which led to negative externalities apart from the loss of livelihoods of the fishermen community which brings into focus the failure of both Government and the Market the two pillars of hope. In the event of such failures, the distressed communities look for another pillar of hope namely 'civil society solutions'. This approach needs to be considered to solve issues related to environmental quality and sustainability. However, during the field work it has been found the gap that, to solve this contentious problem, civil organizations along with high levels of social capital of the local fishermen community and its attributing agency has to be

developed. Social capital and its attributing agency felt intertwined, elucidates that even with high levels of social capital, the agent who represents the social capital has to be strong enough. In spite of the challenge in the measurement of locally present Social Capital, the paper disagrees with the influence of power from the Union to state government, and to local bodies and finally to the community, rather supports the bottom-up approach to make the social capital most effective in the forms of solidarity networks and socio-political movements.

Keywords: *Development Initiatives, Dimensions of Environmental Damage, Solidarity networks, Socio-political movements.*

Relative Toxicity of Lead And Nickel on Some Enzymatic Biomarkers in Epigeic Earthworm *Eisenia fetida* (Savigny, 1826) Under Laboratory Conditions

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Among all soil fauna, the earthworms are not only acting as bioindicator to determine soil pollution but also they provided with some specific enzymatic biomarker to decode the soil contamination. In the present heavy metal toxicity study, the LC50 of lead (Pb) and nickel (Ni) were determined in both artificial and natural ground soil by acute toxicity test (14 days) in *Eisenia fetida*. Low observed effective concentration (LOEC) of mixture of both metals (Pb and Ni) were also determined through repetitive experimental acute toxicity test. In the chronic toxicity test (28 days), the experimental set up had been arranged as control (C), T1 (1506.25 mg Pb), T2 (3012.5mg Pb), T3 (193.75mg Ni), T4 (387.5mg Ni), T5 (753.125mg Pb and 96.875mg Ni) and T6 (1506.25mg Pb and 193.75mg Ni) per Kg of dry soil. After end of chronic periods, specific activity of acid and alkaline phosphatase were determined in the earthworm tissue. The mean difference of recorded specific activity of acid phosphatase, alkaline phosphatase and acetylcholinesterase were significant ($P < 0.01$) between the specific activity of acid phosphatase and alkaline phosphatase.

Keywords: *Lead, Nickel, Eisenia fetida, Enzymatic biomarkers.*

Biocontrol of *Parthenium* Pollution by Vermicomposting, An Environmentally Sustainable Technology Using Earthworm *Eisenia foetida*

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Parthenium is a is one of the most trouble shooting and obnoxious weed of wasteland forest, agricultural land and cause nuisance to mankind. These poisonous weed which is deleterious and allergic. It causes serious problems to human being and livestock. *Parthenium* is a very dominant weed in all over India in general and Karnataka, Tamilnadu and West Bengal in particular. In Salt lake, Kolkata, it is a major threat as it causes severe respiratory trouble..Chemically parthenin is one of the main toxic substances present in the weed responsible for the toxicity. Traditionally the complete eradication of these weeds is very difficult and costly. Various attempts have been taken to control, utilize or destroy *Parthenium* weed but found to be failed. The main objective of this study is to find an alternative biological, ecologically sustainable and economically viable technology to combat the *Parthenium* weed from the surrounding environment. The green matters of these weeds have tremendous potential for being used organic manure. In the present investigation an attempts has been made to use *Parthenium* biomass as a substrate for vermicomposting using the earthworm *Eisenia foetida*. It is found that *Eisenia foetida* sp. utilizes *Parthenium* biomass very rapidly. The results show that by using *Parthenium* biomass along with cow dung and press mud show good source of biofertilizer after vermicomposting. From the above investigation an environmentally sustainable and economically viable technology was developed by which we can eradicate the *Parthenium*, the allergic weed biologically and ultimately transformed into useful biofertilizer. Adverse effects of the products, if any, in soil was also studied. In *Capsicum annum* (chili plant), no adverse effect was observed in seed germination, plant growth and flowering. Germination rate is observed about cent percent.

Biofortified Crops for Food and Nutritional Security

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In underdeveloped countries, malnutrition poses serious socio-economic implications mainly due to inadequate consumption of balanced diet, malnutrition leads to poor health, increased vulnerability to various diseases, which is as high as 11 per cent in Asia and Africa. Around two billion people suffer from malnutrition, while 815 million people are undernourished. Children are the most affected due to malnutrition, as a result 151 million children under the age of five are stunted, while 51 million do not weigh enough according to height (wasting). Nearly 45 per cent of deaths among children under the age of five are associated with malnutrition. The problem is so widespread that 88 per cent of the countries experience two or three forms of malnutrition. Among various parts of the globe, Southern Asia is affected the most by malnutrition with 33.3 and 15.3 per cent of the children (<5 yr) are stunted and wasted compared to global average of 22.2 and 7.5 per cent, respectively. In India, 21.9 per cent of the population lives in extreme poverty, and it is estimated that 15.2 per cent of people are undernourished⁴. As per the National Family Health Survey-4 (2015-2016), 38.4 per cent of the Indian children (<5 yr) are stunted, 21.0 per cent are wasted and 35.7 per cent of the children are underweight. Anaemia is also a serious health issue, where 58.4 per cent of the Indian children (6-59 months) and 53 per cent of the adult women (15-49 yr) are affected from this deficiency.

There is need to change food habit of people by promoting nutria rich crops. Recent trend is to promote bioportified crops. Biofortification is a process where the nutritional quality of a crop is enhanced through genetic manipulation that includes both breeding and transgenic approaches. Among various nutrients, protein, lysine, tryptophan, iron, zinc, vitamin A and vitamin C are essential for human nutrition, and their deficiency leads to various symptoms and health disorders.

Impact of Climate Change on Food Security

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Climate change is a lasting change in the statistical distribution of weather patterns over periods ranging from decades to millions of years. Climate change is caused by Biotic processes, Variations in solar radiations received by earth plate tectonics, Volcanic eruptions and Human influences etc. Climate change alters glaciers, Precipitation, Agricultural conditions, Vegetation, Cropping Pattern, Sea Level and Wildlife habitats. Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life. According to this definition, there are three main dimensions to food security: food availability, access to food, and food absorption. Thus, adequate food production alone is not a sufficient condition for a country's food security. Food security is one of the leading concerns associated with climate change. Climate change affects food security in complex ways. It impacts crops, livestock, forestry, fisheries and aquaculture, and can cause grave social and economic consequences in the form of reduced incomes, eroded livelihoods, trade disruption and adverse health impacts. However, it is important to note that the net impact of climate change depends not only on the extent of the climatic shock but also on the underlying vulnerabilities. Climate change will profoundly affect agriculture worldwide. Food security in many countries is under threat from unpredictable changes in rainfall and more frequent extreme weather. Farmers in poorer countries with harsh climate conditions will likely be most affected. A review of recent scientific literature underlines that the most effective strategy to adapt agriculture to climate change is to increase biodiversity. A mix of different crops and varieties in one field is a proven and highly reliable farming method to increase resilience to erratic weather changes. Some of the most profound and direct impacts of climate change over the next few decades will be on agriculture and food systems (Brown and Funk 2008). All quantitative assessments show that climate change will adversely affect food security (Schmidhuber and Tubiello 2007). Increasing temperatures, declining and more unpredictable rainfall, more frequent extreme weather and higher severity of pest and disease are among the more drastic changes that would impact food production.

Keywords: *Climate Change, Food Security, Livelihood, Trade disruption, Adverse Health.*

Influence of Management Practices on Yield, Economics and Sucking Pest Incidence of Cotton Grown under High Density Planting System

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A field experiment was conducted to know the influences of management practices on yield, economics and sucking pest population of cotton grown under high density planting system was conducted at college of agriculture, Raichur, Karnataka, India during the year 2016-17 and 2017-18. The experiment was laid out in split plot design consisting of three levels of planting geometries viz., S₁: 60 cm x 10 cm (1,66,666 plants ha⁻¹), S₂: 75 cm x 10 cm (1,33,333 plants ha⁻¹) and S₃: 90 cm x 10 cm (1,11,111 plants ha⁻¹) in main plots and six different fertilizer levels and growth retardants viz., M₁: 60:30:30 N:P₂O₅:K₂O kg ha⁻¹, M₂: 80:40:40 N:P₂O₅:K₂O kg ha⁻¹, M₃: 100:50:50 N:P₂O₅:K₂O kg ha⁻¹, M₄: M₁ + mepiquat chloride @ 250 ppm sprayed at 60 DAS, M₅: M₂ + mepiquat chloride @ 250 ppm sprayed at 60 DAS and M₆: M₃ + mepiquat chloride @ 250 ppm sprayed at 60 DAS in sub plots. The result revealed that, a narrow row spacing of 60 cm x 10 cm recorded significantly higher seed cotton yield and net returns (2875 kg ha⁻¹ and ? 78121 ha⁻¹, respectively) over medium and wide row spacings. Among the different management practices, application of 100:50:50 N:P₂O₅:K₂O kg ha⁻¹ + mepiquat chloride @ 250 ppm sprayed at 60 DAS recorded significantly higher seed cotton yield and net returns (2915 kg ha⁻¹ and ? 79870 ha⁻¹, respectively) over rest of the management practices. Sucking pest populations were differed significantly. A wider row spacing of 90 cm x 10 cm recorded significantly lower number of thrips (1.97 and 2.38 leaf⁻¹ at 20 and 40 DAS, respectively), leaf hopper ((1.38 and 2.40 leaf⁻¹ at 20 and 45 DAS, respectively) and aphid population (2.39 2.70 and 1.88 leaf⁻¹ at 45, 60 and 90 DAS, respectively) when compared to medium and closer row spacings of 75 cm x10 cm and 60 cm x 10 cm, respectively. Among the different management practices, application of lower dose of 60:30:30 N:P₂O₅:K₂O kg ha⁻¹ recorded significantly lower number of thrips (1.92 and 2.28 leaf⁻¹ at 20 and 40 DAS, respectively), leaf hopper (2.51 leaf⁻¹ at 45 DAS) and aphid population (2.38 2.73 and 1.90 leaf⁻¹ at 45, 60 and 90 DAS, respectively) followed by application of 60:30:30 N:P₂O₅:K₂O kg ha⁻¹ + mepiquat chloride @ 250 ppm sprayed at 60 DAS. Among the different combinations of plsnt densities and management practices, a combination of 60 cm x 10 cm along with application of 100:50:50 N:P₂O₅:K₂O kg ha⁻¹ + mepiquat chloride @ 250 ppm sprayed at 60 DAS recorded significantly higher seed cotton yield (3178 kg ha⁻¹) and net returns (? 90,396 ha⁻¹) followed by combination of 60 cm x 10 cm along with application of 80:40:40 N:P₂O₅:K₂O kg ha⁻¹ + mepiquat chloride @ 250 ppm sprayed at 60 DAS. (3031 kg ha⁻¹ and ? 84,068 ha⁻¹).

