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BOOK OF ABSTRACTS

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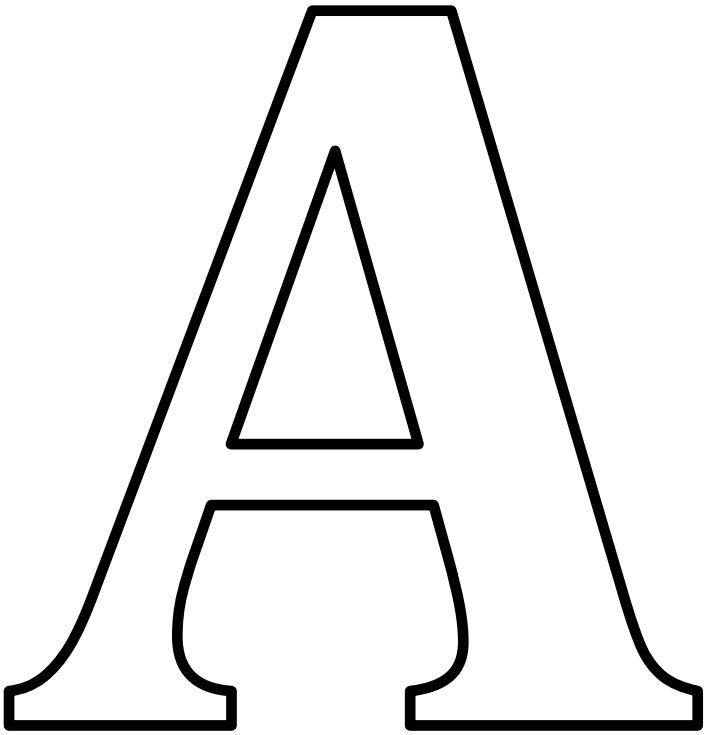

Food Security and Safety under Climate Variables

A - 001

EFFECT OF ROCK PHOSPHATE APPLICATION TO PRECEDING CROPS ON GROWTH AND YIELD OF GROUNDNUT UNDER ORGANIC CONDITION

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Field experiment was conducted at Main Agricultural Research Station, UAS, Raichur, during *kharif* and *rabi* seasons for two consecutive years (2014-15 and 2015-16) to study phosphorus management through different levels of rock phosphate application to preceding bajra and sunhemp on succeeding groundnut in north eastern dry zone of Karnataka. The results of experiment indicated that, application of higher levels of rock phosphate at 150 and 200 kg ha^{-1} to preceding sunhemp and bajra crops recorded significantly higher pod yield of groundnut (1826 and 1859 and 1774 and 1810 kg ha^{-1}) than rock phosphate application at 50 and 100 kg ha^{-1} and these treatments were at par with treatment receiving RDF + FYM (1871 kg ha^{-1}) to both bajra and groundnut crops in the system. The yield parameters such as number of pods per plant, pod weight per plant and 100 seed yield were higher with higher levels of rock phosphate application. Significantly higher plant height, number of leaves per plant, number of branches per plant were recorded with application RDF + FYM and it ware on par with the application of rock phosphate at 150 and 200 kg ha^{-1} to preceding bajra and sunhemp crops. Further these treatments recorded higher microbial population, soil enzymatic activity and available nutrient status of soil. Significantly higher net returns of ₹ 84,004 ha^{-1} in the system was recorded at higher levels of RP (200 kg ha^{-1}) to preceding bajra.

Key words: Sunhemp, bajra, pod yield, enzyme, microbial

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A - 002

RAINFALL VARIABILITY AND ITS IMPACT ON CROP PRODUCTION OF ASSAM

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Agriculture is the mainstay of the economy of the people of Assam. It provides employment to about 60 percent of the working population. Any abnormal variation in the rainfall pattern used to have adverse effect on agriculture. Crop production in Assam is affected through rainfall in two different ways- high rainfall which leads to flood in different parts of the study area and low rainfall which leads to drought like situation in many parts of Assam especially in Nagaon and Marigaon Districts. Avoiding the problem of low rainfall is nearly possible through irrigation, but as irrigation facilities in Assam are highly inadequate, low rainfall amount used to have negative influence on agricultural production. Again heavy rainfall at the end of the crop cycle causes damages of crops and financial losses to the farmers. This study has been carried out with the aim of understanding the impact of excess rainfall or scarce rainfall on crop production of Assam. The main objective of this study is to analyse rainfall variability and trends and its impact on crop production of Assam. Monthly rainfall data for a period of 36 years (1975-2010) recorded in 08 rainfall gauging stations of Assam that are maintained by Indian Meteorological Department (IMD has been analysed. Coefficient of variation (C.V.) and Precipitation concentration index (PCI) has been computed to assess rainfall variability. Agricultural data of all the districts of Assam has been collected for the period 1975-2010 and processed. Carl Pearson correlation method and multiple linear regression analysis are the statistical tools employed to study the relationship and effect of rainfall characteristics on crop production. The statistical significance of correlation coefficients has been tested at 5% and 1% level of significance. Findings showed that there exist a relationship between rainfall variability and crop production.

Key words: Rainfall variability, crop production, trend analysis, coefficient of variation, precipitation concentration index

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A - 003

CLIMATE CHANGE AND FOOD SECURITY LOSS IN FRESHWATER ECOSYSTEM

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In India, the problem of food security is very prominent and climate change is affecting it in complex ways. It impacts crops, livestock, fisheries and aquaculture and it also have economic and social consequences. According to F.A.O. (Food Agriculture Organization) "Food Security exists when all the people at all the times have physical, social and economic access to sufficient, safe and nutritious food preferences for an active and healthy life. Climate change may cause significant increase in inter-annual and intra-seasonal variability of monsoon rainfall and it leads to wet up all the wetlands and decreasing water table. The present study which was conducted on the River Sip a tributary of River Narmada flows in central India. The study included condition of the socio economic aspects of the fisherman community through a survey by using a questionnaire method. The data was collected from four villages by covering two hundred fishermen families. A local Fish market survey was also carried out to collect the overall status of the effects of the current climatic condition on the fisheries sector of that area. This study reveals the continual substandard and pathetic situation of the fishermen community due to the increasing effect of imbalance in the aquatic life of the fishes. Undoubtedly it can be concluded that if the fisheries production will shrink with this rate the future will be tough to fulfill the food demand.

Keywords: - Climate change, Fisheries, Food security, Fishermen community.

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A - 004

ECONOMICS OF RAISED BED PLANTING FOR SOYBEAN (*GLYCINE MAX*) IN SHAJAPUR DISTRICT OF M. P.

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On farm testing were conducted in Shajapur district of Madhya Pradesh during kharif 2015 to assess the effect of raised bed planting on growth characters and yield of soybean crop. The raised bed planting was found better in term of plant population, plant height, number of branches per plant, number of root nodules per plant, seed yield weight per plant, seed index, seed yield comparison with ridge & furrow sowing for soybean crop. The highest productivity of 13.5 q/ha observed in the raised bed planter (FIRB) whereas it was found lowest under ridge & furrow sowing (8.8 q/ha). The net return is the best index of profitability of soybean crop production and higher net return (Rs 27182 per ha) was recorded under raised bed planter system (FIRB) where as lowest net return of (Rs 11616 per ha) was recorded under ridge & furrow sowing.

Keywords: Raised bed planting, soybean crop, Shajapur

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A - 005

EFFECT OF MOLE DRAINAGE SYSTEM ON THE GROWTH CHARACTERS AND YIELD OF SOYBEAN IN SHAJAPUR DISTRICT OF M. P.

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Field experiments were conducted at farmer's fields in Shajapur district in Malwa region of Madhya Pradesh during *kharif* 2016 to assess growth parameters and yield of soybean under mole drainage system in temporary waterlogged vertisols. Mole drainage system was found better in terms of growth parameters; yield attributes and economics parameters comparison with the control. The net return is the best index of profitability of crop production and higher yield (16.8 q/ha) and net return (Rs 31416 per ha) was recorded under mole drain areas whereas, the lower yield (12.6 q/ha) and net return (Rs 23016 per ha) was recorded under control (No mole drain system) for soybean crop. From the study, it can be concluded that the mole drainage are best option for the water logged vertisols and it is the most appropriate, profitable and productive practice in *kharif* crops.

Keywords: Soyabean,mole drainage system, Shajapur, kharif

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A - 006

POST HARVEST CHANGES IN ASCORBIC ACID CONTENT OF CITRUS AURANTIFOIA FRUITS DUE TO BACTERIAL CANKER DISEASE

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Vitamin C, including ascorbic acid and dehydroascorbic acid, is one of the most important nutritional quality factors in many horticultural crops and has many biological activities in the human body. The content of vitamin C in fruits and vegetables can be influenced by various factors such as genotypic differences, preharvest climatic conditions and cultural practices, maturity and harvesting methods, and postharvest handling procedures.

Citrus, a non-climacteric fruit, is one of the most important fruit crops in global fruit industry. Among citrus, in India, 'Kagzilime' or sour lime (*Citrus aurantifolia* Swingle) is cultivated on a commercial scale and is more popular. The juice of *Citrus aurantifolia* is medicinally rich in vitamin 'C' and is a good source of vitamin 'A' and 'B' and considered to help in digestion. Juice soothes cold, cough, sore throat, headache and fever. It is also used as an antiseptic. The remains of peel, pulp and seed is manufactured as fodder.

Citrus bacterial canker disease (CBCD) is one of the most feared of citrus diseases affecting almost all citrus varieties. It is wide spread in citrus producing areas of the tropical and sub-tropical world causing severe canker lesions on all above-ground parts of the plant, leaf defoliation, premature fruit drop, tree decline and reduced fruit marketability thereby affecting its trade internationally. Consequently, it has particularly been managed through eradication procedures and strict quarantine regulations beside other chemical and cultural practices.

It is necessary to investigate the post-harvest changes especially biochemical alterations in different components of fruits of *Citrus aurantifolia* viz. peel, juice, rag and pulp because nutritive value of fruits is mainly due to their high vitamins contents especially vitamin C, and because the loss of food, after its production and harvest has attracted worldwide attention. The increase in food supplies through expensive energy intensive programmes cost much more than through preservation of harvested food and prevention of loss in storage. It is expected that post-harvest biochemical changes leads to bio deterioration in the quality and nutritive value of such fruits. The present study was therefore initiated to investigate the ascorbic acid change which is one of the various aspects of aberrant metabolism in fruits during post-harvest diseased conditions. The investigations were carried out on 'Round' and 'Oval' varieties from 2 –h to 120- h after plucking, both in healthy fruits used as control and correspondingly in inoculated and diseased fruits of contemporary age group. Results showed diminution in ascorbic acid , almost half in peel extract but not so pronounced in juice, rag and pulp during 2- 120 h of pathogenesis.

Keywords: Horticultural crops, Fruit Juice, Biochemical changes, Bio deterioration, Nutritive value

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A - 007

ENHANCING FOOD SECURITY THROUGH CLIMATE SMART AGRICULTURE TO COPE UP WITH CHALLENGES OF CLIMATE CHANGE

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It is imperative in India to go for climate smart agriculture practices in the era of global warming and climate change. Agriculture contributes 21 per cent of the country's GDP and 60 per cent of the employment in Indian economy. The rainfed agriculture occupies 67 percent net sown area, contributing 44 percent of food grains and supporting 40 percent of the population. As 67 % of India's agriculture is rain-fed, therefore, it is extremely sensitive towards vagaries of monsoon and vulnerability is further accentuated by global warming. Under such circumstances, it is essential to tune our agriculture with changing weather conditions which would be based on scientific analyses and technological capabilities with enhanced and accurate Early Warning System (EWS) in place for anomalous weather conditions. The proper weather forecast is necessary for fine tuning the agriculture practices with regard to the changing monsoon pattern. It will be beneficial for the farmers because it will prevent the crop loss and add towards food security. Climate smart agriculture promises to improve resilience and sustain farm productivity and farm income.

Agriculture productivity is affected in many ways under the impact of climate change and some of the important climatic parameters which affect agriculture are- changes in average temperatures, rainfall, climate extremes (hail, heat waves, cyclones etc.); pests and diseases; atmospheric carbon dioxide, ground-level ozone concentrations and changes in sea level.

Climate change is anticipated to decrease cereal production by 20% globally which is a major area of concern with effects unevenly distributed across the world. Future, climate change will likely negatively affect crop production in low latitude countries, while effects in northern latitudes may be positive or negative. Climate change will increase the risk of food insecurity for some vulnerable groups like the poor, labourers, small and marginal farmers and on-farm livelihood earners. The paper seeks out to assess the possible impacts of climate change on agriculture sector leading to food insecurity and the need for climate smart agriculture to deal with it.

Keywords: Global Warming, Climate Change, Climate Smart Agriculture, Food Security

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A - 008

FOOD SECURITY AND SAFETY UNDER CLIMATE VARIABLES

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Food security means availability, accessibility and affordability of food to all people at all times. Availability means food production within the country, food imports and the previous year stock stored in government granaries. Accessibility means food is within reach of every person. Affordability implies that an individual has enough money to buy safe and nutritious food to meet one' dietary needs.

The poorest section of the society might be food insecure most of the times while persons above poverty line might also be food insecure when the country faces a national disaster/calamity like earthquake, drought, flood, tsunami, widespread failure of crops causing famine etc. In case of India, climatic variables or failure in monsoon is the main reason behind making larger section of people food insecure.

Food production in any given year is affected most directly by the values of the critical climate elements (temperature, radiation, precipitation etc.) during the year. The stability of available food supplies is governed by the Inter annual variability of these elements.

Climate fluctuations of the kind witnessed in the 1970s lie within the variability of the present climate. They could have been anticipated by prudent societies if they have been kept on the climatic record. In addition to the normal variability of the climate, there increasing evidence for a change in atmospheric optical properties as a result of the built up of CO_2 and other "greenhouse gases". It is also clear that their built up will continue. It is expected that in the long term this will result in climate change.

Although a large section of people suffer from food and nutrition insecurity in India, the worst affected groups are landless people with little or no land to depend upon, traditional artisans, providers of traditional services, petty self-employed workers destitute including beggars. In urban areas, the food insecure families are those whose working members are generally employed in ill-paid occupations and casual labour market. These workers are largely engaged in seasonal activities and are paid very low wages that just ensure bare survival.

The social composition along with the inability to buy food also plays a role in food insecurity. The SCs, STs, and some sections of the OBCs (lower cast among them) who have either poor land-base or very poor land productivity are prone to food insecurity. The people affected by natural disasters, who have to migrate to other areas in search of work, are also among the most food insecure people. A high incidence of malnutrition prevails among women. This is a matter of serious concern as it puts the unborn baby at the risk of malnutrition.

Keywords: Dimensions of Food Security, climatic fluctuations, failure of monsoon, PAPs, malnutrition.

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A - 009

THE FUTURE OF RICE IN EASTERN INDIA

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In eastern India three types of rice seed are nowadays cultivated: traditional (landraces), high yielding, and F_1 hybrid varieties. Introduced in the 1990s F_1 hybrid rice seed is mostly produced by the private sector, the seed bought each year by farmers, its price increasing. Many farmers are switching directly from traditional varieties to F_1 hybrid rice varieties, choosing the seed by trial and error and encouraged by advertising ploys. Looking holistically at what farmers derive from F_1 hybrids, however, yields a paradox: farmers purchase and grow F_1 hybrid rice even though they do not appear to comprehensively benefit from it. F_1 hybrid rice has become popular because it appears to yield well in an agrarian environment bypassed by the earlier Green Revolution, receiving inadequate support and investment from the public sector (in irrigation, institutional credit, extension work etc.), and in which poverty and lack of information are rife. This paper includes a review of the literature on F_1 hybrid rice and a presentation of data collected during a 2009 study of rice farmers in Jharkhand and subsequent field visits. The paper does not aim to question the process of hybridisation per se, but rather presents a critique of the effects generated by the introduction of F_1 hybrid rice seed to eastern India. Firstly, the introduction and promotion of F_1 hybrid rice encourages subsistence farmers to adopt a form of cultivation that is unsustainable (e.g. chemical input intensive). Secondly, it encourages farmers to produce a food grain that is less nutritious than traditional or high yielding varieties. Thirdly, it absolves the Indian government of its wide-ranging and long-term failures to support farmers. Fourthly, it leaves farmers dependent on private, unregulated entities. Assisted by agricultural scientists, the private sector focuses upon generating profit by developing certain proprietary seed types rather than involving itself in the non-profitable business of supporting farmers to improve cultivation practices, hence output. Rice vendors, upon whom farmers rely for information, are interested to promote and sell F_1 hybrid rice because of its profit margins. Fifthly, farmers are abandoning traditional varieties, and the in-situ preservation of traditional varieties of rice is not being promoted, even though it is widely understood that biodiversity in crop varieties is important especially in the current context of unknown climate change and increasingly unpredictable weather. This paper thus questions the role scientists, the government and the private sector are playing in eastern India's rice sector, and asks 'what is the future of rice in eastern India?'

Keywords: F_1 hybrid varieties, high yielding varieties, traditional varieties, landraces, Green Revolution, private sector, government, scientists, farmers

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A - 010

ASSESSMENT OF PRIMITIVE TRIBAL GROUPS AND THEIR FOOD SECURITY STATUS IN INDIA

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Primitive Tribal Groups (PTGs) are scheduled tribes known for their stagnant population, low level of literacy, pre-agricultural technology, hunting practices and extreme backwardness. There are 75 PTGs have been identified in the country and spread over 15 states & union territories. According to 2001 census, more than 7.85lacs population of PTGs were counted inChhattisgarh state followed by Maharashtra and Jharkhand with 4.08 and 3.87lacs respectively.The population of Birjia tribal in Bihar has been recorded only 17 whereas Sentinels are 39 and Great Andamanese are 43. The census also indicates that Kondareddis tribal of Andhra Pradesh has counted maximum of 85 thousands in the country followed by Dongariakhond (Andhra Pradesh)and Saharia(Rajasthan) with 83 thousands and 76 thousands respectively. This study indicates that the population distribution of PTGs in India is uneven & this is because of the pattern of living, topographical conditions andgeneticalvariability. The major incomes of these PTGs are based on limited agriculture and non-timber forest products (NTFPs). This condition always creates a problem of food security for these PGTs as still they are very poorand out of modern society. The regular population growth on these PGTs may increase the food scarcity which will be a big problem for them and the societies.

Keywords: Primitive Tribal Groups, Population, Food security

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A - 011

STATISTICAL TREND ANALYSIS OF WEATHER PARAMETERS OF SIX DISTRICTS IN JHARKHAND TO STUDY THE VARIATIONS FOUND IN DIFFERENT LAND USE AND LAND COVER AREAS

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Anthropogenic activities have caused humongous alterations to the land surface and the ambient environment since the advent of industrialisation. The changes to the ecosystem have been apparent in some cases and mostly imperceptible in others. The alterations in the land surface have been to a larger extent than the changes in the homogenous water bodies. The regional climate of a place is determined by topographical, climatic and environmental parameters. Recent studies have found that certain anthropogenic forcings have some definitive impact on the microclimate of a place. The state of Jharkhand lies in the Eastern portion of monsoon trough and Tropic of Cancer passes through it. The weather type dominant at Jharkhand is humid sub Tropical type (Cwa) and Tropical wet and dry type (Aw). Due to abundant natural resources in terms of minerals and forest cover, the land usage pattern is variable across the state. The microclimate of any particular area is dependent on its land use/land cover pattern as land surface processes play a major role in determining microclimate and mesoscale climate of an area. The study aims at finding any statistically significant difference present in areas with different land use and cover pattern across the state of Jharkhand. Ranchi, East Singhbhum, Dhanbad, Palamu, Garhwa and Sahebganj districts have been chosen as Areas of Interest (AOIs) where Ranchi is considered as urban zone, East Singhbhum as industrial zone, Dhanbad as mining zone, Palamu and Garhwa as forest zone and Sahebganj as rural zone. The historical datasets of average temperature, precipitation and cloud cover were obtained from India Water Portal and analysed using 1- way ANOVA and Mann- Kendall Trend analysis test. The data sets were analysed for 101 year, 30 year and 10 year time periods for 12 months and Pre monsoon period. The analysis for 1-way ANOVA showed no significant changes in all the six AOIs for the time periods taken under consideration. The 10 year and 30 year datasets showed some variations in temperature, precipitation and cloud cover between the six AOIs, though the changes were not statistically significant. The Mann Kendall trend analysis exhibited presence of trend for temperature and precipitation in case of winter, monsoon and post monsoon months. The Pre monsoon period temperature and precipitation did not exhibit any significant trend for the AOIs. The study found that East Singhbhum exhibited maximum precipitation and cloud cover in the Pre monsoon period and Dhanbad recorded highest average temperature for the pre monsoon months in the time periods of 30 years and 10 years. The study gives suggestive evidences that different land use/land cover areas do have variations in weather patterns. The variations in weather patterns have been more pronounced in the recent years. The study suggests that recent changes in the land use pattern have some effects on the regional and local climate; these changes were not present earlier as proved by the historical datasets. Although statistically significant changes have not been found in the study still changes in the weather pattern over the years could be deciphered.

Keywords: Anthropogenic forcings, Mesoscale climate, Mann Kendall Test, ANOVA

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A - 012

EVALUATION OF THE COMPARATIVE STUDY OF NON-DESCRIPT DESI CHICKEN, RIR AND VANARAJA BIRDS

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The study was conducted in farmers' field of Belia Hossainnager village of Murshidabad District through FLD programme under the guidance of Murshidabad KVK to compare the performance of chickens of non-descript desi (ND), Rhode Island Red (RIR) and Vanaraja (VN) in respect to body weight, egg production and BC ratio. The average initial body weight of day-old chicks were 29.19 ± 3.20, 29.49 ± 3.27 and 31.15 ± 3.47 by genotypes. The lowest and highest mean body weight gain per bird were recorded for ND (329.38 ± 3.32 g) and VN (351.56 ± 5.08 g) respectively, which indicated that average daily growth rate of 5.88 ± 0.05 and 6.27 ± 0.09 g per bird at their 2nd months growth period respectively. Observed egg laying capacity and live body weight were 76, 129 and 112 nos. and 1250, 2450 and 3220 g in 330 days respectively. Benefit cost ratio in ND, RIR and VN were 1.85, 2.39 and 2.12 respectively. Results were evaluated by recording egg production of RIR & VN is 70% & 47% higher than ND though average weight of bird is 100% & 164% higher than ND. RIR is much superior than VN in respect to average egg production & much active and hardy though disease incidence is little higher in both the improved breed than DN bird.

Keywords: Non-descript desi chicken, Rhode Island Red, Vanaraja, Egg production, Body weight, BC ratio

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A - 013

WATER FOR FOOD: INTERLINKING RIVERS

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Water is the key to food security. In the coming decades, feeding our bourgeoning population is going to be a herculean task as water remains 'the most critical finite source' on the planet. Irrigation claims to appropriate nearly seventy percent of freshwater consumption. There is a global consensus on the synergy of water and food security. However, the national policies fall short of aligning the two sectors and adopt a fragmented approach. The various rights, human and fundamental, concede the right to food and fresh drinking water. However, such rights do not include the right to water for agricultural purposes. A nexus approach between food and water issues need a priority in resource management in various countries.

In India, we have vast arid regions as well as flooded plains. Besides, the monsoon comes for a definite time as against the year-long need of water for food production. Some years have bountiful rainfall, while some face drought. Against this backdrop of regional and time variances, interlinking of rivers can be a fair bet. It would not only aid irrigation in the deficit areas, but also generate hydro power and help in controlling floods and devastation.

The paper will analyze the critical issues pertaining to river inter-linking in India- the costs, benefits and trade-offs. The benefits will be examined especially within the framework of food security. The issue needs an extensive deliberation in view of Prime Minister Narendra Modi's ambitious plan to interlink and redesign the natural flow of 30 major rivers which has been touted as the world's largest irrigation infrastructure project. The project designed to irrigate nearly 35 million monsoon dependent hectares by 2050 is faced with enormous challenges such as land acquisition, population displacement, extensive submergence of land and forest areas, endangering species, etc. Environmentalists warn of the severe consequences of meddling with the natural course of rivers by building canals and dams; and instead suggest the traditional methods of recharging groundwater, watershed management and conservation as the sustainable alternative towards food security. Nevertheless, the government has several successful river interlinking projects, such as in Mexico, U.S. and other nations, as a model for emulation. Reducing the ecological costs can be done by careful planning and policy implementation. All such alternatives and prescriptions shall be investigated in the paper.

Keywords: River Interlinking, Irrigation, Food security, Water Conservation, Dams, Ecology.

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A - 014

HEIRLOOM ROOT VEGETABLES AS A FOOD SECURE VEGETABLES IN HIGH ALTITUDE TRANS HIMALAYA, LADAKH

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The food security is the prominent issue in the area of High Altitude where the half of the year remain cut off from the rest of the world and the environmental condition another drawback for the inhabitant of such areas including plants and animals.The heirloom vegetables are vegetables which are coming down from generation to generation which are known for its taste, colour, shape, etc. There are many heirloom vegetables in Ladakh, as Ladakh is the area which is isolated from the rest of the world for half a year, farmer are not having the scientific knowledge of farming but they are with full ingenious knowledge of farming. Heirloom vegetables are in verge of extinction because the life style of the people are changing even with the eating habit of people, In ancient Ladakh there used to be only few vegetables like –radish turnip, swede, onion, lettuce, etc which are mostly grown and different traditional recipes in the menu which are cooked with heirloom vegetables only but now a days Chinese and Continental on the lists of the many households and conventional restaurants. What we found with our study is that there is steep reduction in the heirloom vegetable production in Ladakh area, it might because the farmer are not preserving the heirloom vegetables and what we found is that there is market demand but people are not getting, if the condition is same like this, the time will come where there will be no any heirloom vegetables, then it will be great loss for farmers, the heirloom which are known for its unique taste, colour, shape and its nutrient content and to some extent help people to solve the food security issue at the time of scarcity.

Keywords: Heirloom, Ladakh, Radish, trans-Himalaya, high altitude

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A - 015

RECALLING FORGOTTEN FOOD FOR FOOD SECURITY UNDER CLIMATE CONTROLE

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Food security means food for all and there should be no one without food. There are so many food articles available on earth and their consumption is practiced by rural population and Tribal population for their daily food requirement. These food articles are not only cheap and easily available in locality but nutritious as well. Some of the food ingredients like Ragi (finger millet)Tisi (Flaxseeds), China (Panivargu),need less water for their cultivation hence these are very good crops to be cultivated in present scenario of climate change. In each region exists some forgotten food which have been used in past but the new generation does not use it and it is disappearing with increasing work load on certain selected food grains. The study was conducted with an objective to find out some rare and disappearing food ingredients and to test their acceptability by the panel members and expose these food grains for extensive use. By interviewing rural and old people in the locality some of these food articles were identified and their value added, and base products were prepared.some of these food articles were Ragi, Tisi, China, Mahua, Gular ,and Suthani. All the products prepared from these food articles were highly acceptable on all the parameters such as colour, odour, texture, taste, and over all acceptability. The products prepared were those which are the common food recipes used by the general public such as, Halwa, gulgule, sabji, chutney, vegroll, frenhfries, bhujia, kheer and upma. These food articles are not only, cheap, water economic, draught resistant, nutritionally good but also have medicinal importance. Ragi is rich in fibre, calcium and iron it has a good glucose lowering effect. Tisi has cholesterol lowering effect, Gular is very good anti hepatotoxicagent, Mahua has galactogougeproperty. China (Panivargu) is gluten free so can be given to the patients of gluten intolerance.

Keywords: Ragi, Gular, Panivargu, Mahua, Suthani, Food security

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A - 016

CAMPUS SUSTAINABILITY INDEX: BALANCING CARBON FOOTPRINT AND CARBON HANDPRINT

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With the drastic increase in the emission of CO_2 (carbon dioxide) within the last 30 years be it due to burning fossil fuels in the power plants, using gasoline for transportation, deforestation; especially tropical forest for wood, pulp and farmland and a massive increase in the use of chemical fertilizers, a tremendous pressure has emerged on the delicate balance that exists between planet Earth's climate and life systems. World Meteorological Organization (WMO), reported 19.2 million new displacements due to weather, water, climate and geophysical hazards in 113 countries in 2015.2016 was the warmest year on record, with global average temperature 0.2 degrees centigrade higher than previous year, the European Union's Copernicus Climate Change Service (C3S) confirms. It is alarming that the latest data puts global warming at about 1.3 degrees centigrade higher than the mid-18th century which is considered as the pre-industrial baseline. A healthy environment and availability of enough natural resources ensures sustainability of life on Earth. It is therefore, a growing crisis with large scale implications on mortality, health, economy, and security. Hence, the importance of "Action" at all levels, to tackle this problem cannot be overemphasized. The study aims to look at the aspect of climate change and reflect how the actions taken by our educational institution balance the two complementary concepts—Carbon Footprint and Carbon Handprint. The paper attempts to provide quantifiable and measurable assessment of the implications of the actions using an IPC formula. In addition, it would suggest simple ways, by which the institution can achieve goals of becoming "Carbon Neutral", or improving our "Campus Sustainability", with every passing year.

Keywords: climate change, carbon foot print, carbon handprint, carbon neutral

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A - 017

EFFECT OF SEASONAL VARIATION ON ENDOCRINE PROFILE AND GENE EXPRESSION RELATED TO PIG (RE) PRODUCTION

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Piggery in India contributes substantially to livelihood and nutritional security of resource poor and socio-economically disadvantaged farmers. Climate change including seasonal variation adds another layer of uncertainty to already dynamic animal production system. Physiologically, pig may not be a versatile species to adapt very well to high ambient temperature and humidity. The present study was conducted to ascertain the influence of seasonal variation on (re)production in pigs through assessment of endocrine profile and gene expression. Blood samples of different genetic (native, crossbreed and exotic) and age (grower, finisher, sow and boar) groups of pigs were collected round the year (March, 2014 – February, 2015) from organized farms and farmers' field from Kamrup District of Assam, India. Records of ambient temperature and relative humidity (RH) were collected on daily basis (spanning eight synoptic hours) for base-years (2014-15), and Temperature-Humidity Index (THI) was calculated. Estrogen, progesterone, testosterone, insulin, leptin, T3, T4 and GH hormones were estimated using ELISA, and relative expression for estrogen receptor β (ESRβ), progesterone receptor (PGR), follicle stimulating hormone β subunit (FSHβ), luteinizing hormone β (LHβ), gonadotropin-releasing hormone (GnRH), growth hormone (GH) and growth hormone releasing hormone (GHRH) genes were studied through RT-qPCR. Based on average THI, the seasons were classified as I (November - February), II (March - June) and III (July - October), and it was largely unfavourable during Season III followed by Season II. Mean THI was recorded as 65.76 for Season I, 76.96 for Season II and 80.92 for Season III, respectively. Hormones estrogen, progesterone, insulin, T3 and T4 were found to be influenced by season ($P<0.01$). Genetics of the animal influenced testosterone ($P<0.05$) and T3 ($P<0.01$). Age of (re)productive life of the animals influenced estrogen, progesterone, insulin, testosterone and T4 ($P<0.01$). Level of GH and leptin was not influenced by season, genetics or stage of (re)production. Expression level of *ESRβ* revealed that crossbred (*CB*) and exotic (*Exo*) pigs had higher expression compared to indigenous (*Ind*) pigs during season III. Similarly, expression level of *PGR* was higher in *CB* and *Exo* pigs as compared to *Ind* pigs during season III. *CB* finisher, *Exo* finisher and *CB* boar had lower mRNA abundance for *FSHβ* during season III. *LHβ* had lower mRNA abundance in *CB* grower, *Exo* finisher and *CB* sow as compared to *Ind* pigs during season III. Expression level of *GnRH* during season III revealed higher expression in all groups except *Exo* grower pigs. Similarly, except for *CB* boar, all other groups of pigs had higher expression for *GH* during season III. The mRNA abundance levels for *GHRH* revealed higher levels for all groups except *Exo* finisher and *CB* sow as compared to *Ind* pigs. It may be concluded that season in interplay with genetics and age of productive and reproductive life significantly influences endocrine profile and gene expression related to production and reproduction in pigs. Thus, matching genotype with the environment will require consideration of seasonal variation to appropriate scale for climate-smart livestock production to ensure food security for the ever increasing human population.

Keywords: adaptation, endocrine profile, gene expression, pig, production, reproduction, seasonal variation, THI

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A - 018

A STUDY OF ALTERNATIVE AGRICULTURE AND FOOD PRACTICES IN INDIA

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Contrary to the general perception Agricultural and global food systems are responsible for around 40 percent of GHG emission come from the global food system which includes deforestation before the planting starts, farming, food waste, transport processing and packaging, Freezing an retail and waste. The current global food system, propelled by an increasingly powerful transnational food industry, is responsible for about half of all human produced greenhouse gas emission. Therefore, the climate change mitigation strategies should take and find how the present mode of agricultural practices and consumption patterns could be restructured to trade our way out of climate catastrophe.

This paper will be a study of industrial food production system and it's implication for ecology: with respect to deforestation, the monoculture (where Soya, Palm oil, rapeseeds and Sugar cane have replaced much of the multi crop practices) , the increasing use of pesticides, fertilizers and chemicals, the increasingly grip of biotechnology and the GM crops in particular.

Secondly this paper will see through the data of Global food system i.e. the global food trade, politics of food production and consumption among developed and developing nations, the growing power of food capitalists around the world and its implication. This paper will show that the present dominant mode of food production, consumption, and food politics is totally unsustainable and unjust.

Finally it will project few alternatives discourse on food and agriculture called "eco-agriculture" i.e. agriculture that is friendly to ecology being practiced by various communities and agro-initiatives around India. The new scenario will require a radical change in approach from the current industrial agriculture model : use of techniques such as diversified food, increased incorporation of trees and wild vegetation and biodiversity conservation, small farm practices, local food system in the hands of the small farmers, food sovereignty, the relevance of kitchen garden and terrace garden in urban spaces. All of these have the potential for challenging the Industrial production of foods. In the context this study will have a close look at the agriculture and food habits of Indigenous (tribal) people from India in the context of climate change mitigation strategies as Indigenous people across the world have drown worldwide attention as the eco-saviours in the world bereft of any immediate solution to ecological crisis. This will also include the study of various initiatives of "eco-agriculture" intiated by Debal Deb in West Bengal and Odisha, Madhuri in Madhya Pradesh, Krishi in Chhattisgarh, and "Seed Freedom" initiated by Vandana Shiva.

Keywords: Global political ecology, climate change, eco-agriculture, industrial agriculture, alternative agriculture

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A - 019

FOOD SECURITY AND SAFETY UNDER CLIMATE CHANGE – A REVIEW

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This paper provides a comprehensive study and review of literature related to the assessment of Global Change impacts on Food Security. Global Food security threatened by climate change. The food production systems are now under the confluence of a number of biotic and abiotic stresses including the climate change. Greenhouse gases include CO_2, CH_4, N_2O has caused a rise in the amount of heat from the sun, be radiated back in to space, resulting in climate change (global warming). Hence Food availability and food quality still are the big challenges for scientists due to changing climate. Research on Food Security needs to integrate food security and safety under climate change. FAO stress the necessity to improve food security and reduce the environmental pressure. Climate Change will affect the food quality because of the increasing temperature and decreasing crop growth period. Climate change affects production directly through changes in agro-ecological conditions and indirectly by affecting growth and distribution by incomes. The climate change and food security in various direct or indirect ways published results indicate that the impacts of climate change and significant, however, with a wide projected range (between 5 million and 170 million additional people at risk of hunger by 2080) strongly depending on assumed socio – economic development. Finally, current assessment studies are discussed, suggesting improvements.

Purpose, importance and significance of the research: The objective of this paper is to review the role of global climate models and crop growth models for the study of Climate change impacts on food. It is intended to provide useful background information for govt. as well as policy makers who are interested in understanding the impacts of climate change on food security and to devise suitable adaptation options.

Food security is increasing important for human beings all over the world. Mahatma Gandhi rightly remarked, “To the hungry, God is bread”. Food security at national level refers mainly availability of sufficient stocks of food to meet either through domestic supply or through imports at the domestic level of the country. Thus there is a need to extend the crop area otherwise, it would decrease the food security. Food availability and food quality still are the big challenges for scientists due to changing climate. Research on food security need to integrate population, crop production, climate change and water availability, consequently, to evaluate food security completely and systematically.

Keywords: Global Change, Food Security, Hunger, Vulnerability, Temperature

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A - 020

PHENOTYPING OF UPLAND VARIETIES RECOMBINANT INBREED LINES (RIL) POPULATION UNDER STRESS AND NON STRESS CONDITIONS FOR GRAIN YIELD AND DROUGHT RESISTANCE

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Drought is a major abiotic stress that limits rice productivity in rainfed and upland ecosystems (Bimpong *et al*., 2011) and worldwide, drought affects approximately 27 million ha of rainfed (IRRI, 2011). In India, area under rice cultivation remained stagnant and even declined in the recent years due to water availability. Drought reduces yield by 15–50 per cent depending on the stress intensity and crop growth period at which the stress occurs in rice (Srividhya *et al*., 2011). Eastern India, comprising Jharkhand, Orissa, and Chhattisgarh alone accounts loss of about 40 per cent of the total rice production due to severe drought (Pandey and Bhandari, 2009). Under stress condition date of 50 % flowering flowered one week to one fortnight before than the non-stress (normal/ irrigated) condition. It is observed that average plant height reduced by 12.9%-29.5%, panicle numbers drastically reduced to 41.6%-65.4%, yield of inbred lines decreased from 17.34% -86.04% and average of 44.86%.similarly it also find out that biomass, harvest index, filled grains, total grains, fertility etc phenotypic characters are less under stress condition in comparison to non-stress condition.Variation of DSI_{GY} for rice ranges from -1.081 to 2.116. Drought resistance index for inbred lines rice varies from 0.04 to 2.80 with average of 1.02. The inbred lines having higher value of DRI i.e CO-39(2.80),Br.gora(1.15),HxB-1(1.81), HxB-13,14,19,20,31,34,,80,81,107 etc.(+1) are comparatively more resistance/tolerance to drought than the low value DRI inbred lines i.e. HxB-101(0.09), HxB-18(0.05), HxB-24(0.04) etc.The values of DSI_{GY} made it possible to rank the examined rice genotypes according to their drought tolerance. So that it make easier selection of desired lines/varieties.

Keywords: Drought, DRI, DSI, Inbred

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A - 021

ECONOMICS OF RAISED BED PLANTING FOR CHICKPEA IN MALWA REGION OF M. P.

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On Farm Testing were conducted in Shajapur district in Malwa region of MP during *rabi* 2014-15 to assess the effect of raised bed planting on growth characters and yield of chickpea crop. The raised bed planting was found better in term of plant height, number of root nodules per plant, seed yield weight per plant, seed index, seed yield comparison with normal flat sowing for chickpea crop. The net return is the best index of profitability of chickpea crop production and highest productivity of 16.38 q/ha observed in the raised bed planter (FIRB) whereas it was found lowest under flat sowing for chickpea crop (13.5 q/ha). Highest net return (Rs 57008 per ha) and B: C ratio (3.81) were recorded under raised bed planter system (FIRB) whereas, the lowest net return (Rs 40799) and B: C ratio (3.06) per ha was recorded under normal flat sowing for chickpea crop.

Keywords: Raised bed planting, chick pea crop, yield, Shajapur

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A - 022

AGRICULTURAL CRISIS: A CASE STUDY FROM PUNJAB

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The'' Green Revolution '', was introduced in India to make the country self-sufficient in food production. Punjab, the land of five rivers, was transformed into the bread basket of the country. Soon the yields increased and India could meet its food needs. But the land was wrenched of its nutrients and turned bone dry as extraction of water was must for the chemically laden, high yielding varieties of wheat and rice production. Gradually, the yield of the land decreased and the land became unproductive.

In the book critical perspective on Agrarian Transition, Dr Sukhpal Singh and Smriti Bhogal of Punjab Agriculture University, write in the chapter 'Punjab's small peasantry; thriving or deteriorating', that 88% of the farmers of Punjab have an average debt of Rs. 218,092 per household. The amount of debt per hectare was inversely related to the farm size. It was the highest among marginal farmers at RS. 1,70,184, followed by small farmers at RS. 1,04,155 and for larger farmers at Rs.44,069.

The agricultural crisis in Punjab is deepening. The ground water table is reducing by 2 ft every year, the usage of NPK and other fertiliser are increasing , the indigenous seeds are losing their identity, soil is getting polluted, health and safety issues are increasing, says Randheer Singh Pratap, who has been farming from the last 20 years. With deteriorating soil, the only way to maintain high yields is pump in more fertilisers that further deplete the soil, will also increasing the input costs for the farmers.

The youth in Punjab, like in Uttarakhand, are migrating to cities far away from home. Once the bread basket or food bowl of India, it has now become inextricably dependent on chemicals to produce high yields. The Green Revolution of 1970, brought to India by Norman Borlaug may have been needed; sow native, eat local, and understand the ecosystem before intervention.

Worldwide the main problem today is the decline in productivity of land in the agricultural sector and a growing demand to accommodate the increasing population. What is needed are ways to grow more food without heavy reliance on environmentally costly chemical pesticides, fertilisers, and irrigation water. However, the new methods that are being developed to increase productivity of crop do not come with sufficient research on their long term effect on soil fertility and ecological balance.

Keywords: agricultural crises, Punjab, green revolution, Integrated Crop Management System

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A - 023

EFFECTS OF GLOBAL WARMING ON ENVIRONMENT

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A comprehensive assessment of the impacts of climate change is a grave threat faced by humankind .Changes in the environment-reportedly largely due to greenhouse gases released into the atmosphere by human activity-threaten to make earth uninhabitable for humans. The unnatural climate change we are expecting is the manifestation of a change in the climate of human minds over the past several centuries. To this end an integrated ecological-economic modeling framework is employed, encompassing climate scenarios, agro-ecological zoning formation, socio-economic drivers, as well as world food trade dynamics. Specially, first, impacts of different scenarios of climate change on bio-physical soil and crop growth determines of yield are evaluated on a 5'X5' latitude global grid; second, the extent of potential agricultural land and related potential crop production is computed. The detailed bio-physical results are then fed into an economic analysis, to assess how climate impacts may interact with alternative development pathways, and key trends expected over this century for food demand and production, and trade, as well as key composite indices such as risk of hunger and malnutrition, are computed. This modeling approach connects the relevant bio-physical and socio-economic variables within a unified and coherent framework to produce a global assessment of food production and security under climate change. The results from the study suggest that critical impact asymmetries due to both climate and socio-economic structures may deepen current production and consumption gaps between developed and developing world; it is suggested that adaptation of agricultural techniques will be central to limit potential damages under climate change.

Keywords: Uninhabitable, agro-ecological, bio-physical soil, Coherent

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A - 024

CARBON SEQUESTRATION POTENTIAL IN SWAMI SHANTI PRAKASH GARDEN IN ULHASNAGAR, MAHARASHTRA, INDIA

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In the present investigation, a popular garden named Swami Shanti Prakash Gardenlocated in Ulhasnagar, District- Thane, Maharashtra state, India was selected and studied for carbon sequestration potential. Ulhasnagarwas a colony of migrants in the aftermath of Partition and today is a municipal town. It was once a barren land, now grown and developed into a commercial hub town of Thane district. It is spread out inan area of 13 square kilometers. There are around 57 Parks and gardens in this city, planned and established by the municipal corporation.The garden under study covers an area of 1.90 acresand houses around 170 trees belonging to 29 genus.Trees assimilate the atmospheric carbon through the process of photosynthesis, andsequesters CO_2 from the atmosphere in the form of biomass. Our ecosystem includes three carbon pools: live biomass, dead biomass and mineral soils.The live biomass of trees was estimated on the basis of DBH and tree height .The above ground biomass (AGB) of trees (62.271 Kgs) includes the whole shoot, branches, leaves, flowers, and fruits.The (BGB) belowground biomass (16.1909 Kgs) includes all biomass of live roots excluding fine rootsof diameter<2 mmand was calculated by multiplying AGB withfactor 0.26. The Total biomass (78.460Kgs) is the sum of the AGB and BGB. The organic carbon of the standing live tree was estimated by non-destructive method.Soil plays an important role in carbon sequestration by increasing soil organic carbon (SOC).SOC storage has been widely considered as a measure for mitigating global climate changethrough C sequestration in soil.Average SOC by the whole garden was 45.100%. *Samaneasaman*showed highest biomass (12.362Kgs) followed by*Eugenia jambolana* (9.1548 kgs). MaximumCO_2 (525.175 Kgs) was sequestered by*Polyalthialongifolia*as they were more in number.*Samaneasaman*with 15 trees sequestered339.921Kgs of CO_2. *Eugenia jambolana* sequestered highest amount of SOC 1.807% which is followed by *Mangiferaindica* 1.742%. The sustainable development of the urban trees is important to protect the developing world from the adverse effects of climate change and global warming with the objectives of carbon sequestration is the need of time.

Keywords: Ulhasnagar, Carbon sequestration, biomass, *Eugenia jambolana, Samaneasaman*

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A - 025

PHENOTYPING OF MAIZE FOR DROUGHT TOLERANCE

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Drought is a phenomenon which indicate inadequate supply of water during crop growth and tolerance to drought is the ability of a genotype to grow under drought without any significant loss of yield. Under global scenario of climate change it is very essential to identify the genotype which can grow under a wide range of environment. Drought being a natural phenomenon is difficult to characterize and phenotyping of plant species for drought tolerance is also very complex. Occurrence of drought affects the physiological, biochemical and other traits and ultimately reduces the crop yield. Maize is a C_4 plant which can grow under varied climate *i.e.* from arid to humid region. Productivity of maize is highest among all cereals and very sensitive to water stress. Considering the above facts an experiment was conducted with 24 maize hybrids (developed by crossing of 8 high yielding female lines with 3 drought tolerant testers) in 7 different sets of moisture regimes under Randomized Block Design. Observations were recorded for 22 morphological traits, 13 physiological traits, 6 root traits 3 biochemical traits, 11 stress indices and finally water productivity of individual hybrids. Statistical analysis was performed for Line x Tester, Principle Component Analysis of characters, gene action, heterosis, molecular characterization. The paper discusses on the performance of hybrids under different moisture regimes, identification of parents and hybrids suitable for rainfed, irrigated and stress environment. Finally, desirable characters were also identified for effective selection of drought tolerance in maize. Based on the study, the hybrids BAUIM-2 x HKI-1532, BAUIM-3 x HKI-1532 and BAUIM-5 x HKI-1532 were identified as good performer (heterotic) across the different moistures regimes and can be recommended for cultivation under wide range of environment. The effective characters through which selection can be performed for identifying drought tolerant genotypes are plant height, ear height, leaf area index, ear length,1000 seed weight, % pollen stainability, stay green, root fresh weight, root volume, grain yield per plant.

Keywords: Climate Change, Genotypes, Rainfed, Irrigated, Stress, Gene action, Heterosis

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A - 026

INTEGRATED WEED MANAGEMENT IN *KHARIF* GROUNDNUT (*ARACHIS HYPOGAEA* L.) UNDER IRRIGATED CONDITION

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Groundnut or peanut (*Arachis hypogaea* L.) is known as the ***'king'*** of oilseeds. It is one of the most important food and cash crop of our country. Crop contributes about 40 per cent to the total oilseeds production in the country. Critical period of crop weed competition is the prime factor, which decides the growth and yield of groundnut. The critical period of weed competition in groundnut ranged from four to nine weeks. Weeds cause much damage to the groundnut crop during the first 45 days of its growth. The average yield loss was about 30 per cent whereas, under poor management conditions, yield loss by weeds upto 60 per cent had been reported. Pod and haulm yield decreased with increased crop weed competition up to harvest and the highest pod yield was realized under completely weed free condition. Maintaining weed free environment resulted in maximum yields in groundnut. The highest pod yield (25.05 q ha^{-1}), haulm yield (26.33 q ha^{-1}) and harvest index (47.43 %) was recorded in weed free check and was on par with pendimethalin 38.7 EC @ 1000 g *a.i*. ha^{-1} fb IC at 25 and 35 DAS. This might be due to timely and effective control of weeds by PRE herbicides coupled with POE herbicides along with the IC which provided weed free environment to the groundnut crop. The highest chlorophyll content at 15 and 45 DAS (44.89 and 42.67 SPAD meter values) were obtained in weed free check. This might be due to lower weed competition during critical period of the crop growth stages, which might have provided better availability of soil moisture and nutrients for crop growth. Weed free condition recorded higher bacterial, fungal and actinomycetes count at 15 and 35 DAS per gram of soil which was comparable to other integrated treatments. Significantly higher net returns (Rs. 99,518 ha^{-1}) and a B:C ratio of 3.52 were recorded in weed free check.

Keywords: Groundnut, weed competition, integrated weed management.

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A - 027

NEED FOR - EMBANKING AN EFFICIENT FOOD STORAGE TECHNIQUES FOR A FOOD SUSTAINABLE SITUATION

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Climate change will affect all four dimensions of food security: food availability, food accessibility, food utilization and food systems stability. It will have an impact on human health, livelihood assets, food production and distribution channels, as well as changing purchasing power and market flows. It affects food production directly through changes in agro- ecological conditions and indirectly by affecting growth and distribution of incomes, and thus demand for agricultural produce.

People who are already vulnerable and food insecure are likely to be the first affected. People living on the coasts and floodplains and in mountains, dry lands and the Arctic are most at risk. It is necessary to strengthen the resilience of rural people and to help them cope with this additional threat to food security. Particularly in the agriculture sector, climate change adaptation can go hand-in-hand with mitigation. Climate change adaptation and mitigation measures need to be integrated into the overall development approaches and agenda.

This abstract provides background information on the interrelationship between climate change and food security and ways to deal with the new threat.

Keywords: Sustainable Development, Affects, Measurement, Security

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A - 028

A REVIEW ON PATHOGENESIS RELATED GENES ASSOCIATED WITH PHYTOPHTHORA INFECTION IN MEMBERS OF SOLANACEAE FAMILY

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Phytophthora is an oomycete which causes a dreaded potato disease known as late blight or potato blight. The organism can cause infection in tomatoes and other members of solanaceae family which include bean, pepper, eggplant, squash, watermelon, pumpkin, cantelope, cucumber, tobacco etc. Damage caused by the pathogen remains restricted as a result of the plant's defensive response. Most prominent hypersensitive reaction is when the cells around the infection site rapidly necrose. This response is associated with a coordinated and integrated set of metabolic alterations in plant due to invasion of fungus. In addition, various novel proteins are induced which are collectively referred to as "Pathogenesis - Related proteins" (PRs). These are downstream components of SAR pathway and coded by the host plant but induced specifically in pathological or related situations, do not only accumulate locally in the infected leaf, but are also induced systemically. Induction of PRs has been found in many plant species belonging to various families, suggestive of a general role for these proteins in adaptation to biotic stress conditions. In this study we attempted to make a review on PR genes that were expressed in response to fungal pathogen Phytophthora causing late blight in Solanaceae family. Since some of the tobacco PRs were identified as chitinases and β-1,3-glucanases with potential antifungal activity, it has often been suggested that the collective set of PRs may be effective in inhibiting pathogen growth, multiplication and/or spread. Originally, five main classes of PRs (PR-1–5) were characterized by both biochemical and molecular-biological techniques in tobacco. In 1994 a unifying nomenclature for PRs was proposed based on their grouping into families sharing amino acid sequences, serological relationship, and/or enzymatic or biological activity. By then 11 families (PR-1–11) were recognized and classified for tobacco and tomato. Criteria used for the inclusion of new families of PRs were that (i) proteins must be induced by a pathogen in tissues that do not normally express the protein(s), and (ii) induced expression must have been shown to occur in at least two different plant-pathogen combinations, or expression in a single plant-pathogen combination must have been confirmed independently. General method for characterization of PR genes in different solanaceae crops were to isolate the nucleic acid followed by synthesis of cDNA and amplifying the product using gene specific primers. The amplified products were then sequence and multiple alignment was used to done for highest significant homology. Till date many components of PR gene family have been reported from genomes of several plant species of Solanaceae family. Most important among them are, 755, 394 and 684 from potato (*S. tuberosum*), tomato (*S. lycopesicum*) and pepper (*Capsicum annuum*).

Keywords: Late blight, Fungus, SAR pathway, Downstream components, Vegetable crops

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A - 029

EVALUATION OF THE COMPARATIVE STUDY OF NON-DESCRIPT DESI CHICKEN, RIR AND VANARAJA BIRDS

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The study was conducted in farmers' field of Belia Hossainnager village of Murshidabad District through FLD programme under the guidance of Murshidabad KVK to compare the performance of chickens of non-descript desi (ND), Rhode Island Red (RIR) and Vanaraja (VN) in respect to body weight, egg production and BC ratio. The average initial body weight of day-old chicks were 29.19 ± 3.20, 29.49 ± 3.27 and 31.15 ± 3.47 by genotypes. The lowest and highest mean body weight gain per bird were recorded for ND (329.38 ± 3.32 g) and VN (351.56 ± 5.08 g) respectively, which indicated that average daily growth rate of 5.88 ± 0.05 and 6.27 ± 0.09 g per bird at their 2nd months growth period respectively. Observed egg laying capacity and live body weight were 76, 129 and 112 nos. and 1250, 2450 and 3220 g in 330 days respectively. Benefit cost ratio in ND, RIR and VN were 1.85, 2.39 and 2.12 respectively. Results were evaluated by recording egg production of RIR & VN is 70% & 47% higher than ND though average weight of bird is 100% & 164% higher than ND. RIR is much superior than VN in respect to average egg production & much active and hardy though disease incidence is little higher in both the improved breed than DN bird.

Keywords: Non-descript desi chicken, Rhode Island Red, Vanaraja, Egg production, Body weight, BC ratio

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A - 030

ECONOMIC ANALYSIS OF PLANTING PATTERN AND TIMING OF NITROGEN IN MAIZE (*Zea mays* L)

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Field experiments were conducted at Agricultural College and Research Institute, Coimbatore to study the economic viability of various altered spatial pattern and nitrogen scheduling approaches adopted in maize. The experiments were laid out in split plot design and replicated thrice. Spatial pattern allotted to main plots with six levels viz., M_1- 60 x 25, 30 x 30, 35 x 35, 40 x 40, 45 x 45 and 50 x 50 cm. Three nitrogen scheduling approaches N_1- Recommended dose of nitrogen (RDN) @ 150 kg ha^{-1} in 3 splits, N_2- RDN @ 150 kg ha^{-1} in 4 splits and N_3- Leaf Colour Chart (LCC) based N scheduling were assigned to sub plots. Profitability analysis indicated that square planting of 35 x 35 cm with LCC based N scheduling (M_3N_3) fetched higher gross return (`110462 and 159074 $ha^{-1}$) net income (`70290 and 114180 ha^{-1}) and BCR (2.75 and 3.54) and reduced total variable cost compared to conventional approach. Partial budgeting analysis revealed that among proposed changes M_3N_3 treatment combination increased added returns, reduced cost and gave maximum net gain of 22.1 and 18.6% more than recommended practice during the course of study. Based on the results 35 x 35 cm and LCC based N management could sustain the productivity and profitability in maize.

Keywords: Economics, Leaf Colour Chart, Nitrogen, Partial budgeting, Square planting

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A - 031

CLIMATE CHANGE IN COFFEE TRACTS OF WESTERN GHATS OF INDIA

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Coffee is being cultivated in India for more than 300 years, and at present India is the world's sixth largest producer of coffee. Coffee cultivation provides livelihood for nearly 1.5million families. Temperature and rainfall are the conditions considered to be important in defining potential coffee yield. Both factors interfere in the crop phenology and consequently in productivity and quality. Analysis of weather parameters for four decades indicated increase in quantum of annual rainfall, mean maximum and minimum temperature across coffee growing tracts of Western Ghats. Coffee plants are susceptible to high temperature and soil moisture stress. Such extreme conditions could be responsible for physiological stresses like reduction of photosynthetic efficiency and carboxylation efficiency which leads to reduced instantaneous water use efficiency in coffee plants. This affects normal flowering in the plants by inducing floral abnormalities, improper fruit set and pre mature berry drop. During recent period irregular precipitation patterns during harvesting season found to reduce the out turn. It is evident from the research data analysis that the rains on arabica ripe berries increases floats by 2 to 3% and reduce fruit to wet parchment ratio by 10%. This also leads to 2 to 3% reduction in 'A' grade percentage, 2 to 3% increase in 'B' grades and 3 to 4% increase in 'C' grades in split fruits. Also 100 bean weight reduces by 3 to 4% and bean density by 2 to 3% resulting in reduced fruit to clean coffee ratio by 2 to 3%. Studies on coffee berry growth pattern indicated wide variations of growth trend lines in robusta coffee indicating more vulnerability of robusta coffee for climate changes. The observations confirmed that the peak period of vegetative growth in coffee is postponed by 15 to 20 days compared to earlier years due to changing monsoon rain fall pattern. Mitigation strategies for climate change include interventions like better water harvesting, improved fertilizer use, eco-friendly plant protection measures, adequate shade pattern with more diversification, improved soil conservation techniques, uses of plant growth regulators and nutrient sprays need to be given priority.

Keywords: Climate change, coffee, growth, temperature, mitigation

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A - 032

CALIBRATION AND VALIDATION OF THE INFOCROP MODEL FOR MOISTURE STRESS SITUATION IN COTTON

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INFOCROP model is a generic model that integrates variety, soil, environmental and management practices. In cotton as water deficit stress increases the yield decreases in linear trend. The INFOCROP model overestimates the yield to an extent of 8.79 per cent. The INFOCROP model simulated more number of days for phenological observations *viz.,* anthesis (80 days) and maturity (177 days). The simulated boll weight is less than observed. Similarly INFOCROP model showed 16 percent more leaf area index in irrigated and 5.6 percent in rainfed condition. The boll weight deviated to an extent of 40 percent. During 2010-11 in the present study there was 16 percent decrease in yield in rainfed condition as compared to irrigated condition. There was decrease in growth and yield parameters. Thus considering the overall performance of the INFOCROP model, it predicts the yield to 91 percent of accuracy and hence it can be used in the evaluation of inputs and factors controlling growth for yield prediction in cotton.

Keywords: simulation model, INFOCROP, Phenology, water deficit, leaf area index

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A - 033

CLIMATE CHANGE IMPACTS ON SUMMER MONSOON RAINFALL IN THE GANGETIC WEST BENGAL

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Climate of a region is developed through global atmospheric activities of many years depending on the geographical and geophysical position of that region. The Indian Summer Monsoon is unique and characterized by seasonal reversal wind direction along the shores through Bay of Bengal and the Arabian Sea. Winds laden with moisture blow from the western Indian Ocean along the Indian landmass from the southwest during one half of the year and from the northeast during the other half and consolidate monsoon rains. The rainfall thus covers routinely the entire country with a homogeneous spatial and temporal distribution. While the sea-surface temperature of all the oceans is increasing due to gradual climate warming, the trend of warming of the Western Indian Ocean is more pronounced than the other tropical oceans. This is causing interruption of south-west circulation and monsoon dynamics for the Indian sub-continent. Climate models presented major uncertainties in regard to the regional-scale changes in monsoon dynamics for this region. Major feature of Indian Summer Monsoon system extending towards the east is the continental rain-belt along the Bay of Bengal that moves on to the Indo-Gangetic plains, formation of monsoon trough and frequent low pressure systems during monsoon months. Monsoon anomaly affects the livelihood of almost 75% of the population and the sustenance of all economic activities of the country. Indian climate research programmes focus on the country-wide monsoon variability in sub-seasonal to interannual and decadal scales, and their impacts on the critical resources. The present study examines the climate warming-induced impacts on the Indian Ocean sea-surface, and its implications on the summer monsoon rainfall in the Indian landmass vis-à-vis the Gangetic West Bengal region.

Keywords: Indian Summer Monsoon, monsoon trough, Indo-Gangetic plain, Sea-surface temperature anomaly, Indian Ocean warming

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A - 034

FARMER'S PARTICIPATORY VARIETAL SELECTION APPROACH IN GROUNDNUT (*ARACHIS HYPOGEAE* L.) IMPROVEMENT

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The experiment was conducted during *kharif*-2015 in selected districts of Hyderabad-Karnataka region. Farmer's Participatory Varietal Selection approach was used to evaluate 10 groundnut varieties in farmer fields by the farmers. Based on pooled mean performance of test genotypes for dry pod yield (kg/ha) across locations during *kharif*-2015, the test genotypes GPBD-5 (1572 kg/ha), Kadiri-9 (1492 kg/ha) and ICGV-00351 (1481 kg/ha) were found to be statistically significant over local check (1267 kg/ha). With respect to farmers' preference during *kharif*, Kadiri-9 (22.70 %), GPBD-5 (15.52 %) and Dharani (15 %) were most preferred varieties. The varietal preference among the groundnut stakeholders revealed that, Kadiri-9 being most preferred variety with total rankings of 19, which is followed by ICGV-00351, Kadiri Haritandra, TPG-41, TMV-2, G2-52 and GPBD-5 with total rankings of 18 based on the mean preference of the traits like Seed size, seed shape, testa colour, pod size, pod shape, pod filling, shelling (%), oil content and market price.

Keywords: groundnut, participatory, selection, mother-baby trail, varieties

A - 035

IMPACT OF CLIMATE CHANGE ON THE AGRICULTURAL SECTOR OF WEST BENGAL

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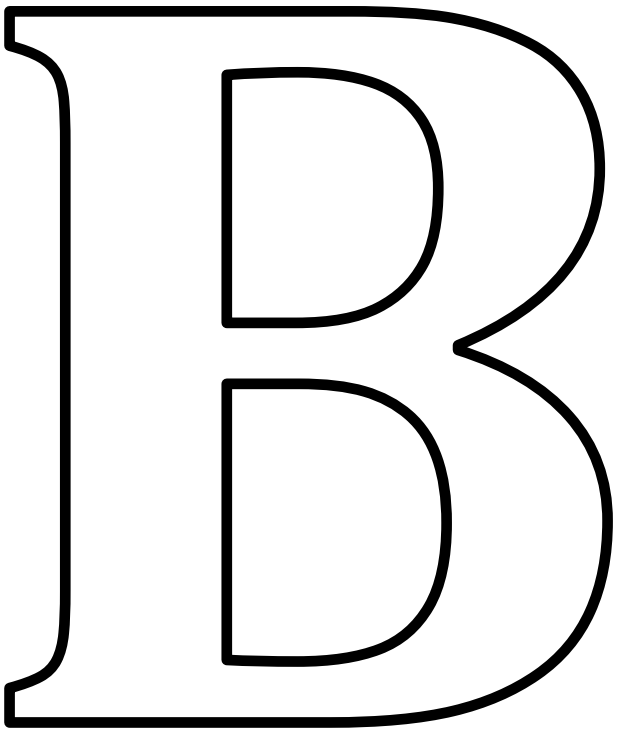
Agriculture production is direct dependence on climate change and weather, is one of the widely studied sector in the context of climate change. Weather extremes are the inhibiting factors for stagnation in the West Bengal food grains production. Small and marginal farmers, and those living on the ecological peripheries, are the worst hit. These farmers are dependent on rain-fed agriculture and fluctuation in rainfall has resulted in major crop loss. Farmers in West Bengal have been able to sow only about one-third of the total area under principal crops in the State so far due to an erratic monsoon. Also increase in infestation of pests and diseases is being reported in rice and horticultural crops.

Recognizing this, it is necessary that the government of West Bengal should address the issue of climate change and focus on providing better environment to improve quality of human life. Adaptation to climate change will need to focus on strengthening measures, such as early warning systems; systems to identify climate change "hot spots" and disaster risk management; and evolving sustainable and eco-friendly farming practices. Other equally important measures call for significantly increase in rural investments to reduce the long-term effects of climate variability on food security through provision of crop and livestock insurance and incentives that encourage farmers to adopt farm and social forestry, conserve resource and better agricultural and land use practices.

Keywords: Climate change, West Bengal, food security, impact



Environmental Biotechnology and Microbiology, Bioremediation

B - 001

BIOREMEDIATION OF WASTEWATER FROM THE DRAINAGE CANAL OF BURLA TOWN, SAMBALPUR THROUGH VERMIFILTRATION TECHNIQUE

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Vermifiltration technology (VFT) is an extension of soil filtration where the microbial degradation activity is facilitated by the presence of the earthworms. In the present study an attempt has been made to assess the efficacy of vermifiltration of the wastewater collected from the drainage canal of Burla town, Sambalpur. The analysis was carried out by considering certain physico-chemical parameters like pH, electrical conductivity, TSS, BOD, COD, nitrate, fluoride, chloride which is considered indicators of the pollution loads in the wastewater. The study revealed that there was significant reduction of the various physico-chemical parameters on vermifiltration. There was significant reduction with respect to the duration of retention of the wastewater in the vermibed. There was reduction of pH, Electrical Conductivity, TSS, BOD, COD, Nitrate, Fluoride and Chloride by 1.2%, 36.9%, 40.3%, 60.5%, 44.4%, 47.2%, 39.7% and 55.1%, respectively by 30th day. The vermifitered water was odour free. Thus vermifiltration technology (VFT) can be utilized as a cost effective odour free process for the processing of the wastewater. Although removal of BOD, COD etc. is achieved by microbial geological system in absence of earthworms in the present study in the control the system is less effective.

Keywords: VFT, Vermifiltration, BOD, COD, EC

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B - 002

BIOELECTRICITY GENERATION BY SANDWICH TYPE MICROBIAL FUEL CELL

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Microbial fuel cells (MFCs) have gained a lot of attention recently as a mode of converting organic waste into electricity. It provides new opportunities for the sustainable production of energy from biodegradable, reduced compounds. MFCs function on different carbohydrates but also on complex substrates present in wastewaters. In this study, a sandwich type MFC that generates bioelectricity by biodegradation of organic matter is developed. The Sludge was collected from Bhagwanpur waste water treatment plant Varanasi UP India, and used as an organic waste. An air cathode, membrane-less MFC containing a mixed culture was constructed. The device was operated continuously under anaerobic condition for duration of 25 days. The parameters such as voltage and current were measured twice a day and value is averaged. Electrode materials play an important role in the performance (e.g., power output) and cost of microbial fuel cells. Acost effective anode and cathode using aluminum mesh and pastedwith activated carbon on both side was used as cation exchange membrane. The area of both anode and cathode was 189.97 cm^2. It is seen that open circuit voltage (OCV) initially increases as with time due to increased growth rate of microbes and reaches a maximum value of 224 mV on the 10^{th} day and stable up to 12^{th} day but after that there is drop in voltage possibly due to decline of available substrate for microbial population and it goes down to 90 mV .When fed with glucose (substrate) on 14^{th} day there is sudden rise seen in OCV as the microbes started growing once again and reached upto 187 mV and then give constant value and stable graph. Just like OCV, current was also measured directly with the help of multimeter. The reading was taken three times in a day at every 2 hours interval and it was averaged on the daily basis. It is observed that there was a definitive increase in the generated current from day 1 to day 10 and then it almost gave constant value. After adding substrate only its maximum value of .08 μA is obtained and after that it gives constant value. The current measured was open circuit current since the external resistance is not used. Hence the voltage generated was due to internal impedance.

Keywords: Microbial fuel cells, Electrode materials, activated carbon, OCV, aluminium mesh.

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B - 003

RESISTANCE OF ENVIRONMENTAL BACTERIA TO TOXIC POLLUTANTS: AN APPROACH TO REMEDIATE POLLUTION

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Rapid industrial development and urbanization have resulted in the production of huge amount of aqueous effluents, many of which contain elevated levels of toxic pollutants including heavy metals and others."Heavy metals" is the group of metals and metalloids with atomic density greater than 4000 kg m^{-3}, or 5 times more than water (Garbarino et al., 1995). Different kind of heavy metals found in the environment like mercury, lead, chromium etc. that shows toxic effects to human beings and other living organisms. While many of them like zinc, copper, cobalt, nickel and iron etc. have certain nutritional characteristics and require as "trace elements" for living organisms.Heavy metals are non-biodegradable thus, persist in the nature and cause various harmful effects to living being by incorporating in the food chain. However, various physicochemical and biological processes are usually employed to eradicate them from industrial wastewaters before liberate into the surroundings. Heavy metals are adsorptive pollutants that can be eliminated through various conventional treatment especially chemical precipitation or coagulation but these methods are less effective and highly expansive when metals present at lower concentration. One such eco-friendly, low cost and efficient alternative to target heavy metals is bioremediation technology that utilizes various microorganisms, green plants or enzymes for the abolition of heavy metals from polluted sites. Microorganisms possess some coping strategies to either transform the element to a less-harmful form or bind the metal intra or extracellular, thereby preventing any harmful interactions in the host cell. Thus, use of heavy metals resistance microorganism for the removal of toxic heavy metals pollutants from aqueous wastewaters or other sources is one of the most recent developments in environmental or bio resource technology.The aim of the present study is to isolate heavy metals and hydrocarbons tolerant and antibiotic resistant microorganisms from different localities and to improve selected strains genetically. These resistant organisms could be a potential agent for bioremediation of heavy metals and hydrocarbons polluted environment.

Keywords: Urbanization, toxic pollutants, bioremediation technology, microorganisms

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B - 004

WASTEWATER BIOREMEDIATION USING HYBRID MATERIAL OF PSYLLIUM AS AN EFFECTIVE FLOCCULANT

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In this study, a natural polymer, psyllium was modified with Poly (Methyl methacrylate) to prepare an efficient flocculant using *Microwave induced* method of grafting. The grafting was confirmed through the various physiochemical techniques such as, study of *Intrinsic viscosity*, FTIR spectroscopy, Elemental Analysis, SEM and Number average molecular weight (Mn). Flocculation efficacy of the synthesized graft copolymers was studied in 1% coal-fine suspension, through *Jar test* and *Settling test* procedure. The effect of dosage and *settling rate* on the performance of flocculation process was also investigated. Further, flocculation efficacy of the *best grade* (as determined in 1% coal-fine suspension) in municipal wastewater was studied for possible application in reduction of pollutant load of wastewater. The treated wastewater was analyzed by its color removal, organic load (in terms of BOD & COD), heavy metals and turbidity reductions. The results obtained showed that the modified natural polymer (i.e. Poly (Methyl methacrylate) grafted psyllium) performed better than the unmodified natural polymer (i.e. psyllium) in the remediation of wastewater. These synthesized materials are eco-friendly, easily available and biodegradable green material.

Keywords: Natural polymers, Biodegradability, Microwave Induced Grafting, Flocculation, Wastewater Bioremediation

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B - 005

A SURVEY OF ANGIOSPERMIC MACROPHYTES IN BIOREMEDIATION PROCESS AROUND WATER BODIES IN NANDED DISTRICT IN MARATHWADA (MAHARASTRA STATE)

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Bioremidiation is a natural process involving microbes to Macrophytes. Macrophytes are Angiospermic plants growing near water or inside the water bodies. The absorption of minerals from the soil is a natural process but some plants absorb various useful and harmful elements beyond their osmotic potential i.e. against the concentration gradient. such plants are useful in pollution control around the cities situated on river bank. The present study enlist some such Macrophytes from Nanded District of Maharashtra state. The probable element absorbed by these plants is also being depicted herewith.

Keywords: Bioremediation, macrophytes, pollution control, Nanded district

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B - 006

STUDY OF VERMICOMPOST PREPARED BY USING DECOCTION TEA POWDER & ITS EFFECTS ON GROWTH OF *HIBISCUS ESCULANTUS*

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The present study was carried on *Hibiscus esculantus* (lady's finger) by using vermicompost. The decoction tea powder is wasted wet garbage and discarded on the dumping ground. It generally creates environmental pollution. This wet garbage can make a good source of nutrient to the vegetable crop plants. The research is carried out by preparing vermicompost using 75% decoction tea powder and 25% mixture of black soil, cow dung, litter and little vermicompost. The compost prepared by using decoction tea powder has increased concentration of necessary nutrients such as P^H, minerals, O.C. total phosphorus, potassium, calcium, magnesium & sodium required for vegetable crop plants for its development. In present investigation by applying this compost, mineral absorption was increased by 1.81 %, O.C. 20.59 %, total phosphorus 0.82 %, potassium 0.51 % and mg by 17.86 %, while sodium shows 12.86 % significant increase in absorption. It is also observed that germination period decreases whereas height of stem, leaf area, flowering and fruits were developed earlier than control soil.