Assessment of Genetic Diversity Among Veldt Grape (*Cissusquadrangularis*) Ecotypes for Morphological Characterization

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Cissusquadrangularis is one of the medicinally important perennial, climbing succulent, widely distributed in Africa, the Arabian Peninsula, Northern India, and Southeast Asia. The plant extract serves as rich source of calcium ions and is known to accelerate healing of fracture, increase the bone strength and stimulate the production of osteoblasts, the cells in the body responsible for bone growth. Investigation on assessment of genetic diversity of fifty veldt grape ecotypes collected from different geographical locations of Tamil Nadu was conducted at Department of Medicinal and Aromatics Crops, Horticultural College and Research Institute, TNAU, Coimbatore from 2019 -2020. The experiment was laid out in a Randomized block design (RBD) with three replications. Among the fifty ecotypes evaluated, majority of ecotypes (64%) exhibited moderate green coloured petiole, 23 ecotypes (46%) produced kidney shaped leaves, 16 ecotypes (32%) with cordate leaves, 7 ecotypes (14%) with circular shaped leaves and 4 ecotypes (8%) with pentagonal shaped leaves. Flowering was observed only in 5 ecotypes (TNCq7, TNCq8, TNCq28, TNCq32, TNCq34) with greenish pink - coloured flowers and the rest remained in vegetative stage only. Variations were observed for seventeen morphological traits of *Cissusecotypes*. The ecotype TNCq32 recorded increased values for plant height (216.4cm), internodal length (10.82cm), stem yield (275.6g), root weight (8.03g), root length (16.70 cm) and number of lateral roots per plant (8.66). Likewise the ecotype TNCq23 registered increased petiole length (2 cm), leaf width (5.76 cm) and ecotype TNCq31 with enhanced number of twiners per plant (18.30) and number of main roots per plant (2.66). Among the morphological traits, highest GCV and PCV were observed for number of matured leaves, number of twiners per plant, number of primary roots per plant, plant height and petiole length. The genetic divergence analysis done by using Mahalanobis D^2 statistics indicated that the cluster IX with one ecotype (TNCq32) was found to be superior among rest of the collection with highest values for root weight (8.03), root length (16.70), root girth (3.52), number of secondary roots per plant (8.66), internode length (10.82), plant height (216.4), stem yield (275.60) and minimum value for days taken for rooting (4.66). The maximum inter-cluster distance of 207.55 was observed between cluster1 and cluster 9, followed by cluster 2 and cluster 9 (178.87).

Keywords: *Cissusquadrangularis*, ecotypes, genetic diversity, PCV, GCV, cluster analysis

Environmental Impact Assessment Reverse phase HPLC Methodology for Detection of Pesticide Residues in Broad Beans

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Vicia faba L. belonging to *fabaceae* family is one of the well-known domesticated pulses. It contains proteins, carbohydrates, lysine, saturated fatty acids, etc. In North-East states, it is consumed as boiled vegetables, chutneys and curries. Plants are extremely vulnerable to black bean aphid, *Aphis fabae* infestations, which makes the plant become stunted and curling of terminal leaves. Severe infestations may cause significant reduction in yield, and unable to make it marketable. Farmers use various groups of insecticides to combat the damage caused by insect pests. Many of the broad spectrum insecticides recommended by pesticide dealers not only kill the targeted pests, they usually cause harm on non-target organisms and environment too. The correct use of insecticides and its recommended package of how and when to use is very important. If the insecticides are not applied in their recommended doses and time of application, it may cause environmental deterioration. Limited information is available on the nature and quantity of pharmacologically active compounds of different insecticides in broad bean in North-east condition. Therefore, the method was developed for the detection of pesticide residues in broad beans which is required to ensure the safe consumption of the vegetable and the environment. A reverse phase high performance liquid chromatography (HPLC) method was standardized and developed for simultaneous detection of insecticide residues of imidacloprid, chlorantraniliprole, fipronil, chloropyrifos and cypermethrin were separated at 220 nm wavelength. Extraction and cleanup process was carried out by modified quick, effective, cheap, rugged and safe (QuEChERS) method coupled with UV-VIS detector. A good satisfactory separation of peak symmetry of the insecticide residues was obtained with isocratic flow of acetonitrile: water (90:10, v/v) with the flow rate of 0.5 ml/min. The fortified samples at 0.05, 0.10, 0.25, 0.50 and 1.00 mg/kg levels of imidacloprid, chlorantraniliprole, fipronil, chloropyrifos and cypermethrin were found to be in the range of 86.15 to 86.50 %, 81.41 to 82.47 %, 80.04 to 82.20 %, 85.23 to 88.67 % and 81.77 to 84.01 % respectively.

Keywords: imidacloprid, chlorantraniliprole, fipronil, chloropyrifos and cypermethrin.

Threats to the Freshwater Ecosystem of Idukki Wildlife Sanctuary and the Importance of Conservation Management

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Freshwater ecosystems contain only about 0.01% of Earth's water. They are arguably among the most endangered ecosystems on the earth. Many freshwater aquatic species are becoming vulnerable because of rapid changes in the environment. Micro and macro habitat alterations are becoming threats to the aquatic life that leads many species, especially fishes towards extinction. Because of the Climate change, the global freshwater biodiversity is declining more rapidly than the terrestrial one. The uniqueness of the freshwater ecosystems in terms of habitat features and fauna make them extremely vulnerable to change. The main threats to the freshwater ecosystem are non-native species, dam construction, diversion for irrigation, over-exploitation, habitat destruction, deforestation, etc. Particularly, the removal of riparian vegetation has profound influence on rivers, streams and their associated flora and fauna. Idukki wildlife sanctuary (IWS) is one of the most nature rich areas in Kerala, with steep mountains and undulating hills and valleys. The major rivers flowing through the area are Periyar and Cheruthoniar. A field study was conducted in the IWS, Kerala over a period of two years (June 2017 to June 2019). The basic physico-chemical parameters were analyzed in the field itself using portable water analyzing kit. The samples collected from 9 different sites were filtered with the Whatmann filter paper and the specimens were preserved. Multi-variant analyses were done to figure out the species similarities and assemblage in the habitat. In the analyses, the physio-chemical features of the environment were recognized as decisive factors in the distribution of species and the organization of stream communities. Also, observed that the fluctuations in fish communities are related to the habitat diversity and the species richness tend to vary from upstream to downstream. The fish communities change over seasons, and the temporal factors like floods and drought largely determine the species assemblage and composition. Floods cause many physical and chemical changes in the rivers of the IWS. The sudden increase in water velocity reduces the water temperature, increases its turbidity, and alters its chemical composition. These have been recognized as decisive factors in the distribution of species and the organization of stream communities. Some species take advantage of the flooding for spawning as it initiates bloom of micro-fauna, while others retreat to pools and return only when flood waters subside. Thus, the conservation of freshwater habitats and the associated fauna has increasingly become a priority because the endangered fish population declines after floods. Understanding the ecology, habitat use, population dynamics, its diversity and distribution helps in formulating conservation and management plans. The conservation and management are a long-term and continuing activity that includes protected area management, captive breeding for reintroduction programs, restoration of freshwater ecosystems. Though, captive breeding is possible for the conservation, it is not as effective as restoring the freshwater ecosystem of the IWS. Restoration is an important conservation effort for protecting the threatened taxa and its habitat. Also, it is recommended to promote basic education, awareness, and active involvement of the local people in the conservation management.

Keywords: *Species, Diversity, Idukki, Rivers, Floods, Over-exploitation, Captive breeding, Awareness, Restoration and Management*

Environmental and Agricultural Issues of India

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Indian rural people have practiced agriculture for centuries and developed their traditional knowledge and capacities in different regions to produce grains and sustain. They selected their cropping pattern on the basis of their traditional observation of weather conditions. Sayings of Ghagh Kavi are very popular in eastern Uttar Pradesh. Technology induced development of agriculture is a recent phenomenon. We talk about social as well as economic development. Economic development is not class neutral creates disparity as the technological inputs are not available to all alike. Some get benefitted more than some other segments of the society. There is no zero-level environmental degradation once the process of development is initiated in an area in response to development policy. The paper deals with the elaboration of the concept of development taking example from some sectors of the economy such as the scenario in agricultural development in India.

Keywords: Agri-ecosystem, Agri-environmental sustainability, Agri-environmental indicators, Sustainable agriculture, Environmental sustainability, Indian states.

Impact of COVID 19 Pandemic on World Environment and Economics

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The worldwide disruption caused by the COVID-19 pandemic has resulted in numerous impacts on the environment and the climate. The severe decline in planned travel has caused many regions to experience a drop in air pollution. In China, lockdowns and other measures resulted in a 25% reduction in carbon emissions and 50% reduction in nitrogen oxides emissions, which one Earth systems scientist estimated may have saved at least 77,000 lives over two months. However, the outbreak has also provided cover for illegal activities such as deforestation of the Amazon rainforest and poaching in Africa, hindered environmental diplomacy efforts and created economic fallout that some predict will slow investment in green energy technologies.

Keywords: Covid-19, Pandemic, Environment, Climate, Air Pollution.

Post COVID 19 and New World Order: Geo-economics and Power Politics on the Indian Ocean

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The Indian Ocean is a vast theater of Power politics in the 21st century. Its strategic importance of power politics lies in its geo-economics'. Stretching from the resource-rich Africa and substantial energy resource of the Middle East to the South Asian labor market and manufacturing industries, the Indian Ocean is pivotal for the world economy. The importance of trade and its ideal scope in regions make the Indian Ocean hotspot of economic, military, and strategic engagement. These significances make the Indian Ocean a vibrant trading hub, connecting the Middle East to Southeast and East Asia and Europe, and the Americas. India's locational situation in the heart of the Indian Ocean makes India a geopolitically crucial nation of the world. India's economic goals and security strategy can be seen vividly on the waters of the Indian Ocean, where it is continuously working on the balance of power with its rivalries, specifically China. Henceforth, the India and Indian ocean is noteworthy to study and understand along with its the geo-economics' and the power politics and how the countries' outlooks are changing with each day by creating a new world order. Against this backdrop, the broad aim of the study is to understand India on the Indian Ocean from a geo-economics' perspective and how the covid-19 has changed the countries' policies and development over the region. Significant findings reveal that India has been actively working on the policies on the Indian Ocean by maintaining a strong relationship with the Indian Ocean littoral state. The Covid-19 situation has created many changes in the world order, resulting in the favour of India and its policies.

Keywords: *Geo-economics, Security, Indian Ocean, Sea route, Policies.*

Environmental Awareness of College Students- A Case Study

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The primitive environment of the world was so pure, virgin, undisturbed, uncontaminated and quite hospitable for all life forms to exist. From the introduction of industrial revolution, men began to pollute the environment. As a result, the modern civilized men are facing various horrible problems associated with environmental pollution. Though the destruction of environment in the past may be excused from the point of view of ignorance of the common people, but it can't be now. Therefore, the environmental education is socially more essential and relevant today than the past. The present research paper is an attempt made to assess the environmental awareness of students of under graduate level of different degree colleges of district South 24 Parganas, West Bengal, India. Random sampling technique was used and 150 students studying in arts, commerce and science of undergraduate classes were surveyed. The data were analyzed by using SPSS software. The study found that, the college students have average level of environmental awareness. The study suggests some remedial measures to increase the environmental awareness among college students.

Keywords: *Environmental Education, awareness, pollution.*

Intrinsic rate of natural increase of ischnoceran louse, *Goniodes dissimilis* Denny, 1842 (Isochnocera: Phthiraptera:Insecta)

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The ischnoceran louse, *Goniodes dissimilis* Denny, 1842 infesting the chicken, *Gallus gallus domesticus* (Linnaeus, 1758) reared *in vitro* condition ($35 \pm 1^\circ\text{C}$, 75-82% RH, at feather diet), to record the incubation period, duration of three nymphal instars, adult longevity and daily egg rate. Chaetotaxy of nymphal instars has also been recorded. The data obtained from *in vitro* experimentation were used to construct the life table and to determine the intrinsic rate of natural increase (r_m). The value of r_m of aforesaid species was computed as 0.043 and the doubling time of its population appeared to be 17.50 days. In comparison to the other species studied so far, *G.dissimilis* seems to be a moderate breeder.

Keywords: *In vitro, intrinsic rate, doubling time, Isochnocera, louse, Phthiraptera.*

Increasing Trends of Population Status of Little Cormorant (*Phalacrocorax niger*) at Purba Medinipur and Its Probable Cause

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Popularly known Little Cormorant, (*Phalacrocorax niger*) is widely distributed in West Bengal, India belongs to the Family Phalacrocoracidae (Order Ciconiiformes). There is total 38 cormorant and shags species present in the world, only 4 species are occurred in India (Anon 2003). Little Cormorant is found all over Kerala, India and distributed throughout the sub-continent except parts of North-east and the Himalaya in Bangladesh, detailed works have been done on different aspects of the Little Cormorant but little information is available on population status of West Bengal. Although the overall population of the bird (little cormorant) of India is declining, the population of this bird species dramatically increasing in Purba Midnapur. Every ecosystem has a carrying capacity. Excessive loss or gain is not good sign for nature. Recently we observed the cormorant population of Purba Medinipur specially at Kolaghat, Nandakumar, Haldia, Khejuri increasing significantly. Many common bird populations are decreasing in a striking way. But that is not true in case of little cormorant. Present study was aimed to find out the fact of the trend of population of Purba Medinipur. We studied the population of little cormorant at three points viz. Kolaghat, Nandakumar and Kapasharea. The study was performed in last 7 years from 2015 to 2021. The study proved that population of *F. niger* increase from 443 to 1269 at highway road side of Kolaghat in 2015 to 2021. The present study also proved that number of nests also increased from 82 (2015) to 475 (2021). In the last seven year the number of birds increase 300% and the nesting efficiency also increased 600 % at Kolaghat. In the covid period the number of birds increased 30% of its previous year and nesting increased 40%. The rate of increase is abnormal as increasing population of only one species can reflect mal health of nature. Very high increase of nesting ensures the easy availability of food source in the local area. Same result is reflected from the population of Nandakumar and Kapasharea of Purba Medinipur. At Nandakumar number of bird and nest increased from 31 and 2 (2015) to 231 and 61 (2021 respectively). Increased rate of every last seven year also calculated. Nesting rate at last two year is very high in compare with previous year. It suggests that availability of fish is easy in Purba Medinipur. This result indicates very rapid shifting of agricultural land to fishery which is very dangerous and alarming.

Keywords: Population of cormorant, Nest, Fishery, Land shifting pattern, Kolaghat.

Diversity of Ant (Hymenoptera: Formicidae) in Nandigram, Purba Medinipur, West Bengal, India

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Ants are belonging to the family- Formicidae of order- Hymenoptera under the class- Insecta. There are more than 15,000 ant species are presents in all over the world. Ants are one of the most diverse groups of social insects. They act as an ecological indicator and ecosystem engineer. In this study, 'Diversity of ants (Hymenoptera: Formicidae) Nandigram, Purba Medinipur, West Bengal, India has been observed. Ants were collected from human habitats, road side, grass land, crop field etc. The study was carried out from February 2019- May 2021. During the study, 16 species of ants were identified. The recorded ants belong to 5 subfamilies: Myrmicinae, Formicinae, Dolichoderinae, Ponerinae, Pseudomyrmecinae. Out of these five subfamilies, Formicinae (41.35%) is the most abundant subfamily in the term of species richness followed by Myrmicinae (41.09%), Ponerinae (7.02%), Pseudomyrmecinae (5.59%) & Dolichoderinae (4.94%).

Keywords: *Formicidae, Hymenoptera, Diversity, Species richness.*

Biology of White Fly- Host Plant Selection and Life Cycle

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Whiteflies (Homoptera, Aleyrodidae) are one of the most noxious insects who attack crops and other plants around the world. Larva, as well as adults feed on various plant species and cause damage by excreting honey dew on fruits, leaves etc. Honey dew provide suitable environment for fungi that decreases the photosynthesis rate. This study carried out from April, 2020 to June, 2021. Observations focused on the host plant selection, site of laying eggs on the leaf, egg laying pattern, presence or absence of honey dew and a bit of life cycle.

Keywords: *Homoptera, Honey dew, Photosynthesis.*

Diversity of Fishes in River Haldi, Purba Medinipur, West Bengal

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Biodiversity study is very much essential for scientific data banking as climatic changes are occurring in an unexpected manner. Riverine fish diversity of any region has great significant in environmental assessment of that region. West Bengal is nourished by rivers with a total freshwater about 2,72,380 ha area. However, despite the huge water resource, the knowledge of fish diversity is very inadequate, especially in southern part of West Bengal, known as South Bengal. A study was carried out from March 2018 to February 2019 to assess the Ichthyofauna density and diversity indices in the Haldi river, Purba Medinipur. A total number of 90 fish species belongs to 13 order, 30 families and 52 genera were recorded. Shanon-Wiener diversity index (H') were recorded maximum during monsoon season. Out of 90 fish species 25 endangered, 35 vulnerable species, 15 low risks near threatened and 15 low risks least concern fishes were recorded.

Keywords: *Biodiversity; Ichthyofauna; Shanon-Wiener diversity index; Endangered; Near threatened; Vulnerable; Least concern.*

Diversity of Earthworm in Haldia, Purba Medinipur, West Bengal

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Earthworms are very important components for soil ecosystem and play a vital role in decomposition and nutrient cycling. Study on the diversity of earthworm was carried out from January, 2020 to March 2021 in Haldia, Purba Medinipur. Various methods were applied for extraction of the specimens from the soil. Study explored the advantage and disadvantages of different methods. Climate variables and habitat are important in shaping of earthworm community.

Keywords: *Soil ecosystem, Decomposition*

Impact of Light on Homing Behaviour of Two Coloneal Nesting Birds- Little Cormorant (*Microcarbo niger*) and Little Egret (*Egretta gargetta*)

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Extraordinary ability of animals, which enables most of the bird species to carry out remarkably precise long-distance migrations and homing behaviour, has fascinated natural historians for as long as animal behaviour has been of interest. Little cormorant *Microcarbo niger* and little egrets (*Egretta gargetta*) build nest mostly on same host plant. Both of the species are least concern according to IUCN. Both the species are daily migrant. The observation of both the species are very fascinating job for behaviour study. In the present study at Kolaghat, Purba Medinipur, West Bengal, the homing behaviour of both species, who build their nest on the same plant was studied to find out the impact of light intensity. In the same time other parameter were also studied to investigate the exact cue of their homing behaviour in different season of the year. Result shows that during non-breeding season cormorant and egret starts their return journey at 4.10 and 4.00 at 1700 and 2100 Lux intensity. During non-breeding months cormorant and egret completion of homing occur 1.10 and 1.00 hr. Heron return earlier than cormorant. Maximum homing of cormorant and egret occur at 200 and 432 lux respectively. But the above information differs with April and May (breeding months). Cormorant and heron starts homing at 3122 and 3021 lux intensity duration summer months. Egret return late during reproductive period. Cormorant returns at very less light intensity during winter due to use maximum foraging time. But during non-breeding the food requirement is less and moreover the daily light period is significantly longer. So, during nonbreeding summer period earlier homing behaviour was observed. This result shows that cormorant shows very little impact of light intensity on homing rather parental investment. But egret shows significant impact of light intensity on homing.

Keywords: Migration; Homing behaviour; Light intensity; Parental investment.

Ecology and Population Distribution Pattern of *Modiolusun dulatus*

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Population distribution pattern of the species, *Modiolusun dulatus* (Mytiloidea: Mollusca) are well known. In our recent study since 2017 and our last 1 year survey reflects a new report of the presence of this saline species in riverbank of Haldiriver, Purba Medinipur, WB, India. In this study we get different body size of *Modiolusun* different parts of the river bank of Haldi. We measure different parameters (salinity, pH and DO) of water in different seasons for relating the water quality. In four different study sites we measure depth of shore (m), surface area of brick (sq cm), total colony number, position of colony in the brick. The species number vary with the salinity of the water and they prefer moderately saline water. The species attached with the hard substratum like brick or concrete wall. Moderately large species are found favor of tide. The population distribution is dependent with the salinity & the depth they prefer where the availability of good both the time of high tide and low tide.

Keywords: Water parameter, Salinity, high tide.

Diversity of Toad in Purba Medinipur, West Bengal

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Amphibians show a very high level of diversity and endemism. Amphibians are facing global declines from the past few decades. Anuran amphibians are important components of any tropical and subtropical vertebrate fauna. Frog is one of the most diverse groups of vertebrates. Nearly 90% of the living amphibians are found in India. More than 80% of amphibians are endemic and show a narrow range of distribution. 284 species are described under class amphibia in India. West Bengal shelters 50 amphibian species. This study emphasizes on the diversity of anuran fauna in Purba Medinipur district. The study was conducted from 2018-2019 at Purba Medinipur, West Bengal, India.

Keywords: Endemism, Anura, fauna.