Keywords: Decoction tea powder, vermicompost, nutrition, lady's finger, fruit, yields

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B - 007

SCREENING OF GROUNDNUT GENOTYPES AGAINST STRIPE AND BUD NECROSIS DISEASE UNDER FIELD CONDITIONS IN WEST BENGAL

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Groundnut or peanut stripe and bud necrosis disease is caused by groundnut stripe virus and tomato spotted wilt virus, respectively. The present experiment was conducted on twenty five groundnut genotypes during Rabi and Kharif seasons of 2001-02 and 2002-03 under field conditions at different locations of West Bengal. Three lines of each genotype consisting of 90 plants were screened to test the susceptibility of the disease periodically at different days after sowing. At 60 days of plant age out of twenty five germplasm only 13 have showed the infection of bud necrosis but the infection was varied with a highest of 10 percent and 12 genotypes did you not showed any type of symptoms of bud necrosis. A second observation was made on 80 days old plants, almost all the genotypes showed infection but highest incidence was recorded upto 16.66 percent followed by 13.33 percent. The incidence of groundnut stripe was also recorded on 80 days old plants only but the infection percentage was higher as compared to bud necrosis. The highest incidence up to 50 percent was observed in genotype J-11 and TMV-2, while the minimum infection was recorded in genotype ICGV95299, DH45 and VG77 up to 13.33 percent.

Keywords: Groundnut, stripe, bud necrosis, germplasm, screening

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B - 008

STUDIES ON THE PRESENCE OF BIOACTIVE COMPOUNDS IN THE FRUIT AND LEAF EXTRACTS OF *SYZYGIUM CUMINI* THROUGH GC-MS ANALYSIS

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Syzygium cumini L. (f. Myrtaceae) commonly known as Indian Blackberry or jamun is an evergreen tropical tree with thick, greyish brown bark. It is an important medicinal plant as it contains a number of phytoconstituents and essential oils. These phytoconstituents protect us from various hazardous diseases such as diabetes, diarrhoea, various stomach ailments and skin diseases. These phytochemicals and antioxidants can be analysed by GC-MS. GC-MS is a technique used to separate mixtures into individual components using a temperature controlled capillary column. In my study, I evaluated the different phytoconstituents present in this plant along with the one which is present in major amount and the other present in least amount through GC-MS technique. The methanolic solvent of leaf and fruit of *S. cumini* was sent *to* AIRF, JNU for GC-MS Analysis. The result shows that a number of bioactive compounds are present in the fruit and leaf extract of *S. cumini* where 1,2,3 Propanetriol(63.52%) and Decanoic acid(0.02%) are present in fruit extract as the major and minor compounds respectively. The leaf extract of *S. cumini* shows 2,6,10 Trimethyl (10.21%) as the major compound and Sebacic acid (0.01%) as the minor compound. So, the plant *S. cumini* is rich in phytoconstituents and medicinally very important.

Keywords: GC-MS, leaf extract, phytoconstituents, *Syzygium cumini*

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B - 009

STUDIES ON THE SOLUBILITY PERCENTAGE OF DIFFERENT EXTRACTS OF *SYZYGIUM CUMINI* AND THEIR ANTIBACTERIAL ACTIVITY AGAINST MIXED COLONIES OF SOIL-BORNE BACTERIA

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Syzygium cumini L. (f. Myrtaceae) also known as black plum or jamun is a densely foliaceous tree which was first introduced in Florida. It is a medicinally rich plant. Each part of this plant has its own significance. There is also variation in the solubility of different extracts of *S. cumini* when dissolved in different solvents. In our study, we calculated the solubility percentage of different extracts of *S. cumini* .The solvents taken were methanol, ethanol and DDH_2O. The fruit extract of *S.cumini* dissolved in ethanol showed the maximum solubility percentage (78%) whereas the minimum solubility percentage was shown by seed extract dissolved in ethanol (15%). Antibacterial culture test of *S. cumini* was also carried out where we studied if the extract of blackberry is effective against killing or inhibiting the growth of soil-borne bacteria. In our study, methanolic extract of leaves of *S. cumini* and ethanolic extract of leaf, bark and seeds were taken for antibacterial analysis. The ethanolic extract of seeds of jamun showed the best results having maximum zone of inhibition ($3.5cm^2$) and the minimum zone of inhibition ($1.73cm^2$) was shown by the ethanolic extract of the bark. This shows that extracts are potential antibacterial agent and can be used to produce drugs.

Keywords: Antibacterial, inhibition, soil-borne, *Syzygium cumini*

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B - 010

CALIBRATION AND VALIDATION OF THE INFOCROP MODEL FOR MOISTURE STRESS SITUATION IN COTTON

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INFOCROP model is a generic model that integrates variety, soil, environmental and management practices. In cotton as water deficit stress increases the yield decreases in linear trend. The INFOCROP model overestimates the yield to an extent of 8.79 per cent. The INFOCROP model simulated more number of days for phenological observations *viz.,* anthesis (80 days) and maturity (177 days). The simulated boll weight is less than observed. Similarly INFOCROP model showed 16 percent more leaf area index in irrigated and 5.6 percent in rainfed condition. The boll weight deviated to an extent of 40 percent. During 2010-11 in the present study there was 16 percent decrease in yield in rainfed condition as compared to irrigated condition. There was decrease in growth and yield parameters. Thus considering the overall performance of the INFOCROP model, it predicts the yield to 91 percent of accuracy and hence it can be used in the evaluation of inputs and factors controlling growth for yield prediction in cotton.

Keywords: simulation model, INFOCROP, Phenology, water deficit, leaf area index

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B - 011

MICROBIAL BIOMASS C AND N DYNAMICS IN A PURE PINE STAND AND AN ENRICHED PINE STAND

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A study was conducted in pure and enriched Pine stand to access the impact of enriched plantation on the dynamics of microbial biomass across the season. The experiment was laid out in a completely randomized block design with pure Pine stand and enriched Pine stand as treatments with three replicates. Amongst the treatments the enriched Pine stand maintained a higher microbial biomass C and N compared to pure Pine stand. The repeated measures analyses showed soil moisture, microbial biomass N and pH were significantly affected due to enrichment of Pine stand. Soil moisture, microbial biomass C, N and organic C changed significantly during the growing season. The microbial biomass in soil declined during vigorous growth period across all the treatments with a maximum decline recorded for enriched Pine stand indicating microbial biomass formed an important source of N during the growth period. Total dry matter production under two treatments indicated that spacing of saplings is important. Our results indicated that the optimum spacing regime for the present study was 2x2 m where the available land was used most effectively. Our study demonstrated that the practice of interspacing pure Pine stand with saplings of broad leaved tree species is beneficial in terms of amount of microbial biomass C and N and plant growth.

Keywords: Enriched Pine stand, Microbial biomass C and N, Pure Pine stand,

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B - 012

MYCOLOGICAL STUDIES OF INDUSTRIAL WASTES FROM INDUSTRIAL LOCALITY

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Industries play important role in economic development of country but the effluent releases from them cause water pollution and health hazards to mankind. Control of pollution is one of the prime concerns of society today with economic constraints on pollution control processes, affordable and effective methods have become a necessity. Untreated or partially treated contaminated waters and industrial effluent discharges into natural ecosystems pose a serious problem to the ecosystem and the life forms. The fungal strains were isolated by conventional serial dilution technique from industrial effluents. The aim of present study is to check the fungal load (isolation and morphological characterization) of industrial effluents that converts into hazardous substances due to the pollution caused by local population and their activities. Our study shows that twenty three fungal species of six genera have isolated from industrial effluent of Malanpur Gwalior M.P. Some fungal species are pathogenic and others are useful for human society.

Keywords: Fungi, Industrial effluent, Pathogenic, *Aspergillus*

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B - 013

A STUDY OF ANTIBACTERIAL ACTIVITY OF CRUDE EXTRACT OF *EUPHORBIA HIRTA* L. AGAINST *ESCHERICHIA COLI*

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Euphorbia hirta L.has been widely used by Tribal as traditional medicine in a treatment against infectious pathogens. *Euphorbia hirta* L. is a perennial herb belonging to the family Euphorbiaceae. Antibacterial activity of crude extract obtained from the aerial parts of *Euphorbia hirta* L. were tested against *Escherichia coli* using the agar disc diffusion method. The susceptibility of the test bacteria varies with the type of solvent of same plant parts used. Among treatments, maximum *in vitro* inhibition of tested bacteria *E. coli* was scored in methanol extracts of leaf of *E. hirta* which offered Zone of Inhibition of 25 mm and Zone of Inhibition Area of 686.88 mm^2 .The potentiality of the plant parts against the test bacteria was evaluated by Diameter of Zone of Inhibition (DIZ) and Zone of Inhibition Area (ZIA) indicated the presence of more active compounds in extracts. Methanol, Dimethyl sulfoxide and Aqueous extracts were found to be more active, whereas, ethanol possessed moderate effect on the test bacteria.

Keywords: Antibacterial activity, solvents, crude extract, *Euphorbia hirta* L., *Escherichia coli*

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B - 014

ALLEVIATION OF SALT STRESS IN GERMINATING RICE SEEDLINGS BY THE APPLICATION OF SODIUM NITROPRUSSIDE

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Salinity is one of the major factors limiting agricultural production around the world. Rice production in India is an important part of the national economy. Saline soil and alkaline soils are challenges in the path of rice production. According to Central Soil Salinity Research Institute (CSSRI), about 7.3 million hectares of India's land area is affected with the twin problems of alkalinity and salinity coupled with water logging. More than 17 lakh hectares of land in India is saline. Rice being the principal food crop in India was chosen for the research work. High concentration of salts can result in plant stress (Epstein and Bloom 2005). Rice growing in the saline soils gets physiologically stressed as a result osmotic imbalance occurs due to the presence of higher amount of dissolved ions of various salts principally sodium chloride (NaCl) and magnesium chloride ($MgCl_2$) and production of reactive oxygen species (ROS) inside the cells, which are toxic for soil environment also. Effect of the exogenous sodium nitroprusside ($C_5FeN_6Na_2O$ or SNP or simply nitropress), a nitric oxide donor on the salt tolerance of rice (*Oryza sativa* L.) seedlings indicated that NO (nitric oxide) donor could decrease the inhibitory effect of the salinity stress on the growing seedlings. The specific role of NO in regulating the salt tolerance of rice was confirmed by pre-treatment of seeds using sodium ferrocyanide, ($Na_4Fe(CN)_6.10H_2O$ or yellow prussiate of soda or YPS) taken as control. In the present study the effect of sodium nitroprusside (SNP) was studied whether it could result in the alleviation of salt stress in the germinating seedling of rice. SNP has the ability to release free nitric oxide. Effect of exogenous SNP on the salt tolerance of rice (*Oryza sativa* L.) seedlings indicated that NO donor could considerably reduce the growth inhibition, water loss in the seedlings. Seedling growth statistics could also confirm such result in SNP pre-treated seeds. Test for total proline content and peroxidase activity shown elevated levels of proline production and peroxidase activity in stressed seeds than SNP treated seeds. The result could confirm the positive impact of SNP pre-treatment or priming to withstand or alleviate slightly the salt stress on the crop plant seedling taken for the study.

Keywords: salinity, rice (*Oryza sativa* L.), reactive oxygen species (ROS), sodium nitroprusside (SNP), sodium ferrocyanide or yellow prussiate of soda (YPS), proline, peroxidise, priming

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B - 015

PRODUCTION AND CHARACTERIZATION OF A THERMOACTIVE AMYLASE FROM *BACILLUS SUBTILIS RK1*

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Amylases are most important hydrolytic enzymes for starch based industries. From industrial point of view, it is desirable that amylase is active and stable at higher temperature. Organisms from thermophilic environment have ability of producing enzymes with unique properties as compared to those of mesophilic environment. The present study aimed at isolating novel amylase producing bacteria from hot water reservoir of Rishi Kund, Munger (Latitude- 25.38, Longitude- 86.47), Bihar, India. Out of seven isolates, four of them showed variable capability for starch degradation. The isolate RK1 was the most potent one and was identified as *Bacillus subtilis* RK1, using 16S rDNA sequencing. Enzyme production was found to be maximum at temperature of 50°C and pH 6 with 1% starch after 48 h of incubation, under shake flask culture. The enzyme was characterized with optimum temperature (70-80°C) and pH (8.0). It was highly active between pH 6.0 and 10.0 and active and stable after 30 min of incubation at 60-80°C. Effects of various metal ions were tested on enzyme activity. The enzyme was activated in presence of Ca^{2+}, Mg^{2+} and Fe^{2+}, while presence of $Zn^{2+}$and Cu^{2+} resulted in its inhibition. The present finding indicates that this thermostable and alkalophilic enzyme, amylase is suitable for starch liquefaction and detergent industries.

Keywords: Amylase, Rishi Kund, Thermostable, alkalophilic, Starch liquefaction

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B - 016

IMPACT OF FOLIAR APPLICATION OF NUTRIENTS ON QUALITY OF SOYBEAN

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An experiment was conducted at BAU experimental farm (Kanke), Ranchi, Jharkhand during *Kharif* (Soybean) season 2015 on sandy loam soil with low organic carbon (4.10 g/kg) and available nitrogen (192.5 kg/ha), moderately acidic (pH 5.1) in nature, medium potassium (128 kg/ha), phosphorus (13.65 kg/ha), boron (0.58 mg/kg), molybdenum (0.25 mg/kg) and zinc (0.60 mg/kg).Soybean is worldwide growing important oilseed crop. It is the cheapest source of plant protein for poor people but availability of protein for ever increasing population remained too less. To meet out this increasing demand farmer use more and more chemical fertilizer through soil application to increase productivity. It have vast multiplicity of uses as food and industrial products besides a nutritive fodder for animals, that's why it is also called as "*wonder crop*", "*miracle crop*", and "*golden bean*". Abundant use of chemical fertilizer degrades the soil physico-chemical properties resulted in non-availability of nutrients to the plants. In order to avoid or minimize the severity of such condition, foliar application of nutrients is imperative. The experiment was laid out in a RBD with 9 treatments: T_1- RDF + water spray, T_2- RDF + urea 2% spray, T_3- RDF + DAP 2% spray, T_4- RDF + MOP 0.5% spray, T_5- RDF + 19:19:19 ($N:P_2O_5:K_2O$) 2% spray, T_6- RDF + molybdenum 0.5% spray, T_7- RDF + boron 0.5% spray, T_8- RDF + zinc chelated 0.5% spray and T_9- RDF only and replicated thrice. Foliar application of nutrients influenced protein content in grain. Maximum (37.37%) was recorded with RDF + 19:19:19 ($N:P_2O_5:K_2O$) 2% spray, nutrients failed to cause significant variation in the oil content and were non-significant. The highest oil content (18%) was obtained with application of RDF + molybdenum 0.5% spray while the lowest oil content was recorded with RDF alone (17 %).Application of RDF along with molybdenum 0.5 % spray produced significantly higher oil yield (274.46 kg/ha) than all other combination of nutrient.

Keywords: Oil content, Oil yield, Protein, Soybean

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B - 017

DEVELOPMENT OF SUPERIOR SOMACLONES OF AROMATIC LOCAL CULTIVAR OF RICE (*ORYZA SATIVA* L.)

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Aromatic rice has great demand in international as well as national markets for aroma. However, it possesses very low yield potential. The traditional local aromatic land races also possess very low combining ability with the modern high yielding varieties and subsequently to development of transgressive segregants. Thus, there is strong need to develop suitable genotype(s) using biotechnological tools. We have developed somaclones from Kalo Nuni (a local aromatic rice cultivar). The somaclones, TC 4/8 had the maximum yield followed by TC 5-1, TC 4/4, TC 4/5, and TC 4/7. Yield increase of TC 4/8, TC-5-1 was 54.75% and 50.33% more over the yield of parental cultivar, respectively. The plant tissue culture thus may be recommended to create genetic variability in rice as a trustworthy biotechnological tool.

Keywords: Local cultivars, aromatic rice, somaclones, biotechnological tool

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B - 018

ALGAE MEDIATED CARBON SEQUESTRATION TO MITIGATE CLIMATE CHANGE

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The global carbon cycle has altered significantly due to extensive use of fossil fuels which lead to increase in the emission of greenhouse gases such as CO_2, CH_4, NO_2 and CFCs causing climate change. In order to achieve environmental and economic sustainability, a renewable, carbon neutral fuels are required that are also capable of sequestering atmospheric carbon dioxide. Amongst various carbon sequestration technologies, the biological methods particularly the ones using microalgae, have several merits. This include, direct CO_2 capture and fixation from flue gases by suitable micro-algal strains and their biomass conversion into useful products. This is quite important because the separation of CO_2 from flue gases takes a major portion over 70% of the total sequestration cost. Microalgae have ability to fix CO_2 using solar energy with efficiency 10 times greater than the terrestrial plants with numerous additional technological advantages. They have comparatively higher growth rate, allowing a large quantity of biomass production in a shorter amount of time in a smaller area. In addition carbon fixed by microalgae is incorporated into carbohydrates and lipids, so that energy, chemicals or food can be produced from algal biomass. Microalgae have a huge potential for the production of biofuel and can replace fossil fuels. Due to these advantages microalgae can be extensively used to capture CO_2 from power plants, steel, cement, oil, automobiles and many other industries and the resulting algal biomass can be not only used for biofuel production but also for various industrial products such as fertilizers and pharmaceuticals. Besides giving environmental and economic benefit, large scale algae cultivation can create a large number of jobs at different levels in the society.

India has a unique opportunity for algae production because it contains the basic resources needed to grow algae in abundant quantities: India produces over 170 million metric tons of CO_2 annually; contains abundant saline water; receives abundant sunlight; and has an impressive knowledge base and technical expertise within the energy industry.

Keywords: Microalgae, climate change, carbon sequestration, biofuel

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B - 019

MICROALGAE: NATURE'S CO_2 SCRUBBER

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Today global warming is a major concern all over the world, which is caused due to emissions of high amount of greenhouse gases which include carbon dioxide, methane, nitrous oxide etc. Out of these gases, CO_2 is of major concern. Microalgae are phototrophic microorganisms with simple nutritional requirements, and comprising the major primary producers on this planet. A promising technology could be the biological capture of CO_2 using microalgae due to its unmatched advantages over higher plants and ocean fertilization. Photosynthetic efficiency of microalgae ranged from 10–20 % in comparison with 1–2 % of most terrestrial plants. Some algal species, during their exponential growth, can double their biomass in periods as short as 3.5 hours. Moreover, advantage of being tolerant of high concentration of CO_2 (flue gas), low light intensity requirements, environmentally sustainable, and co-producing added value products put these as the favoured organisms. Advantages of microalgae in comparison with other sequestration methodologies are discussed, which includes the cultivation systems, the key process parameters, wastewater treatment, harvesting and the novel bio-products produced by microalgal biomass.

Keywords: biofuel, carbon, greenhouse, microalgae, photosynthesis

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B - 020

EFFECT OF TEMPERATURE ON THE PRODUCTION OF ENZYME PROTEASE BY *ASPERGILLUS NIGER* ON DIFFERENT TYPES OF FINISHED LEATHER

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Aspergillus niger is a saprophytic fungus which grow frequently and dominantly on all types of finished leather. Biochemically, the leather is a complex organic material which contains proteins, fats, glycerides, minerals etc. Hence, it forms a favorable medium for the growth of fungi. Because during finishing operations some substances like gelatin, albumins and casein etc. are used as protein binders. These substances make leather highly susceptible and most vulnerable to fungal attack as they serve as nutrients under suitable relative humidity, temperature and moisture of the leather surface. The growth of leather deteriorating fungi depend on the production of many enzymes, the most important being the proteolytic and lipolytic enzymes. These enzymes play an important role during deteriogenesis of the leather by deteriogens. Such facts prompted the isolation of 47 fungi from ten types of leather samples belong to different animals and *in vivo* estimation of enzyme protease of *Aspergilus niger* at different temperature and suitable relative humidity and duration of storage. Data revealed that 30^0 C temperatures is the most conducive for the secretion of protease enzyme in comparison to 25^0 C and 35^0 C temperature.

Keywords: Leather, *Aspergillus niger*, Enzyme Protease, Temperature.

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B - 021

BIOTECHNOLOGICAL AND ENVIRONMENTAL ASPECTS OF GENETICALLY MODIFIED CROP USAGE

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By rDNA technology in crop improvement has been made during the last 34 years. India is facing the challenges of rising population along with shrinking area of cultivated land, diminishing water resources, malnutrition, and detritions in soil quality, food security and global warming. The role of Biotechnology is to raise the yield ceiling and to provide sustainable production systems in agriculture to meet the food security of India. GM crops are genetically improved and contain a gene or genes from the same or a different species artificially inserted in its genome. Tissue Culture & Transformation – gives the maximum flexibility for moving genes within or between species. Bt-cotton - first GM crop in India – 2002, second in global cotton production, cultivating an area 8.0 million hectares, yield gain - 31% reducing in pesticide sprays by 39%. Improvement in nutrient quality with the expression of enzymes of β-carotene pathway in rice endosperm and amelioration of Vitamin A deficiency are observed. Bt Brinjal is a bright example of putting Science into Agriculture. Biotechnology Policy of India and Cartagena Protocol which provide guidelines for safe handling and trans-boundary movement of GMOs are described. GM proponents claims that GM is a precise technique that allows genes coding for the desired trait to be inserted into the host plant with no unexpected effects. Over 75% of all GM crops are engineered to tolerate herbicides GM crops do not deliver the promised benefits; they create numerous problems, costs, and risks This study shows that GM Bt toxin does affect humans, contrary to claims from the GM lobby and regulators.

Keywords: Food security, crop improvement, nutrient quality, β-carotene, Bt toxin Mkg636

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B - 022

STUDY OF ANTIMICROBIAL ACTIVITY OF *PSIDIUM GUAJAVA* AGAINST PATHOGENS CAUSING COMPLICATED URINARY TRACT INFECTION

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As the microorganism are resistant day by day from antibiotics. The main objective of this study is antimicrobial activity of *Psidium guajava* against clinical isolates from UTI samples. Our study focuses on antimicrobial activity and future prophylactic potential of the leaf extract of *Psidium guajava.* The genus *Psidium* belongs to the family Myrtaceae, traditionally used in treatment of several diseases such as inflammation, diabetes, hypertension, wounds, pain and fever. This review focused on investigates the phytochemical profile of *Psidium guajava* leaves and antimicrobial activity against the urinary tract infection. The guava (*Psidium guajava*) is a phytotherapic plant and the leaves of guava contain an essential oil rich in cineol, tannins, triterpenes, flavonoids, resin, eugenol, malic acid, fat, cellulose, chlorophyll, mineral salts, and and have many bioactive components, used in medicine that is believed to that help to treat and manage various diseases such as urinary tract infection. In this study, we aim to evaluate the total antimicrobial activity of parts of guajava. If it is effective against the growth of urinary tract infection so it is used as herbal medicine. On the basis of the present finding, guava leaf-extract might be a good candidate in the search for a natural antimicrobial agent. This study provides scientific understanding to further determine the antimicrobial values and investigate other pharmacological properties and can considered being as equally potent as the antibiotics.

Keywords: *Psidium guajava*, UTI, antimicrobial agent, prophylactic potential

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B - 023

POPULATION DYNAMICS AND DIVERSITY OF SOIL MICROBES IN SEVOKE, PANTHABARI AND BUXA FOREST IN NORTH BENGAL, INDIA

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Soil is a natural body consisting of layers of mineral of variable thicknesses, which differ from the parent materials in their morphological, physical, chemical, and mineralogical characteristics. Productivity and sustainability of soil's health is directly affected by qualitative and quantitative properties of microbial community. Techniques, such as sole-carbon-source utilization (SCSU) using measures to examine the natural variation, diversity, functional capabilities of the microbial population. It has been revealed that selected bacterial colonies from all sampling sites are white in colour except Panthabari Forest (off white in colour). Likewise other phenotypical characters (Shape, Marginal character, transparency) have been found to show variation in case of all sampling sites. It has been found that bacterial population of Aerobic heterotrophic bacteria is highly dense in Panthabari forest area(279±21.40) and bacterial population of Asymbiotic nitrogen fixing bacteria is very much less in Sevoke (2.33±1.24).One way ANOVA test revealed that there is no significant difference in Actinomycetes population in all sampling sites. Other bacterial populations' viz., Aerobic heterotrophic, Gram negative, Nitrifying, Phosphate solubilising, Starch hydrolyzing and Asymbiotic nitrogen fixing bacteria are found to be significantly different between sampling sites. Despite the difficulty of the task, new results are regularly obtained, which contribute to a better description and understanding of microbial spatial patterns and their ecological relevance. It has been observed that microorganisms present in the soil have beneficial roles. It is the local environment that affects nutrient or food uptake, competition, or predation risk, and therefore indirectly controls growth, movement, reproduction, and survival.

Keywords: Mineral, Soil, Bacteria, Population, Microorganism, Environment

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B - 024

MEIOSIS IN CHAROPHYTA: A CHALLENGE TO CYTOLOGISTS

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Charophytes are one of the most favourite biological materials from cytological view-points and, because of the reason, quite appreciable amount of work on mitotic sequences have been analysed at world-level. In comparison, the process of meiosis lags far behind and it has not been discovered so far inspite of serious attempts made in India, France, U.S.A., Portugal and Germany.

Meiosis does take place in Charophyta as demonstrated by Sundaralingam (1946) where n=28 is present in both spermatogenous and vegetative structures in Chara zeylanica.

So far meiosis is concerned, four well-recognised hypotheses have been advanced by Oehlker (1916), Tuttle (1924, 1926), Goncalves da Cunha (1941) and Guerlesquin and Noor (1982). Among all the above, the opinion proposed by Guerlesquin and Noor (1982) appears to be the most correct one. Inspite of this, the meiotic figures have not been discovered and that still remains to be a big cytological problem.

The difficulties encountered while dealing with oospore are due to the presence of thick, pigmented and 3-walled oosporic membrane. The oogonial covering is a great hurdle which has to be either dissolved or to be taken out from the site, allowing carmine to get in.

It is a sad affair to record that no cytological work is being done now in any lab. of the world. Let us renew our energy and effort once again to carry out this work. It is a challenge especially to cytologists of our younger generation to come forward with new methods and technologies to unveil this mystery of nature.

Keywords: Charophyta, Meiosis, cytological, Chara zeylanica

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B - 025

STUDY TO INVESTIGATE THE MICROBIAL DIVERSITY OF DIFFERENT SOIL CONDITIONS OF PURULIA DISTRICT, WEST BENGAL

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Microbes account for most of the diversity of life on our planet. There are more kinds of microbes than plants, vertebrates and insects combined. Microbes have been around for billions of years. They have adapted to nearly every environment on earth and can just eat anything including metal, acids, petroleum, and natural gas, all of which are toxic to us. The convention on Biological Diversity (CBD) defined the soil biodiversity as the variation in soil life, from genes to communities, and the ecological complexes of which they are part i.e from soil microhabitats to landscapes. Soil organisms are extremely variegated in terms of morphology, quantity and life style. This study aims to investigate the microbial diversity of different soil conditions of Purulia district, West Bengal mainly by two methods; the direct observation and counting and the functional assays which include different biochemical techniques. For this study four different soil samples(Sample1,2,3,4) from four different sites were selected and their physical characteristics were noted, followed by serial dilution (up to 10^{-13}) and plating on Nutrient Agar plates. Colony characteristics study along with microscopic observation of the growing colonies were done. This is then followed by different biochemical techniques like oxidase test, catalase test, and MRVP (Methyl Red-Voges Prausker) test. All the isolated soil bacteria showed MR +ve & V.P-ve except those contained in 10^{-13} dilution of Sample 1, 10^{-11} and 10^{-13} dilution of Sample 2, 10^{-9} and 10^{-13} dilution of sample 3 and 10^{-5},10^{-7},10^{-13} dilution of Sample 4, thereby indicating the diversifying nature of microbes in soil.

Keywords: CBD, MRVP, Catalase, Serial Dilution, Oxidase

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B - 026

ISOLATION AND CHARACTERIZATION OF PHOSPHATE SOLUBILIZING DIAZOTROPHIC BACTERIA FROM RHIZOSPHERE OF *ERAGROSTIS CYNOSUROIDES*

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Diazotrophs are known to enrich the fertility of soil by releasing fixed nitrogen, as well as triggering and enhancing the plant growth by different PGP (Plant Growth Promoting) activities, like phosphate solubilization, IAA production, siderophore production, antimicrobial activities, etc. This study was aimed to isolate and characterize the phosphate solubilising diazotrophic bacteria from rhizosphere of grass, *Eragrostis cynosuroides.* Soil samples were collected from grass population growing on the road side (deprived of any chemical fertilizer) of Danapur, Bihar, India. A total of seven rhizospheric bacteria were isolated, designated as DR1……DR7, further screened for their nitrogen fixing and phosphate solubilizing properties. The isolate, DR2 exhibited highest nitrogenase activity (60.23 nmole C_2H_4 mg^{-1}protein h^{-1}) and phosphate production (40.36 mg/l), as compared to DR1, DR3, DR4, DR5, DR6, and DR7, so selected for further investigation. Phenotypically, DR2 was whitish, gram positive rod, motile and spore forming bacteria. The effects of various parameters like incubation period, temperature, pH, carbon and nitrogen sources were investigated to optimize the condition for maximum phosphate solubilization. The most efficient activity was observed at 96 h incubation (41.32 mg/l), temperature 35˚C (44.51 mg/l) and pH 7 (45.86 mg/l). Glucose (46.12 mg/l) and ammonium sulphate (48.16 mg/l) as carbon and nitrogen sources respectively appeared to be best for phosphate solubilization. The identification of DR2 is based on the 16s rDNA sequencing and phylogenetic analysis, identifying the strain as *Bacillus subtilis*, DR2 (KP455653). The present study indicates that the strain *Bacillus subtilis* DR2 has the potential to provide unavailable nutrients to the growing crops and thus can be explored for its effective PGP activities to be used in agriculture.

Keywords: Rhizobacteria, Nitrogenase activity, DR2, PGP, 16S rDNA sequencing

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B - 027

IN SILICO CHARACTERISATION OF DRUG MOLECULES FOR HUMAN PAPILLOMA VIRUS (HPV) BY RE-TASKING OF OLD DRUGS

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The high cost and protracted time line of new drug discovery are major roadblocks to creating therapies for diseases. The identification of effective and safe therapies that alleviate disease is central to the practice and progress of medicine. *Re-tasking* of old drugs, also commonly known as *Drug Repositioning* or *Drug Repurposing* of drugs. The traditional drug discovery includes Target Identification, Target Validation, Lead Identification, Lead Optimization and ultimately Pre-clinical Pharmacology and Toxicology. A repositioned drug does not need the initial 6–9 years typically required for the development of new drugs, but instead goes directly to preclinical testing and clinical trials, thus reducing risk and costs. Thus, repurposed drugs can bypass much of the early cost and time needed to bring a drug to market; representing a pragmatic way to achieve success for pharmaceutical companies. Cancer is a complex disease in which cells in a specific tissue are no longer fully responsive to the signals within the tissue that regulate cellular differentiation, survival, proliferation and death. As a result, these cells accumulate within the tissue, causing local damage and inflammation. Cervical cancer is responsible for 10–15% of cancer-related deaths in women worldwide and it ranks no. 2 in the Indian scenario. *Human Papilloma Virus (HPV)* is the main cause of it. HPV encodes six non-structural proteins (E1 To E6) and two structural proteins (L1 and L2). HPVs encode two oncoproteins, E2,E6 and E7, which are directly responsible for the development of HPV-induced carcinogenesis. The purpose of this study is to develop a computational predictive platform and characterize new drug molecules for cervical cancer treatment using the available tools and software's. In order to accomplish the above said aim ,atomic-level models of HPV group of proteins (HPV-16 E2 and HPV-16 E6) were developed and then drug molecules against HPV Proteins from drug databases (Drug databank, Zinc database, FDA) were identified. Each of the screened drugs were docked to the active sites of the target protein using the CDocker algorithm by the software *Discovery Studio.* Based on the docking scores of different protein-drug complexes,the drug molecule with the best *Dock Score* (-65.691) was noted as *Rucaparib*. All the protein-drug complexes were optimized and simulated using GROMACS. Binding of *Rucaparib* to the DNA binding domain of HPV-16 E2, prevents it to abrogate the cell cycle events and thereby ceases uncontrolled cell division. Further studies are based on recognition of structurally similar ligands to Rucaparib from various drug databases along with all favorable modifications using pharmacophore modelling . And then those modified ligands will be again docked to the targets . The protein-ligand complex with a comparable Dock Score to Rucaparib will be established as one of the repurposed drugs for Cervical Cancer treatment.

Keywords: Drug Repositioning, Dock Score, Discovery Studio, GROMACS

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B - 028

INVESTIGATION OF ANTI-MICROBIAL POTENTIAL OF VARIOUS HERBAL FORMULATIONS

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In recent times there has been renewed interest in the herbal remedies as the existing synthetic drugs have several limitations. Medicinal plants are an integral part of human health care system. Antimicrobials of plant origin are not associated with many side effects, enormous therapeutic potential to heal many infectious diseases and low cost of treatment. The majority of the population in developing countries uses plants or plant preparations in their basic health care. Many plant species have been proved to have antimicrobial activity. In 2008 global market for herbal remedies across all segments currently brings in about $83 billion. In 2012, the sales were nearly $5.6 billion (USD) with a growth of 5.5%.Sales of herbal dietary supplements in the United States increased by 7.9% in 2013, reaching a total estimated figure of six billion dollars for the first time. The proposed aim of this study is to Investigate The Anti-microbial Potential Of Various Herbal Formulations. . *Euphorbia Hirta* belongs to the plant family euphorbiaceae is a annual herb, a slender stemmed,annual hairy plant with branches,including inflorescence. *Euphorbia hirta* is often used traditionally for female disorders, respiratory ailments (cough, coryza, bronchitis, and asthma), worm infestations in children, dysentery, jaundice, pimples, gonorrhea, digestive problems, and tumors. It is reported to contain alkanes, triterpenes, phytosterols, tannins, polyphenols, and flavanoids.Young branches with leaves and inflorescence part of *Euphorbia hirta* was crushed and extracted with methanol .The following extract was then stored at 4˚C.On the other hand, the same protocol was followed with *Thevetia peruviana* (Yellow Oleander) using solvents like Acetonitrile, Isobutanol, Propane-2-ol , methanol respectively.The resultant residue of above extractions performed with Acetonitrile, Isobutanol, Propane-2-ol was dissolved in distilled water separately. After the solvent preparation, herbal formulations of both the plant species was prepared. Antimicrobial assay of both the plant extracts will be done by Disc Diffusion Method and their MIC will be determined.

Keywords: MIC, *Euphorbia hirta*, *Thevetia peruviana*

B - 029

ANTIBACTERIAL EFFECT OF MUSCLE OF FRESHWATER SNAIL, *BELLAMYA BENGALENSIS* (JOUSSEAUME, 1886) ON HUMAN PATHOGENS

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Bellamya bengalensis is freshwater edible snail in Jharkhand belongs to phylum- Mollusca, class- Gastropoda. It has potential nutritional importance as well as medicinal value to cure asthma, anaemia, and eye problems. So, the aim of this study was to characterize antibacterial activity of meat of *Bellamya bengalensis* against human Pathogenic bacteria. In this assay two types of alcoholic solvent ethanol and methanol were used for the muscle extract preparation. Standard disc diffusion method was carried out for screening of antibacterial activities. The *Staphylococcus aureus* showed maximum susceptibility of (17.66±1.52mm) inhibition zone against ethanol extract whereas methanol extract showed (10.33±0.57mm) and ciprofloxacin drug showed (19.66±0.58mm) inhibition zone. Comparative Statistical analysis student's t-test was done between mean of inhibition zone obtained for both extract showed that inhibition zone of ethanol extract was significantly more than methanol extract at 1% level. But ethanol extract showed no significant difference with drug, indicating similar antibacterial efficacy .In case of *Klebsiella pneumoniae* sensitivity test showed inhibition zone of (12.33±0.57mm) for ethanol extract, (10.00±1.00mm) for methanol extract and (13.66±0.58mm)for drug ciprofloxacin and statistical analysis showed that ethanol extract had significantly more inhibition zone than methanol extract at 5% level but drug showed significantly more inhibition zone than both alcoholic extracts at 1% level. In case of both bacteria ethanol extract of muscle showed more antibacterial efficacy than methanol extract. The present finding suggest that freshwater snail having good antimicrobial activity against pathogenic microbes. Therefore, they can be used to treat *S.aureus* and *K.pneumoniae* pathogenic infections and it will be boon for our society.