Morphological and Anatomical Study of River Slug

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Perhaps the family Onchidiidae is the most neglected family among Gastropods. There are several species under the genus *Onchidium*. The species are morphologically & anatomically dissimilar to each other. Morphology and anatomy of three different species under the genus *Onchidium* & *Onchidelle* were studied in our laboratory. For morphology study we consider different parameter like length, width, weight and body color & for anatomy studied we consider mainly Digestive tract (buccal mass, esophagus, salivary gland, stomach, hepato-pancreas, intestine & radula). Comparative anatomy of three species *Onchidium* sp., *Onchidelle* sp., *O.x.* & a correlation between body size & different parts of the digestive tract were studied. There are several differences found among those three species, such as body shape & size, body color etc. There also have some differences in anatomical characteristics.

Keywords: *Gastropods, Morphology, Anatomy.*

Nesting Site Selection of Cormorant, Heron and Egret Birds

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Location of nests is an important parameter for the success rate of reproduction in many sea birds. Nest is a shelter for many birds which saves themselves from the predators or harsh environment. This study evaluated nest site selection of the three bird species- cormorant (*Microcarbo niger*), little egret (*Egretta gargetta*) and heron (*Ardea alba*) at KTPP Township, Kolaghat, West Bengal. These birds show colonial nesting. Counting of nests on 22 trees of these three birds gave a clarification about the nesting site selection. The result shows that heron & egrets come first on a tree for building their nests and cormorants come later. But when cormorants start their nesting, the number of the nests of heron and egrets decreases.

Keywords: *Colonia nesting, Nest site selection.*

The Pharmaceutical Potential of *Soymida febrifuga* (RoxB) A. Juss and its Conservation efforts and Management

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Soymida febrifuga (Roxb) A. Juss belongs to the family Meliaceae, is a medicinal plant commonly known as “Rohina” or “Rohan” and “The red Indian wood”. It has great potential for medicinal and timber uses. It is distributed in the tropical dry forest of India to dry forests of the western peninsula and Indo-Malaysia. It is a reputed folk medicinal plant which is used throughout ancient times. The phytochemicals of this plant contain several bioactive compounds including glycosides, alkaloids, flavonoids, tannins, phenol, Saponins, Flavonoids, Terpenoids, etc, which are useful in several humans as well as in animal’s diseases. The evolution of phytochemicals of this plant from the bark and stem bark extracts have been confirmed that the plant has tremendous potential of medicinal properties and could be used as an antibacterial, antimicrobial, anti-cancer remedy, anti-helminthic, anti-inflammatory, dental diseases, uterine bleeding, and hemorrhage and acid, refrigerant, for blood coagulation, aphrodisiac, laxative, good for sore throat, cures tridosha fevers, etc. The plants are hardly affected through the anthropogenic pressure for their medicinal trades and are limited by the difficulty in propagation, high seedling mortality rates and low seed viability, and problem in natural regeneration. In Chhattisgarh, basically in the Bilaspur forest circle, the population of the plant is very rare and venerable however some of the plants which are located in this region are found in damaged conditions. More attention is required for enhancing knowledge of advanced medicinal potential, regeneration, and conservation strategies for their sustainable utilization.

Keywords: Medicinal plants, seeds germination, pharmaceutical activities, conservation, managements, sustainable utilization.

Effect of Foliar Spray of Humic Acid on Root Growth and Yield Components in Redgram (*Cajanus cajan*)

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The present study examined the effect of foliar spray of humic acid on root Growth, yield components and quality in Redgram (*Cajanus cajan*). The study was conducted during Kharif 2015-16 at Main Agricultural Research Station, 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. Redgram root growth including root length, shoot length, root dry weight, shoot dry weight, leaf area, dry matter production, flower drops, minerals content (quality) and yield components were measured at 60,90 DAS and at harvest, respectively. Significant differences (p<0.5) were observed for all the above mentioned parameters across the humic acid levels. The all the treatments differed significantly in root length(cm), root fresh weight(mg), root dry weight (mg) and T₄ recorded significantly higher root length(cm), root fresh weight(mg), root dry weight (mg) (24.25, 27.12, 9.93, respectively) as compared to all other treatments. Significantly higher redgram pod yield was recorded with application of 4.0ml/L of 15% of Humic (2,154 kg/ha) followed by application Humic acid liquid 15% @ 2.5 ml/l of water (1323.02 kg/ha). However, lower pod yield was recorded in untreated control (1073.88 kg/ha) extent of reduction in pod yield was 32 % University check Planofix 4.5 % @ 20ppm (1288.66 kg/ha). Similarly higher number of pods and pods weight were also recorded in T₄ (126.88 and 75.45, respectively) while lower number of pods and pods weight were recorded in control (89.38 and 44.88, respectively). Based on this study, the foliar application T₄ Humic acid liquid 15% @ 4.0 ml/l of water may be recommended to improve growth physiology, quality and yield components of redgram in similar environmental conditions. Further, research is required in diverse plant environments to determine economically feasible application levels of Humic acid while comparing it with other plant growth regulators sources.

Keywords: Humic acid, Growth Physiology, flower drop, mineral content and yield.

Laser Land Leveling Technique for Enhancing Water Productivity in Tungabhadra Project Command Area

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In Tungabhadra Project (TBP) Command area paddy-paddy is a traditional cropping system and cultivated in more than 80% of the command area. Though paddy fields are nearly leveled, unevenness of growth and yield variability are observed quite often in a given piece of land. This may be attributed to non-uniform spread of irrigation water and hence nutrients applied over the field. Conventional methods of land leveling followed traditionally are good enough to meet only the partial requirement of land leveling and leaves scope of improvement. The use of laser technology in the precision land leveling is of recent origin in India. It not only minimizes the cost of leveling but also ensures the desired degree of precision in land leveling. Live field demonstration of the laser leveling technology by the Saline Water Scheme centre, Gangavathi attracted many farmers especially of the tail end command who get canal water for irrigation once in 20 days rotation basis. Over the past four years, about 105 farmers got benefitted through laser leveling technology in about 350 ha. Once such good example is Sri. Ramakrishna S/o N. Suri Narayana R/o Devicamp, Karatagi, Gangavathi, District Koppal of Karnataka, a successful farmer who leveled 4 ha land with the laser leveler, who taken this equipment on rent basis from Saline Water Scheme, Gangavathi. In comparison with paddy yields under laser leveled field and the field leveled through conventional methods, higher water saving and yield was observed. The farmer could enhance paddy yields by 12 % (Rs. 6000/ ha) and saved irrigation water to a tune of 20-25% as compared to traditionally leveled land. A field day was also organized on laser guided land.

Keywords: *Land leveling, Laser leveling, Paddy, Precision agriculture, water Productivity*

Seed Physiological and Biochemical Parameters of Cotton as Influenced by Different Packaging Materials and Storage Conditions

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A lab experiment was carried out to study that seed physiological and biochemical parameters of cotton as influenced by different packaging materials and storage conditions. Cotton seeds were stored in different packaging materials viz., cloth bags and aluminium bags and vacuum packed bags stored at room temperature ($25 \pm 2^\circ\text{C}$) and cold storage ($4 \pm 1^\circ\text{C}$) for a period of 18 months. The treatments having six combinations and consisting of different containers viz., cloth bags, aluminium bags and vacuum packed bags were replicated four times in both cold and ambient storage conditions in completely randomized design. The results of the study revealed that the least fluctuations in all seed biochemical parameters viz., oil content and enzyme activity such as α -amylase, lipase and protease and seed physiological parameters such as mineral content (Cu, Mn, Zn and Mn), moisture content and electrical conductivity values were recorded in vacuum packed seeds than cloth, aluminium bags for cotton seeds stored under cold storage compared to room temperature throughout the storage period. Among the containers, the seeds stored in vacuum packed bags maintained the seed biochemical and seed physiological parameters with least deterioration compared to seeds stored in cloth bags and aluminium bags.

Practical application: Farmers, traders normally pack the seeds of various crops in either polythene bags, gunny bags or cloth bags before being used for propagation in the next season. Many seeds lose viability during the storage due to their sensitivity to oxidation and variation in moisture content during the storage period. It has been found that storing the crop seeds under vacuum packed bags enhance the shelf life while maintaining the quality. Since the seed is an essential input in agriculture, it is utmost necessary to maintain the viability and Vigour of the seed. Many a times, it so happens that the good quality seed is not available to the farmers in time due to various reasons, the average productivity of most of the crop plants has gone down considerably in the last one decade and one of the reasons for such decline is the poor quality of seeds being used by the farmers. Vacuum packaging has been found to be superior technology in preserving the seed quality i.e. physiological and biochemical aspects of different field crops.

Keywords: *Moisture content, electrical conductivity, mineral content, biochemical parameters, oil content, Cotton, vacuum packaging and cold storage.*

Modulation of Physio-Biochemical Changes Associated With High Temperature Stress and Their Amelioration by of Salicylic Acid in Fenugreek

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Plants are blessed with many defensive mechanisms to adapt genotoxic and environmental insults among them high temperature proved to be highly detrimental because of global warming. In these experiments we studied whether there exist any relation between temperature intensity and duration with growth responses, physiological and metabolic activities and stress melioration by Salicylic acid. The high temperature significantly reduced the plant growth, membrane thermostability, increased proline content, protein content and electrolyte leakage in the leaves. The effects were more pronounced at 40°C/24h. Growth by high temperature stress completely got neutralised by the application of hormone SA at 40°C/24h. We analysed three categories of proteins i.e. proteins in control plants, stressed plants and after SA treatment using two-dimensional electrophoresis and matrix-assisted laser desorption/ionisation time of flight mass spectrometry. Our results indicate that out of most protein spots successfully identified under high temperature, 12 spots showed highest differential regulation. These high temperature stress responsive proteins were involved in signal transduction, stress/defence/detoxification, protein metabolism (i.e. translation, processing, and degradation), photosynthesis, amino acid metabolism, carbohydrate metabolism, and energy pathways, and may therefore be functionally relevant for many biological processes.

Keywords: *High temperature stress, Trigonella foenum-graecum, Salicylic acid, enzymes, Proteins.*

Performance Evaluation of Marine Metal Resistant Bacterium *Lysinibacillus sphaericus* Asrpsd 99 for Bio-Removal of Toxic Arsenic(III) Ions

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The arsenic contamination in the environment from various anthropogenic and geogenic sources is a major environmental issue in many regions of the world. In the Southeast Asia region, basically in India and Bangladesh, humans and animals are regularly exposed to elevated levels of arsenic pollution through contaminated drinking water and food crops. Excessive arsenic consumption beyond the permissible limit (0.01 mg L^{-1}) can create multiple acute and chronic health issues. Bioremediation of arsenic using metal tolerant saline bacteria was found to be a more efficient, cost-effective and eco-friendly method as compared to the conventional physico-chemical methods. Detoxification of arsenic can be done by both non-enzymatic (i.e., biosorption and bioaccumulation) and enzymatic (i.e., transforming toxic trivalent arsenite (As^{+3}) to its comparatively less toxic pentavalent arsenate (As^{+5}) through bio-oxidation using bacterial arsenic oxidase enzyme) methods. In the present study, bioprospecting of arsenic (As) tolerant marine bacteria from the Paradip port, Bay of Bengal, India was carried out for the evaluation of As(III) bioremediation efficiency. Among 110 numbers of isolated As-tolerant bacteria, *Lysinibacillus sphaericus* AsRPSD99 showed the highest resistance (i.e., up to 1550 mg L^{-1}) against As(III) with high NaCl (11% w/v) tolerance capacity. Besides As(III/V), this strain also showed resistance towards varieties of heavy metals like Cr(VI), Cd(II), Pb(II), Cu(II), Ni(II), Zn(II), and antibiotics like penicillin, ampicillin, penicillin, rifampicin. Under the optimum parametric conditions of 3% w/v NaCl, pH 6.0, 130 rpm agitation speed, 1 g L^{-1} biomass dose and 360 minutes as equilibrium time, 97.58%, 96.72%, 89.58%, 69.74%, 56.31% of As(III) removal by live biomass and 95.96%, 94.91%, 85.67%, 66.49%, 54.36% of As(III) removal by dead biomass of AsRPSD99 were achieved for 100, 200, 300, 400 and 500 mg/l of initial As(III) concentration, respectively. Whereas, the maximum As(III) biosorption capacity (q_{max} , mg g^{-1}) of 281.55 and 271.8 mg per 1g biomass was obtained with 500 mg L^{-1} of As(III) for live and dead biomass respectively. Biosorption processes were found to be best fitted with the pseudo-second-order model and can be described as a two-step process (surface adsorption and intercellular accumulation). The adsorption isotherm was found in

accordance with the Langmuir model representing the monolayer adsorption mechanism. The intra-particle diffusion model confirmed the intracellular accumulation, which is more in the case of live biomass due to active transport of As-ions into the cell surface via metabolic and enzymatic activities. FTIR and FESEM-EDX analyses confirmed the possible interactions of bacterial cell surface ligands like hydroxyl, carbonyl carboxyl, and amine groups with arsenic ions during the biosorption process by means of surface adsorption, ion exchange, and micro-precipitate. The overall findings of this experiment suggest that *Lysinibacillus sphaericus* AsRPSD99 can potentially be employed for As(III) removal implementing both live and dead biomass form from the polluted saline environment in a cost-effective way.

Keywords: *Bioprospecting Marine bacteria, Lysinibacillus sphaericus, Biodegradation, Arsenic.*

***Euplotesaffinis* (CILIOPHORA: SPOROTRICHIDA) in Water Reservoir Nandur Madhmeshwar Dam, Maharashtra, India**

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Water samples were collected from different sites of NandurMadhmeshwar dam located in Nashik, Maharashtra, India. During the investigation a hypotrich ciliate *Euplotesaffinis* reported from most of the sites of the dam. Present species compared with the previously described species of the genus *Euplotes*. The size of the cell, shape of macronucleus, position of the micronucleus, length of adoral zone of membranelle (AZM) and shape of peristomal plate were considered for the identification of the ciliate and it has been observed that these structures show the resemblance with the *Euplotesaffinis* hence this species is redescribed here as *Euplotesaffinis*.

Keywords: *Ciliate, Hypotrich, Protozoa, Morphology, Taxonomy.*

Nesting of House Crow at Rural And Urban Area in Pre COVID And Post COVID Period- Sharp Behavioural Changing Pattern

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The house crows (*Corvus splendens*) generally construct nest in trees of selective species. In the present study an attempt was made to compare the tendency of nesting at few urban and rural area of Howrah district. West Bengal, India. Accordingly, survey was conducted in different places of railway station area during the period of seven consecutive breeding seasons from 2014 to 2020. There are many factors of selection of plant species for nest building and site selection on the same tree for the same. These are canopy configuration, leaf phenology and food resource mobilization, ramifications, number of suitable branches and height. The house crows are known as scavenger birds eats organic house refusals, dead- semi decomposed and even animals or parts of animal body. Its territory in close association with human's house their density is much higher in cities than in the rural areas. Our study reflects the result that from the rural area the number is reducing rapidly whereas in the urban area the number moderately increasing.

The total number of crow nest at three rural railway station Abada. Nalpur and Deulti- the total number changes 54, 74, 49, 67, 61, 57 and 21 in 2014, 15, 16, 17, 18, 19 and 2020 respectively. It shows gradual decreasing trend. Whereas at three Urban railway station area total number nest varies 79, 72, 92, 107, 115, 122 and 85 in 2014, 15, 16, 17, 18, 19 and 20 respectively. However total number is reducing in total in 147, 126, 141, 164, 178, 169 112 in respective year. It is also important finding that in pre covid period the number of the nest was more. Although most of people predicted that the number of bird as well as number of nests was expected to increase. But as the bird crow basically depends on waste food of man, and as the amount of waste food decreased in large amount due to lockdowns, the number of the nest in all the areas was decreased.

We observe two main site of nesting and these are on tree and on electric lamp post /or overhead electric post of railway. In different year the number of nests on tree varies as 116, 196, 119, 148, 149, 171 and 106 on successive breeding season from 2014 to 2020. But the number of nests on electric post varies as 17, 20, 22, 26, 27, 8 and 6 in consecutive breeding year from 2014 to 2020. It shows the crow generally prefer the tree as favourite nesting site irrespective of both rural and urban area. Another important finding is that the average minimum height of nesting site selection was reduced from 38.73 feet to 21 feet. Average minimum height of nesting was 37.4, 37.2, 40, 44, 37, 36.8 ft in 2014, 2015, 2016, 2017, 2018 and 2019 respectively whereas in 2020 the minimum height for nesting by common crow was 21.2 ft. So, in the covid period the crow shows the changed behavioural pattern.

Keywords: Nest building, Resource mobilization, Ramifications.

Socio- Economic Status of Fisherman Community Along The Estuary Part of The Subarnarekha River

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Fishing is a main source of income for the people who live near the ecosystem, and it has a significant impact on their livelihood and socioeconomic development. The aims of this study were to collect crucial data on the economic and livelihood situations of fishermen in the Subarnarekha estuary in the villages of Kirtania and Chandrabali in the Baleswar district of Orissa from July 2020 to January 2021 using a well-structured questionnaire survey method. The most of the fishermen were from Hindu families and were between the ages of 31 -40(52 %), Over 28% of fishermen are illiterate, and 50% of fishermen can only sign. Fishing was the primary occupation of over 72 percent of fishermen in the study area, followed by daily labour (18%) and agriculture (10%). Around 62 percent of fishermen have 5-6 family members, 20% have 7-10 family members, and 18% have only 2-4 family members. The average annual income of most fishermen was between Rs. 25000 to Rs. 50000 (46 percent), with just 2 percent of respondents earning more than Rs. 100000 per year. According to the study, approximately 58 percent of fishermen have a kuchcha home, 34 percent have a semi-kuchcha house, and only 4% have a pukka house. About 42% of fishermen used kuchcha sanitation, while 24% used pukka sanitation with government schemes, 13% used semi-pukka sanitation, and 6% had pukka sanitation without government schemes. The key problems of the fishermen group in the study region were found during this investigation, including a lack of scientific knowledge, illiteracy, insufficient credit facilities, and a lack of government funding, and other. To resolve these problems, the government must be more constructive, and local non-governmental organizations (NGOs) must play a key role in enhancing the social development of local fishermen.

Keywords: *Livelihood Status , Literacy, Sanitation, Income and Expenditure.*

Strategic Environmental Assessment: Significance and Problems

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The evaluation of environments especially biodiversity and rural ecosystems has become a vital of investigation for social scientist. As we are witnessing the environmental change which more rapid and dynamic in nature we need to realize how much we depend on factor of production by ecosystem services such as plant health, soil health, pest management and its control along with changing climatic conditions at regional and national levels. The emerging discipline of ecological economics provides methods for assessing the economic value of resources; economic analysis can be useful in strengthening the case for conservation.

The new era of conservation will be more effective with advent of Strategic Environmental Assessment (SEA) Studies are inevitably undertaken to evaluate potential negative impacts as well as to formulate Environmental Management Plans to overcome the identified impacts which takes place in early stage of decision making of object cycle or any development activity. The Strategic Environmental Assessment significance reveals that, SEA should be made with the purpose for determining the current status of the environment and identifying impact of critical activities on wide range of potential activities which have alternatives which acts as proactive approach for development works. The findings also states that, inappropriate screening and incapable to tackle the right issues are major drawback of the environmental impact assessment (EIA) process, where as Strategic Environmental Assessment is helpful in decision making process to meet environmental objectives while maintain natural systems which focus on sustainability agenda which helps the investigator to identify the sources of natural resources deterioration in future. Hence, The SEA is a promising management tool used extensively by governments and NGO's for project planning and approval. The Government bodies should practice, adopt and create awareness about the SEA significance and provide guidelines and checklist for understating an SEA over EIA for all the activities which deteriorate the environmental quality in general, to be more specific the projects and location of mining, landfills etc.

Performance Evaluation of Marigold Crop in Protected Cultivation

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Growing crop under greenhouse has increased dramatically in recent years. This is due to the fact that these systems allow nutrition and irrigation to be controlled more efficiently, which generates higher yields. The experiment was laid out in split plot design with three replications, as a subplot in two climatic conditions of inside and outside greenhouse as main plot. Among the treatments in the experiment, the plant height, stem girth, plant spread, no. of branches per plant and flower yield (1.21 kg) was recorded highest and shortest duration to flower bud appear and open was recorded in IGH with 100% ETc. Among the treatment combination the highest water use efficiency was observed in IGH with 100% ETc (961.79 kg. ha⁻¹mm⁻¹). These results might be due to adequate moisture availability in the soil which might have increased various physiological processes, better plant nutrient uptake and higher rates of photosynthesis, which might reflect on higher flower weight. Results from the experiment show that highest flower yield was observed IGH because of increases in life span of crop therefore, number of flower harvest were 11 in IGH when it compared with OGH only 9 harvests. The economic viability of the growing media in both environment conditions in terms of benefit cost ratio considering water use efficiency was estimated. The results showed the highest B: C ratio was recorded in IGH soil with 100% ETc respectively (6.5:1). Therefore cultivation under greenhouse considered as the effective tool and it would serve the environmental friendly atmosphere for crop growth, pesticide free quality produces, reduced amount of water requirement and reduction in labour usage.

Keywords: Protected Environment, Pesticide Free, Water Usage Efficiency, Higher yield.