Keywords: *Bellamya Bengalensis*, antibacterial effect, muscles extract, ciprofloxacin drug, t-test

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B - 030

ANTIBACTERIAL ACTIVITY OF FRESHWATER EDIBLE CRAB, *SART0RIANA SPINIGERA* (WOOD-MASON, 1871) ON CLINICAL PATHOGENS

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Sartoriana spinigera is a freshwater edible crab in Jharkhand. The present investigation was taken up to study the antibacterial activity of wet muscle tissue of *S. spinigera* against most common 4 bacterial species namely *Escherichia coli, Klebsiella pneumoniae, Staphylococcus epidermidis* and *Salmonella enterica.* In this assay 3 different solvents eg. Ethanol, Methanol and Acetone were used for the muscle extract preparation. Agar Well Diffusion Method was carried out for the study of antibacterial activities. The *Escherichia coli* showed maximum susceptibility of (20.5±0.50 mm) inhibition zone against methanol extract, whereas ethanol extract showed (18.41±0.52 mm) inhibition zone and acetone extract showed (16.5±0.50 mm) inhibition zone respectively. Statistical analysis using Student's t-test showed methanol susceptibility is significantly higher than ethanol and acetone at 0.01% level. Positive control with drug, Nalidixic Acid showed (17.16±0.28 mm) inhibition zone. For *Klebsella pneumoniae* showed maximum inhibition zone (18.45±0.50 mm) with methanol extract whereas ethanol extract showed (16.38±0.53 mm) inhibition zone and acetone extract showed (14.16±0.28 mm) inhibition zone respectively. Student's t-test showed, methanol susceptibility was significantly higher than ethanol and acetone at 0.01% level. Positive control with drug Nalidixic acid showed no zone of inhibition. The *Staphylococcus epidermidis* showed susceptibility of (16.58±0.52 mm) inhibition zone against methanol extract whereas ethanol extract showed (14.16±0.28 mm) inhibition zone and acetone extract showed (12.5±0.50 mm) inhibition zone respectively. Statistical analysis showed, methanol susceptibility was significantly higher than ethanol and acetone at 0.01% level. Positive control with drug Amikacin showed (17.15±0.25 mm) zone of inhibition. Sensitivity test of methanol extract against *Salmonella enteric* showed the inhibition zone (17.38±0.53 mm) whereas ethanol extract showed (16.5±0.50 mm) inhibition zone and acetone extract showed (15.41±0.52 mm) inhibition zone respectively. Statistical analysis showed, methanol extract susceptibility was significantly higher than ethanol extract at 1% level whereas in between methanol extract and acetone extract was found significant at 5% level. Positive control with drug Amikacin showed (13.08±0.14 mm) inhibition zone. Analysis of varience test was done between group of means of different solvents against one colony and also in between different colonies in the same solvent which signifies that the group means are significantly different ($p<0.01$). The result showed strong response of wet muscle tissue of *S. spinigera* against clinical pathogens and may replace existing inadequate and cost effective antibiotics.

Keywords: Muscle extract, Inhibition zone, t-test, ANOVA, Nalidixic acid, Amikacin

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B - 031

IN SILICO IDENTIFICATION AND CHARACTERIZATION OFCADHERINS AND C-TYPE LECTINS GENES INVOLVED IN FLACHERIE DISEASE IN *BOMBYX MORI L.*

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The major problem of sericulture in a tropical country like India is the high incidence of diseases in silkworm among which flacheire is very common. Cocoon losses due to silkworm diseases in India are approximately 30-40%. Flacherie generally called as septicemia is characterized by flaccid body conditions of growing larva when infected with bacterial or viral pathogens. Therefore, identification of genes involved in disease and investigation of their role becomes important.Cadherin-like protein, BtR175 is a receptor protein for the insecticidal toxin.Low expression C-type lectin (LEL-1) act as Pattern recognition receptors (PRRs) in innate immunity and are engaged in pathogen recognition. *In silico* identification andcharacterization of host genes BtR-175 and LEL-1 will offer a deeper understanding of pathogenesis. A Clustal Omega generated multiple nucleotide sequence alignment is used to create a phylogenetic tree using Neighbour-Joining method to figure out the relationship among flacherie related genes. Moving parallel from genomics to proteomics level, characterization of protein's primary, secondary and tertiary structures is achieved using ExPASy sever, SOPMA tool and MODELLER softwareso as to identify specific domain, interaction sites and active sitesof the corresponding proteins. The DOPE score of BtR-175 protein obtained using MODELLER 9.15 is -32858.34. Thus, the crucial information on active site of proteinssynthesized from disease causing genes may help researchers to develop inhibitors or ligands against flacherie disease.

Keywords: Sericulture; Septicemia; Flacherie; Neighbour- Joining

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B - 032

HAIRY ROOT INDUCTION: A BIOTECHNOLOGICAL APPROACH FOR CONSERVATION

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Since prehistoric times, the treatment and cure of diseases has been one of the primary concerns of mankind. Local practitioners have used indigenous plants and herbs for centuries all over the world to treat a variety of ailments and these have exhibited clear pharmacological activities. Traditional medicines have been developed over millennia using the acquired experience and accumulated knowledge of man and both beneficial and harmful effects of plant materials have been studied and theories about their uses have been developed. Thus, man has succeeded in discovering cures using herbal, animal and mineral medicines. Many indigenous medicines began as a myth and then transferred to new generations as folk medicines and finally developed as modern drug treatments following a scientific analysis of their effects.

In addition to primary metabolites plants having array of phytochemicals and secondary metabolites which exhibit a wide range of biological activities and have immense potential application in the chemical-pharmaceutical industries as pharmaceuticals, agrochemicals, flavors, fragrances, colors, biopesticides, and food additives. Specially, secondary metabolites of pharmaceutical significance are alkaloids, glycosides, flavonoids, phenols, phlobatanis, saponins, terpenes, volatile oils, tannins and resins etc. Currently one fourth of all prescribed pharmaceuticals in industrialized countries contains compounds directly or indirectly, via semi-synthesis, is derived from plants. Furthermore, 11% of the 252 drugs considered as basic and essential by WHO are exclusively derived from flowering plants.

The production of a metabolite is often restricted to a species or genus and might be activated only during a particular growth or developmental stage, or under specific conditions related to the season, stress or nutrient availability or difficult to cultivate in the field or grows slowly and takes many years before to be ready for harvesting. On the other hand, acquisition of forest lands, cultivable land for various developmental purposes and over exploitation the plant species for various economic reasons are causing rapid loss of plant species in general and medicinal plants in particular. Generally, the whole plant or their parts; root, rhizome, stem, leaves or flowers are widely used for herbal drugs. It is interesting to note that any damage to aerial plant is retrieved shortly. However, extraction of underground parts, especially root, uprooting of the whole plant is must which itself is detrimental for the plant in question. If uprooting is continued for long time the plant will be endangered and will extinct soon.

Keywords: Secondary metabolites, Hairy roots, *Agrobacterium rhizogenes*, Ri plasmids, biofermentor

B - 033

CLASTOGENIC EFFECT OF CARBONATED DRINK ON *ALLIUM CEPA CHROMOSOME*

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Higher plants are important subjects for genetic test. Among the plant species, *Allium cepa* has been used extensively to evaluate chromosome aberration and disturbance in mitotic cycle, mainly because it is cheap, easily available and its chromosome are clearly visible. Effect of coca cola on *Allium cepa* root tips was studied considering different concentration (50% and 100%) with different time exposures (8hrs and 10 hrs.)

It was found that both the concentration of soft drink and time exposure affect the mitotic index of Allium cepa. The Coca-cola induced mitotic abnormalities like C-mitosis, stickiness, bridges, fragmentation and laggard of Chromosome in 50% concentration as well as in 100% concentration. In many cells the chromosome was destroyed. Damaged cells are high in count in high Coca-cola concentration. But the most important feature is beaded appearance or pulverized configuration of chromosome. There is a significant difference in mitotic index with respect to different concentration of coca cola. The mitotic index and chromosome abnormalities are used to evaluate genotoxicity and micronucleus analysis used to verify mutagenicity of the coca cola.

Keywords: Clastogenic Effects, Mitotic Index, Stickiness, Adherent Chromosome, Laggard of Chromosomes

B - 034

STUDY OF TISSUE CULTURE AND SYNTHETIC SEED PRODUCTION OF *PLUMBAGO ZEYLANICA L.*

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Plumbago zeylanica L. belonging to the family Plumbaginaceae is commonly known as **chitraka**. Its roots and leaves are used as medicine. Root is used as antidote for snake bite, mental disorder, body pain and gonorrhea. Leaves are used to treat leprosy and some skin diseases. The root part is widely used traditionally in the treatment of various infections and diseases. The plant is a wild growing plant and is not cultivated so the indiscriminate collection of roots and non- cultivation has impact on biodiversity. Thus tissue culture studies are performed in *Plumbago zeylanica*. To protect the somatic embryos from the external environment the synthetic seeds are produced which are then further used for the production of plants.

In my present study the leaves were used as the explants. Surface sterilization of explant was done. These explants were then aseptically cultured on MS medium supplemented with different plant growth hormones. The callus produced from tissue culture was used to produce synthetic seed for large scale production of the plants and to reduce the risk of maintenance, storage and transportation of the cultured plants. For the production of synthetic seed the callus were chopped aseptically and were encapsulated with sodium alginate and liquid MS medium without $CaCl_2$ supplemented with growth hormones of similar concentration as used in tissue culture for the production of synthetic seeds.
Best result of callus induction and root regeneration was observed on MS medium supplemented by 2ppm NAA.

Keywords: antidote, MS medium, *Plumbago zeylanica, s*urface sterilization

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B - 035

THE MAKING OF ARTIFICIAL SEEDS OF *PLUMBAGO ZEYLANICA L.*

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Synthetic seeds are the artificial encapsulation of somatic embryo, shoot buds or aggregates of cell or any tissues which has the ability to form a plant in *in vivo and in vitro* condition. Synthetic seeds can be stored for a long time in appropriate condition. Synthetic seeds are used to provide protection to the artificially produced propagules. It can be used to propagate hybrid plant, genetically modified plants, endangered species, elite genotype moreover synthetic seed production is cost effective when compared to traditional method and can be directly used in fields. Artificial seed can be transported from one country to another without obligation from quarantine department. They are small therefore they are easy to handle. The seeds provide aseptic condition to the plant material or explant, which is present inside the capsule. Synthetic seed crops are easy to maintain because of uniform genetic constituent. This technology improves the production and also produces environment friendly plantation.

The synthetic seeds were produced from the callus produced from tissue culture of *Plumbago zeylanica* L. for large scale production of the plants and to reduce the risk of maintenance, storage and transportation of the cultured plants. The roots and leaves of *P. zeylanica* contain plumbagin a major component that constitute about 0.03% of dry weight of the roots, which has been identified as significant bioactive component related to several pharmacological activities, like antitumor, antimicrobial, anticancer, wound healing, anti-inflammatory and altered T-cell proliferative activities and antifertility actions. *Plumbago zeylanica* is a useful plant.

For the production of synthetic seeds the callus were chopped aseptically and were encapsulated with sodium alginate and liquid MS medium without $CaCl_2$ supplemented with growth hormones of similar concentration as used in tissue culture.

Keywords: antitumor, antimicrobial, *Plumbago zeylanica,* synthetic seeds.

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B - 036

STUDY ON *PSIDIUM GUAJAVA* FOR ITS SOLUBILITY AND ANTI-BACTERIAL ACTIVITY

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Psidium guajava is largely regarded as a food loaded with natural medicines. In our present work, it was thought worthwhile to find out the scientific basis. So the solubility of different extract was done by dissolving the dried extract of guava leaf, fruit, and bark in 10ml of methanol, ethanol and dd H2O respectively. Bark of guava dissolve in ethanol shows highest solubility while fruit of guava dissolve in ethanol shows lowest solubility.

Antibacterial culture was done using *Psidium guajava* leaf and fruit to know the inhibitory effect against soil borne bacteria. Ethanol extract of fruit shows maximum inhibitory effect with zone of inhibition of 3.870 cm2. This result support the traditional use of this as medicine. The study demonstrated that herbal medicine can be as effective as modern medicine to combat pathogenic micro-organisms and overwhelming the antibiotic resistance.

Keywords: Antibacterial, inhibitory, Psidium *guajava,* solubility.

B - 037

PRESENCE OF BIOACTIVE COMPOUNDS OF *PSIDIUM GUAJAVA* THROUGH GCMS ANALYSIS

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Psidium *guajava* is a small tree with spreading branches. It is an evergreen tree having medicinal properties. It is used to treat cholera, vomiting diarrhea, epilepsy and even digestive disorders. Every part of plant be it leaf, bark, fruit are used for medicinal purpose.

GC-MS analysis was done to identify different substances present in the methanol extract of Psidium *guajava* leaves and fruits. The material was sent to AIRF, JNU for GC-MS analysis. The result showed that the methanol extract of *Psidium guajava* leaf has Stigmast-5-en-3-ol, (3 Beta)- 9.74% as major compound and Oxirane, 2,2-[oxybis(methylene)] bis 0.17% as minor compound. While methanol extract of *Psidium guajava* fruit has 9,12-Octadecadienoic acid (z, z)- 29.39% as major compound and Labda-8(17), BE-DIEN-15-OL 0.25% as minor compound.

Keywords: AIRF- JNU, GC-MS analysis, major compound, *Psidium guajava*

B - 038

CELL WALL STRUCTURAL CHANGES IN RICE HUSK PRETREATED FOR BIOETHANOL PRODUCTION

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Pretreatment is the pivotal step in the utilization of biomass for bioethanol production. An economically feasible system only allows mild pretreatment strategies for industrial bioethanol production. The steam explosion pretreatment process is reported to be effective in preparing rice husk for these processes with the use of mild acids or bases. In the current work, pretreatment method like steam explosion pretreatment method was used with NaOH and HNO_3 to degrade the complex structures and release the sugars entrapped within lignin. The effect of pretreatment on the rice husk cell-wall matrix and its components are characterized microscopically (atomic force microscope and scanning electron microscope) and spectroscopically (Fourier Transform Infrared Spectroscopy) in order to understand this increase in digestibility. The steam explosion pretreatment does not degrade the fibrillar structure of the cellulose but causes profound lignin re-localisation. Result from current work indicates that wax has been removed and hemicellulose has been partially removed. Results indicate that steam explosion pretreatment increases the digestibility by increasing the accessibility of the cellulose through re-localisation of the lignin and a partial removal of hemicelluloses, rather than by disruption of the cell wall.

Keywords: Pretreatment, bioethanol, rice husk, cell wall

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B - 039

ISOLATION OF THERMOPHILES WITH XYLANASE ACTIVITY FROM HOT SPRINGS OF JHARKHAND.

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Thermophiles are the organisms which can withstand and grow in high temperature between 40-80°C. Since these organisms grow at high temperature, they are not commonly found in the nature. These organisms are found in geothermal regions of the earth like hot water springs, deep sea hydrothermal vents, coal mines, mud pots, natural water heaters and geysers etc. Bacteria found in these geothermal regions contains enzymes that can function at high temperature. Isolation of these enzymes has been proven to be of great use in the field of Biological Science, Pharmaceuticals, Industries etc.Jharkhand has the good reservoir of geothermals. The hot springs of Jharkhand are located along a zone running more or less of Damodar Valley Coalfields. In Jharkhand the thermal springs are found n Tatta-Jarom of Palamu district and Surajkund, Duari,Bagodar of Hazaribagh District. Among these Surajkund is claimed to be the hottest hot spring in India which has a surface temperature of 87°C and average subsurface temperature of 165°C. The microbial diversity of the hot springs of Jharkhand are not fully discovered yet. There is a lot of scope for utilisation of these organisms in the field of medicine, biological sciences and in industries. These organisms has the potential to replace the traditional technologies used in these areas and it can save energy, environmental exploitation as well as investment capital.The purpose of this study is aimed to isolate thermophilic bacteria from hot spring of Surajkund, Hazaribagh and study its potential of xylanase activity. Xylan is the most crucial polysaccharide and main type of hemicellulose (major component of plant cell wall). Xylanase plays a major role in microorganisms thriving on plant sources for degradation of plant matter into usable nutrients. However commercial applications of xylanase include: chlorine free bleaching of pulp(papermaking), textile, chemical, bread making, animal feed, food additive, gene technology, extraction of coffee, plant oils and starch.Soil and water sample from Surajkund hot spring was taken and cultured at 45°C and 50°C. Bacterial colonies obtained were then further purified and these purified colonies are then checked for its xylanase activity. Colonies with xylanase positive will be characterized for its morphological and biochemical tests will be performed and 16S rRNA sequencing and phylogenetic analysis will be done.

Keywords: Xylanase, Surajkund, Hazaribagh, 16S rRNA

B - 040

COMPARATIVE PHYLOGENETIC ANALYSIS OF MEP PATHWAY GENES OF IN ASTERACAE PLANTS

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The elucidation of biochemical pathways has been a longstanding goal of scientists studying plant secondary metabolism. The leaves of Stevia rebaudiana (Bertoni) accumulate at least eight steviol glyco-sides (SGs), the concentrations of which vary quite widely depending on the genotype and production environment .The diversity of SGs results from elaboration of the aglycone steviol by various glycosyl transferases As a result of differential glycosylation, each SG has distinctive organoleptic properties. Rebaudioside A is 242 times sweeter. Geuns et al. have shown that steviol or related metabolites do not accumulate in the human body and that at least in healthy human subjects pure stevioside taken at a dose of 750 mg/day had no effect on either blood pressure of insulin levels In addition to being an approved sweetener in many countries, the World Health Organization has now recognized that stevioside is not genotoxic and assigned a temporary acceptable daily intake for steviol glycosides of 0–2 mg/kg body weight.The configuration of steviol was resolved more than thirty years ago and the work that followed concluded that steviol was synthesized from kaurene via the mevalonate pathway. Like the synthesis of many diterpenes, however, it was later demonstrated using in vivo labeling with glucose and NMR spectroscopy that the precursors of steviol are actually synthesized via the plastid localized methylerythritol4-phosphate (MEP) pathway.In this study, National Center for Biotechnology Information (NCBI) was searched to collect nucleotide sequences that encode MEP enzymes homologues. A number of MEP pathway gene sequences from stevia species were phyletically analysed to light the way for the evolution characteristics of sweetener-producing plants homologues.The study is about to interpret molecular phylogeny of those genes involved in Reb-A production. To interpret the evolutionary relationships through phylogenetics by constructing a number of gene trees and by reviewing the positions of the species.

Keywords: NCBI, MEP, Reb-A, MSA

B - 041

PROCESS OPIMIZATION OF PHENOL BIODEGRADATION BY MIXED BACTERIAL CONSORTIUM ISOLATED FROM EAST CALCUTTA WETLANDS

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Phenolic compounds are aromatic pollutants, which are present in the effluents of various industries including petrochemicals, coal coking, coal gasification, tanneries etc. The compounds penetrate soil through the municipal or industrial sewage to surface water. Exposure to phenol may result in irritation of the eye, conjunctional swelling, hepatic damage, anorexia, dermal rash, dysphasia, gastrointestinal disturbance and even nervous disorder. Phenol is the representative of all phenolic compounds and the safety limit of phenol concentration in effluent is set as 0.168mg/l by EPA (USA). Common methods for waste treatment fail to remove low concentration phenol to meet environmental regulations and there is a need for a polishing step or end of the pipe treatment.

Objective of the present work is to develop a cost-effective and environment friendly technique treatment of industrial waste for biodegradation of phenol using locally available bacteria. Mixed bacterial consortium was isolated from the soil of East Calcutta Wetlands, a region situated at the eastern fringes of Kolkata (formerly known as Calcutta). It is the major waste treatment and recycling site of Kolkata and is known to be rich in biodiversity. The soil-microflora of this region are likely to have degradation ability for various organic pollutants.

Mixed bacterial consortium was isolated from the soil of East Calcutta Wetlands using MS media containing glucose. The isolated mixed bacterial culture was then acclimatized to phenol by gradually increasing concentration of phenol and decreasing concentration of glucose in the media till phenol completely replaced glucose as the carbon source over a period of three months. Individual species present in the mixed culture were isolated and identified by 16s rRNA analysis. The individual bacterial species present in the consortium as identified by 16s rRNA analysis were *Pscychrobacter sp*., *Stenotrophomonas maltophilia*, *Bacillus subtilis* and *Escherichia coli*. The maximum specific degradation rate and specific growth rate was observed at 800 mg/L of phenol concentration.

The parameters for biodegradation of phenol were optimized by Response Surface Methodology (RSM). To check the initial input range of the process parameters, the mixed bacterial culture was inoculated in MS media supplemented with 500 mg/L phenol. These were incubated under varying temperatures (20°C, 30°C, 40°C and 50°C, keeping pH constant at 7.0) and varying pH (5.0, 6.0, 7.0 and 8.0, keeping temperature constant at 30°C) at 100rpm. Cell concentrations and phenol concentrations were measured in each flask at regular time intervals. After fixing the initial input range, the process was optimized by RSM using free trial version of Design Expert 9.0 licensed from "Stat-Ease, 2021 East Hennepin Ave, Suite 480, Minneapolis, MN55413".

Keywords: process optimization, batch reactor, varying temperature, pH, cell loading, Response Surface Methodology

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B - 042

THE EFFECT OF EXTRACTS OF *CORIOLUS VERSICOLOR* ON REGULATION OF TUMOR SUPPRESSOR GENES (P53, P51) AND PRO APOPTIC GENES (CASPASE FAMILY) AND CYTOTOXICITY ON PANCREATIC (PANC-1 AND COLORECTAL COLO205) CANCER CELL LINE

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Coriolus versicolor is an edible mushroom also called as Yunzhi belonging to species of the basidiomycetes class (Polyporaceae family) of Fungi. Its therapeutic potentials against cancer is gaining acceptance worldwide and exhibit anti-tumor effects on various types of Cancer Cells. The wild variety of *Coriolus versicolor* mushroom has been collected from the North 24-pargana district of the state of West Bengal of which morphological and genetic studies have been performed. The ethanolic Soxhlet extracts of wild edible mushroom *Coriolus versicolor* and ethanolic fractions collected from column chromatography were used for the study of antioxidant activities in different assays such as Ferric anti-oxidant reducing power (FRAP) and scavenging activity on 1,1-diphenyl-2-picrylhydrazyle (DPPH) radicals.On the basis of the above study, the best antioxidant property of different fractions were subjected on pancreatic (panc-1) and colorectal (CoLo205) Cancer cell line by using MTT assay and studied the apoptosis induction of modulation of p53, p51 and Bcl-2 protein expression by Western Blotting.

Keywords: Mushroom, *Coriolus versicolor*, Basidiomycetes, Polyporaceae, Soxlet, Cell line, MTT assay, Apoptosis, FRAP, DPPH, panc-1, CoLo205, p53, p51, Bcl-2.

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B - 043

MICROBIAL DEGRADATION OF POLYETHYLENE TEREPHTHALATE

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Today the world is facing problem related to spread of plastic all around us which causes infection and pollution. Polyethylene terephthalate (PET) is extensively used throughout the world. PET is made from petroleum and is widely used in textile industries and plastic bottles. Most of the PET product simply end up by land filling and never enter the recycling process. Currently, the only PET products being recycled are bottles, but the amount of recycled account are just 37% of the total production volume of PET bottle i.e. 6.13 million tons. Currently, the chemical method is being used to recycle PET waste, which is quite energy consuming process and shows only assimilation of PET waste. Various microorganisms have also been reported to assimilate PET waste. However, assimilation is not the final solution of this problem as it is only a partial degradation. Recently, A Gram-negative, aerobic, non-spore-forming rod-shaped bacterium, *Ideonellasakaiensis* strain 201-F6 was isolated from a microbial consortium. Strain 201-F6 has been identified which uses PET as an energy resource and is able to produce environment friendly bi-products such as ethylene glycol and terephthalic acid. This strain produces two enzymes capable of hydrolyzing PET and the reaction intermediate, mono (2-hydroxyethyl) terephthalic acid. Based on the property of PETase and MHETase it is now understood that the strain 201-F6 is capable of using PET as its major energy source and convert it into easily degradable components.

Keywords: Plastic Biodegradation and Assimilation, PET, *Ideonellasakaiensis* strain 201-F6, PETase and MHETase

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B - 044

KINETICS OF BATCH MICROBIAL DEGRADATION OF CARBAZOLE BY NEWLY ISOLATED PSEUDOMONAS SP. SM5A1

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A bacterial strain designated SM5A1 was isolated from soil sample collected from petrol pump and its carbazole, a nitrogen containing heterocyclic aromatic hydrocarbon, degrading efficiency was determined. The phylogenetic relationship revealed that the strain SM5A1 belongs to the genus *Pseudomonas*. The isolated strain showed approximately 100% degradation of carbazole (500 ppm) in 48 hrs. Its efficiency was also measured by supplying additional carbon source like yeast extract, glucose and glycerol but no significant changes in the activity were observed. The carbazole degrading efficiency was tested at different concentrations of carbazole *viz*. 50, 100, 200, 300, 400, 500, 600, 800, 1000 ppm and the degradation rates were observed. Growth kinetics of the isolate was investigated at different carbazole concentrations. The Haldane kinetic model effectively predicted the biodegradation of carbazole alone, although a slight incongruity was noted in cases of higher initial carbazole concentration. The experimental data is well fitted with the Haldane's model (R^2 = 0.91) as compare to the Monod's model (R^2 = 0.72) as a result of self-inhibition which occurred because of excess carbazole concentration.

Keywords: Carbazole, *Pseudomonas* sp., Growth Kinetics, Haldane model, Monod model

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B - 045

ZSM-5/ CNF COMSITE: AN EXCELLENT DYE ADSORBENT

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Water pollution is one of the most severe problems all over the world. Pollution of water occurs when substances that will modify the water in negative fashion are discharged in it. Various industries including textile, food, printing, pharmaceutical, leather, cosmetic and paper industries commonly use dye staffs to dye their products. As a result, different types of dyes and pigments are widely being produced and the residual, unspent and waste dye effluents are generally unloaded into the aquatic environment. Moreover, these dyes are found to be toxic in nature inducing not highly & unimaginable harmful to the environment but also potential carcinogenic & genotoxic effects in human being as well. Therefore, dye removal becomes a very important and especially challenging area of wastewater treatment.

Therefore, the aim of present study is to develop low cost, recyclable, eco-friendly and biodegradable film absorbents based on ZSM-5 zeolite. The delaminated (D-ZSM-5) and ion exchanged (Cu-ZSM-5 and Fe-ZSM-5) forms of ZSM-5 zeolite have been obtained after modifications. Novel composites have been obtained by mixing modified zeolites with cellulose nanofibrils (CNFs) of variable concentrations (20 and 80 wt%) via casting method. These composite films are characterized by FTIR and XRD echniques and employed for cationic Rhodamine B (Rh6B) and anionic Reactive Blue 4 (RB4) dye removal via the adsorption process. The influence of contact time, initial dye concentration and pH is investigated on the dyes` adsorption in aqueous buffer solutions. Maximum dye removal is observed for a higher (80%) amount of ZSM-5 containing films. The study reveals that ZSM-5/CNFs films can potentially be used for the removal of cationic and anionic dyes.

Keywords: Zeolite, composites, cationic dye, anionic dye, adsorbent

B - 046

INFLUENCE OF MICROBIAL VOLATILES ON CASHEW ROOT AND STEM BORER *NEOPLOCAEDERUS FERRUGINEUS* (L) COLEOPTERA: CERAMBYCIDAE

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Neoplocaederus ferrugineus (L) (Coleoptera:cerambycidae) is a serious pest on cashew *Anacardium occidentaele.* The adult beetles lay eggs on the lower part of the trunk from which the grubs emerge and enter into the trunk portion and causing several galleries filled with frass.A tree with heavy number of grubs finally die as the transpiration is fully cut off. Reports indicate that frass on infested tree is the most preferred site for laying the eggs by *N. ferrugineus* followed by basal of the tree trunk. Insects mainly depend on olfactory cues to locate and select oviposition sites, whereas colonization of the host material by microorganisms often modifies volatile emissions and insect oviposition preferences are known to be related to Microbial volatile organic compounds (MVOCs) which are associated with insect digestive tracts or frass as well. During our regular field studies, we observed that fermenting/fermented frass was the more preferred site for this pest for laying the eggs than the fresh frass and even the number of eggs in fermenting frass was more when compared to the fresh frass. Present study aims to investigate the presence, identification and their possible role of MVOCs in attracting gravid female to prefer fermenting/fermented frass for laying eggs. Fermenting/fermented frass samples were collected from National Research Centre for cashew, Puttur, Dakshina Kannada Dist, Karnataka. Microbes were isolated from frass and Grams staining technique was used to differentiate between Gram-positive and Gram-negative organisms, while simultaneously learning about the cellular morphology and arrangement and characterised by 16S ribosomal DNA (16S rDNA) sequencing. The volatiles from the cashew frass normal, fermented as well as the bacterial isolates from the fermented frass are collected through dynamic head space collection. Microbial isolates were cultured in three different types of liquid media viz; Nutrient Broth NB, Luria Burteni Broth LBB, Soya bean casein digest broth SCDB. The volatile so collected were analyzed on a gas chromatograph. Among these media microbes grown in LBB media has released more volatiles and to name few, *Bacillus cereus* has released Benzaldehyde, ethyl, 3-ethylacetophenone, Ethanone, 1-(4-ethylphenyl, Phenol, 2, 4-bis (1,1-dimethylethyl, Cis-2-nanodecane, 9-octadecenoic acid, n- Benzenethanol, n-propyl 11-octadecanoate, 2-propenoic acid methyl ester and *Klebshella varicola* has released p-benzoquionine, Benzaldehyde,4-ethyl, dodecane, 1H-benzocycloheptene, 2-tridecanone, 2-pentadecanal, Phenol, 2, 4-bis (1,1-dimethylethylate), 2-pentadecanone, Pthalic acid, decyl isobutyl ester, Hexadecanoic acid methyl ester. The confirmation of presence of these compounds were done by inoculating the microbes to the fresh frass and allowed to ferment over a period of time. Some of these identified compounds were known to be responsible for attracting gravid females of various insects for laying their eggs, which further confirms that the microbial volatiles have a major role in host and pest interaction or in other words a tri tropic interaction. The role and their possible effective use in management of the cashew root and stem borer are discussed in this study.

Keywords: Microbes, cashew frass, MVOCs, Oviposition

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B - 047

TO STUDY CODON AND AMINO USAGE IN ZAIRE EBOLA VIRUS WITH MULTIVARIATE ANALYSIS

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Zaire ebola virus (ZEBOV) causes severe hemorrhagic fever in humans and non-human primates (NHPs) with high fatality rates. To identify highly expressed genes and essential genes, codon bias analysis is required. Multivariate analysis of codon and amino acid usage was performed for Ebola virus by using the software CodonW. It was revealed that species is under mutational bias and translational selection. The correspondence analysis of codon and amino acid usage will help to evaluate various parameters like codon adaptation index (CAI), effective number of codons (Nc), Relative Synonymous Codon Usage (RSCU), Frequency of optimum codons (Fop) and GC%. Low bias was noticed in most of the genes. A comparison with other viruses, namely, Influenza virus (H5N1) and HIV was also performed. The results can be helpful to design new broad-spectrum therapeutic drugs diagnostics or vaccines.

Keywords: Ebola virus, multivariate analysis, Codon usage bias, CodonW

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B - 048

EFFECT OF TIME AND COLCHICINE ON THE MITOTIC INDEX OF *ZANTHOXYLUMARMATUM* ROXB.

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In the present work *Zanthoxylum* seeds were treated with varying concentrations (0.05, 0.1, 0.25, 0.5, 0.75 and 1 %) of colchicine for different durations (12, 24 and 48 hours) and the mitotic index (MI) was worked out. The effect of colchicine was observed by working out the mitotic index. When the seeds were treated with varying concentrations of colchicine for 12 hours the MI was found to be decreasing from 0.05 to 1%. But when the time duration of seed soaking in colchicine was increased to 24 and 48 hours the MI was found to be more. In 24 hours treatment the MI increased from 73(0.05% colchicine) to 79 % (1 % colchicine) and in 48 hours treatment MI increased from 70 (0.05%) to 77% (1 % colchicine).

Keywords: Mitotic index, *Zanthoxylumarmatum* Roxb.

B - 049

EXPLORING THE TRICLOSAN DEGRADATION BY MICROORGANISMS FROM WASTE-WATER

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Aim: The major focus of the present work is to study the bio-degradation of triclosan by a micro-organism isolated from a waste-water sample.

Significance: Triclosan is an anti-microbial agent which has found its application in the pharmaceutical and cosmetic industries. However, the concentration increase of this chemical has been so rapid that now it is raising serious concerns regarding its effects on health of all biotic as well as abiotic components of this ecosystem. It has become a priority pollutant raising controversial issuesThe safety profile of triclosan has been questioned recently after the observation that triclosan was determined not only in wastewater but also in human breast milk.So, it is important to find a biological way for the degradation of such chemical.

Findings of importance: We have isolated bacteria that have the capability to degrade triclosan when cultured on Tryptone Soya Agar plates containing trace amount of triclosan (about 0.1%). 2 out of these isolates when screened by UV-Vis Spectrophotometer (UV 1800 Shimadzu) showed a peak shift from 280 nm to 276 nm, suggesting bio-transformation of triclosan to catechol. These isolates when biochemically characterized stained pink, suggesting gram negative and were small rods in shape.

Keywords: Triclosan; Anti- microbial; Biodegradation; Catechol; UV-Vis pectrophotometer; Gram-Negative

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B - 050

IN-SILICO DESIGNING DRUG MOLECULES FOR EBOLA VIRUS

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Ebola virus identified is an envelope, single-stranded, negative-sense RNA virus that causes severe hemorrhagic fever in humans and nonhuman primates. This virus is naturally resistant to various antibiotics, and there is no proper treatment for infection caused by this pathogen. An attempt was made to design new drugs for treatment of infection caused by Ebola virus. Structure based drug designing (SBDD) method was adapted for discovering new drug leads against important targets. Two main proteins that are essential for pathogenesis of the organism selected as targets, namely, glycoprotein & nucleoprotein. After the proteins were selected as target, drug molecules namely, Toremifene, ibuprofen & Zmapp were chosen as 'template' from a small molecules database that scored well when docked *in-silico* against targets. New 'lead' molecules were designed and reported based on template. The 'leads' were further validated with molecular interaction and ADME/Tox study. The current study has potential for successful implementation for synthesis of new drugs against Ebola virus infection.

Keywords: Ebola virus, Glycoprotein, Nucleoprotein, toremifene, ibuprofen, Zmapp

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B - 051

STUDY ABOUT GROWTH PARAMETERES AND LIPOXYGENASE AND HYDROPEROXID LYASE GENES IN DIFFERENT PEANUT CULTIVARS

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The production of peanut (*Arachishypogaea*) is being threatened by the changing environments condition. The quality and yield of peanut are affected by drought and salinity. We have selected economically important peanut crop for the present investigation. In this study different varieties (TAG-24, GAUG-10, GG-2, GG-5, ICGV-91114) of peanut received from Directorate of Groundnut, Gujarat were selected for the study of germination and growth pattern. Germination percent of three varieties (GG-5, GG-2, GAUG-10) were 100% while rest showed 90% of germination. Growth pattern of three varieties (GG-5, GG-2, GAUG-10) were relatively higher compared to other varieties. Study about some genes (like lipoxygenase and hydroperoxidelyase) related to flavor and odor under abiotic stresses is being carried out. Obtained findings about expression pattern of these genes will be presented.

Keywords: *Arachishypogaea*, peanut, RT-PCR, stress.