Forest and Indigenous People A Relationship: A Micro Level Study of South Bengal

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Forest is the natural resources are the gift of nature. Natural resource should be utilized by all without hampering the diversity. Conservation of natural resources should be kept in mind while using it for the future generation. The indigenous people are mostly associated with the natural resources. They are mainly dependent on the forest product for their livelihood .It is the general theory that no one can look after the forest and environment better than the ethnic people because their survival and identity depends on it. They are considered to the best conservationists as they have managed their cultivated lands and conserved their forest products for many generations. Agriculture and collection of forest products are a part of the indigenous people culture in some parts of India and Shifting cultivation i.e agricultural system in which plots of land are cultivated temporarily, then abandoned and allowed to revert to their natural vegetation while the cultivator moves on to another plot. Slash and burn is one of the primitive practices of cultivation. Moreover the indigenous peoples depend on the collection of forest products such as wood, honey, wax, timber, fruits and other items to earn money and also to lead their daily livelihood. This paper aims to identify the relationship between forest and the indigenous people. The study revealed that a strong relationship has been found among the forest and the indigenous people.

Keywords: *Indigenous people, Forest, Natural Resources, Utilization, Preservation.*

Fluoride Stress Variably Affects the Overall Physiology and Grain Development in Three Contrasting Rice Cultivars, Representing A Potential Biohazard

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Ingestion of fluoride through consumption of contaminated food grains has been regarded to be hazardous for consumer health. The current study indicated the possible occurrence of such biohazard due to fluoride bioaccumulation in rice grains and straw (cattle feed). The effects of fluoride toxicity at three stages of grain development in three rice genotypes, viz., IR-64, Gobindobhog (aromatic), and Khitish, were also studied. Irrigation with fluoride-infested water inhibited grain formation in IR-64 and reduced grain yield in Gobindobhog. Fluoride toxicity promoted seed sterility in IR-64 by triggering reactive oxygen species (ROS) production and cellular necrosis, suppressing the genes like *GIF1*, *DEP1*, and *SPL14* (positively controlling seed formation) and inducing *GW2* (negatively mediating grain development). Gobindobhog showed intermediate fluoride sensitivity and accumulated high levels of proline, anthocyanins, flavonoids, and phenolics due to the induction of genes like *P5CS*, *ANS*, and *PAL* in developing grains. The agronomic attributes in Khitish were unaffected by fluoride stress due to regulated fluoride uptake and high expression of *GIF1*, *DEP1*, and *SPL14* along with an increased synthesis of anthocyanins, flavonoids, and phenolics. Khitish also accumulated low ROS as a result of which lowest lipoxygenase expression (among selected cultivars) was observed in the developing grains. Fluoride entry was accelerated in the straw of Khitish, possibly due to the absence of regulated uptake mechanism in dead seedlings. The ecological concerns regarding fluoride bioaccumulation and reduced grain yield at the varietal level were also established, based on the current investigation.

Variations in Physiological Parameter of Annual Moringa (*Moringa oleifera* Lam.) Cv. PKM-1 Leaves as Induced by Growth Regulators

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Moringa, a medium sized tree valued mainly for its pod and leaves. Technically advancing world has just paused and look back the tradition to gain nutritious food by means of utilizing naturally available vitamin, mineral and antioxidant sources rather than medicines. In this way the moringa has gained its importance for both as vegetables and for medicinal purposes. Yield is the main focus for any cultivation. To meet out the greater demand of food production has to be advanced without sacrificing the nutritional part. In this connection the present study on growth regulator spray induced variations in physiological parameters of annual moringa (*Moringa oleifera* Lam.) was studied at field level under randomized block design with three replications at Horticultural College and Research Institute, Periyakulam, Tamil Nadu. The chlorophyll content, protein and phenol content variations in moringa leaves were analysed from treatment induced plants. The treatments include GA₃ 20 ppm, NAA 20 ppm, SA 0.5 %, Nitrobenzene 0.5 %, Paclobutrazol 20 ppm and Mepiquat chloride 50 ppm along with a control. Among the seven different treatments chlorophyll 'a' (2.13 mg/g), chlorophyll 'b' (0.62 mg/g) and total chlorophyll (2.75 mg/g) content of leaves was highest in Mepiquat chloride 50 ppm spray while the soluble protein content (15.79 mg/100g) was in NAA 20 ppm and total phenol (0.22 mg/g) content was in Nitrobenzene 0.5 %. The growth retardant Mepiquat chloride 50 ppm increased the chlorophyll content as well as protein and phenol content as close as NAA 20 ppm and Nitrobenzene 0.5 % respectively. Chlorophyll content is the direct measure of photosynthetic efficiency of a crop. Retardant treated leaves are generally dark green in colour because of enhanced chlorophyll synthesis. Retardant application increases the cytokinin level that promotes the level of chlorophyll production. Enhanced proteins synthesis leads to formation of metabolic systems; the ensuing metabolism determines the capacity for growth, development and yield production. Phenolics provides structural integrity and ensures antioxidant activity in crop. These factors as a whole ultimately leads to increased production. Hence, Mepiquat chloride 50 ppm can used to increase the nutrition content of leaves and productivity of moringa crop.

Keywords: Moringa, leaves, growth regulators, chlorophyll, protein, phenol.

Traditional Agroforestry for Climate-Smart Agriculture and Food Security

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Climate-resilient farming is a need of the day to mitigate the climate adversities and food for everyone. Tree domestication in farmland termed agroforestry is one technique to achieve climate-smart agriculture owing to future climate change, which ensures production and productivity of the farm. Agroforestry can improve wood production function and environmental quality and is a most effective measure of climate change. The paper deals, the wood production function of trees occurring with agriculture crops in the plain zone of Chhattisgarh, India. Tree species structure and wood production were determined from 60 sample plots of 0.41 ha size of three districts Bilaspur, Janjgir-Champa, and Mungeli of Chhattisgarh State. Total 17 tree species encountered on crop fields in Bilaspur, ten species in Janjgir-Champa, and four species in Mungeli districts. The most abundant trees species across districts was *Butea monosperma* (Lam) (27.19%), followed by *Acacia nilotica* (L.) (18.2%), *Terminalia arjuna* (Roxb.) (15.51%, and *Albizia procera* (L.) (8.33%). The mean wood production was maximum (13.37 t ha⁻¹) in Bilaspur and minimum (6.54 t ha⁻¹) in Janjgir-Champa. The potential wood production in agroforestry trees is estimated at 3.09 million tons for Bilaspur district and 1.7 million tons for Janjgir-Champa district, if all the farmers of these districts are promoted to maintain the current level of trees in their farms. The farmers may be attracted to agroforestry through the market and industrial support, which eventually improves wood production and would help mitigate the climate change function and eventually ensure food security maintaining natural ecosystem outside forests.

Keywords: *agroforestry, food security, climate-resilient.*

Noise: An Overview

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Noise Pollution is unwanted or offensive sounds that affects us. A sound can be preserved as noise by a person and at the same time other person may find it pleasing. The noise is measured in decibels (dB). The various sources of noise include traffic noise, domestic noise, industrial noise etc. Exposure to noise can affect human health and well being. It can cause annoyance and other psychological effects on the health. Even higher noise levels can induce hearing loss also. Noise can be controlled by reducing the noise at source. Creating awareness among people can also help in decreasing the noise levels. Reductions in noise levels have a positive impact on human body and mind.

Keywords: *Noise, Decibels, traffic noise, hearing loss, awareness.*

Intelligent Corona Virus Detection Biochips in Human Welfare

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At the end of year 2021, the pandemic of of CoviD19 has suffered millions of life's, worldwide. Novel Coronavirus belonging to group retrovirus, has faster mutation rate and abilities to adopt in human cytological system. Virus alters the normal metabolism and pulmonological process resulting in respiratory illness and cardiovascular defects. Advanced molecular technologies polymerase chain reaction can detect the virus in infected patient mucous samples. What, if you can detect the virus in your body before it starts causing infection to you? My current article deals with the advance level of use of genomic technologies fusion with artificial intelligence. The development of smart intelligent virus detection Biochips could be a useful device that may transplant in our skin interstitium. The Biochip architecture possess preloaded Coronavirus genetic information. The first interaction of virus with human body will activate the Biochip and it will alert the recipient, thus prior treatment and vaccination may plan. In this way, we can save the patients life before the beginning of disease and control any virus including corona community level transmission.

Keywords: *Novel Coronavirus, Biochips, nucleic acids, artificial intelligence (A.I.).*

Biochemical Characterization of Actinomycetes, Biocontrol Agents Against *Sclerotium rolfsii*

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Biological control with potential actinomycetes is receiving greater attention all over the world. Among actinomycetes, *Streptomyces* being root-colonizing and rich producer of secondary metabolites has become one of the important promising group of antagonists. Studies were conducted on collection, isolation of actinomycetes and their efficacy against *S. rolfsii* under *in vitro* conditions using dual culture method and bio chemical characterization.

To understand the biochemical activity of all the strains various enzymatic screening studies were carried. These are the cellulase, lipase, protease, chitinase, HCN production and amylase assays.

Each potential isolate was inoculated onto a specific medium for enzymatic assays. In cellulase assay, all the five isolates showed positive reaction. The isolates Ggd, Kdr, Kyd, Lrp and Mkc formed a clear zone of 10 mm. The isolates Ggd, Kdr and Kyd showed positive reaction in lipases assay. While negative reaction was showed by Lrp and Mkc. In proteases assay the isolates Ggd, Kdr and Kyd showed positive reaction. Negative reaction was showed by Lrp and Mkc. In chitinase assay, all the five isolates showed positive reaction. The isolate Ggd formed a clear zone of 20 mm while Kdr and Kyd with 15 mm, Lrp and Mkc with less than 10 mm. All the five isolates screened for HCN production assay and light brown discoloration on filter paper was observed for the isolate Ggd while remaining four isolates Kdr, Kyd, Lrp and Mkc formed a cream colour discoloration. It was observed that all the isolates produced a clear zone for amylases test while the diameter of clear zone was around 20 mm for Ggd, Kdr and Kyd whereas less than 20 mm for Lrp and Mkc isolates. In the present study, the isolate Ggd was positive for all the enzymatic assays showing its highest enzymatic activity. The isolates Kdr and Kyd were also good in enzymatic activity and were positive for all the assays except for HCN production assay. The isolates Lrp and Mkc were positive for only cellulase, chitinase and amylase assays.

Biochemical characterization of these isolates revealed that all the isolates were capable of producing chitinase, cellulase, amylase, lipase and proteases while only one isolate *i.e.*, Ggd showed positive for HCN production. The enzymatic activity of *Streptomyces* strains plays an important role in the biocontrol of stem rot disease and the plant growth promotion is a good outcome.

Avian Community and Ecological Status of Major Wetlands of Bilaspur, Chhattisgarh

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Wetlands are one of the most productive ecosystems that support diverse habitats and biodiversity and are known for its various ecosystem goods and services. About half of global wetlands have found to be lost, and the conditions of remaining wetlands are deteriorating due to natural as well as anthropogenic cause. The negative economic, social, and environmental significances of diminishing water quality in wetlands are one of the major issues of concern for degraded wet-lands in India. Thus, it is imperative to emphasize on the restoration of the degraded wetlands along with the conservation and management of the existing wetlands since they are one of the most valuable and fragile components of the watershed. It has been strongly suggests that the management practices for wetland conservation should be based on the traditional knowledge and resource uses that will eventually aid in fostering biodiversity and preserving key ecosystem services in cost-effective and sustainable way.