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B - 052

COMPUTATIONAL PROFILING AND CHARACTERIZATION OF ENZYMES INVOLVED IN 1, 3-PROPANEDIOL PRODUCTION

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1, 3-propanediol is a industrially valuable chemical that is produced through the bioconversion of glycerol in two step processes. As this process has got several limitations, developing new technology will help in simpler production of 1, 3-propanediol. Glycerol dehydratase, 1, 3-propanediol dehydrogenase and glycerol dehydrogenase are the three key enzymes that regulate the above bioconversion. For the societal benefit agro-wastes can be used as the source raw material to produce 1, 3-propanediol but to improve the rate of conversion and productivity, metabolic pathway should be studied thoroughly.

Here, we intend to characterize and profile the enzymes to study the role in the metabolic pathway of 1, 3-propanediol production. The work emphasizes on insilico sequencing and structure prediction, validation, interaction studies. Production pathway was also studied and analyzed. The production of 1, 3-propanediol with aimed object will help in valuable utilization of agro waste and also uplift the economic standard of the rural sector of India.

Keywords: 1, 3 Propanediol, Metabolic pathway, Bioconversion, Agro wastes, Insilico prediction

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B - 053

REMOVAL OF AZO DYE FROM AQUEOUS SOLUTIONS BY CHEMICALLY TREATED RICE STRAW KINETICS, THERMODYNAMICS AND OPTIMIZATION USING RESPONSE SURFACE METHODOLOGY

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The feasibility of chemically treated rice straw as a low- cost biosorbent for the removal of azo dye (congo red) form aqueous solution was investigated. The influence of various operational parameters such as pH, biosorbent dose, concentration, temperature was studied for batch experimental setup. To evaluate the equilibrium relationship between the adsorbate concentration in the liquid phase and that on the adsorbent surface at a given condition differrnt isotherm model such as Langmuir, Freundlich and Dubinin- Radushkevich models were studied. For kinetics pseudo first and second order model were used. Thermodynamics study indicated this is spontaneous and endothermic in nature. Response Surface methodology (RSM) was applied for optimization of process parameter responsible for the biosorption process and to evaluate the effects and interaction between process variables.

Keywords: Biosorption, rice straw, isotherms, kinetics, thermodynamics, column study, RSM

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B - 054

ESTIMATION OF TOTAL ANTIOXIDANT STATUS, PHYTOCHEMICAL PROPERTIES AND MARKER COMPOUNDS OF *NIGELLA SATIVA* LINN. SEED EXTRACT

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Nigella sativa (family Runanculaceae) commonly known as kalonji is considered to be the greatest healing herb of all times. This herb has been used to strengthen immune system, purify blood, protect against a number of diseases and support healthy living from time immemorial.

In the present study, *Nigella sativa* seed extract was evaluated for its phytochemical properties and oxidant status by FRAP method. Its marker compounds was estimated by HPTLC method. The result indicated the presence of alkaloids, saponins, glycoside and sugars in the ethanolic extract of *N.sativa* seed. Total antioxidant status was found to be significantly ($p<0.01$) high in ethanolic extract of *N.sativa* seed. HPTLC study revealed the presence of two compounds at very high concentration and three components in small concentration. The major components are considered to be Thymoquinone and Nigellone.

Keywords: *Nigella sativa,* phytochemical properties, FRAP method, antioxidant status

B - 055

A COMPARATIVE STUDY OF PROTEIN EXTRACTION METHODS FOR SECRETOME OF *ASPERGILLUS* SPECIES

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The widespread use of fungi in different biotechnological processes can be attributed to their intrinsic characteristics. They are relatively easygoing organisms and most of them can be grown in bioreactor in a quite cheap and easy way. They can utilize agriculture waste as substrate such as bagasse for production of various proteins. They are eukaryotes, and thus valuable expression hosts for proteins requiring elaborate posttranslational modification. They can secrete an impressive arsenal of extracellular enzymes and proteins, generally referred to as secretome, which represents a powerful biochemical toolkit for the catalysis of a great number of valuable reactions. The choice of sample preparation protocol is a critical influential factor for extraction of proteins. Two methods for protein precipitation are applied, which rely on different principles, have been compared for precipitation of extracellular proteins of *Aspergillus fumigatus* and *Aspergillus niger* species. Secretory proteins were extracted using TCA/acetone and Ammonium sulphate procedures. It was found that TCA/acetone delivered higher protein recovery of 87.62% and 88.43% while the percentage recovery of extracellular proteins using Ammonium sulphate was 71.95% and 73.32% for *Aspergillus fumigatus* and *Aspergillus niger* strains respectively.

Keywords: Protein precipitation, Secretory Proteins, Ammonium sulphate, TCA/acetone

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B - 056

DECOLORIZATION OF METHYL RED AND DIRECT BLUE BY MICROORGANISMS

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Azo dyes are the largest group of synthetic colorant and the most common synthetic dyes released into environment. Azo dyes pose environmental problem due to their toxicity and mutagenic affects. Azo dyes are widely used in textile and food industry. The release of textile dye effluents into water bodies leads to major environmental and health problems. Microorganisms have the ability to carry out dye decolorization, are inexpensive, eco-friendly, and can be applied to wide range of dyes. This work focuses on decolorization of azo dyes namely Methyl Red and Direct Blue by using microorganisms. Screened microorganisms showed the ability to decolorize methyl red and direct blue. Decolorization was studied using plate assay followed by broth assay. Percentage decolorization was recorded using UV-Visible Spectrophotometer.

Keywords: Azo dye, Methyl Red, Direct Blue, decolorization, UV-Visible spectrophotometer

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B - 057

OPTIMIZATION OF PHYSICAL PARAMETERS FOR MICROBIAL DECOLORIZATION OF METHYL ORANGE

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Throughout the world, dye waste water has become the major source of environmental pollution. Therefore, economical and bio-friendly approaches are needed to remediate dye contaminated effluent from different industries. Azo compounds constitute the largest and the most diverse group of synthetic dyes and are widely used in a number of industries such as textile, food, cosmetics and paper printing. Microorganisms have shown the potential for the decolorization and mineralization of azo dyes. Five samples in the form of soil and water were collected from Bihar and Jharkhand. Out of 66 isolates obtained, 6 of them showed promising decolorizing activity on Methyl Orange. SCA1007 showed 90 to 95% decolorization of Methyl Orange within 24h. SCA1007 were further used to optimise the decolorization of Methyl Orange.The decolorization efficiency of isolate was function of operational parameter like pH, temperature, dye concentration and salinity. The optimal condition obtained for decolorization of Methyl Orange was pH 7, 35^0C, maximum dye concentration of 150 mg/L and salinity 0.5%-5%. Decolorization activity was detected by UV– visible spectrophotometer.

Keywords: Methyl orange, pH, Temperature, Salinity, UV – visible spectrophotometer

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B - 058

OPTIMIZATION OF NUTRITIONAL PARAMETERS FOR ENHANCED DECOLOURIZATION OF CRYSTAL VIOLET DYE BY *ASPERGILLUS FLAVUS* NCIM 650

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Textile, paper and printing industries have grown considerably in the last few years where a significant amount of synthetic dyes are used. These industries utilize large volumes of water in its processing operations and generate substantial quantities of wastewater. Dye wastes are usually discarded into water with/without processing and they pose a serious threat to the environment. Aesthetic merit, gas solubility, water transparencies are affected by the presence of dyes even in small amounts. Among many classes of synthetic dyes used in the industries, triphenyl-methane group of dyes such as crystal violet has been extensively used and is a potent carcinogen. Colour of crystal violet is easily retained in water bodies and usually contributes a major fraction of BOD. It also prevents sunlight penetration through water thus affecting the marine life. Being recalcitrant, if not treated, will remain in nature for extended period of time. Wide range of known methods for dye removal is categorized - physical, chemical, biological. In recent years, there have been intensive researches on fungal decolourization of textile wastewater. The use of fungi is a promising alternative to replace or supplement current treatments. Fungus because of their large mycelial surface area and ability to degrade a diverse range of pollutants has been explored to decolorize and degrade dyes. Successful application of decolourization of textile dyes to treat high concentration of industrial effluents will be a mile stone owing to advanced treatment processes. Biological method was emphasized because it is cost effective and eco-friendly. This work is aimed to optimize the physical and nutritional parameters for efficient decolourization of crystal violet dye by *Aspergillus flavus* NCIM 650. Dye decolourization was monitored using a scanning UV/visible spectrophotometer. *Aspergillus flavus* NCIM 650 decolorized 93.4% of 50 mg/l dye within 48h of incubation in a mineral salt medium at 37°C pH 7 and 150 rpm using Glucose as the carbon source and Beef extract as nitrogen source.

Keywords: Bioremediation, Dye, Triphenyl-methane, Carcinogenic, Recalcitrant, Fungus

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B - 059

EXTRACELLULAR PROTEASE PRODUCTION BY ENTOMOPATHOGENIC FUNGUS *BEAUVERIA BASSIANA*

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Beauveria bassiana is a well-known entomopathogenic fungus which considered as a non-selective bio-insecticide in agronomy. It acts as a parasite on a wide variety of arthropods. Protease is a group of different classes enzyme that performs proteolysis; protein catabolism by hydrolysis of peptide bonds. Entomopathogenic fungi have the potency to produce extracellular protease as its combat mechanism against insect's exoskeleton. Proteolysis activity was detected in the culture fluid when *Beauveria bassiana* was grown in a medium containing 2% casein as a sole carbon source, compared to that grown in Czapek Dox Broth (CDB) medium (sucrose less) supplemented with BSA, egg yolk, gelatine and maize extract in separate Erlenmeyer flasks. After protein extraction and purification; Sodium Dodecyl Sulfate (SDS) PAGE (12%) was used for 1-D electrophoresis analysis for the visualization of protein band by Coomassie Brilliant Blue staining. Protein amount was estimated by Bradford method before quantified protease activity. The activity of protease was assessed by measuring the release of Trichloroacetic acid (TCA) soluble peptides from casein. From this research maximum proteolytic activity was recorded in BSA mediated medium (2.00 U/ml) and the minimum activity was recorded in gelatin mediated medium (0.73 U/ml). Enzymatic activity of casein medium, egg yolk and maize extract supplemented casein medium were recorded as 1.25, 1.21 and 1.75 U/ml respectively. Application of such entomopathogenic fungi in agricultural field as the bio insecticide; not only protect the crop also reduction of chemical pesticides can form an opportunistic green environment.

Keywords: protease, *in vitro* production, biological control, green environment

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B - 060

PHYTOCHEMICAL SCREENING OF TWO MUSHROOMS, AND THEIR ANTIOXIDANT AND ANTICANCER PROPERTY IN HELA CELL LINE

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Cancer is the second leading cause of death worldwide. But now a day's edible medicinal mushrooms have been used to prevent and cure Cancer. Here in case we have used two edible mushrooms to cure this problem. The bioactive compound of these mushrooms shows the anticancerous activity in HeLa cell line. The purpose of this study is to identify the different phytochemical screening condition such as, by using ethanol, methanol, acetone, chloroform, hot water and cold water. The antioxidant activity were analysed in terms of total phenolic content, total flavonoid content, DPPH, FRAP. The DPPH value of *Astraeus hygrometricas, Pleurotus sajor-caju* exhibit the highest EC-50,the methanolic EC -50 value is 57.06µg/ml i.e. .05g/ml and .04g/ml. The GCMS study of these mushroom shows the bioactive compound, i.e. necessary to identify which compound is responsible to treat in HeLa cell line. For mushroom genomic study we can apply different DNA isolation techniques such as CTAB and SDS method and the extracted DNA was purified, and ITS1,5.8S RNA and ITS2 was amplified by using Primer in PCR and the PCR condition has been standardized. Through this methodology we are going to identify the mushrooms compound i.e. essential for the treatment of cervical cancer cell line through which we are covering a broad era of cancer cell biology by using different Biochemical and cell biology application.

Keyword: Cancer, HeLa cell line, DPPH, FRAP, Phytochemical, PCR

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B - 061

BIOCHEMICAL CHARACTERIZATION OF PGPR ISOLATED FROM *STEVIA REBAUDIANA*

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Stevia rebaudiana, a perennial herb from the Asteraceae family, is known to the scientific world for its sweetness and steviol glycosides (SGs). SGs are the secondary metabolites responsible for the sweetness of Stevia. These are non-mutagenic, non-toxic, antimicrobial, and do not show any remarkable side-effects upon consumption. It has many medical applications and its role against diabetes. Plant growth promoting rhizobacteria (PGPR) help the plant to grow in a nutrient defecient medium and convert atmospheric nitrogen into usable form for plants. PGPR easily establishes a successful relation in the soil ecosystem due to their high adaptation to a wide variety of environments, faster growth rate and biochemical versatility to metabolize a wide range of natural and xenobiotic compounds. PGPR was isolated from the roots of stevia plant for the Biochemical test. Biochemical characterization of the isolated bacterial strain was done. When subjected to gram staining it was found to be gram negative bacteria and the morphology as observed under the microscope was rod shaped. The isolate gave negative result for the Catalase test. Further, Oxidase test will be done which will aid in identification of the bacteria.

Keywords: *Stevia rebaudiana,* Biochemical Characterization, Plant growth promoting rhizobacteria (PGPR)

B - 062

IDENTIFICATION OF GCC BOX IN THE PROMOTER REGION OF UBIQUINOL CYTOCHROME C CHAPERONE GENE USING MOLECULAR BEACON PROBE AND ITS *IN SILICO* PROTEIN-DNA INTERACTION STUDY IN RICE (*ORYZA SATIVA* L.)

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Rice is the primary staple food for more than half of the world's population but very sensitive to various abiotic stresses (submergence) causing crop loss. During abiotic stresses various genes are differentially expressed to cope up with the stress conditions. The identification of *Sub1A* gene was a major breakthrough for the submergence tolerance which often regulates other genes by binding to their consensus promoter motifs such as GCC box. It was observed that Ubiquinol Cytochrome C chaperone (*UCCC*) gene was among many up-regulated differentially co-expressed genes having GCC box as a conserved motif. The primary role of *UCCC* gene is oxidative respiration but also has imperative secondary functions in plants. Therefore, *UCCC* gene was selected for the identification of GCC Box in the promoter region using Molecular Beacon Probe based Real Time PCR and their interaction with Sub1A protein. Real Time PCR analysis confirmed the presence of GCC box. Subsequently, the interaction of Sub1A with GCC box was studied through HADDOCK server. Protein-DNA interaction thus, suggested significant binding affinity of Sub1A towards GCC box present in the promoter region of *UCCC* gene.

Keywords: 3D-DART, Differentially expressed genes, HADDOCK, I-TASSER Oryza sativa, Sub1A, Ubiquinol Cytochrome C Chaperone gene

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B - 063

BACTERIOCIN ACTIVITY OF BACTERIAL ISOLATES FROM DIFFERENT ENVIRONMENTS AGAINST*STAPHYLOCOCCAL* ISOLATES FROM PROCESSED FROZEN FISH SAMPLES OF RATNAGIRI DISTRICT (MAHARASHTRA STATE), INDIA

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The Ratnagiri district is well knownfor best quality fish capture and export. The processed frozen fish typessuch as*Itoyori, Lizard fish, Croaker, L Sardine, L Jacket* and *Ribbon* fishesare exported to different countries.However, many a times processed frozen fish samples receive rejection due to presence of *Staphylococcus aureus* which is known pathogen and hence needs to be controlled. The conventional methods are impracticable to control *Staphylococcus aureus*and use of nonconventional, safe and eco-friendly methods is need of time.

In the present investigation, *Staphylococcus aureus*isolates obtained from processed frozen fish samples were preserved at 4^{o}c. The bacterial isolates from different environments like soil, water, plants and food materials were studied for antagonism against *Staphylococcus aureus*isolates.

Out of total 94 bacterial isolates aimed for bacteriocin production, 14 showed inhibitory action against *Staphylococcus aureus*isolates of processed frozen fish samples. Out of these 14 isolates, 4 were lactic acid bacteria, 3 were Gram positive endospore producing rods, 3 were Gram negative rods and 4 were Gram positive cocci.Ability of bacteriocinproduction was studied using purification by salt precipitation (ammonium sulphate), Solvent extraction (chloroform 2:1 methanol) and confirmation of protein nature of bacteriocin by inactivation of inhibitory ability after exposure to proteolytic agents like trypsin, pepsin and urea. Two bacterial isolates were observed to be promising onesfor bacteriocin production. After optimisation of production process, these isolates can be further exploited for control of *Staphylococcus aureus*in the contaminated processed frozen fish samples to improve its global acceptability and reduce the losses of fishermen in India.

Keywords: Bacteriocin, Environmental isolates,*Staphylococcus aureus*, frozen fishes

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B - 064

POTENTIAL OF MICROALGAE: PHYCOREMEDIATION, BIOMASS AND BIODIESEL PRODUCTION – A FIELD PILOT STUDY

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The organic and inorganic substances which were released into the environment as a result of domestic, agricultural and industrial water activities lead to organic and inorganic pollution. The pollution, an ever increasing problem throughout the world, is the introduction of substance or energy into the environment resulting in deleterious effects such as endangering human health, harming living resources and ecosystem. Industrial effluents are conventionally treated using a variety of hazardous chemicals for pH correction, sludge removal, colour removal and odour removal. The extensive use of chemicals for effluent treatment results in huge amount of sludge which forms the so called hazardous solid waste generated by the industry and finally disposed by depositing them in landfills. Algal technology avoids use of chemicals and the whole process of effluent treatment is simplified and eco-friendly. The research of cultivation of algae on waste streams for wastewater treatment was conducted as early as the 1950s, and the symbiotic algal-bacterial relationship in waste stabilization pond was first proposed in which algae were used as tiny aeration devices to provide large amount of Oxygen (O_2) through photosynthesis for aerobic bacteria to oxidize and degrade the organic compounds in wastewaters while heterotrophic bacteria concomitantly release CO_2 and the nutrients needed by microalgae during photosynthesis. Phycoremediation is an option that offers the possibility to destroy or render harmless various contaminants using natural biological activity of algae. As such, it uses relatively low-cost, low-technology techniques, which generally have a high public acceptance and can often be carried out on site.

In the present investigation of chrome sludge from an electroplating industry and both combined effluent and dye bath effluent from textile dyeing industry was screened using micro algae *Chlamydomonas pertusa, Chlorella conglomerata, Chlorella vulgaris, Chlorococcum humicola, Chlorococcum vitiosum, Chroococcus turgidus, Dactylococcopsis raphioides, Desmococcus olivaceus, Scenedesmus dimorphus* and *Scenedesmus incrassatulus* were conducted in the laboratory and field level of pilot study. Chrome sludge of electroplating industry was treated with micro alga, *Desmococcus olivaceus* (Persoon ex Acharius) JR Laundon and supported algal growth in the laboratory and open raceway pond. There was a considerable amount of sludge reduction and biomass production in open raceway pond amended with chrome sludge. Textile dyeing effluents supported very good growth of micro algae, *Chlorococcum humicola* (Naegeli) Rabenhorst in the laboratory and field level of pilot study. The pilot tank trials were conducted using slope tanks in the industry. *Chlorococcum humicola* could effectively grow and remediate the effluent by reducing BOD, COD, turbidity, colour, odour, TSS, total hardness, calcium etc., there was also a significant reduction of sludge and biomass production. The lipid analysis algal biomass showed the existence of a single fatty acid in major composition and a very little unsaturation which is essential for biodiesel production. GC-MS analysis of *Chlorococcum humicola* showed 91 - 94% of total saturated fatty acids content, which suggests that it is highly suitable for biodiesel production. *Chlorococcum humicola* has a great potential of being a feed stock for biodiesel production inspite of low lipid content.

Keywords: Microalgae, *Desmococcus olivaceus*, *Chlorococcum humicola,* Phycoremediation, Electroplating chrome sludge, Textile dyeing effluent, Field pilot experiment, Biomass and Biofuel production

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B - 065

EFFECT OF SEEDING ANAEROBIC GRANULAR SLUDGE TOWARDS SIMULTANEOUS REMOVAL OF NITROGENOUS AND CARBONACEOUS SUBSTRATE IN AHR

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Majority of industrial effluents contain both organic matter (OM) and nitrogen, which serves as one of the major limitations in field-scale application of anaerobic ammonium oxidation (anammox) process. Anammox is a novel microbiological approach that has changed the traditional concept of biological nitrogen removal. The process facilitates direct oxidation of ammonium nitrogen into nitrogen gas under anoxic conditions with nitrite as an electron acceptor. This study explored the underlying hypothesis of seeding anaerobic granular sludge to facilitate simultaneous reduction of both carbonaceous and nitrogenous substrate. Anaerobic granular sludge collected from high rate UASB reactor treating coke oven wastewater was seeded in laboratory-scale anammox hybrid reactors (AHR) in different seed ratios, i.e., 0.2, 0.4, 0.6 and 0.8. AHR demonstrated excellent symbiosis between different functional pathways, viz., anammox, denitrification and anaerobic degradation, which resulted synergistic removal of both OM (95.4%) and nitrogen (97.4%) at optimal seeding ratio of 0.6. The contribution of various pathways, viz., anammox, denitrification and anaerobic degradation towards nitrogen and OM removal was also worked out. The increase in COD/TN ratio (0.04-1.67) resulted decline in anammox contribution (67.8% to 23.5%) while the denitrifiers and anaerobes were predominant at higher COD/TN ratio. The study opens the door for researchers and scientists for field-scale testing and demonstration of the process for wide varieties of industrial wastewaters.

Keywords: anammox, denitrification, anaerobic degradation, symbiosis, pathways

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B - 066

HOST-INDUCED SILENCING OF THE *CgCOM1* GENE PROTECTS TOMATO AND CHILLI PLANTS FROM THE ANTHRACNOSE DISEASE-CAUSING FUNGAL PATHOGEN *COLLETOTRICHUM*

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Anthracnose disease is caused by ascomycetes fungus, *Colletotrichum spp.* which is responsible for heavy yield loss in tomato and chilli worldwide. Here we report the Host-Induced Gene Silencing (HIGS) of an essential *Colletotrichum gloeosporioides* virulence gene, *Conidial Morphology 1* (*CgCOM1*) involved in fungal conidial and appresorium development, as a method to enhance resistance of tomato (*Solanum lycopersicum* var. Pusa Rohini and Pusa Early Dwarf) and chilli (*Capsicum annuum* var. Pusa Jwala and Pusa Sadabahar) plants against *Colletotrichum sp.* For this study, we have developed stable transgenic lines of tomato and chilli using the RNAi construct of the fungal pathogen gene *CgCOM1* employing *Agrobacterium*-mediated transformation. Transgenic plants were characterized by molecular and gene expression analyses. Fungal challenge assays on leaves and fruits showed that the transgenic lines were resistant to anthracnose disease-causing *Collectotrichum sp*. in comparison to the wild-type leaves and fruits. Our study showed that HIGS (Host-Induced Gene Silencing) can be used to suppress the expression of fungal developmental genes to inhibit the growth of disease causing *Collectotrichum sp*., thus conferring the host plant ability to resist pathogen attack.

Keywords: HIGS, RNAi, *CgCOM1*, *C. gloeosporioides*, Anthracnose

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B - 067

PRODUCTION OF VALUE-ADDED METHOXYPHENOLS BY MICROBIAL TRANSFORMATION OF EUGENOL

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Over the past few years, due to increasing consumer's interest towards the use of natural food products, market demand of the aromatic compounds that plays important role in the development of flavour and fragrance are also increasing. Hence, food industries have encouraged remarkable efforts towards the development of biotechnological processes for the production of flavor compounds. The world's most popular flavor, vanillin, is no exception. This work deals with isolation and screening of microorganisms capable of biotransformation of eugenol to value-added compounds such as ferulic acid and vanillin. Eugenol has a great potential as a starting material for the synthesis of aromatic flavorings and aromas as it is a natural renewable resource and the transformation processes using eugenol as substrate are environmentally friendly. Isolation of 10 morphologically different bacterial strain were performed using enrichment culture technique followed by their screening. Total 15 bacterial isolates were screened including bacterial culture obtained from the departmental culture collection and found capable of utilizing eugenol at a concentration of 0.01% and biotransform it into methoxypenol derivatives like ferulic acid, coniferyl aldehyde and vanillin. The products were confirmed by high performance liquid chromatography (HPLC) and UV–vis spectroscopy.

Keyword: Eugenol, Feruic acid, Vanillin, Biotransformation

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B - 068

POTENTIAL USE OF WASTEWATER MICRO-ORGANISMS TO ELIMINATE MICROPOLLUTANT TRICLOSAN FROM ENVIRONMENT

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Triclosan, an environmental pollutant which is being released from a large number of household items and healthcare products is creating a havoc not only ecologically but is adversely affecting human body as well. Triclosan belongs to a class of compounds which are considered potent carcinogens and are established endocrine disruptors. Triclosan is a CNS depressant and also induces membrane hyperpolarization by increasing intracellular Ca^{2+} concentration that activates Ca^{2+}-dependent K^{+} channels in human body. Being lipophilic in nature, Triclosan is capable of accumulating in different organisms higher we move the food chain. Various chemical and physical methods have been employed to remove Triclosan from the environment but these methods are not environment-friendly. Research is being carried out to employ biotechnological routes for its removal. One such approach is Biodegradation which is the main focus of this study. The main objective of this study is to isolate and screen different micro-organisms which can be employed to effectively remove Triclosan from our wastewater system. A total of 12 morphologically distinct bacterial colonies were isolated capable of utilizing Triclosan as a sole carbon source when grown in M9 Mineral Salts Media. The isolates were further screened in different minimal media with yeast extract and without yeast extract to establish a defined media to support maximum growth of these isolates in presence of Triclosan (0.2%). The screened isolate was identified biochemically using Bergey's Manual of Determinative Bacteriology.

Keywords: Carcinogen, CNS depressant, Membrane hyperpolarization, Catechol, UV-Visible Spectrophotometer

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B - 069

QUALITY OF CULTURED SHRIMP FROM INDIAN SUNDARBANS IN CONTEXT TO MICROBIAL LOAD

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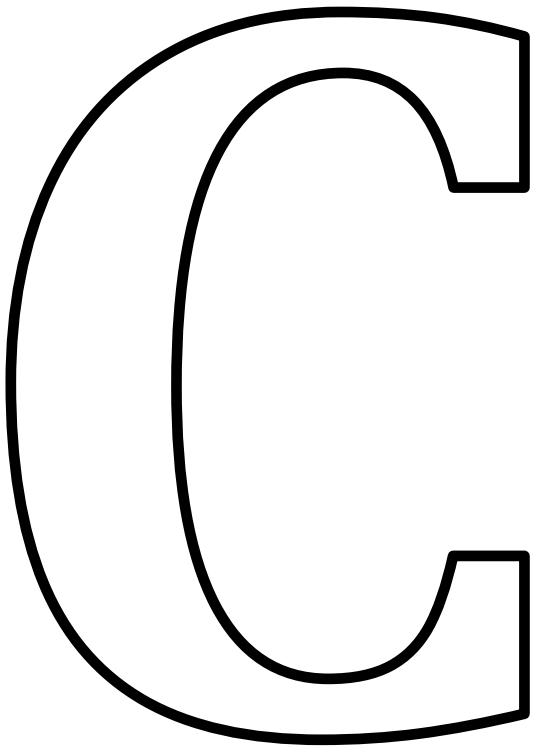
Fecal coliform and Total coliform count were done in Penaeus monodon collected from two different islands of Indian Sundarbans namely Bali and Chotomollakhali. The count was higher in the shrimp sample, water and sediment collected from Chotomollakhali Island where the shrimps were not fed with feed containing additives (garlic extract). In Bali Island the cultured shrimps were fed with feed containing additives (garlic extract) and seaweed based protein. This formulated natural feed not only boosted up the shrimp growth but also arrested the microbial load to a considerable level.

Keywords: Penaeus monodon, quality, Indian Sundarbans, microbial load



Biodiversity Dynamics and Crisis

C - 001

INDIGENOUS KNOWLEDGE SYSTEM AND SUSTAINABLE LIVELIHOOD PRACTICES OF THE LIMBU TRIBE (A STUDY IN KALIMPONG SUBDIVISION OF DARJEELING DISTRICT OF WEST BENGAL)

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Indigenous knowledge has been defined as the knowledge acquired by local peoples and indigenous people over many hundred years through direct contact with the environment which passes on from one generation to other. By the very nature of their habitat and ecology, the tribals depend heavily on forest for their survival, livelihood, occupation and recreations. Indigenous people are very near to nature and use varieties of skills and ways to conserve the natural recourses like kirati community.

The kirat people were found to be rich in indigenous knowledge, skill and practices especially for the utilization of medicinal plants and livelihood purposes. Among these, Limbu is the most dominant indigenous tribe and one of the oldest communities and are largely concentrated in the Darjeeling District in West Bengal, India. They were using such knowledge, skill and practices to protect the rich and varied biodiversity in unwritten form and such knowledge, skill and practices are being transferred from generation to generation.

Indigenous traditional knowledge of Limbu tribe has contributed a lot in biodiversity conservation in the past, but at present context these kinds of knowledge are disappearing since the tribe is facing lot of problem. The diverse indigenous knowledge of the Limbu tribe is on the verge of extinction due to different reasons such as globalization, industrialization, urbanization that has led to environmental degradation, habitat loss and climate change.

Attempt has been made in this research paper to make a deep analysis of the indigenous knowledge system of the Limbu tribe with regard to biodiversity conservation. Particular attention has been paid to develop and evaluate sustainable livelihood practices of the community and recommend measures to protect them from environmental hazards.

Keywords: Indigenous, Limbu, environmental degradation, sustainable, biodiversity

C - 002

EFFECT OF SEASONAL VARIATIONS ON THE LIFE CYCLE OF A CALLIPHORID FLY *CHRYOSOMYAMEGACEPHALA* (FABRICIUS, 1794)

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Forensic entomology is defined as knowledge about insect and its relationship with a decomposed body. With this knowledge, post-mortem interval (PMI) can be estimated. PMI can be determined by taking into consideration the insect evidence and the developmental stage of the insects. A PMI estimation is based either on insect developmental rates oron insect colonization and succession patterns of carrion and insect activity are highly influenced by temperature, which can vary, based on season and geographic location.

Chrysomyamegacephala (Fabricius, 1794), is one of the Calliphorid flies with forensic and medical importance has been studied for the effect of seasonal variations in its life cycle duration and morphological parameters. Results show that in summer season life cycle of the fly is completed in 212 hrs. In rainy and winter season life cycle is completed in 246 hrs. and 305 hrs. respectively. In summer temperature was high so life cycle of the fly was completed within a short duration and size of the maggots was small at each stage as compared to winter and rainy season. Length, width, and weight of the maggots recorded more in the rainy season and life cycle duration was prolonged.

Carrion decomposition studies conducted in various geographic locations and during varying seasons within one geographic location are therefore a necessity in developing baseline data for use in the field of forensic entomology. Carrion decomposition studies conducted in various geographic locations and among seasons within one geographic location are therefore a necessity in developing a baseline data set for use in the field of forensicentomology.

The purpose of this study is to investigate seasonal and regional differences in carrion decomposition patterns and carrion blow fly communities from Osmanabd district (MH). To date, no seasonal or regional studies have been conducted in this area. This affords an excellent opportunity to make a significant contribution to the baseline database used in forensicentomology.

Keywords: *Chrysomyamegacephala*, temperature, humidity, entomology, developmental, cadavers

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C - 003

DENSITY, POPULATION STRUCTURE AND BIOMASS STOCKPILE OF TREE SPECIES IN JAVADHU HILLS SOUTHERN EASTERN GHATS, TAMIL NADU, INDIA

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India is a home for mega biodiversity spot. Conserving the Tree species is very important to protect their genetic pool *in situ*. A quantitative ecological study was conducted in Javadhu hills to estimate density, population structure and biomass stockpile of all tree species in 10 hectare plot in the study area. Trees of size 10cm DBH (Diameter at Breast Height) were measured and tagged with consecutive numbered tags. Density, population structure and biomass stockpile of species' varied across the study plots. There are 44 genera, 62 species belonged to 22 families were documented. Density ranged from 1 to 1085 $ha^{-10,}$ basal area varied from 0.02 to 45.53 m^2 ha^{-10}. Likewise, frequency and abundance also varied in study area. Anthropogenic impacts on tree population were also studied. Conservation measures are very much essential to protect this valuable species from over exploitation and extinction from on natural resources

Keywords: anthropogenic effect, Eastern Ghats, tropical forest, south India

C - 004

A SURVEY OF ANGIOSPERMIC MACROPHYTES IN BIOREMEDIATION PROCESS AROUND WATER BODIES IN NANDED DISTRICT IN MARATHWADA (MAHARASTRA STATE)

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Bioremidiation is a natural process involving microbes to Macrophytes. Macrophytes are Angiospermic plants growing near water or inside the water bodies. The absorption of minerals from the soil is a natural process but some plants absorb various useful and harmful elements beyond their osmotic potential i.e. against the concentration gradient. Such plants are useful in pollution control around the cities situated on river bank. The present study enlist some such Macrophytes from Nanded District of Maharashtra state. The probable element absorbed by these plants is also being depicted herewith.

Keywords: Bioremediation, macrophytes, pollution control, Nanded district

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C - 005

EFFECT OF FERTILIZER ON THE PRODUCTION OF MULBERRY (*MORUS ALBA* L.) VARIETY M5

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A field experiment was conducted at mulberry garden at Pandharpur tashil, Solapur (M.S). The experiment was conducted during 2014-2015 and 2015-2016. The experiment consisting of M5 mulberry variety, the selected plot is designed which having 2 types of spacing namely 3'× 3', 3'× 2' and different fertilizer doses. The present investigation is shows that the impact of M5 (3'×3') spacing type and T1 (NPK) fertilizer treatment on leaves weight as well as height of plant which shows positive results.

Keywords: Mulberry Variety, Spacing, Fertilizers, Leaf Production.

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C - 006

VARIATION IN THE FLORAL MORPHOLOGY OF MADAGASCAR PERIWINKLE IN DIFFERENT WEATHER CONDITIONS

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Catharanthus roseus (L) God Don; 1837 is commonly called as sadabhar. It is an exotic plant and in Mexico it is called as Madagascar periwinkle or rosy periwinkle. It is a species of flowering plant in the dogbane family Apocynaceae. It is native and endemic to Madagascar but now is grown as ornamental and medicinal plant worldwide. It is a drug source of vincristine and vinblastine used to treat cancer. It was formally called as *Vinca rosea.* In the present study the morphological variations in the flowers of the same bush were observed in different seasons.

The flowers exhibited different shape and size depending upon various weather conditions. The flowers were large and healthy during the rainy season. The size varying between 3.5-4.5 cm. in diameter. Whereas during the winter months (Nov-Jan) the flowers size showed marked reduction. It being between 0.8 -1.5 cm in diameter. Again in summer months the size of the flowers was below normal. Also the different flowers parts namely sepals, petals, stamens and carpels exhibited variations in size. The two follicles did not set in the winter months. However fruits were present during rains and less so in summer.

Keywords: exotic, endemic, vincristine, season

C - 007

AVIFAUNAL DIVERSITY OF THE ARID AND SEMI-ARID HABITATS OF RAJASTHAN, INDIA

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The state of Rajasthan falls in the arid and semi-arid regions of India with the great variation in precipitation. The green cover is mostly the feature of the rainfed sites of Aravallis. Due to development of canals resulting into the increase in irrigated agriculture, the western half is providing the opportunity of developing green spaces in form of agro-ecosystem. The man-made ecosystems such as urban green spaces and agro-ecosystem have high biological diversity, including both remnant species and species purposefully or unintentionally introduced by human actions. There can be important habitats and valuable corridors for both common and less common species. To assess the avifaunal diversity of these habitats in the changing perspective, we aimed to investigate the sites in different conditions and compared it with the different regions of the state. The investigation also included habitats from human settlements and agricultural fields in form of altered to unaltered gradient. The sample sites included sites of fourteen districts from western half, central hilly terrains, southern plateau and eastern half of Rajasthan. Eleven first level habitat types were recognized based on the IUCN categorization of habitats. Over 325 species were recorded from different sites, out of which approx. 70% species were resident of the investigating area. About 110 species were from wetland habitats. Around 200 species were distributed in all the habitats irrespective of human settlements but near about 40 species were recorded only from the wild habitats away from human settlements. The districts of eastern half of Rajasthan harboured great diversity followed by the southern districts. Twenty-five species of global importance were recorded from different sites. The globally threatened species include three critically endangered vulture species, namely Indian White-backed (*Gyps bengalensis*), Long-billed (*Gyps indicus*) and Red-headed (*Sarcogyps calvus*); two endangered species Egyptian Vulture (*Neophron percnopterus*) and Lesser Florican (*Sypheotides indica*); six vulnerable species Dalmatian Pelican (*Pelecanus crispus*), Lesser White-fronted Goose (*Anser erythropus*), Lesser Kestrel (*Falco naumanni*), Sarus Crane (*Grus antigone*), Indian Skimmer (*Rynchops albicollis*), Pied Tit (*Parus nuchalis*) and Green Avadavat (*Amandava formosa*). Sites alongside Chambal River were recognized for the presence of vulture species whereas Abu Hills were mainly identified as hotspot for the Green Avadavat. The grassland habitats of southern half were harbouring the Lesser Florican whereas Sarus Crane harboured wetland habitats of southern most districts at large. The diversity of avifauna is taken for identifying the importance of urban biodiversity for each district head quarter. This investigation was an attempt to collate all the researches carried out by the authors in the study area and to call the integrative research by studying relationships between the anthropogenic activities and urban biodiversity of the cities from the parts of Rajasthan.

Keywords: avifauna, diversity, habitats and Rajasthan

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C - 008

COMMUNITY SENSITIZATION FOR CONSERVATION OF SACRED GROVES (DEVRAIS), BY MAHARASHTRA VRUKSHA SAMVARDHINI, PUNE, MAHARASHTRA

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Sacred groves in western Maharashtra are patches of forest preserved on religious ground. Only these preserved forest patches remain undamaged whereas the surrounding areas have scanty or eroded vegetation. Many studies show that the floristic surveys and ecology of sacred groves were carried out by different groups, scientists and ecologist. In this respect, special scientific community got involved for such survey and published research papers/articles in national and international journals. Local people have conserved these sacred groves for generations due to their devotion and belief system towards the Deity in Sacred Groves and these deities are still being worshipped in a traditional way as per local customs and taboos, etc. Commonurbanites even if highly educated do not comprehend the importance of sacred groves in nature conservation or the role of local people in the conservation.

Conservation is possible only after awareness. We, the members of Maharashtra Vruksha Samvardhini, a Pune based NGO, working in nature conservation realized this need. Hence we started a project Mission Devari to communicate and sensitise the community and the society about sacred groves. We conducted various awareness programmes. Participants from different walks of life expressed their desire to know more about sacred groves. Maharashtra Vruksha Samvardhini organized field visits to give experience of the sacred groves to the community.

In this respect, field visits in Sacred Groves were organized in Devrais located near Velha, Mulshi & Ambegaon Talukas of Pune District. More than 10 visits were conducted between June 2015 and November 2016 in different seasons. In these visits, people belonging to different fields and having affinity towards nature participated. Each one was very much eager to visit Devrai, and wanted to know the flora, fauna and traditional knowledge of local people. Every visit consists of about 15 participants belonging to different age groups. Feedback forms were given to each participant and their observations were recorded.

Mission Devrai reached out to the students of Department of Environmental Science, S.P. Pune University by giving different projects related to Devrai/Sacred Grove concept and its conservation issue. Seven students focused their attention towards ecology and ecosystem studies and created awareness of conservation. We also educated British students of IISER on different aspects of Devrai and gave them the first-hand experience through field visit. We also provided necessary expertise and guidance to the first year post-graduate students of IISER on their 'Earth Medicine' project. All these efforts are necessary for community either rural or urban to understand nature conservation.

Most of the participants appreciated sacred groves and are coming forward to participate in the movement of Mission Devrai for conservation of sacred groves.

Keywords: Community, Sacred Groves Conservation, Field Visits

C - 009

KANWAR LAKE: A DYING WETLAND ECOSYSTEM

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Kanwar Lake, as it is locally called, is located 22 km north-west of Begusarai district. It is a residual oxbow lake, formed due to meandering of Gandak River, a tributary of Ganga, in the geological past. Once a heaven for migratory birds, the Kanwar Lake in Bihar, Asia's largest freshwater oxbow lake, is today a dying wetland ecosystem. A recent meeting on "Wetland Governance in South Asia", held in Delhi, discussed whether this lake can be saved if it is declared a Ramsar site. Kanwar Lake was declared a notified area under the Wildlife (Protection) Act of 1972. To check poaching of birds, it was declared a protected zone by the Bihar state government in 1986; the government of India declared it a bird sanctuary in 1989. The authorities had notified 15,000 acres in the area as wetland, which makes it six times bigger than Kaladeo National Park in Bharatpur. But the legal protection accorded to the wetland seems to have been of little help. It is shrinking fast. The lake covered 6,786 ha in 1984, which reduced to 6,043.825 ha in 2004. By 2012, the lake area had reduced to a mere 2,032 ha (Ashok Ghosh). Kanwar lake is a habitat for many critically endangered like Oriental white-backed vulture, vulnerable and near threatened birds. Till the 1980s, the lake was one of the largest breeding grounds for migratory birds. But now poachers and trappers have taken over, leading to a steep decline in bird population. Poisonous pesticides used in farming also pose a major threat to the birds in the area. This wetland is also needed to put a stop to land deals. According to SAEE, massive inflow of silt is decreasing the depth of the lake. Every year, about 3.8 cm of silt is deposited in the Kanwar Lake. Weeds have spread across the marshy wetland, leading to the loss of lake's natural biodiversity. Extensive deforestation, overgrazing, unsustainable agricultural practices, and over exploitation of biomass for fuel, fodder and timber purposes have stripped the land of its natural vegetation cover, resulting in erosion. The lake bed has been encroached extensively by the rich farmers and local peoples. Researchers suggested that comprehensive management of wetland and its buffer zone should be taken up involving active participation of the stakeholders. A strong legal framework is needed for the protection of this notified area said environmental lawyers. For this mapping of the original extent of the lake needs to be undertaken and then notified. Mapping of wetland and the catchment area should be done by a committee that includes panchayat representatives and other stakeholders so that there is no further encroachment Wetland and the canal connecting the wetland and river should be desilted so that inflow and outflow mechanism becomes active. Removal of encroachment and illegal farming from the lake bed No pollutant should be allowed to enter the water body. Awareness and capacity building programmes need to be undertaken for the stakeholders for the management of the lake. By these activities we can control and revive the biodiversity of Kanwar Lake.

Keywords: Wetland, Biodiversity, Encroachment, Revive.

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C - 010

DIVERSITY AND SYSTEMATIC ACCOUNT OF PHYTOPHAGOUS MITE (ACARI: ERIOPHYOIDEA) OF TWO NORTHERN DISTRICTS OF WEST BENGAL, INDIA

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Among the Acarieriophyoid mites are second largest group with regard to their economic importance as phytophagouspests throughout the world (Lindquist *et al*., 1996). The great diversity of these tiny plant feeders is related to their extreme hostspecificity and intimate host relationships. Several of them are directly responsible for developing various disease symptoms in plants viz. blisters, galls,erinea, big bud, rusting fruits, spoiling blossoms, blasting buds, Besides direct injury they are also known to transmit viruses to the plant body.

The present work deals with the systematic study of eriophyoids mites made during the period from 2008 to 2015 in two northern districts namely, Malda and DakshinDinajpurof West Bengal, India. The objective of this work is to explore the eriophyoid fauna of the area, to provide a taxonomic account of these mites and to record nature of damages inflicted by these mites to their host plants.

Studies on this group reveals thataltogether 51 eriophyoid species in 28 genera under 8 tribes of 6 subfamilies under two 2 families are known from this area. Of these species, 27 are in the subfamily Phyllocoptinae, 8 in Diptilomiopinae, 6 in Eriophyinae, 2 in Rhyncaphytoptinae, 4 each in Nothopodinae and Cecidophyinae. Maximum number of species (8) are found under the genus *Diptilomiopus* Nalepa. Out of these 19 species are considered new to science. During the period of the work 6 new species have been described. 31 species are reported for the first time from this area. The host plants recorded so far include 26 economically important species including herbs, shrubs and trees. Rest 17 host plants are wild. Three species are recorded for the first time from India. The rest species are also recorded from the area for the first time. The plant families with highest number of eriophyoid species (ES) recorded from this area are Moraceae (8 ES) followed by Anacardiaceae (6 ES), Apocynaceae (4 ES), Rubiaceae (4 ES) and Euphorbiaceae (3 ES). Other plant families are found to harbour 1 or 2 eriophyoid species.

The systematic account of these species, their period of infestation, nature of damage and host association are discussed in this paper.

Keywords: eriophyoid mite, taxonomic account, host association, West Bengal, India

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C - 011

ORCHID FLORA IN JHARKHAND AND THEIR ETHNO-MEDICINAL USES

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Orchids are delicate flowers but highly loved for luxury, beauty and strength. Their appearance especially their geometrically shaped petals makes them highly desirable and exotic. Orchids are considered to be the 14th anniversary flowers. In the flower shop, orchids are the highly priced flowers. They add an elegance and beauty to the flower arrangements and decoration. Pink orchids convey affection, white orchids signify purity, red orchids represent love and understanding and yellow orchids represent fertility. Orchids are very specific to their climatic habitat for their growth and flowering. Some of the states of India have rich orchid diversity and orchids are grown for commercial purpose through tissue culture methods. In Jharkhand too there are orchids which are specific to this region. Orchids usually grow on the trees as an epiphyte but some are terrestrial too. Orchids are used in the treatment of ear ache, dropsy, to kill maggots, skin diseases, diarrhoea, headache, muscles pain etc. This research aims to document orchid species found in Jharkhand and their ethno medicinal uses that they can be preserved in Orchid house.

Keywords: Orchid, Jharkhand, ethno- medicinal

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C - 012

TOTEMIC BELIEF AND BIODIVERSITY CONSERVATION AMONG THE MUNDA AND ORAON TRIBES

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Biodiversity depletion has been a major concern to mankind. The used of indigenous belief by some communities has been reported to assist in the conservation of biodiversity. Therefore, this study was conducted with the aim of identifying such beliefs that have been used or are still being used as tools for biodiversity conservation by Oraon and Munda tribes. Oraon and Munda have a tradition of totemism; they name their clan after plants, animals and other objects of their daily needs or environment. Both in depth interview with key informants and group discussion methods were used. It was found that many totems which included, animals, plants and animals and shrines exert significant influence in the conservation of biodiversity in the study area.

Keywords: Totemic, Biodiversity, conservation, Oraon, Munda

C - 013

SERPENTINE VEGETATION OF ANDAMAN, INDIA: A UNIQUE ECOSYSTEM

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Serpentines are reported to occur over wide areas at or near the surface in Andaman group of islands of India. Rutland Island and Chidyatappu in the South Andaman and the Saddle hills in the North Andaman possess ophiolites in contiguous blocks covering appreciable areas. The soils have low nutrient content and contain high amount of nickel which may vary from 2700- 10100 µg g-1. The vegetation was found to be evergreen broad-leaved sclerophyllous scrub having trees never exceeding 4-5 m in height and the vegetation is very unique of its type. This type occurs at 350m and above on eroded lateritic soils on ridges or even at lower elevations and are sharply distinguishable from the non-serpentine vegetation. The vegetation also includes some nickel hyperaccumulators that are restricted to the soil and many of these plants are rare. Saddle hill forms the major part of the North Andaman Biosphere and strict enforcement of restrictions is needed. Rutland Island should also be declared as a protected area. Exploitation of the forests, chiefly by the settlers, should be contained. An awareness of protection and conservation is of urgent need to protect this unique habitat.

Keywords: Andaman, ophiolites, sclerophyllous vegetation

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C - 014

DIVERSITY OF BUTTERCUPS (RANUNCULUSL.) AND THEIR CHANGING DEMOGRAPHY IN KASHMIR HIMALAYA

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Kashmir Himalaya, constituting part of the Great Himalayan Range, represents a repository of buttercups growing at different altitudes from plains to subalpine/alpine meadows.Belonging to genus *Ranunculus* L. they are terrestrialor aquatic, annual or perennial,represented by 18 species (viz., *R. arvensis, R. brotherusii, R. chaerophyllos, R. hirtellus, R. hyperboreus, R. laetus, R. lingua, R. membranaceus, R. munroanus, R. muricatus, R. natans, R. palmatifidus, R. pulchellus, R. rubrocalyx, R. sceleratus, R. trichophyllus, R. tricuspis,* and*R. trilobus*) in the study area. Of these *R. arvensis, R. laetus, R. muricatus,* and *R. sceleratus* are the most common species growing in plains. In the present work an attempt has been made to assess their changing demography. Due to unsustainable developmental activities in Kashmir valley and overgrazing by sheep and cattle in pastures,*R. lingua,R rubrocalyx*and *R. munroanus,* with sparse populations only in the valley, have become threatened, hence need to be conserved. *R. hirtellus*, mostly growing under the shade of *Abies* and *Betula*at higher altitudes and subalpine/alpinemeadows of Kashmir valley,is becoming threatened due to overgrazing,habitat loss on account of natural catastrophes like landslides and indiscriminate cutting of pine trees for commercial purposes and other developmental activities. On the other hand, the size and number of populations of *R. sceleratus,* the celery-leaved buttercup, are increasing at an alarming pace due to eutrophication of water bodies. *R. trilobus,* the three-lobed buttercup, has recently got introduced from subtropical parts of India into the valley and is successfully competing with and replacing already existing populations of *R. arvensis* due to its higher seed output (10-fold) as compared to the latter and more than 90% seed germination. Due to loss of microhabitat, which is so fragile in subalpine/alpine heaths, by natural causes and anthropogenic activities particularly unregulated masstourism, some of the buttercups (viz., *R. diffusus, R. kamchaticus, R. jacquemontii,R. rufosepalus*) reported earlier by some authors from the study area have not been found despite exhaustive survey.

Keywords: *Ranunculus*, Buttercups, Kashmir Himalaya, alpine/subalpine meadows, unsustainable development

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C - 015

BREEDING BEHAVIOUR OF TICKLESTHRUSH (*TURDUS UNICOLOR*) IN KASHMIR VALLEY

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The present study was carried out in District Kupwara during spring and summer months to study some breeding parameters of Tickil's thrush and to know the possible reasons responsible for decline of bird population observed in last few years. The main reasons found responsible for decline of its population are:-

- Habitat destruction due to conversion of orchard land for residential and commercial purposes.
- Imbalance in prey predator ratio.
- Scarcity of food during breeding season.

Nest building was observed from mid-April and continued till mid-June. Nests were preferably made on walnut, mulberry, pear, peach, apricot, apple willow and popular trees. Dry delicate grass, root hair, animal hair, cotton / nylon fibres and wet mosses were used as nest material Eggs laying was initiated in the month of April ,3 to 5 eggs were laid in nests with the rhythm of one on each day or alternately. The mean clutch size recorded was 3.5 eggs and average incubation period noted was 437 hours (18.5days).

Keywords: Tickil's thrush, breeding, hatchling

C - 016

MAN-ANIMAL CONFLICT WITH REFERENCE TO MAN-EATING TIGERS OF SUNDARBAN

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Man-animal conflict has been a hallmark feature of human society in many localities close to prime wildlife habitats. The world's largest mangrove forest of Sundarban spanning over a large area of the Gangetic delta of India and Bangladesh is home to a significant population of Bengal tigers (*Panthera tigris tigris*). From time immemorial, these swamp tigers have become largely infamous for their man-eating habits. Many aspects of the biology of these tigers, living in a terrain which is hostile and difficult to access, still remains incompletely understood. In spite of a number of measures, reports of tiger attack on man still pour in, sometimes with fatal consequences on either side. The reasons for the unusual aggression of Sundarban tigers towards man are still largely speculative. Some of the reasons that have been cited with fair amount of uncertainty are discomfort in stomach due to salt water, developing a taste for human flesh through corpses, mistaken identity due to postural similarities with their natural prey, inability to hunt prey because of old age or injury and close proximity of human habitat with frequent encounters with honey and wood collectors. Whatever be the cause, this habit has often resulted in man-animal conflict with fatalities on both sides. The incidents of man-eating has significantly reduced these days with good management practices but an in-depth and thorough scientific study in this regard still remains the need of the day.

Keywords: Sundarbans, man-animal, conflict, management

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C - 017

IDENTIFICATION OF THREAT CATEGORIES OF FLORISTIC DIVERSITY AND ITS PRIORITIZATION FOR CONSERVATION TO DEVELOP MANAGEMENT STRATEGIES IN TIRTHAN WILDLIFE SANCTUARY OF DISTRICT KULLU, HIMACHAL PRADESH, NORTH WESTERN HIMALAYA

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Human settlements at a place normally starts with the cutting down of trees around for construction of houses and initiation of agricultural activities, especially with reference to the hilly terrain. At times, it results in overexploitation of the native tree species also adding to the habitat destruction. As the human population grows, the need for land increases, which if allowed to continue in a haphazard manner also leads to habitat alterations. Major threats to biodiversity are anthropogenic activities particularly development of roads, hydro-electric projects, urbanization, industrialization, deforestation, habitat loss and fragmentation, over exploitation, pollution, invasions of alien species and global climate change. These all anthropogenic activities are leading to habitat alterations, disruption of community structure and ecosystems. Overall, in the Indian Himalayan Region, over exploitation and habitat degradation are the two major factors responsible for decrease in population of the species. In view of the rapid loss of biodiversity, it is imperative to assess and conserve biodiversity, at regional, national and international levels.

The increased demands on natural resources of the region, consequent to present development efforts and ever increasing population have further hampered overall development of mountain areas. On the contrary, resource depletion accompanied by environmental degradation, has become a common scenario of the region, thereby, leading a growing social dissatisfaction. Keeping the above said things in view, a study was carried out in Tirthan Wildlife Sanctuary of Himachal Pradesh between 2008 and 2011 to identify the status of the floristic diversity, to identify threat categories and to prioritize them for conservation.

Total 157 species (22 Trees; 42 Shrubs; and 93 Herbs) belonging to 105 genera and 56 families have been identified as threatened from the Tirthan wildlife Sanctuary. The Conservation Priority Index (CPI), which is cumulative value of these attributes, is used for each species to categorize under different threat category for Tirthan Wildlife Sanctuary. Maximum Threatened species (125 spp.) were distributed in the zone varying from 2100m-2800 m above msl, followed by the zonations of 2801m-3800m (123 spp.) and 3801m-4800m (39 spp.). Twenty six (26) species were identified as Critically Endangered, 28 species as Endangered; 40 species as Vulnerable and 63 species as Near Threatened.

Occurrence of significant number of threatened species indicate that these species are facing high anthropogenic pressures, hence merit attention for conservation. Therefore, present attempt has been made to; i) assess the threat categories of floristic diversity; ii) study the distribution pattern and iii) suggest strategies for its conservation.

Keywords: Critically endangered, endangered, vulnerable, Indian Himalayan Region

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C - 018

EVALUATION OF FLORISTIC DIVERSITY AND TO EVOLVE SITE SPECIFIC MANAGEMENT AND REJUVENATION STRATEGIES FOR THE CONSERVATION OF VARIOUS SACRED GROVES IN KULLU VALLEY OF HIMACHAL PRADESH

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Sacred groves and sacred plants are being considered as an important component in all societies of Himachal Pradesh. Their history may be traced back to Vedic periods, the Ramayan period and the Buddha period. There are a number of sacred groves and forests attached to various local deities in Himachal Pradesh. Being the relicts of conserved natural forests these sacred groves are locally known as "*Deovan*" and are deeply associated with religious beliefs that they are abode of 'Forest God'. Sacred groves are more or less pockets of climax vegetation serving as repository of biodiversity and genetic resources and harbouring several wild relatives of crop plants, plants of medicinal, ethno-botanical, mythological and ecological importance. Although these sacred forests are protected by social taboos and religious faith but they are not immune to anthropogenic disturbances.

There is a need to revitalize the beliefs of the people towards these sacred forests and a community-oriented approach has to be initiated to have a meaningful intervention in protecting the sacred groves. Extensive field surveys were undertaken during 2005-2008 to inventorize the sacred groves. Location of sacred groves and their details were collected through personal contacts with villagers, knowledgeable persons, temple committee members, forest department staff and various social organizations as a result of which a total of 33 sacred groves were recorded in the valley out of which 25 are associated with the male deity and 8 with female deity. These sacred groves were found rich in plant biodiversity; a total of 224 plant species were recorded. The sacred groves serve as a storehouse of medicinal plants, during the study ethno botanical information on 69 plant species were also documented.

During the present study it was observed that the quality of most of the sacred groves are getting degraded and the number of sacred grove are also declining as social values and religious beliefs are changing due to urbanization and loss of faith in tradition and culture, heavy biotic pressure and expansion of market economy. Apart from the sacred groves located in the villages like Bhanara, Garh, Nagni, Karal, Rudgi and Halan–I villages, all the other sacred groves were found in different stages of degradation. Threats affecting each sacred grove were identified and site-specific management strategies for the conservation and rejuvenation of sacred groves were evolved through Participatory Rural Appraisal and informal discussions. The study showed that change in social values, religious beliefs, modernization, urbanization, heavy biotic pressure, etc., caused considerable damage to the sacred groves. Hence, several informal discussions were held with the local people of the area in each sacred grove so as to make them well aware about the importance of plants, sacred grove and the concept of environmental conservation.

Keywords: Biodiversity, degradation, management plan

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C - 019

BIODIVERSITY AND EFFECTS OF LOSS OF BIODIVERSITY IN JHARKHAND

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Biodiversity boosts ecosystem productivity where each species, no matter how small, all have an important role to play. Greater species diversity ensures natural sustainability for all life forms. India is a mega diverse nation, housing around 10% of world's species. Much of Indian diversity in intricately related to the socio-cultural practises of the land. Unfortunately due to population explosion, climate change lose implementation of environmental policies, several species are facing the threat of extinction. Not only does this affect the food chain, but also the culture of millions of Indians.

Biodiversity conservation a vital environmental concern without a proper balance between all forms of life and ecosystem, lots of problems are bound to be generated .Plants and microorganisms on the earth to maintain a delicate balance with a variety of life forms which called biodiversity. Hence, Biodiversity Conservation is essential for existence, as it provides the plant fundamental building blocks for many goods and services.

In this study it is focused that the common man is more aware of domino effect of species loss and what we stand to lose. Through this study my aim is to create awareness, by increasing participation of people in Biodiversity documentation and conservation. In addition there are several organizations carrying out notable conservation work in Jharkhand.

The destruction of habitats is the primary reason for the loss of biodiversity. When people cut down trees, fill a wet land, plough grasslands, burn a forest, the natural habitat of the species is changed or destroyed. These changes can kill plants, animals and microorganisms. As well as disrupt complex interactions among the species. By fragmentation of a large forest tract, species occupying deeper parts of forests are first to disappear. Over exploitation of a particular species reduces the size of its population to an extent that bit becomes vulnerable to extinct.

A massive side effect of air pollution is the global warming which can pray havoc which biodiversity. Human caused increases in green effects are likely to create disturbances in atmospheric temperature affecting living flora and fauna. Loss of biological diversity due species extinction is going to have major impact on our planet, and we better prepare ourselves to deal with them there has been growing concern that very high rate of modern extinctions due to habitat loss, over harvesting and other human caused environmental changes. Our study shows that future loss of species has the potential to reduce plant production just as much as global warming and pollution. In eco systems were species losses fall within intermediate projection, species is expected impacts of climate warming and increased ultra violet radiations due to stratospheric ozone loss, the impact of species loss ranked with those of many other major driver of environmental change, acid deposition on forest and nutrient pollution.

Keywords: Biodiversity, flora and fauna, climate change, global warming

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C - 020

ALOEVERA - A HERB WITH VARIETY OF MEDICINAL VALUES

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Aloe-vera is a popular medicinal plant of Liliaceae family which has diverse uses. This has rosette of fleshy leaves which is smooth or spined. Its protoplasm consists of a number of enzymes. The examples are amylase, catalase, Lipase, oxidase, alkaline phosphatase etc. The important constituents of aloegel are Vitamin B1, B2, B6, C B-Carotene, Choline, Folicacid etc. It also contains Lectins as important proteins. A large numbers of anctiseptic agents such as urea nitrogen, cinnamonic acid salicylic acid sulphur and phenols. The beauty is that its juice having salicylic acid and lupeol are wonderfully effective painkillers.

The important uses of aloe-vera are in the treatment of skin disorders, respiratory disorders, antitumor activity, antiaging uses, analgesic uses, in dental care wound healing, cosmetic use, skin protection. It is also used as an antiseptic, antidibetic, anti-inflammatory activity.

It has been tasted that if one takes the juice of Aloe-vera, it functions as cell damaging process reducer in course of stress feeling. Finally, it is concluded that aloe-vera is an excellent Indian plant which diverse theraputic characteristics.

Key words: Aloegel, Salicylic Acid, Lupeol, Vitamin C, Herb

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C - 021

INTERACTIVE EFFECTS OF CLIMATE CHANGE AND AIR QUALITY ON TREE PHENOLOGICAL RESPONSES IN THE URBAN ENVIRONMENT

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Global climatic variations have significantly impacted the responses of tree species related to development and phenology. These variations are slow evolutionary process and difficult to observe and interpret. But changes in urban environment are rapid and provide us the opportunity to study these variations in spatial-temporal gradient. Air pollution along with urban heat island are the major stress factor for urban vegetation. Responses of different tree species with mix pollution affects in a pollution gradient can unveil interesting patterns in tree responses to air pollution and climate change which can be further modeled to understand pollution specific or overall mechanism behind the tolerance or sensitivity. Climate change induced phenological shifts in plants strongly affect ecosystem structure and function. Apart from climate change, air pollution is a major driver in urban atmosphere. It is well known that plants have the capability to change their specific activity with changing environmental conditions. Annual cycles flowering, fruiting and leafless periods with counting of number of flowers and fruits in selected tagged branches were conducted in eleven tropical tree species (*Cassia siamea,* Lam., *Dalbergiasissoo* Roxb., *Caesalpiniasappan* Linn., *Ficusreligiosa* Linn., *Polyalthialongifolia* (Sonner) Thwaties., *Anthocephaluschinensis* (Lam) A. Rich., *Mangiferaindica* Linn*., Ficusbenghalensis* Linn., *Psidiumguajava* Linn., *Albizialebbeck* Linn. and *Eucalyptus citriodora*Hook.,) growing in three different land uses (industrial, commercial and urban background) of Varanasi city situated in Indo-Gangetic plains (IGP) with continuous air quality (particulate matter, sulfur dioxide, nitrogen dioxide, ozone and carbon dioxide) and meteorological(temperature, relative humidity, wind direction and wind speed) monitoring throughout the campaign. Wide variations among tree species were found with respect to intra-species asynchrony for flowering (0.32-0.91), fruiting (0.61-0.97) and leaf-fall (0.22-0.92). Among plants, *F. religiosa* showed maximum asynchrony index in both leaf fall and flowering followed by *A. lebbeck*. In most cases flowering period was 7-17 days earlier in industrial and commercial areas compared to urban background site. *A. lebbeck* and *C. sappan* tended to show early flowering at commercial sites. *D. sissoo* showed prolonged leaf less phase in industrial area compared to urban background. All deciduous tree species showed a distinct time lag between the estimated dates of initiation of the vegetative phase and the succeeding reproductive phase, although time lag was comparatively less in trees growing at industrial area. Multiple linear regression analysis showed temperature, relative humidity and carbon dioxide concentrations accounts for maximum variability in tree phenology. Among air pollutants particulate matter, ozone and nitrogen dioxide were identified as major air pollutant accounting for 4-9% and 7-14% variability in flowering and fruiting respectively. These phenological observations can be very useful in understanding climate change and air pollution induced changes in plant phenology in urban environment. Based on these results, phenological models can be prepared to assess future urban air quality and climate change effects in urban environment.

Keywords: Tree, Climate change, Temperature, Particulate matter, Urban, Land use, Phenology

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C - 022

POTENTIAL EFFECTS OF NITROGEN ADDITION ON CARBON ALLOCATION IN ABOVE AND BELOW-GROUND COMPONENTS OF HERBACEOUS PLANT BIOMASS AND ITS DIVERSITY IN DRY TROPICAL ENVIRONMENT OF INDIA

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Atmospheric CO_2 has been rising continuously from 280 ppm at the start of industrial revolution to nearly 400 ppm in 2015. Fossil fuel burning and deforestation caused continuous rise of CO_2 in the atmosphere and it is expected to reach 550 ppm in the middle of this century. Moreover it is predicted to reach at 700 ppm by end of the 21st century. Hence, reduction of CO_2 is a big challenge among the ecologist. Plant biomass and soil are two major components for the storage of organic carbon. Globally, these components stored nearly 2050 Pg, which is nearly three times higher than that in the atmosphere. Therefore carbon storage capacity in soil, forest and grassland ecosystems has been the focus of significant research. Studies have shown that Nitrogen (N) input affected the above and below ground carbon allocation of the plants. Among the tropics; the carbon allocation patterns of dry tropical plants are lacking. In this reference, we assessed the impacts of N amendment on the above and below ground carbon allocation in herbaceous plant biomass and its diversity in the seasonally dry tropical environment of India. Study was conducted in campus of Banaras Hindu University India. For this experiment, 72, 1×1 m plots were established. The plots were categorised in six groups of N treatment; $N_{control}$ (without N), N_{30} (30 kg N ha^{-1} yr^{-1}), N_{60} (60 kg N ha^{-1} yr^{-1}), N_{90} (90 kg N ha^{-1} yr^{-1}), N_{120} (120 kg N ha^{-1} yr^{-1}), N_{150} (150 kg N ha^{-1} yr^{-1}). Data on carbon allocation in above- and below- ground component of herbaceous plant biomass and its diversity from each plot were collected and analysed. Results showed significant variations in carbon allocation in above- and below-ground component of plant biomass and its diversity due to N amendment. Among the different N doses; maximum herbaceous diversity and carbon allocation in above- and below-ground component of plant biomass were found in medium nitrogen dose (N_{60}-N_{90}). The minimum carbon allocation in above- and below-ground component of plant biomass were in control plot, while the diversity was minimum in high nitrogen dose (N_{150}). Among the plant components, carbon allocation was significantly higher in above ground plant biomass than the below ground plant biomass. The higher dose of N (N_{150}) reduced the herbaceous diversity and below ground plant carbon. Results also showed quadratic response for the herbaceous plant diversity, above- and below-ground plant carbon due to the N treatment. Thus, the study suggested that the moderate dose of N treatment could be beneficial in promoting the species diversity and carbon sequestration in the dry tropical environment.

Keywords: Above- and below-ground biomass, carbon allocation, dry tropical environment, N-amendment, species diversity.

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C - 023

ROLE OF *STACHYTARPHETA JAMAICENSIS* (VAHL.) FOR CONSERVATION OF INSECTS

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Stachytarpheta jamaicensis (L.) Vahl. is a species of the plant family Verbenaceae. It is usually found along country roadsides. It is an annual herbaceous plant and sometimes perennial that grows 60-120 cm tall. Upper leaf surface was shiny and however with rough feel. The plant produced spike with purplish sessile flowers which attracted higher number of butterflies were under threat of extinction. Habitat conservation can be easily practiced with this perennial herb. It is an important nectar source for the maintenance of local butterflies. Since it's considered as an important plant to be introduced in ecotourism.

Keywords: Butterflies, conservation, ecotourism

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C - 024

A REPORT ON SOME LICHENS NEW TO RANCHI, JHARKHAND, INDIA

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The present paper shows the occurrence of five lichen species from Ranchi, Jharkhand for the first time. The species belong to four families (Caliciaceae, Parmeliaceae, Teloschistaceae, Chrysotrichaceae) and represents four growth forms of lichens found growing on rock and trees. These species are *Dirinaria Consimilis, Parmotrema reticulatum*, *Caloplaca cinnabarina*, *Chrysothrix candelaris*, *Parmoterma tictorum***.** Brief morpho-taxonomic details of all the five species have been dealt with their ecology and distribution.

Keywords: Lichens, Ranchi, Ecology, Distribution.

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C - 025

PRACTICING SACRED CULTURES AND NOURISHMENT OF ENVIRONMENT IN WEST BENGAL

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Culture of do-Ecology is the lane of environmental redecoration. It means meeting the need of the current and future generation without ecological harm. To maintain this we have to search out different Green-gateways through which we can reach a sustainable environment. But actually human's natures hanker after demand and more demand, forgetting the health of our environment. To grip the resources we are moving forward from chilly Poles to interior Aowa tribe area of Amazon; the actual frame of the environment is being deteriorating. So in this phase we are in need of some overhaul measures and focus should be given on our traditional sciences like nourishment of Sacred Groves. Since inception of our civilization, every aspect is changing. Civilized populace and their every demandable foot-print are the prime causes of these changing. In Vedic-Ramayana-Bible-Mahabharata-Quran period, society was formed on religious-based-environment (i.e. social environment based on religion) and on the pillar of this religious-deterministic-mental-frame, people shaped their nature-based-culture, and one of them is Sacred culture like: Sacred tree worshipping, Sacred rock worshiping, sacred soil mound worshipping, and sacred pond worshipping. But unfortunately people's perception about their environment has been changing and now-a-days nature is being considered as an Economic-Bank. Therefore, change in socio-cultural dimensions is controlled by economic activities. Environmental based rituals and festivals are now are being eroded in many ways. Present day planning and developmental policies are too much misty for environmental conservation as well as renewal. There are more than dozen of international conventions related to conservation of our environment, but little emphasize has been given on the renewal of environment through the revival of age-old cultures, for example nourishment of Sacred Groves. In this context we can remind our age-old line i.e. old is Gold. This folk-belief is the core-gem of every civilization and it is very true that every development has a limit in respect of time, speed, intensity, magnitude and realm. So after a certain limit we fail to maintain the health of our eco-environment because of our unusual demand of resource.

Keywords: Sacred tree worshiping, Sacred rock worshiping, sacred soil mound worshipping, sacred pond worshipping

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C - 026

REDESCRIPTION OF SPECIES OF NEMATODE PARASITE FROM HOST *CAPRA HIRCUS (*L.) IN AURANGABAD DISTRICT (M. S.) INDIA

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The present study was conducted to investigate the helminth parasite of *Capra hircus* (L.) during the period of June-2013 to May-2015. The present nematode parasites are small in size, elongated, cylindrical, body is yellowish white in colour, buccal capsule small, bent-like hook, cuticle transversely striated. All the morphological characters are observed and identified that said species as redescription of a *Bunostomum*.

Keywords: Capra *hircus* (L.), India, *Bunostomum*

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REDESCRIPTION OF SPECIES OF *HELICOTYLENCHUS* SP. SHER, 1966 (NEMATODA: TYLENCHIDA) IN BHOKARDAN REGION, DISTRICT JALNA, MAHARASHTRA

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Morphological observation is made on population of *Helicotylenchus* species recovered from around roots of sugarcane plants. From Bhokardan regions. The species is characterized by body length 0.6 mm, long labial region continuous to slightly offset, rounded anteriorly flattened. Stylet 26-28 µm long. Female reproductive system amphidelphic, ovary single outstretched. Vulva transverse, near posterior parts of body. Tail more curved dorsally terminus irregularly hemispherical. All these character are observed in *Helicotylenchus* species hence nematode is identified and redescribed.