In the state Chhattisgarh, wetlands cover up to 2.5% of total geographical area. River/ Stream accounts about 179088 ha, reservoirs up to 90389 ha and tanks/ponds up to 40226 ha area. Wetlands of the state are also facing various threats to be extinct. There is a significant reduction in the extent of open water from post-monsoon to pre-monsoon. Such reduction is a matter of great fall to conserve the wetlands and the habitat belonging to it. In spite of such severe reduction of natural habitats for flora and fauna, there is no much study reported confining major area of the state Chhattisgarh. Therefore, through present investigation Bilaspur district of Chhattisgarh will be taken under intensive consideration to assess the avian community diversity and ecological status of major of wetlands of the region.

Keywords: *Wetland, Ecosystem services, Biodiversity, Avian Community, Management.*

Targeting Safe Shallow Aquifer for Drinking Water: A Case Study in An Arsenic Affected Area of West Bengal

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Large number of populations of Bengal Delta Plain (BDP) threatens by naturally happening arsenic bearing groundwater. Long-term exposure to As in drinking water above permissible limit results several diseases including cancer, ultimately cause death. Access to safe arsenic water (which is used as drinking and farming water) is thus of prime importance and must be implemented. It is known for instance that deep wells (> 150 m) are generally safer and contains lower concentration of As, thus providing safer water to the community and mostly, the shallow aquifers are highly contaminated with arsenic. The concept of consumption of drinking water from nearby tube wells is highly popular in the daily life of the rural people and it's a common practice that poor villagers install their tube wells at their premises. The problem is that these deep tube wells installation requires advanced drilling technology with very high installation costs. The concentration of arsenic (as well as the chemical signature of the water) varies with depth, with deep aquifers having less arsenic than the shallow ones. However, in the latter case, the arsenic content is dependent on the sediment. Present study investigates a hydrogeochemical comparison between Brown sand aquifer (BSA) and Grey sand aquifer (GSA) within shallow depth (< 70 m) in an As affected area of West Bengal followed by the potentiality of BSA as safe drinking water source. Higher concentration of NH^+ , PO^{3-} , Fe and As along with lower Eh in groundwater of GSA indicates the reductive dissolution of Feoxyhydroxides coupled to the microbially catalyzed mineralization of organic matter releases As in groundwater of this aquifer. BSA accommodates much lower As concentration (< 10 ppb) than GSA and it can be used for sustainable drinking water supply source.

Keywords: Arsenic, Bengal Delta Plain (BDP), Aquifer, Brown sand aquifer (BSA), Grey sand aquifer (GSA).

Implications of Rapid Assessments Butterfly Diversity in Rajgir Wildlife Sanctuary

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Rapid loss of biodiversity due to urbanization is estimated to be between 1,000 and 10,000 times higher than the natural extinction rate. With only 2.4% of world's land area, India accounts for 7-8% of all recorded species, of which 4.95% area is under various degrees of protection. As it is very challenging to increase area under forest cover, urban/semi-urban landscapes provide good opportunity to boost biodiversity conservation efforts.

Butterfly diversity was assessed in various habitats (Mixed forest, scrub forest, plantations, gardens and human influenced habitats) of Rajgir Wildlife Sanctuary and semi-urban landscape in and around Rajgir Wildlife Sanctuary. We encountered a total of 743 individuals of 42 butterfly species belonging to 37 genera under five families. Inventory completeness was approx. 60% of estimated butterfly species richness which is considered as 'reasonable' for taking conservation decisions. Highest species richness was recorded in heterogeneous habitats while least in homogeneous habitats. Generalist species were abundant in open habitats like human influenced habitats and scrub forest while specialist species were restricted to habitats like Plantations, gardens and mixed forest. Observations were also taken on their feeding habits and diurnal activity patterns. These results suggest that decrease in green areas (agriculture and forests) negatively impact biodiversity composition in terms of generalist and specialist species composition.

Keywords: *Butterflies, conservation, inventory completeness, semi-urban landscapes, Wildlife Sanctuary.*

Ethnobotany Phytoconstituents and Phytopharmacology of *Bombaxceiba* Linn

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Plants have been an important source of medicines since the beginning of cultivation. *Bombaxceiba* is commonly known as silk cotton tree and semal which belongs to family Bombacaceae. Its medicinal usage has been reported in the traditional systems of medicine such as Ayurveda, Siddha and Unani. It has a wide range of medicinal and pharmacological applications. Many parts of the plant (root, stem bark, gum, leaf, prickles, flower, fruit, seed and heartwood) are used by various tribal communities and forest dwellers for the treatment of a variety of ailments. The plant literature survey shows that the plant possesses astringent, cooling, stimulant, diuretic, aphrodisiac, demulcent and tonic effects and also helps in treatment of dysentery. It also possesses important pharmacological activity such as aphrodisiac, anti-inflammatory and hepatoprotective activity in addition to anticancer and anti-HIV activity, it has an anti-*Helicobacter pylori*, antiangiogenic, analgesic and antioxidant activity and hypotensive, hypoglycemic and antimicrobial activity. It is reported to contain important phytoconstituents such as naphthol, naphthoquinones, polysaccharides, anthocyanins, shamimin and lupeol. This paper provides an overview on pharmacological, phytochemical properties and therapeutic properties of the plant.

Keywords: *Bombaxceiba, Simbal, Simul, Ethnobotanical uses, Phytochemistry, Pharmacological activities.*

The Impact of Road Traffic Noise: A Review

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Noise Pollution is very dangerous pollution now days. It gives the direct impact in our human life. Many humans who are constantly contact with the noise and result of that they are suffering with the cardiovascular disease and hypertension. There are many resources in the noise pollution like construction site, political rallies and public event. Beyond this sources road traffic also playing very important role in increasing the noise pollution. Any transport like rail, road, and air are the chronic source of noise. In previous studies, authors reported about the valuation of the road traffic reduction. Some of the researchers also investigate with the residents data. This study reports the various problems of the minimize the effect in their work places. In the city areas, there are several govt.and private organisation, business centres having both side of the busy traffic 24 hrs.The traffic volumes increasing day by day and gives the harmful impact on the individuals. Statistical analysis was carried out between a group of individuals work areas. This model will give the advanced solution to minimize this problem.

Keywords: *Noise, Pollution*

Effect of Deficit Irrigation and Drip Emitter Spacing on Soil Moisture, Yield and Water Use Efficiency of Maize (*Zea mays*) under Semi-Arid Condition

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The experiment on standardization of micro irrigation technique for maize crop was initiated at new area, Entomology block (E8) of Main Agricultural Research Station (MARS), University of Agricultural Sciences (UAS), Raichur during late *Rabi* 2019-20. The experiment was laid out in three replications with main treatments (emitter spacing) such as 0.3 (M_0), 0.4 (M_1) and 0.5 m (M_2) and sub treatments such as ET levels i.e. 0.6 (S_0), 0.8 (S_1), and 1.0 (S_2). During this year, maize sowing was taken up during 8th of January 2020. The soil moisture readings were recorded during 60 DAS (mid stage). During 60 DAS, the highest soil moisture was recorded in 0.3 m emitter spacing. In sub treatments, 1.0 ET level treatment recorded highest moisture in all the three locations i.e at the point of emitter, 20 cm away from the dripper (along) and 20 cm away from the dripper (across). Among the different emitter spacing, significantly higher grain yield (53.34 t/ha) was recorded at 0.4 m emitter spacing as compared to 0.3 and 0.5 m emitter spacing. In sub treatments, significantly higher grain yield (53.85 t/ha) was recorded at 1.0 ET level as compared to 0.6 ET (46.76 t/ha) but observed on par grain yield (52.72 t/ha) at 0.8 ET level. In interaction effect, significantly higher grain yield of maize was recorded in emitter spacing of 0.4 m with 1.0 ET level i.e. M_1S_2 followed by M_1S_1 and least in case of emitter spacing of 0.5 m with 0.6 ET level (M_2S_0). Among the different emitter spacing, higher use efficiency (WUE) 171.01 kg ha⁻¹ mm⁻¹ was recorded at 0.4 m emitter spacing as compared to 0.3 and 0.5 m emitter spacing. Significantly higher WUE (194.19 kg ha⁻¹ mm⁻¹) was recorded at 0.6 ET level as compared to 0.8 ET (164.13 kg ha⁻¹ mm⁻¹) but observed least in 1.0 ET (134.18 kg ha⁻¹ mm⁻¹) treatment. This is mainly because of deficit irrigation where, lesser amount of water was applied in 0.6 ET.

Keywords: Maize, Soil moisture, Grain yield, Water use efficiency.

A Systematic Review on Multi-Nutritional and Phytopharmacological Importance of *Perilla frutescens*

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Perilla frutescens (L.) Britt, a worldwide distributed plant, is an important economic crop and with a long cultivation history in China as well as some other countries in Asia. The plant species were the main parts of folk medicine practiced by the ancient peoples in different parts of the world. *Perilla frutescens* (L.) is an annual short-day plant belonging to the family Labiatae which is used by ancient people in different parts of world. The *P. frutescens* have been used as an important traditional herbal medicine for treating various disease including depression, anxiety, tumor, cough, antioxidant, allergy, intoxication, and some intestinal disorders. Perilla seeds contain considerably high levels (approx. 60%) of α -linolenic acid, which can be expected to possess various biological activities. The leaves are said to helpful for asthma, colds and different types of flu's. The current review have been written after gone through several literature of review on *P. frutescens* and a great effort have been given to enhance the pharmacological contents in current review from different literature of review . The current review included many bioactive metabolites present in *P. frutescens* and their nutritional as well as pharmalogical importance .

Keywords: *Perilla frutescens*, *Phytochemistry*, *Phytomedicine*, *Antioxidant activity*.

Assessment of Biological Defluoridation Methods to Mitigate Fluorosis in Raichur District

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This study showed that occurrence of fluoride is highly sporadic in Raichur district and the concentration of fluoride varies from 1.5 to 7.5mg/l. Natural contamination of groundwater by fluoride causes irreparable damage to plant and human health. High oral intake of fluoride results in physiological disorders, skeletal and dental fluorosis, thyroxin changes and kidney damage in humans. High fluoride levels inhibit germination, ultra structural malformations, reduce photosynthetic capacities and other physiological and biochemical disorders in plants. Biological defluoridation can serve as a best alternative to the conventional methods of defluoridation.