Keyword: *Helicotylenchus*, Jalna, Sugarcane

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C - 028

FLORISTIC COMPOSITION AND DIVERSITY OF HOMEGARDENS IN ANGARA BLOCK, RANCHI, JHARKHAND

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Homegardens ensure crop diversification, provide diversified products through low in amount but nutritious in nature and conserve plant genetic resources. Homegarden serves as an important source of food and that also maintains productivity, protect natural resources, minimize environmental impacts and provide economic and social needs. The study focused on the composition and diversity of plant species in homegarden of four selected villages of Angara block of Ranchi, Jharkhand. A total of 101 plant species (21 tree, 10shrubs, 13 sapling, 11 seedling and 46 herbs) belonging to 43 families were recorded. In the tree layer Verbenaceae, Rhamnaceae Anacardiaceae and Leguminosae in sapling layer Rhamnaceae, Verbenaceae and Anacardiaceae, in seedling layer, Rhamnacea, Verbenaceae and Moraceae in shrubs layer Caricaceae, Moringaceae and Verbenaceae were most dominant family. However, in herbs layer Poaceae, Brassicaceae, Solanaceae Cucurbitaceae and Malvaceae were most dominant family. Density of tree, sapling, seedling, shrubs and herbs varies from 840-1390, 170-270,100-140,590-2110 and 42690-102320 stems ha^{-1} respectively. The basal cover of tree, sapling, seedling, shrubs and herbs varies from 25.40-33.40, 0.62-1.76, 0.05-0.62, 5.21-12.30 and37.52-64.98 respectively. Diversity indices of different villages of study area the Shannon index of tree, sapling, seedling, shrubs and herbs varies from 1.77-3.46, 1.91-2.77, 1.90-2.52, 0.72-2.27 and 3.01-4.22, respectively. Similarly, Simpson's index of tree layer lies between 0.12 to 0.46, sapling layer 0.17to 0.46,sapling layer 0.18 to 0.29, shrubs layer 0.25 to 0.54 and herb layer 0.08 to 0.21. Species richness of the tree, sapling, seedling, shrub and herb having between 1.38-2.22, 0.74-1.36, 0.65-1.04, 0.63-1.06 and 1.77-3.00, respectively. Equitability ranges from0.74-1.24of tree layer, 1.07-1.33 of sapling layer, 1.25-1.41 of seedling layer, 0.45-1.27 of shrub layer, 1.02-1.21 of herb layer. Beta diversity lies between1.31 to 4.60 of the tree, sapling, seedling, shrub and herb layer. The practice of indigenous agroforestry homegarden is an integral component in Jharkhand and play crucial role in supplying vegetables, fruits, fuel wood, small timber, herbs and spices etc for their daily requirement. The homegardens in Jharkhand were like other tropical homegardens for producing subsistence farming systems. The high diversity and complexity in the structure of homegardens fulfill a range of social, economic and ecological functions. These indigenous homegardens also contribute to the in-situ conservation of plant genetic resources including rare and under-utilized species besides reducing the pressure on nearby forest areas for the extraction of fuel wood and other non-timber forest products. The homegardens and its management can be improved by proper management practices, more research, co-operative and extension services.

Keywords: Home garden, diversity, Jharkhand, management

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C - 029

BIODIVERSITY AND INDIGENOUS USES OF SOME MEDICINAL PLANTS BY ETHNIC COMMUNITIES IN GOLAGHAT DISTRICT OF ASSAM

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Folklore medicinal uses of plants associated with the livelihood of people belonging to few ethnic communities residing in Golaghat district of Assam have been studied. Plants and plant products are traditionally used among the tribal societies especially of this region from time immemorial. Traditional agriculture is the primary mean of livelihood of these people which depend mostly on surrounding plant communities for their day to day needs. Hence, forest resources play an important role in the economy of these people in acquiring food, fodder, fuel and medicaments. In this communication ninety four (94) plant species represented by fifty one (51) families covering eighty five (85) prescriptions used for the treatments of thirty (30) broad diseases by "Deoris, Karbi, Nepali, Missing and Tea garden communities" of the region have been reported. For ethno botanical studies each plant species described (uses of parts like leaves, bark, roots, rhizome, fruits etc.) botanical name, vernacular name, parts used, purpose of used and mode of administration are documented. Among these families, *Zingiberaceae* occupied the major position followed by *Euphorbiaceae* and *Verbenaceae.* In this context particularly *Rubus moluccanus, Solanum nigram, Leucas plukentii, Costus speciosus, Combretum acuminatum, Listea glutinosa, Polygonum species* and *Bryophyllum calycinum* are found to be new to the literature of Indian Medicinal plants, which are used in cancer, abortion, diabetes respectively used by the ethnic communities. Likewise, use of plant species *Clerodendrum colebrookiana, Ageratum conyzoides, Drymaria cordata, Solanum Khasianum, Cassia obtusifolia* are found to be similar to the uses by other tribes of this region. In course of the study thirty six (36) villages of ethnic communities were visited. The information of indigenous knowledge of local traditional healers and native plants were collected during field trips on the basis of interviews with the village people, medicine men and elderly persons whose empirical knowledge is widely respected. The plant species were then identified and information was compared with those of some important Indian medicinal plant literature. The present communication tries to focuses the ethno medico botanical diversity and the study presents new research effort and perspective on the search for new drugs based on traditional knowledge.

Keywords: Deoris, Karbi, Missing, ethno botanical, indigenous, rhizome

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C - 030

DENSITY AND DIVERSITY OF SCENEDESMUS OF NIRA LEFT BANK CANAL BARAMATI

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Population pollution are continuous growth leading to scarcity of natural resources like water, Coal, Diesel and Petroleum Destruction of forest, Natural habitat of animals and Humans. Growing strength of Building, Industries, habitants and Transportation vehicles contributing to greenhouse gases leading to climate change. Energy security and climate change are both global challenges. In order to end energy crises and to combat global warming Scientist are beginning to look to Biofuels as a replacement of energy source. According to DOE (Department of energy, govt. of USA has reported that algae yields 30 times more energy per acre than land crops keeping earth clean and free from pollution .Climatic conditions of the country is favorable for this alternative source of energy as it has abundant fresh water resources excellent weather sunshine make it a prime location .

Keywords: diversity, scenedesmus, Nira left bank canal

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C - 031

DIVERSITY AND POPULATION OF WADERS IN THE CATCHMENT AREA OF EKRUKH WATER RESERVOIR, (HIPPARGA LAKE) OF NORTH SOLAPUR TAHSIL SOLAPUR DISTRICT (M. S.)

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Wader birds are commonly found along the shoreline and mud of an aquatic bodies. These birds feed on small insects and crustacean in the mud or sand. These birds have long legs suitable for wading. Many waders have sensitive nerve endings at the end of their bills which enable them to detect prey items hidden in mud or soft soil. Regular monitoring camps were conducted at the study site for June -2015 to May-2016. The present study is endeavored to prepare a checklist of waders from the Ekrukh water reservoir over the period of 12 months. The study was carried out by arranging monthly survey camps early in the morning. 15 species belonging to 6 families have been recorded in this reservoir.

Keywords: Waders, reservoir, catchment area, irrigation, storage capacity.

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BREEDING OF PURPLE MOORHEN *(PORPHYRIO PORPHYRIO)* IN DHARMAVEER SAMBHAJI TANK IN SOLAPUR CITY (M. S.) INDIA: UNDER THREAT

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The present paper deals with nesting behavior, incubation of eggs, parental care of young ones and threat of loss of breeding site of Purple moorhen, *Porphyrio porphyrio* in Dharmaveer Sambhaji water tank of Solapur city. The breeding period of this bird is June to September. The nest is a circular mass of floating debris. The female lays 3 to 7 pale yellowish spotted brown eggs on such floating nest. The incubation period is of 18 to 24 days and it is carried out by female only. Young ones are fed under the parental care of female bird only. The male not involve in incubation and parental care. Because of speedy urbanization, the encroachment of human activities in and around the tank .and high water pollution due to domestic activities the breeding site of this bird is under threat. Regular camps were conducted to study the breeding behavior of purple moorhen for last ten years. There is a great need to run conservation awareness programs in the society regarding the protection of these breeding sites. The historical Sambhaji tank should be protected from the interference of public activities. Fencing should be set around the tank that will prevent the anthropological activities. A favourable situation will be made available for the normal breading of purple moorhen free from pollution in future.

Keywords: Purple moorhen, *Porphyrio porphyrio*, Nest, Incubation, Parental care, Young ones, Threat

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C - 033

PLANT TISSUE CULTURE AS A POWERFUL TOOL TO CONSERVE AND PROTECT BIODIVERSITY OF JHARKHAND (1. *ADANSONIA DIGITATA* L. 2. *COUROUPITA GUIANENSIS* AUBL.)

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Adansonia digitata L. (African Baobab) belongs to the Bombacaceae family and *Couroupita guianensis* Aubl. (Cannonball tree) belongs to the Lecythidaceae family are highly endangered mythological trees found in the land of Jharkhand. In order to conserve and protect plant tissue culture has been recognised as a powerful tool in checking potential danger to the floras of the environment. In order to preserve genetic resource of great economic and medicinal value attempts are to be made to bring these multipurpose trees species under the preview of tissue culture techniques. The germination of seeds of *Adansonia digitata* under natural conditions is limiting factor for plant regeneration. To overcome this problem, an efficient protocol was developed for *in vitro* micropropagation through seed germination. Mature seed and fresh leaves as explants were used in both from the mother trees for plant regeneration

Keywords: *Adansonia digitata* L. (African Baobab), *Couroupita guianensis* Aubl. (Cannonball tree), mythological trees, Endangered species Genetic resources, Tissue culture

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C - 034

OCCURRENCE OF SOME RARE PLANTS IN KORBA DISTRICT (CHHATTISGARH) AND THEIR HABITAT ECOLOGY

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Each and every plant species play an important role in regulating biodiversity dynamics. Rare plants grow in unique microhabitat and any alteration in environmental factors leads to disappearance of that particular species. A case study reveals the effect of development and industrialization on the vegetation of Korba district (One of the leading power producing district of Chhattisgarh State). Due to high deposition of mineral, the soil provides alkaline substrate which is suitable for growth of some rare terrestrial plants. Three years (2014-2016) of data collection and observation results, due to industrialization, mining and construction of power plants as well as decrease in annual rainfall causes depletion of some rare plants *viz. Drosera burmanii, Peristylis lawii, Nervilia crociformis, Nervilia aragoana, Platenthera susanne*, *Habenaria diphylla, Habenaria dentate, Habenaria digitata, Liparis odorata*. These microhabitats are now under pressure due to anthropogenic activity. Thus, the conservation strategies and study of theses microenvironment is mandatory to promote the biodiversity potential.

Keywords: Habitat specificity, Soil salinity, RET taxa

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C - 035

DUST MIITE FAUNA AND SOME UNRECORDED MITES FROM POULTRY FARM, CULTURE MEDIUM AND WHEAT FLOUR

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Mites are four legged belonging to phylum Arthropoda and class Arachnida. They prefer humid environmental condition rich in organic matter. They are found in almost every habitat. Many species of mites are known to be present in stored food products such as grains. They are found almost everywhere inhabiting all habitats. Some of them are minute enough that they are suspended in air; therefore study of mites also forms an important part in the field of Aerobiology. Almost all animals –terrestrial or aquatic are parasitized by mites. Some are predatory. Most of the mites are ectoparasite. They feed upon blood, shed skin. There are many mesostigmatan, astigmatan, and prostigmatan species that live on and in the skin of birds. Some of the mites parasitize the insects as well. The intramural dust ecosystem comprises the dust of indoor. The mites are found to be present. The colour of mites varied from white, translucent white to pale yellow in colour. HDM has maximum nutritional and environmental adaptability. Some are found in birds like chick, fowl, duck, pigeon etc., causing various infections in birds- externally and internally. The mites found in poultry dust are allergens causing allergy in sensitive individuals. It also results into aero- bio pollutants. Some of them are very tiny and light weights therefore are suspended in breeze, and forms exclusive part of Aerobiology. It takes 20 minutes to 2 hours for them to settle back down out of the air. The activities that create airborne mites are spreading of straw, wood shaving by hand, placing out trays of chicks, transferring of hen, ruffling of feathers. They are reported to control aquatic weed like *Eichhornia* observed in 1990 by M. A, Haq N. Ramani and Konikranst. Mites are contaminants in fungal and other culture media. The poultry, flour mill workers exposure poultry dust is substantial and it may develop permanent breathing problems. The present investigation on Biodiversity of mites' in intramural dust 04 different mites was found. The varied habitats in study were dust from poultry, wheat flour. The dust was collected from poultry houses. Mites found in wheat flour dust revealed single mite which is *Acarus*. The tiny mites were also observed trapped in the Tilak Air Sampler. Unidentified mite: The mite was observed caught in Tilak Air Sampler. It is revealing the fact that tiny mites are suspended in air. Another site of collection was wheat flour mill and mites were observed in culture medium of *Drosophilla*. The mites were mounted in glycerine jelly after treating it with lactic acid. The mites found in poultry dust is common predatory mite *Cheyletus* (Latreille 1776), *Urodiaspis* (Berelese 1916), storage mite *Acarus siro*(Linnaeus 1758), and parasitic mite *Machrocheles* (Latreille 1829).

Keywords: Arachnida, biodiversity, poultry dust, flour, Aerobiology

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C - 036

THE STATUS OF ABUNDANCE DISTRIBUTION OF THE WILD PLANT SPECIES IN COMMUNITIES OF NORTH-EASTERN UTTAR PRADESH, INDIA

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A simple point sampling approach was adopted to account the occurrence of uncommon or rare species within different habitats across the vegetational landscape of north-eastern Uttar Pradesh. The species which fell at the lower end of the distribution of species abundance were treated as rare. The abundance of plant species of common occurrence decreased and that of uncommon or rare species increased significantly during the span of three decades. The change in species abundance of rare plants during different decades and after three decades was highly significant in relation to certain ecological as well as taxonomical variables. The grassland community had a significantly higher proportion of rare species as compared to forest and scrub communities; the rare herbs and shrubs showed much greater change in their species abundance. Among various life forms, all other except hemicryptophytes showed an increase in the number of rare species and the change in species abundance was highly significant for therophytes. The regression analysis revealed that the total number of species/family was positively correlated with the number of rare species/family except in case of Cyperaceae. The analyses of various threat combinations which caused the decline of species, may help understand the conservation status of plant species within a vegetation.

Keywords: Species abundance, vegetaional landscape, random-point sampling, IUCN rarity categories, threats, conservation

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THE ARCHITECTURAL PATTERN AND CLONAL GROWTH STRATEGY OF A FEW SELECTED PLANT SPECIES OF NORTH-EASTERN UTTAR PRADESH, INDIA

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Architecture of a plant is the morphological expression of the genetic blue print at any one time and may show plasticity with respect to site condition. The present study attempts to analyse the growth features and subterranean architectural development of some medicinally valuable wild plants of various forest communities of north-eastern UP and elaborate observations were made on geophytes such as *Costus speciosus, Curculigo orchioides* and *Elephantopus scaber.* The initial architectural development of these species during the first year of growth was observed on seeding within the sal-forest and experimental plots. The individuals of different age producing sprouts, as a result of cut or damage, were readily available. The quantitative measurement of growth features of naturally growing 2 ± 1 year old individuals of species of *Costus*, *Curculigo* and *Elephantopus* were made. The shoot growth of these geophytes was vulnerable to periodic stresses especially during the summer. The severe cutting and burning completely damaged the aboveground parts and the individuals could tide over the adverse condition only by their subterranean root-stock or basal part of the stem. The specific geometric branching of root-stock and spacers provide an efficient foraging mechanism and exploitation of the resources in their vicinity. Such species place modules (ramets) preferentially in relatively resource-rich sites in their neighborhood, thus actively selecting micro-habitats through plasticity in their growth pattern.

Keywords: architectural, medicinal plants, Uttar Pradesh, plasticity

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C - 038

NITROGEN POLLUTION TURNING CARNIVOROUS PLANTS INTO VEGETERIANS

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Carnivorous or insectivorous plants generally evolved in moist, nutrient poor, ombrotrophic bogs probably to balance their cost of carnivory. Thus, they derive their required nutrition from their prey (insects, arthropods). But chronic nitrogen deposition affects the growth of the trapping mechanisms of these plants. Nitrogen pollution has negative influence on the growth and function of different types of insectivorous plants. In Sarracenia purpurea (purple pitcher plant), production of traps can be phenotypically plastic trait depending on nitrogen content in the plant. Increased nitrogen reduced the production of pitchers (leaves specialized for prey capture) relative to phyllodia (leaves for photosynthesis). High levels of nitrogen and nitrogen, phosphorous ratio depresses the population growth rate of Sarracenia purpurea. In Drosera capensis (sundew plant), soil nitrogen content affect the mucilage production in tentacles and hence become less carnivorous. Rapidly closing snap- trap mechanism in Dionaea muscipula, (venus flytrap) also gets affected by nitrogen concentration. In nitrogen rich soil the closure time of the snap trap increases. So, insectivorous plants in nitrogen rich bogs trap fewer bugs and this also affects their population growth. Thus, it can be concluded that the population of different insectivorous plants is rapidly declining due to nitrogen pollution in different parts of the world.

Keywords: Nutrition, prey capture, pitcher, mucilage, snap-trap mechanism, population growth

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C - 039

A REVIEW ON THE ECOLOGY OF INVASIVE *AE. ALBOPICTUS* AND ITS EFFECTS ON RESIDENT SPECIES AND PUBLIC HEALTH

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Investigations of biological invasions focus on patterns and processes that are related to introduction, establishment, spread and impacts of introduced species. One of the most dynamic events in public health is being mediated by the global spread of the invasive mosquito *Aedes albopictus*. This review focuses on the ecological interactions operating during invasions by *Ae.albopictus* the most vectors of Dengue and DHF. *Aedes albopictus*, a mosquito native to Asia, has been one of the fastest spreading animal species over the past two decades. In addition to the ecological problems inherent in rapid spread of any species, of particular importance are the serious public health risks posed by the introduction and establishment of an aggressive pest and efficient disease vector. *Ae. albopictus* has spread from its native range to at least 28 other countries around the globe. Its rapid expansion and vectorial capacity for various arboviruses affect an increasingly larger proportion of the world population. Competitive interactions, shaped by environmental parameters, can lead to the exclusion of some species or to a stable coexistence. There has been a well-documented decline in the abundance of *Ae. aegypti* following invasion of *Ae. albopictus*. This decline is consistent with the hypothesis that interspecific competition, probably among larvae, is the mechanism by which *Ae. albopictus* displaces *Ae. aegypti*, which is a specialist developing in man-made containers. *Ae. albopictus* is superior to *Ae. aegypti* in resource competition, maintaining greater population growth at higher combined densities, and producing greater survivorship during periods of low food availability. Thus, it is possible that resource competition could contribute to the displacement of *Ae. aegypti* by *Ae. albopictus.* Therefore, it is crucial to encourage more surveillance and/or control of the *Ae. albopictus* population and research efforts in the at risk areas, including those in developing countries. Responses to the challenges of controlling this vector are expected to be enhanced by an increased knowledge of its biology, ecology, and vector competence.

Keywords: *Aedes albopictus, Ae. aegypti*, invasive species, vector competence, public health, surveillance

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C - 040

ASSESSMENT OF DIVERSITY OF BUTTERFLIES IN SERAMPORE COLLEGE CAMPUS: A PROXIMATE LEVEL APPROACH FOR CONSERVATION

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Butterflies are good indicators of environmental alterations as they are sensitive and are directly affected by changes in the habitats, atmosphere, temperature and the weather conditions. Therefore butterflies are treated as an important model group in ecology and conservation. Diversity and distribution of butterfly is very much dependent on availability of specific host plants vis-à-vis vegetation type of a particular area. Infact, they maintain a symbiotic relation with plants as they not only provide food and shelter to the immature but also ensure food and protection to the adult. The conservation of butterflies is necessary to sustain varied kinds of ecosystem services for human well-being. In view of the essential ecosystem services rendered by butterflies and to promote conservation management, the present study was aimed at the estimation of the butterfly diversity at Serampore College Campus.

28 butterfly species belonging to the families of Papilionidae, Pieridae, Nymphalidae and Lycaenidae were recorded in the present study. It was observed that Hedge blue had the highest relative abundance (29.10%), followed by Tawny coster (16.42%) while Lesser grass blue and Commander (both 0.13 %) showed the minimum abundance. Maximum butterflies were recorded during post-monsoon (August – October) and winter (December to February) seasons. The present study is a preliminary attempt to make an inventory of the butterfly communities in an adjoining area of Kolkata vis-a-vis to emphasize the need for their conservation. In view of the essential ecosystem services rendered by the butterflies and to promote conservation management, the present study was aimed at the estimation of the butterfly diversity across the sub-urban areas of Serampore, Hooghly. The results of the study are expected to supplement the necessary information on the ecological roles and conservation management of the butterfly species in Hooghly and similar geographical areas in India.

Keywords: environmental indicator, ecosystem services, habitat loss, species richness, conservation

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C - 041

EXPLORATION OF DIVERSITY OF AQUATIC INSECTS AS POTENTIAL MOSQUITO CONTROL AGENTS ALONG AN URBAN-RURAL GRADIENT IN WEST BENGAL

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Biological control of mosquitoes is based on the foundation of trophic interactions between mosquito and a wide range of co-inhabiting organisms. Among these organisms, predators, parasites and pathogens exploit mosquitoes as a resource, thereby regulating mosquito population to a desired level. Successful regulation of mosquito using predators depends on several factors that include habitat similarity and species-specific efficiency. Selection of the biocontrol agent depends on the concerned mosquito larval habitats, since efficacy of vast majority of the predators vary with the larval habitat. The diversity of these insects and their prey in the temporary pools are on record that prompts for evaluation of their ecology in the wetlands for the purpose of classical or conservation biological control with the aim of preserving the natural environment. The assessment of the macro invertebrate community of the temporary pools and allied wetlands with predatory insects as the key element will help to understand the importance of predator-prey interactions in mosquito productivity. The correlation between the productivity and diversity of the aquatic insects will be emphasized to substantiate the abundance at the spatial and temporal scale. The present study was carried out to identify and assess the relative abundance and diversity of aquatic insects across the comparable ponds and temporary pools located in Kolkata, Howrah and Hooghly each having varied anthropological activities. Results showed irrespective of orders, post monsoon (Sep-Nov) and the winter months (Dec-Feb) recorded the highest abundance of aquatic insects. The coleopteran beetles were the most abundant taxa followed by the hemipteran bugs. The values of diversity indices indicated that Kolkata scored highest in terms of diversity and evenness while Serampore was placed second. Analysis of variance on the abundance of predator insects considering the species, sampled months and ponds as predictor variables indicated significant interactions in all the cases. Therefore, the proposed study was aimed to evaluate the population abundance and species assemblages with reference to diversity of these aquatic insect predators to supplement the information necessary for framing conservation biological control.

Keywords: Wetland, vector borne diseases, biocontrol agents, diversity indices

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C - 042

PLANTS USED IN INDIAN TRADITIONAL CUSTOMS: THEIR ROLE IN BIODIVERSITY CONSERVATION

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Biodiversity is an important gift of nature that provides people with livelihood and plays important role in human civilizations. Plants play a key role in human spirituality, religion and culture and they are an integral part of biodiversity. Plants have been associated with human beings since ancient times in India. Their use has either been related to a belief or to a custom. A large number of plants are worshipped as gods and goddesses and many other plants are used for worship in different Indian traditional customs. These traditional customs serve as a useful tool in conservation of plant biodiversity. The present paper deals with the study of 16 genera, from 10 families, in Gwalior region and nearby areas. The uses of these plants in traditions as well as their medicinal values have been recorded.

Keywords: Biodiversity, plants, Gwalior, medicinal value

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C - 043

INDIGENOUS KNOWLEDGE AS THE KEY OF ECOLOGICAL RESTORATION – A CONCEPTUAL STUDY IN JHARKHAND

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Indigenous knowledge is the total way of life of a tradition oriented society. The cumulative body of this knowledge continues to survive in many other local societies, although often in reduced forms. Investigations into the traditional resource use norms and associated cultural institutions prevailing in rural societies highlights that a massive element of local biodiversity, regardless of their use value, are preserved by the local traditional practices. The practices show the strong relationship between the people and nature. The indigenous society is lacking in formal education, consciousness in scientific outlook towards life and logic. They are run by belief system. This belief system is the collective attitude and it controls the way of life of a folk society. Belief systems have a considerable effect on environmental attitudes and can therefore play a significant role in ecological conservation practices. People live so closely within their natural World. It seems inevitable that they would have useful knowledge about their environment. With the advancement of technology and expansion of population, industries are established and expanded to meet the demand of people which lead to environmental degradation. To avert that threat, the environmental knowledge system which comes under the rubric of Traditional Ecological Knowledge, may be helpful in this regard. Indigenous knowledge has over the years played noteworthy position in solving several major social-ecological plights. Folk people have relied on biodiversity as a buffer against environmental inconsistency, change and catastrophe. Manifold folk belief, rituals, customs; taboos can conserve the ecology in sustainable manner. The use and protection of different plants, animals, sacred groves etc. by the ethnic people through Indigenous knowledge depend on their cultural value. Thus; it should be preserved for sustainable ecology and Ecological restoration.

Keywords: Indigenous Knowledge, Belief System, Biodiversity, Ecology, Sustainable Ecology, Ecological Restoration

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C - 044

OVIPOSITION SITES, EGG LAYING PATTERNS AND THE EGG MORPHOLOGY OF THREE PHTHIRAPTERAN SPECIES INFESTING COMMON QUAIL *COTURNIX COTURNIX* L. (GALLIFORMES: PHASIANIDAE)

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Phthirapteran ectoparasites exhibit considerable diversity with respect to egg laying pattern, egg laying sites and the egg morphology. Furthermore, the egg shell morphology of different phthirapteran species is species specific and can be used as a tool for the identification of lice. Three phthirapteran species (one amblyceran -*Menacanthus abdominalis* Piaget, 1880 and two ischnoceran species- *Cuclotogaster cinereus* Nitzsch, 1866 and *Goniodes astrocephalus* Burm. 1838) were recorded from the common quail *Coturnix coturnix* L in the district Rampur and neighboring areas. Present paper provides information on the oviposition sites, patterns of egg laying and the egg morphology of the aforesaid three species infesting common quail *C. coturnix* L.

Keywords: Amblycera, Ischnocera, Lice, Oviposition, Phthiraptera

C - 045

A NOTE ON PHTHIRAPTERAN ECTOPARASITES INFESTING WHITE BREASTED WATER HEN, *AMAURORNIS PHOENICURUS*

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White breasted water hen, *Amaurornis phoenicurus* were examined for the presence of phthirapteran ectoparasites. One amblyceran species, *Pseudomenopon phoenicuri*, Price, 1974 was collected from infested water hens. Present report furnishes information on the prevalence, intensity of infestation, range of distribution of the louse on the aforesaid host. Furthermore, information on it site of oviposition and egg laying pattern has also been furnished. Additional remarks on the morphological features of the louse have also been supplemented along with biometrical analyses of measurement.

Keywords: Amblyceran, *Amaurornis phoenicurus*, Lice, Phthiraptera, *Pseudomenopon phoenicuri*

C - 046

CLIMATIC CHANGE AND ITS EFFECTS ON THE BIODIVERSITY OF INDIAN SUNDERBAN

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Sunderban is the largest block of tidal halophytic mangrove forest of the World covering about one million ha. in the delta of the rivers the Ganga, Bramhaputra and Meghna. It is a unique type of ecosystem and supports a huge floral and faunal diversity. This forest is an independent "Biom", enriched with different biodiversities along with a great variety of wild life.Mangrove forests are one of the most productive and bio-diverse wetlands on earth. Yet, this unique coastal tropical forest is among the most threatened habitats in the world. In this study we have find out the effects of climatic change and major problems from different anthropogenic activities on biodiversity in Indian part of Sunderban. Different anthropogenic impacts, geomorphic stress, recurrent coastal flooding, rise in sea level, huge silt deposition, high salinity, loss of soil fertility are the main reasons of biodiversity loss and steep fall in fishery resources.So aproper environmental management plan is needed to conserve this endangered ecosystem and to attain a sustainable development of the region.

Key words: Sunderban, Mangrove forests, Climatic change,Anthropogenic activities.

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C - 047

DIVERSITY AND STATUS OF AVIAN SPECIES IN HANSADANGA LAKE, WEST BENGAL, INDIA

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Birds are known as good bio-indicator as they are very sensitive to slight changes in the surrounding environment. The present study was carried out in Hansadanga lake (23° 27´ N and 88° 27´ E) of West Bengal (India) to explore the present status, diversity and richness of avian species. The study was conducted for one year (January 2016 to December 2016). The point count and line transect methods were applied in bird counting. Among different bird families, Anatidae was found to be the most dominant area, 51 species were resident, 12 species were resident migratory and 19 species were winter migratory. On the basis of relative abundance, 12 species were very common, 25 species were common, 18 species were uncommon and 27 species were enlisted in rare category. The Shannon, Simpson and Margalef's indices were also analysed to understand the species diversity and richness of the study area. So the present study will provide baseline information of bird diversity of the study area.

Key words: Avian species, Diversity, Richness, Hansadanga Lake, West Bengal, India.

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C - 048

ETHNOBOTANY AND ITS IMPACTS ON LOCAL TRIBAL POPULATION OF RANCHI

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In this communication, efforts have been made to record and discuss ethnobotany and its impacts on tribal population of Ranchi. This discipline ethnobotany is one of the fertile avenue of scientific research and its potential manifestation is widely perceived for the human beings from day one of human civilization. Frankly speaking, biological inter-relationships exist in between man and plants in our day to day life. Both of them depend upon each other. Life on this green planet is impossible when one of them is missing.

The tribal belts of Ranchi, especially its rural segments, are quite rich in biodiversity like Uttarakhand and Chattisgarh. The herbs and shrubs are medicinally significant which are useful for the treatment of diseases for the poor population.

Quite a number of plants have been collected in different seasons of the year which have been taxonomically analysed. Their plant parts like root, stem, leaf, flower and even the whole plants have chemicals which are used for the treatment of diseases.

Attempts would be made in the present work to discuss the plants collected and their varied uses for the treatments of human populations.

Keywords: ethnobotany, tribal, biodiversity, medicinal, Ranchi

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C - 049

ROLE OF *ELEPHANTOPUS SABER* IS NATURAL REMEDY FOR POISONOUS BITESS AND HERBAL MEDICINE OF RURAL AREA

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Elephantopus scaber L.is natural remedy for poisonus bites herbs. Plants look like stamp food of an Elephants .locally called Ban Tamaku.It growing all over India including Argada in Ramgarh district of Jharkhand. The whole plant is an established source of drugs such contains germacranolide sesquiterpene lactone containing two lactone rings and Epoxide functional groups; (Antitumor activity of *Elephantopus scaber* leaves Linn against Dalton;s ascitis Lymphoma) ; A/C to Indian Journal of pharmacutical sciences 2003 Jan -Feb; 64 (!) 71-3) such as 17; 19-dihydrodeoxyelephantopin; iso 17, 19-dihydro-deoxyphantopin and 8-hydroxyl Noringenin are the most important bacterial activity .

Keywords: *Elephantopus scaber* L, germacranolide sesquiterpene lactone, Ramgarh

C - 050

OCCURRENCE OF SALT TOLERANT BRYOPHYTES AS BIOINDICATOR AT SPECIFIC HABITAT IN BILASPUR (CHHATTISGARH)

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Bryophytes are known for their growth and development in extreme conditions and different ecological habitats. These plants are also used as experimental model for study bioaccumulation, habitat indicator and ecological studies. Few mosses are reported globally high salinity tolerant as they grow near seashore. Present inventory reveal occurrence of three species of mosses viz. *Campylium stellatum, Bryum Capillare, Minium hornum* around Bilaspur region, which is reported as salt tolerant and they grow below litter line and stabilizing soil. These studies indicate the occurrence of certain important taxa and also focus on edaphic factors affecting the forest ecosystem. These groups of plants are emerged in specific environmental conditions and temporal fluctuations of environmental factors.

Keywords: Bryophytes, Salt tolerant, Habitat, Edaphic factor, Chhattisgarh

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C - 051

POTENTIAL ANTIOXIDANT AND REACTIVE OXYGEN SPECIES SCAVENGING ACTIVITIES OF *HIBISCUS ROSA SINENSIS (L.)* ETHANOLIC FLOWER EXTRACT

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The objective of the investigation was to evaluate the potency of *Hibiscus rosa sinensis* ethanolic flower extract, as a potential natural antioxidant. In vitro total antioxidant capacity and reducing power of *H. rosa* sinensis extract (HRSE) was assayed during the investigation. For this purpose butylated hydroxytoluene (BHT) and ascorbic acid (ASA) were used as references respectively. HRSE showed a two-fold stronger antioxidant capacity than that of BHT. On the contrary the reducing power of HRSE was less than that of ASA, with the reaction time and extract concentration. The HRSE was also screened for the reactive oxygen species (ROS) scavenging activities such as O_2•− (Superoxide radical), H_2O_2 (Hydrogen peroxide), NO (Nitric Oxide) and compared to that of butylated hydroxyanisole (BHA). BHA showed a scavenging activity of (62.4%), (64.6%), and (38.5%), respectively at a concentration of 200µg/L. Results showed that the scavenging action of HRSE, in case of O_2•− (61.8%) and NO (37.8%) was close enough to that of BHA. On the other hand it was lower for H_2O_2 (46.4%).

Keywords: *Hibiscus rosa sinensis*; *Hibiscus rosa sinensis* flower extract ; Antioxidant activity; Free radical Scavenging activity; Reactive Oxygen Species; Superoxide radical

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C - 052

AN OCCURANCE OF *CORVOSPONGILLA LAPIDOSA* (ANNADALE 1908) (PORIFERA: SPONGILLIDAE) FROM BABAI RIVER TRIBUTARY, DHANEPUR, GONDA, UTTAR PRADESH

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The freshwater sponge *Corvospongilla lapidosa* (Annandale 1908) (Porifera : Spongillidae) is reported for the first from the Babei river Dhanepur Dist. Gonda from Uttar Pradesh sponges are biological indicator species this clearly indicates good ecological status of the said river. The sausage shaped spicules of this sponge observed during investigation shows adaptive value to thrive in low silica environments. The species is tolerant to high turbidity. High calcium and bicarbonate may be unfavourable and the sponge has not been found either on molluscan shells or on aquatic vegetation. It can thrive in water less than than 1m depth. Some Physico-chemical aspects of this lentic habitat of *C. lapidosa* reveals the base data for the species ecology. Present study will help in documentation of freshwater sponge diversity of this area and for further research in this field.

Keyword: Ecology; Porifera; *Covospongilla lapidosa*; Babai River, silica, turbidity; spicules, sponge research

C - 053

POPULATION DYNAMICS *OF CIRCUMONCOBOTHRIUM* SP. (SHINDE, 1968) IN FRESH WATER FISH *MASTACEMBELUS ARMATUS* FROM MARATHWADA REGION (M.S) INDIA

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The present communication deals with the population dynamics of *Circumoncobothrium* Sp. (Shinde, 1968) in *Mastacembelus armatus* from Marathwada region (M.S) India during the period of June-13 to May-14. A total 121 *Circumoncobothrium* sp. were recorded from 248 fishes. The report summarizes the data of incidence, intensity, density and index of infection of *Circumoncobothrium* sp. from *Mastacembelus armatus* with effect of environmental factors.

Keywords: *Mastacembelus armatus,* Population dynamics, *Circumoncobothrium* sp.

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C - 054

BIODIVERSITY INDICES OF MACRO-BENTHIC INVERTEBRATES OF CERTAIN LOTIC WATER BODIES AT BHOJPUR

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Biodiversity is a multidimensional property of natural systems. A biodiversity index is a quantitative measure that reflects how many types (genera/species) are there in a data set (a community) and simultaneously takes into account how evenly the basic entities (such as individuals) are distributed among those types. The basic idea of a biodiversity index is to obtain a quantitative estimate of biological variability that can be used to compare biological entities, composed of discrete components in space or in time.

This paper reports different biodiversity indices of macro-benthic invertebrates of various lotic fresh-water bodies namely Ganga River, Barahara; Sone River, Sahar and Gangi River, Arrah, Bhojpur at Arrah during 2013-2014 using standard methods. Measurement of biodiversity index includes proportional abundance as well as richness as the measure of biodiversity.

Shannon-Wiener Index is widely used Information static index to take account in to rare species in a community. In this work, gross average of Shannon-Wiener Index of macro-benthic invertebrates was calculated to be 1.849 with a minimum average of 1.478 of insects and a maximum average of 2.170 of molluscs at Gangi River, Arrah. The value depends on the effective number of genera at these water bodies. Simpson Dominance Index (=D): Gross average of Index was found to be 0.847 showing a range of 0.758 of insects at Ganga River to 0.904 of crustaceans at Sone River. Simpson Diversity Index (1 – D): Gross average of index was calculated to be 0.153 with a minimum of 0.096 of crustaceans at Sone River and a maximum of 0.242 of insects at Ganga River, Arrah. Simpson Reciprocal Index (1/D): As far as Simpson Reciprocal Index is concerned, its gross average was calculated to be 1.195 with a minimum of 1.106 of crustaceans at Sone River and a maximum of 1.319 of insects at Ganga River, Arrah. Margalef species richness index: The gross average of Margalef species richness Index was found to be 2.236 with a minimum of 1.073 of insects at Gangi River and a maximum of 7.826 of crustaceans at Ganga River, Arrah. Menhninick's Index: The gross average of Menhninick's Index it was found to be 0.920 ranging from 0.308 of annelids at Gangi River to 2.198 of crustaceans at Sone River, Arrah.