Tree Species Composition and Diversity in Protected and unprotected Tropical Forest of South Eastern Chhattisgarh

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Forest contributes greatly to climate change and support sustainable livelihood to forest dwellers across World. At the time of corona pandemic when the whole world is fighting against this virus, the sustenance of the people life of forest areas are also challenging. The disease has restricted the movement of villagers to forest areas. We have studied the forest dynamics, composition and natural regeneration of protected and unprotected forest of Bilaspur, Chhattisgarh before and after lockdown during March 2019 to 2021. Results showed that lockdown has positive impact on the regeneration of some forest species than the period before lockdown. A total 37 forest tree species and 34 seedlingspecies from 19taxonomic families were recorded. There was almost 20% higher IVI in species occurring in protected areas than the unprotected neighbouring forests. This also resulted to a higher regeneration of the tree species in this forest due to covidlockdown. We have found some interesting results that demonstrate the benefits of prohibition of people to forests for better management of forests. It concludes, that degradation of natural forests of Chhattisgarh are due to the high biotic pressure, erosion, wildfire etc., which should be controlled through effective management plans involving local peoples so that they may feel ownership of the forest, benefit for livelihood and protect the forests.

Keywords: *Forest, Composition, Regeneration, Climate Change, COVID.*

Influence of Plant Growth Regulators on Growth, Physiology, Yield and Quality of Transplanted Watermelon (*Citrullus Lanatus* L.)

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A field experiment was conducted during summer 2020-21 at Main Agricultural Research Station, Raichur, University of Agricultural Sciences, Raichur to find out the influence of plant growth regulators on growth, physiology, yield and quality of transplanted watermelon (*Citrullus lanatus* L.). The experiment was laid out in randomized complete block design with three replications and ten treatments. Seed treatment is done at the time of sowing and foliar spray was taken at 35 days after sowing. Among the treatments, seed treatment of humic acid at 2000 ppm and foliar spray of humic acid at 1500 ppm had the profound effect in improving the growth and yield attributes viz., vine length (225.2 cm), number of branches per vine (7.1), number of leaves per vine (99.3), inter-nodal length (12.3 cm) and yield attributes viz., fruit yield per vine (9.90 kg) and fruit yield per hectare (37.10 ton). The yield enhancement might be due to the improvement in growth and yield attributes.

Glasgow Climate Pact 2021: Phase Down of Coal, Which is the Single Biggest Contributor to Climate Change

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Glasgow Climate Pact is the first climate agreement drafted and signed on 13 November 2021, by the participating 197 Parties explicitly planning to reduce coal usage. Because coal, is the single biggest contributor to climate change which was not mentioning in the previous COP agreements. In the agreement word mentioned “phase down” use of coal, rather than to phase it out. In the participating 197 countries, over 140 countries pledged to reach net-zero emissions, More than 100 countries, including Brazil, pledged to reverse deforestation by 2030 and more than 40 countries pledged to move away from coal. Our nation (India) also promised to draw half of its energy requirement from renewable sources by 2030. Governments of 24 developed countries and major car manufacturers (GM, Ford, Volvo, BYD Auto, Jaguar Land Rover, and Mercedes-Benz) also have committed in this pact to “work towards all sales of new cars and vans being zero emission globally by 2040, and by no later than 2035 in leading markets”, however, others major car manufacturing nations like the US, Germany, China, Japan and South Korea, as well as most pronounced Volkswagen, Toyota, Peugeot, Honda, Nissan and Hyundai had not signed up to the pledge. India, the third-largest emitter of carbon dioxide by jurisdiction, set the latest target date planning to be net-zero by 2070, however, Earlier China is the largest emitter of carbon dioxide by jurisdiction had committed to net-zero carbon emissions by 2060.

For the protection of our environment, it’s too good for future. The pact states that the use of unabated coal should be ‘phased down’, as should subsidies for fossil fuels. Perhaps the most consequential change was language that requests parties to come to COP27 in Egypt with updated plans on how to slash greenhouse gas emissions by 2030.

Keywords: *Glasgow Climate Pact; COP agreements; phase down; coal; zero emission.*

Effect of Different Drying Conditions on Quality Parameter of Quick Cooking Germinated Brown Rice

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Different traditional drying methods for preparation of quick cooking rice still beset by many problems including long rehydration time, inferior quality, lower hardness and less sticky. So this study was conducted to development and standardisation of process technology for producing quick cooking germinated brown rice by adopting suitable drying methods. Quick cooking germinated brown rice was prepared from Prativa variety of paddy using different drying methods. Brown rice was soaked for 12 h, germinated for 24 h in an incubator and pressure cooked followed by storing at 4°C in refrigerated condition for 24 h. The samples were then hot air dried at 70, 90 and 110°C, microwave dried at 1.6, 2.4 and 3.2 W/g power level and freeze dried. The cooking qualities, physico-chemical parameters and sensory attributes of the dried samples were studied. Freeze dried and microwave dried QCGRR were found to be better than hot air dried samples. Taking all the quality parameters into consideration, microwave drying at 3.2 W/g power level was selected to be the standard one for preparation of quick cooking germinated brown rice. The cooking time, mean sensory overall acceptability score, broken percentage and GABA content of QCGBR obtained by the standard microwave drying method were found to be 5 ± 1 min, 7.5 ± 0.577 , $10.04\pm 0.92\%$ and $58.8\pm 1.42\text{mg}/100\text{ g d.m.}$, respectively. The drying method could be adopted for preparation of QCGBR which is a novel convenient health food.

Keywords: *Freeze drying, Microwave drying, Hot air drying, Quick cooking germinated brown rice, Cooking properties.*

Aging Studies of Quick Cooking Germinated Brown Rice Associated to Brown Rice, Germinated Brown Rice and White Rice

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The research work was undertaken to study the change in moisture content, cooking properties and biochemical parameters of brown rice, germinated brown rice, quick cooking germinated brown rice and white rice during storage. Freshly harvested paddy of *Prativa* variety was milled in rubber roll sheller and polished in laboratory polisher to get brown rice (BR) and white rice (WR). Brown rice was soaked in demineralised water for 12 h, germinated at $27\pm 1^\circ\text{C}$ temperature and 85-90% relative humidity for 24 h and dried at 50°C to get germinated brown rice (GBR). GBR was cooked under pressure, conditioned in refrigerated storage and dried at 90°C to obtain quick cooking germinated brown rice (QCGBR). The rice samples were stored in poly ester terephthalate bottle and metalized polyester poly pouches under ambient condition. Cooking time, water uptake ratio and volume expansion ratio increased, whereas decrease in solid loss, phenolic and amylose content were observed in both the packaging materials during storage. Cooking time of BR, GBR, QCGBR and WR increased from 25.5 ± 1.27 , 18.5 ± 0.92 , 5 ± 0.25 and 10.5 ± 0.52 min to 29.5 ± 1.4 , 21 ± 1.4 , 6 ± 0.3 and 11.8 ± 0.59 min, respectively after six months of storage in MPP packs. The phenolic content of BR, GBR, QCGBR and WR decreased from initial values of 104.2 ± 5.21 , 95.2 ± 4.76 , 74.4 ± 3.72 and 38.9 ± 1.94 to 103.3 ± 5.16 , 94 ± 4.7 , 72.9 ± 3.64 and 36.2 ± 1.81 mg GAE/100 g, respectively after six months of storage in MPP packs. The rice samples can be stored safely up to 4 months in poly ester terephthalate bottle and 6 months in metalized polyester poly pouches.

Keywords: *Quick cooking germinated brown rice, Storage, Cooking properties, Germination, White rice.*

Salicylic Acid: Role of Phytohormones in Growth and Development during Stress Conditions

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Plant hormones are naturally released biochemicals found in plants known as phytohormones that regulate plant growth and yield under varying environmental conditions. There are many plant hormones in plants that appear at the time of their need for development starts from embryogenesis to seed germination. Their presence may stimulate reactions that are signal and causative agents for stress responses. Plant hormones include auxins, gibberellins, cytokinins, salicylic acid, abscisic acid, ethylene (gas) etc. Out of these salicylic acid performs some major role in growth and development of the plant important for their physiological functions such as increasing resistance of plants to System Acquired Resistance (SAR) to withstand the large number of stresses. It also increases metabolic rates, which contributes to the energy saving of the plant through alternative pathways. Salicylic acid acts as a transmitter of the cell to withstand environmental stresses such as dryness, coldness, heat and also increases the plant's ability to withstand salt stress. Salicylic acid chemical formula is $C_7H_6O_3$ and symbolized as SA called chemical ortho hydroxyl benzoic acid.

Keywords: *Phytohormones, Salicylic acid, Physiology, Embryogenesis.*

Screening and Characterization of Endophytic Bacteria for Improving Plant Growth under Multiple Abiotic Stress Conditions

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Multiple abiotic stresses in soil due to heavy metal pollution, salinity, drought, extreme temperature etc., greatly reduce the plant growth and crop productivity by interfering normal physiological, biochemical and molecular processes in plants. Hence, in recent years the use of multiple abiotic stress tolerant microbes has received increased attention among agronomists and environmentalists since such microbes colonise with host plants even under abiotic stress conditions and concurrently produce plant beneficial metabolites including which have crucial role in plant growth promotion and abiotic stress tolerance. The present study was carried to isolate, screen and characterize the multiple abiotic stress tolerant endophytic bacteria from metal contaminated regions and to select suitable inoculant which might be useful to improve the plant growth and ecophysiological response under multiple environmental stress conditions including heavy metals and drought.

Among a collection of endophytic bacteria isolated from the tissue interior of *Catharanthus roseus* and *Azadirachta indica* grown in metal contaminated regions of Salem, Tamil Nadu, 16 strains were selected based on abiotic stress tolerance including multi-metals (Cd, Cu and Zn), drought and temperature and *in vitro* plant growth promotion assay. Among them, seven isolates namely ECU02, ECU04, ECU07, EZN01, EZN02, EZN07 and ECD02 exhibited maximum levels abiotic stress tolerance and plant growth promotion. These 7 strains were further tested for PGP traits including IAA production, P solubilisation, siderophore and ammonia production etc. Based on multiple stress tolerance, *in vitro* plant growth promotion and PGP traits, four isolates, namely ECU02, ECU04, EZN02 and ECD02 were selected and further genetically characterised as *Bacillus thuringiensis* (ECU02), *Exiguobacterium mexicanum* (ECU04), *Bacillus velezensis* (EZN02) and *Acinetobacter radioresistance* (ECD02). Due to diverse properties including multiple stress tolerance, *in vitro* plant growth promotion and PGP traits, expressed by endophytes, such isolates could be used as efficient bioinoculant to improve plant growth in marginal lands. Further studies on the assessment of the inoculation effects of these endophytes on plant growth and ecophysiological response under multiple environmental stress conditions are under progress.

Keywords: *Endophytic bacteria, heavy metals, siderophores, drought, Bacillus.*

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