Thus, these values suggest that the water bodies investigated in this study (a) have real macro-benthic invertebrate communities with moderate diversity, (b) have mature and stable communities as well as (c) moderately polluted water. The macro-benthic invertebrates of these water bodies are under stress due to natural and/or anthropogenic factors.

Keywords: Shannon-Weiner index, Simpson Index, Margalef index and Menhninick's index

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C - 055

AN EXAMINATION OF POPULATION DISTRIBUTION PATTERN AND CONSERVATION STATUS OF BOABAB TREE IN RANCHI, JHARKHAND

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Environmental challenges and conservation are becoming acute day by day. The fate of tree population in any area is remarkable in the context of conservation of biodiversity. Especially, for some rare variety of trees, that needs a special strategy of conservation for its sustainable utilization. The present study was undertaken in Ranchi, Jharkhand to understand the species structure, distribution pattern and current conservation status, of rare variety of a tree commonly known as Boabab tree *Adansonia digitata L*. (Malvaceae). This rare variety of tree is native to African forest and has been utilized by human beings for many useful purposes like bark (for medicine), fruits (for juice) etc. In Ranchi, three trees are present in Doranda main road. Some stress factors like vehicular traffic and human interference cannot be neglected due to its presence on road side. This work summarizes various facts associated with this tree like medicinal values, mythological and environmental significance. Based on existing knowledge and empirical study, an approach is suggested which may be used for its management and conservation. This will create an inventory for further research work and would give a chance for environmentalist and ecologist to take measures for its protection.

Keywords: Baobab, Ranchi, *Adansonia digitata*, Environmental, Jharkhand

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C - 056

ETHNOMEDICINAL TREASURE OF SANTHAL TRIBE OF LITTIPARA BLOCK OF PAKUR DISTRICT (JHARKHAND)

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Littipara is one of the block the Pakur district. The area is dominated by *Santhal* and *Paharia* tribes. The forest wealth is a major source of livelihood besides herbs necessary to treat various ailment for these tribals. Santhals still have the strong beliefs on the traditional system of medicines.

This traditional system of cure passes on from generation to generation without any proper documentation. There is a need to document the ethnomedicinal practices and the plant related to it as these invaluable plant species are dwindling at greater pace.

A survey conducted in the area since 2014 reveals that the plant treasures are used to cure various diseases like diabetes, gastrointestinal problems, hypertension, skin ailment etc.

In the present communication twenty five plants species known to cure various ailments has been presented in detail.

Keywords: Diseases, Littipara, Medicinal plants, traditional knowledge, tribal

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C - 057

BIODIVERSITY OF TROPICAL FOREST COVERS OF BALASORE DISTRICT, ODISHA, INDIA

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The structure and function of tropical forest ecosystem is maintained by upper storey vegetation layer which principally consist of tree species. The tropical forest covers of Balasore, one of the coastal district of Odisha was analysed for structure, composition and diversity of upper storey vegetation layer (≥ 30 cm circumference at breast height) along with various groups of animal species. A total of 94 tree species representing 77 genera and 38 families were recorded in this area. The average number of species per family was nearly equal to 2.5 and per genus was >1.2. The species diversity index and concentration dominance of the forest were 3.69 and 0.06, respectively. The Importance Value Index (IVI) of species ranged from 0.55 to 40.47. Within the same tropical forest covers of the district the diversity of various groups of animal species recorded were 20 vertebrates, 140 birds and 29 amphibians. The biodiversity of the tropical forest covers of Balasore district in relation to species composition and richness of both plants and animals are diverse with many of them as rare occurrence in the area supports the need of conservation for future use and sustenance.

Keywords: Flora, Fauna, composition, Species diversity, Concentration of dominance, IVI, Conservation.

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C - 058

ETHNOMEDICINAL PLANTS, INDIGENOUS KNOWLEDGE AND CONSERVATION OF BIODIVERSITY IN SANTAL PARGANA, JHARKHAND

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This paper examines the local uses and ethics of medicinal plants in Santal Pargana. The function of medicinal plants and traditional health practitioners in the traditional health care system is outlined with identification of the fundamental role of beliefs about causation of ailment and how this affects patient's health care choices. There is mixed proof of over-exploitation of plants and plant parts for medical purposes in Santal Pargana, although it appears that the pre-conditions for over-harvesting are present. Traditional systems of land tenure and the demarcation of sacred sites which contain useful plants contribute to the conservation of biodiversity. However, current policies may undermine these indigenous conservation strategies. Medicinal plants may be able to take part in some role in providing sustainable rural livelihoods in certain tribal areas, and in conserving valuable habitats and plant species, but the clear definition of property rights is a prerequisite.

Keywords: Traditional knowledge, Ailments, Conservation

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C - 059

ON THE GENUS *ADORETUS* DEJEAN, 1833 (RUTELINAE: SCRABAEIDAE) OF A BIODIVERSITY HOTSPOT ZONE OF INDIA

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The family Scarabaeidae of the insect order Coleoptera is the largest family in the entire animal kingdom and is known by about 27,800 species contained within 11 subfamilies and 600 genera worldwide. Among these the genus *Adoretus* Dejean, 1833 of the subfamily Rutelinae ranks second in terms of number of species described till date throughout the globe.

These beetles play a very significant role in forest ecosystem both in their larval and adult stages by pollinating plants and recycling plant materials. Despite its importance in forestry as well as in agriculture the genus is poorly known, particularly from this part of the globe and demands thorough revisionary taxonomic studies.

The study area Buxa Tiger Reserve, Dooars, represents one of the tropical forests of Eastern Himalaya, which falls within one of the 35 biodiversity hotspots of the world and one of the four of India. The reserve is located between latitudes 26°30" to 26°55" North and Longitudes 89°20" to 89˚35" East of India and occupies an area of about 759.26 sq. kms.

Both extensive and intensive surveys were conducted in different beats under different ranges of Buxa Tiger Reserve. Field visits were made in every month of each calendar year during the period of survey (except 15th June to 15th September when the forest remains closed for rejuvenation). For collection of the samples sweep nets, bush beating and hand picking techniques were used. Several pit fall traps were laid in the forest to collect ground dwelling scarabs. In the evening hours UV light trap was used to collect nocturnal scarabs. The collected samples were examined under Stereozoom Binocular Microscopes Zeiss SV6, SV11 and Olympus SZ 30 and were identified with the aid of relevant literatures.

The faunistic investigation of the forest revealed in the recognition of 76 scarab species of which 11 species are recorded within the genus dealt herewith. Out of the recorded 11 species, *Adoretus rugosus* Arrow 1914 is reported as new from the country, while *Adoretus renardi* Brenske 1893 as new from the state of West Bengal and *Adoretus lasiopygus* Burmeister 1855 from the study area. The forest is dominated by the members of *Adoretus bicaudatus* Arrow, 1917 as is represented by highest number of individuals. The recorded taxa show about 12% endemism and are of mainly oriental in distribution. Their seasonal distribution is most during Premonsoon followed by Monsoon and Postmonsoon.

Keywords: *Adoretus Dejean,* Buxa Tiger Reserve, Scarabaeidae, biodiversity hotspot zone

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C - 060

INFLUENCE OF SOME ABIOTIC FACTORS ON THE ABUNDANCE OF *BRACHIONUS SPP.*

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The observation was done for 12 months in two wetlands. The 1st wetland (P-1) was an unmanaged, without any human interference and mostly covered by macro vegitations like *Ipomia sp, Nelumbo sp. Spirodella sp, Lemna sp etc.* While the other one (P-2) was a sewage fed managed wetland where pisciculture is practiced, utilizing the Calcutta city sewage.

During study among the physicochemical parameters dissolved oxygen (DO) varies from 1.3 to 10.6 mg/lit in P-1 and 2.4 to 14 mg/lit in P-2, dissolved organic matter (DOM) from 0.38 to 5.7 mg/lit in P-1 and 0.75 to 4.47 mg/lit in P-2. pH, one of the most important parameter of water was found in between 6.5 to 8.43 in P-1 and 7.8 to 9.3 in P-2. On the other hand Free Carbon dioxide (CO_2) ranges from 5 to 30 mg/lit in P-1 while in P-2 it was 0 to 24 mg/lit. , total alkalinity (TA) from 60 to 76 mg/lit in P-1 and 148.8 to 244 mg/lit in P-2, Biological oxygen demand (BOD) in P-1 was from 2 to 6.67 mg/lit and in P-2 it was from 8.4 to 27.2 mg/ lit.

A brief description of the periodicity of different species of *Brachionus* has been given below with a view to emphasize their relative importance. Genus *Brachionus* was represented by 9 Species of which *B. patulus* and *B. quadridentatus* were predominant in P-1, while in P-2 there were 12 species belonging to this genus among which *B. angularis, B. caudatus, B. falcatus* and *B. diversicornis* were dominant. Except these other important representatives were *B. rubens, B. forficula, B. calyciflorous*. The most important species *B. angularis* was observed in few months with a range from 1 to 5 ind/lit in P-1 while in P-2 it ranges from 16 to 810 ind/lit and found throughout the study. The other Brachionoid species *B. calyciflorous,* in P-1 found occasionally while in P-2 it was dominant with a variation of 1 to 474 ind/lit. *B. rubens* was more dominant in P-2, occurring in 9 occasions with a maximum of 17 ind/lit. *B. caudatus* was also dominant in P-2 than P-1, ranging from 2 to 69 ind/lit. On the other hand *B. patulus* among brachionus was only recorded in P-1 during 9 times but not observed in P-2. The other species *B. falcatus, B. diversicornis,* were occasionally found in both the wetland.

Although the abundance of *Brachionus* was largely governed by many physicochemical parameters of water yet pH, alkalinity, eutrophic condition are the principle factors in controlling the dynamics of different species of *Brachionus*.

Keywords: *Brachionus*, abundance, influence, abiotic factors, dynamics.

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C - 061

INVASIVE PLANTS: A THREAT TO BIODIVERSITY

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Invasive plants have threatened the biodiversity globally. It has been recognized as one of the most serious problem affecting the structure, composition and natural ecosystem and semi natural ecosystem. In Kanke area, a number of invasive alien plant species like *Parthenium hysterophorus L., Lantana camara L., Ricinus comunis, Argemone Mexicana, Ageratum conyzoieds, Calotropis procera, Clerodendron sps., Ipomea sps.,Tridex procumbens* and *Eichorrnia cressipes* etc. have been reported.These plants have been recorded on the basis of field exploration and literature consultation.These have adverse impact on biodiversity and cause considerable ecological damage to natural habitat. These invasive species have not only damage the biodiversity but also threatened the indigenous flora of the study region. These species have encroaching the large area of land especially forest where they affect the forest floor vegetation and reducing native tree regeneration. The present study concluded that the alien species are currently spreading with high reproductive efficiency, competitive ability, fast growth rates and allelopathy which make them successful invaders of natural habitat. These invasive plants have not only ecological impact, but they also cause a number of disease including food and fodder scarcity. If these invasive plants will continue to spread, the endemic species may get extinct, germplasm of economic plants become rare and cultivated lands would become land of invasive alien species. So, there is a need of awareness and decision making programmes regarding control and eradication of invasive species.

Keywords: Invasive species, Kanke, biodiversity, threats, awareness.

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C - 062

ICHTHYO-DIVERSITY OF KHANWARI POND OF DISTRICT KAUSHAMBI (U. P.), INDIA

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An initial survey was under taken to study the occurrence and diversity of fishes in naturally occurring perennial pond of Khanwari village of Kaushambi district of Uttar Pradesh. The survey was conducted during all the 12 months of year 2015. A total of 27 species of fishes belonging to 19 genera, 15 families and 8 orders were identified as a preliminary survey and observation. This was the first ever systematic survey on the fish diversity of this pond. Order Siluriformes was found most dominant represented by 10 species, followed by Cypriniformes with 6 species.

Keywords: Ichtho-diversity, Siluriformes, Cypriniformes, Khanwari pond

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C - 063

A NOTE ON THE POPULATION CHARACTERISTICS OF PHTHIRAPTERAN ECTOPARASITES INFESTING BLACK PARTRIDGES *FRANCOLINUS FRANCOLINUS*

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Two phthirapteran species (one amblyceran, *Menacanthus kalatitar*, Ansari, 1951 and one ischnoceran, *Goniocotes jirufti*, Ansari, 1947) were recovered in district Rampur from black partridges, *Francolinus francolinus*. The present report provides first information on the prevalence, mean intensity, sample mean abundance and range of infestation of *M. kalatitar* and *G. jirufti.* Furthermore, information on the population composition (sex ratio, adult nymph ratio and the ratio of three nymphal instars) of both the species has also been supplemented. An attempt has also been made to determine whether the frequency distribution of both the phthirapteran species conforms to negative binomial model (by computing the exponent of negative binomial and the D of poulin).

Keywords: Amblycera, *Francolinus francolinus,* Ischnocera, Lice, Phthiraptera

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C - 064

SURVEY OF AQUATIC MACROPHYTE DIVERSITY OF MOHABALA LAKE FROM BHADRAWATI TAHSIL OF CHANDRAPUR DISTRICT (M.S.) INDIA

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In present survey total 57 aquatic macrophytes documented belonging to 32 families and 46 genera and they belonging to different groups like Angiosperms, Pteridophytes and Algae from Mohabala Lake of Bhadrawati Tahsil of Chandrapur district. Angiosperms contributes 54 species (95.08%) followed by Pteridophytes contributes 02 species (3.27%) namely *Azolla pinnata* R.Br. *Marsilea quadrifolia* L. and Algae contributes single species (1.63%) *Chara globularis* J.I.Thuiller. Monocots contributes 20 species (35%) belonging to 11 families and dicots contributes 34 species (60%) belonging to 18 families. Angiosperm macrophytes shows dominance over Pteridophytes and Algae in Mohabala Lake of Bhadrawati Tahsil. Dicots showing dominance over monocots. Emergent macrophytes contributes 41 species (72%) and showing the dominance over floating macrophytes are 10 species (17 %) and submerged macrophyte 6 species (11%). Herbaceous macrophytes dominating and represents 51 species (89%),followed by creepers represents only 03 species (5%), under shrubs only 02 species (4%) and shrubs only one species (2%).These aquatic macrophytes play important role to improve the quality of water.

Keywords: Aquatic macrophyte, Mohabala Lake, Bhadrawati Tahsil, Chandrapur

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C - 065

ECOLOGICAL STATUS OF OUSTERI WETLAND: A COMPLETE CHECKUP OF BIODIVERSITY CONCENTRATION

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Ousteri Lake is one of the important wetlands, harbouring many different types of flora and a suitable habitat for many different fauna. It was declared as a sanctuary during October 2008. The National Wetland Conservation Program of Ministry of Environment and Forests identified Ousteri as a nationally important wetland and the Bombay Natural History Society (BNHS) named it as an Important Bird Area (IBA). The International Union for Conservation of Nature and Natural Resources (IUCN) has identified this lake as one of the heritage sites. The present paper examines the state of environment in and around the Ousteri wetland and assesses the probable threats to the lake and its ecological environs. Ousteri Lake supports diverse rich and rare flora and fauna. Ousteri Lake, due to its extreme hydrological fluctuations across the annual cycle, gives rise to interesting pattern of flora and fauna in the lake. The northeast monsoons leave the lake flooded during the winter months, while the scorching summers leave it totally dry. Ousteri Lake had been primarily used as a tank for irrigation purpose. Thus, one finds vast stretches of land, about 2000 acres being cultivated. The main crop grown is paddy and the only subsidiary is sugar cane. The natural vegetation, altered much by human agencies consist of over 220 species belonging to 63 families. The vegetation study conducted by SACON (2011) recorded 472 plant species in total. In which, the herbs occupy 40% followed by trees (21%). Other life forms are represented by less than 100 species. Ousteri Lake and its environs provide a wide variety of habitat for many floral species in which 190 species are listed as Least Concern, 23 species are Near Threatened, 24 species are Vulnerable according to the IUCN Red List. About 14 floral species are coming under Endemic categories. With regard to fauna, 202 are listed as Least Concern, 13 species are listed as Near Threatened, two species in Vulnerable, three species in Endangered and one in Critically Endangered categories. Moreover, five species are in endemic categories.

Keywords: Environs, Flora, Fauna, threatened species, endangered species.

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C - 066

COMPARATIVE STUDY ON ACARI POPULATION OF RECLAIMED FOREST AT GHATOTAND COAL MINING AREA AND NATURAL DECIDUOUS FOREST

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Acari are one of the most abundant species-rich group of soil mesofauna which provide a useful function as biological indicators of habitat disturbance, soil quality and reclamation success. A comparative study on Acari population was done on soil samples of reclaimed forest at Ghatotand coal mining area and natural forest with respect to distribution, diversity and seasonal abundance pattern to understand their role in reclamation accomplishment. For better understanding of seasonality pattern correlation between various edaphic factors was also observed. Significat positive correlation was observed between moisture and Organic Carbon Content both at natural (0.8806) and reclaimed (0.6382) forest. Ten species of Acrachnids were found at both natural and reclaimed forest. *Rhagidia* sp.was found to be the most abundant species at both natural and reclaimed forest while *Caloglyphus* Sp.was least abundant. The Species diverstity of natural forest was comparatively higher yet a considerable decline was observed in summer season. Monsoon peak and summer decline in population was observed at both the forests. Seasonal abundance of various arachnids followed similar pattern yet a considerable difference in community structure was observed. The Population fluctuation of acari in summer season was higher at reclaimed forest than that of natural forest. A significant increase (2.16 to 2.19) in species diversity of was observed from first to second year of study period at reclaimed forest indicating successful reclamation prescription.

Keywords: Mesofauna, Species Diversity, Reclamation, Seasonality pattern

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C - 067

ROLE OF ABIOTIC ELICITORS FOR IMPROVING SECONDARY METABOLITE SYNTHESIS IN *BACOPA MONNIERI* AND *ADHATODA VASICA*

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Higher plants are rich source of bioactive compounds or phytochemical which are used in pharmaceuticals industry. Many plants containing high value compound are becoming endangered because of overharvesting which threatens the biodiversity. Chemical synthesis of these plant derived compounds is not economically feasible. Thus new approaches are needed to enhance the synthesis of plant derived compounds. Environmental factors viz. temperature, humidity, light intensity, the supply of water, minerals, and CO_2 influence the growth of a plant and secondary metabolite production. Secondary metabolites play a major role in the adaptation of plant to the environment and in overcoming stress conditions. *Bacopa monnieri* is one of the important medicinal plant used for centuries as a memory enhancer, anti-inflammatory, analgesic, antipyretic, sedative and antiepileptic agent. On the other hand *Adhatoda vasica* has been used with much success to treat asthma, chronic bronchitis, and other respiratory conditions. The aim of the present study was to screen the plant for its phytochemical component and to study the effect of simulated water stress on the growth of these plants. Several parameters such as chlorophyll content, nitrate reductase, proline concentration, relative water content and concentration of active component were taken into consideration. The leaves were treated with various concentration of PEG to simulate water stress condition. A significant change in the content of proline, chlorophyll and nitrate reductase was observed at different level of water stress.

Keyword: Biodiversity, Environmental Stress, Secondary metabolites, Proline, Chlorophyll, *Bacopa monnieri*, *Adhatoda vasica*

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C - 068

SOME AQUATIC AND MARSHY WILD EDIBLE PHYTORESOURCES USED BY THE MUNDA TRIBE OF DISTRICT KHUNTI, JHARKHAND, INDIA

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Wild plants have provided an important source of food since time immemorial and even in present scenario. The Mundas are the dominant tribal community of Khunti district and are considered as the earliest aboriginals of the State Jharkhand. The Munda people are very close to nature and have hereditary traditional knowledge of consuming aquatic and marshy wild plants and plant parts viz. tuber, shoots, leaves, fruits etc. as a source of food. It is interesting to note that much of their folk knowledge is endemic. Although, these wild edible plants play an important role in rural food security, they are mostly ignored during land use planning and implementation, economic development and biodiversity conservation. Moreover, due to modernization of society and change in their lifestyle, indigenous traditional knowledge is rapidly eroding. The present paper compiles and evaluates the ethnobotanical data on about 17 wild edible aquatic and marshy plants traditionally used in various forms by the Munda tribe. The study is an effort to fulfil a part of the knowledge gap by providing data on the diversity and traditional knowledge, a prerequesite for People's Biodiversity Register. The documentation of these uncultivated and underutilized wild edible plants will further make these phytoresourses popular and can provide an alternative, inexpensive and healthier source of food for an ever increasing population.

Keywords: Aquatic and marshy plants, Food security, Indigenous, Munda tribe, Traditional knowledge, Wild edible

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C - 069

SPORE PRINTS OF SOME MUSHROOMS COMMONLY FOUND IN ANGARA AREAS OF RANCHI

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A mushroom is the fleshy spore bearing fruiting body of a fungus, typically produced above the ground on soil or on its food source. Mushrooms can be edible as well as poisonous and the poisonous ones are known as toadstool. The word "MUSHROOM" is most often applied to those fungi that have a stem(stipe), a cap (pileus) and gills(lamelleae) on the underside of the cap (Basidiomycetes, Agaricomycetes). Their spores called BASIDIOSPORES are produced on the gills and fall in a fine rain of powder from under the caps. The spore print is only one charecteristic used in making the taxonimic determination. If the cap is cut off and placed gill-side-down, a powdery impression reflecting the shape of the gills is formed. The colour of the powedery print is called a SPORE-PRINT. Spore print is used to help to classifiy them. Spore- print colour include white, brown, black, purple-brown, pink, yellow and creamy but almost never blue, green or yellow. The poisonous false parasol (*Chlorophyllum molybdites*) has a green spore deposite. The spore print is not always successful as some mushrooms are too young or old to produce spores. Spore print also be used to help in distinguish between similar species. Mushrooms are used extensively in cooking in many cuisines. They are known as the meat of the vegetable world. Even edible mushrooms may produce allergic reaction in susceptible individuals.

Keywords: Fungi, toadstool, stipe, pileus, lamalleae, basidiomycetes, ascomycetes, basidiospores, spore-print, texonimic importance

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C - 070

DISCONNECT BETWEEN TAXONOMY AND ETHNIC GROUPS & THEIR SKILLS A THREAT TO BIODIVERSITY CONSERVATION

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The intimate relationship between the human and plant world has evolved over generations of experience and practices. Situated in the eastern part of India, Jharkhand as the name suggests it is rich in biodiversity and their traditional usage. There are 32 tribal groups, out of which Santhal, Munda, and Oraon are the most popular tribes. Ethnic groups live close in the vicinity of the forest and managed to converse the biodiversity. Plants are conserved in natural habitat and are being worshipped as home of God and Goddess. These are used as food sources as well as they have many herbal and medicinal uses. The unconventional knowledge has been and is being transmitted orally from generation to generation, may be decreasing gradually due to the indifference in the youth of the present day, in the light of electronic age advancement. Ethnotaxonomy deals with naming and classification of plants and animals by human societies in their language. For convenience, they have classified plants on different basis, for instance uses, pharmacognosy, appearance etc. Some of the plants mainly used by them are *Terminalia arjuna, Diosphyrous melanoxylon, Butea monopherma, Phyllantus niruri* etc. With the advancement of science and technology, taxonomists have devised different methods to classify plants on the basis of morphology, anatomy, genetics (cytology), phylogeny, chemistry etc. Modern taxonomists/botanists study about the identification, adaptability and abundance of different plants, which ethnic people may not know. If the knowledge of ethnic group and scientific knowledge come together in one frame, it may be a help to conserve biodiversity. Disconnection may lead to extinction of a particular plant, if it is less in number and is being overexploited. But in case of unawareness, this may be a threat to biodiversity and the road to a certain disaster.

Keywords: Ethnic group, Jharkhand, Ethnotaxonomy, Taxonomy, Biodiversity, Connect-Disconnect.

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C - 071

DATA ANALYSIS OF INVASIVE PLANTS SPECIES OF INDIA

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India is mainly a tropical country endowed with rich biodiversity due to diverse biogeographic zones. Huge number of plants originating from other regions of the world has become invasive in India and they pose great threat to its native biodiversity, cause economic loss and poses health hazards. They have been introduced in environment by humans intentionally or otherwise through human agency or accidentally from one region to another. These plants grow and flourish in any area with the minimum resources and suitable environmental conditions. The present study reanalyzes the data published checklist of 173 species of invasive plants in India. We used descriptive statistics to find out if invasive plants in India show a pattern in terms of their nativity, taxonomy, habit, habitat, mode of propagation. Our results indicate that most of the invasive plants in India originate from tropical America and family Asteraceae has the largest share of invasive plants.

Keywords: Alien plants, Biodiversity loss, Invasive plant species.

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C - 072

DISTRIBUTION AND CONSERVATION STATUS OF PLANT GENETIC RESOURCES OF TROPICAL DECIDUOUS FORESTS OF RANCHI, JHARKHAND, EASTERN INDIA

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Study was conducted in 21 different locations using belt transects (50 m x 100 m size) to study the distribution and conservation status of plant genetic resources of tropical deciduous forests of Ranchi, Jharkhand, Eastern India. A total of 132 plant species (81 identifies and 51 (may be overlapped) unidentified) are reported in the present study. Of which 33 are herbs and grasses, 46 shrubs (including woody climbers and woody epiphytes) and 52 trees. The 81 identified plant species are belonging to 68 genera and 39 families. Highest diversity is contributed by the family Fabaceae (14 species), followed by Rubiaceae, Malvaceae, Euphorbiaceae and Combretaceae by 5 species each. The forests of Jharkhand is very poor in terms of tree density (37 individuals ha^{-1}) but the basal cover of trees are very high 2513.86 m^2ha^{-1}. The per hectare density of shrubs and herbs are quite high in the studies forests and it is 16,450 individuals ha^{-1} and 4,42,500 individuals ha^{-1} respectively. In case of trees, highest density as well as basal cover is contributed by *Shorea robusta* (82.46% and 82.10% respectively). The most dominant associates of *S. robusta* in terms of density, frequency and dominance are *Buchanania lanzan* and *Diospyros melanoxylon.* Other common associates of Sal are *Terminalia tomentosa*, *Butea monosperma, Lagerstroemia parviflora, Schleichera oleosa, Terminalia belerica, Terminalia chebula*, etc. On the other hand, *Croton oblongifolius* (26.44%) and *Clerodendrum viscosum* (25.68%) contributed highest density in case of shrubs, whereas, *Panicum* sp. (23.16%) and *Desmodium triflorum* (16.38%) in case of herbs and grasses. This study can be considered as a model for plant diversity study in the Sal dominated forests, based on which proper management strategies can be formulated for the conservation of this unique type of forests with high dominance of deciduous tree species.

Keywords: Plant diversity, density, species richness, dominance

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C - 073

ECOLOGICAL VARIATION IN SOME SPECIES OF FAMILY BIGNONIACEAE

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The earth is undergoing rapid environmental changes because of human actions. Ecological diversity is a result of variations in the ecosystem based on their physical features and climatic situations. During assessment of possible impact of climate change on plant species, we have taken into account not only the possible changes in ecosystems and the ecological amplitude of the adaptation of these species, the diversity of habitats in which these species can be conserved, the abundance of their populations, but also other internal and external factors. Soil and climate factors together explained a good amount of the variance in plant species between and within biomes. Species–specific responses to environmental variability imply that tree responses to future climate will likely be not synchronised among species, which may translate into changes in structure and composition of future forest communities. In particular, we speculate that outcome of the climate change in respect to relative abundance of *Kigelia* and *Jacaranda* at the regional levels will be highly dependent on the balance between increasing temperatures and precipitation. Ecological variation of plants can also be a result of emission of greenhouse gases. The growth rates of different species are because of the variation of the temperatures. The geographic ranges and abundance of many terrestrial plants are limited by temperature extremes. Within a region differences in temperature – dependant growth could cause different plant species to be specialized on different portions of the growing season. The temporal variation is also a cause of limiting the abundance of plants with diversity and composition of terrestrial plants. Changes in any of these constrains could thus change the abundance of species and genotypes in a habitat. Warming directly affects the rate of transpiration, photosynthesis, and other biogeochemical processes. For instance, enhance CO_2 concentration can increase photosynthetic rate especially for plants growing in warm and dry condition. Naturally the plants have their own mechanism to tolerate a certain level of increased temperature. As soil temperature increases, the decomposition rate of organic matter will increase, and nutrient mineralization and availability for plant uptake become increased at presence of sufficient water if other conditions are unchanged. Thus the interaction and the different combination effect of rise of CO_2 concentration and temperature is determined by soil properties, water, mineral, and nutrient availability, etc., as a result the expected response of plants in different environments and climate variability can be either positively or negatively affected.

Jacaranda mimosifolia L., Kigelia africana (Lam) Benth. are some plants grown in temperate zone of family Bignoniaceae. *Kigelia* is a highly variable monospecific genus of this family. Its fruit is huge sausage like and is hanging from the limbs on the long rope like stalks. These are distributed all over India but found abundantly in West Bengal. These are found mostly in wetter areas and riverine area although both are native to Africa. Many ecological variations were found in *Kigelia* during the research work compared to different workers like branched inflorescence, valvate aestivation, axile placentation in ovary, campylotropous ovule arrangement, etc whereas in southern part as such there is no fruiting. Last explanation for the perceived pattern is one of the key observations adduced as evidence for the general ecological argument that diversity begets stability.

Keywords: Kigelia, aestivation, species- specific, placentation, temperature

C - 074

MEDICINAL POTENTIAL OF SOME PLANTS OF JHARKHAND

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Plants have been selected and used empirically as drugs for centuries. Indigenous traditional medicine has played a vital role in the discovery of novel medicinal products from plants. The use of plants for the purpose has been known to the early Vedic-aryan. Jharkhand, state in India; is rich as far as biodiversity of medicinal plants is concerned. The forest area is about 40% of the total area of Jharkhand. It has been observed that the tribals have great love and knowledge of medicinal plants. They use them for wide range of health related problems.

Fifty nine plant species found in Jharkhand area, have been documented along with their scientific names, common names, family, ethnobotanical uses and cosmeceutical relevance. The information on plants' used for the treatment of diseases like malaria, menstrual cycle, disorder, leucoderma, skin diseases, vitality, joints pain, skin cancer, epilepsy, stomach cancer, anxiety, osteoarthritis, polio, blood cancer, gonorrhoea, spermatorrhoea, rheumatism etc. has been included. These traditional medicines of indigenous origin may be integrated with national healthcare system, once those are scientifically proven for a particular ailment. It is hoped that an ethnomedicinal study will provide important database of the different usage of plants for curing different diseases.

Jharkhand could be a hot medical tourist spot. Abundance of medicinal plants at every corner is an unexpected resource which could be used for the benefit of human kind. The present study identified several plants species and their ethno botanical uses. Although Jharkhand is considered to have rich sources of medicinal plants; there are limited number of scientific results found. The present study and the database would be beneficial for embarking scientific validation of plants found in Jharkhand region.

Keywords: ethnomedicinal study**,** healthcare, scientific validation, unexpected resource

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C - 075

A SURVEY OF ODORIFEROUS PLANTS AND THEIR VARIOUS USES AMONG THE FOLKS AROUND ITCHA-GARH HILL AREA IN ORMANJHI BLOCK OF JHARKHAND

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Itchagarh hill is the highest mountain in Ormanghi block. The foothill is the harbourage of a number of villages inhabited by several ethnic groups. Some of the plants or plant part found in this area bears a distinct smell. For example, the fruit of 'Dhela' (*Alangium salvifolium*) reminds of fish smell while the plant of 'Kado sag' (*Limnophila rugosa*) is the redolent of 'Fennel'. The aim of present survey was to identify those plants bearing peculiar smell and also get the information about their medicinal and other uses. More than eleven such plants have been identified.

Keywords: Odoriferous plants, Itchagarh hill, Distinct smell, Jharkhand

C - 076

A REPORT ON THE BIODIVERSITY OF MOTHS (LEPIDOPTERA: HETEROCERAN) IN AGRO-HORTICULTURE FIELD OF JHARKHAND

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Heteroceran Lepidoptera (moths) is one of the major pests on different economical plants in agro-horticulture fields of Jharkhand. Their larval stage vigorously feed on the different parts of the plants. The research project is designed to seasonally collect the moths from different sites by the help of light trap method and then identified by the help of various authentic resources including the ZSI, Patna. The collect data was then processed under the Shannon-Wiener diversity index to obtain the biodiversity value and Simpson dominance index to get the dominant species in the ecosystem. The host plants were vegetables, cereals, fruits and some wild type plants. The field work was done from June, 2016 to January, 2017 and then found that the major species of moths collected belonged to families Sphingidae, Tortricidae, Noctuidae, Arctiinae and Pyralidae. The commonly found moths of family Noctuidae were *Heliothis zea,* Boddie, *Helicoverpa armigera,* Hubner, *Nyctemera adversata,* Schaller and *Catocala fraxini,* Schrank were while from the family Sphingidae they were *Acherontia lachesis,* Fabricius, *Acherontia styx,* Westwood, *Deilephila nerii*, Linn., *Deilephila lineate,* Linn., *Agrius convolvuli*, Linnaeus and *Acherontia atrophos, Linn.*. The common moths of the family Tortricidae were *Cydia pomonella,* Linn., *Acropolis excelsa,* Meyrick, *Tortrix viridana,* Linn., *Lymantria dispar,* Linn. *Cacoecia compacta,* Meyrick.

Keywords: Heteroceran Lepidoptera, agro-horticulture, pests, Shannon-Wiener diversity index, Simpson dominance index, Sphingidae, Tortricidae, Noctuidae, Arctiinae and Pyralidae

C - 077

SEASONAL VARIATIONS AND BIODIVERSITY OF ZOOPLANKTON IN HARSOOL-SAVANGI DAM, AURANGABAD, INDIA

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The present study concerns seasonal variations, correlation coefficient and biodiversity indices of zooplanktons during January – December 2008 in the Harsool-Savangi dam, Aurangabad India. A total of 25 genera were recorded of which 10 were Rotifers, 8 Cladocerons, 5 Copepods and 2 Ostracods. Present study revealed maximum percentage wise compositions of Rotifers at north site 58.28 %, Cladocerons at south site 29.78 %, Copepods at east site 16.59% and Ostracods at south site 4.20 %. Minimum percentage wise compositions Rotifers at south site 51.54%, Cladocerons at west site 26.71 %, Copepods at north site 11.03% and Ostracods at north site 1.36%. Margalef's index (R_1) and Menhinick index (R_2) values (3.58 and 0.87) were found to be the highest at south site and lowest values (3.16 and 0.56) were found at north site. Simpson's index (λ) values (0.43) were found to be the highest at north site and lowest values (0.37) were found at south site. Shannon– Weiner index (H') values (1.06) were found to be the highest at south site and lowest values (0.94) were found at north site. Maximum species evenness was recorded at south site; minimum species evenness was recorded at north site. Maximum population density of Rotifers, Cladocerons, Copepods and Ostracods (799, 350, 163 and 18) were recorded at north site in summer and minimum (58, 35, 22 and 13) were recorded at south site in monsoon respectively.

Keywords: Zooplankton, biodiversity indices and percentage wise compositions

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C - 078

BIODIVERSITY OF TROPICAL FOREST COVERS OF BALASORE DISTRICT, ODISHA, INDIA

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The structure and function of tropical forest ecosystem is maintained by upper storey vegetation layer which principally consist of tree species. The tropical forest covers of Balasore, one of the coastal district of Odisha was analysed for structure, composition and diversity of upper storey vegetation layer (≥ 30 cm circumference at breast height) along with various groups of animal species. A total of 94 tree species representing 77 genera and 38 families were recorded in this area. The average number of species per family was nearly equal to 2.5 and per genus was >1.2. The species diversity index and concentration dominance of the forest were 3.69 and 0.06, respectively. The Importance Value Index (IVI) of species ranged from 0.55 to 40.47. Within the same tropical forest covers of the district the diversity of various groups of animal species recorded were 20 vertebrates, 140 birds and 29 amphibians. The biodiversity of the tropical forest covers of Balasore district in relation to species composition and richness of both plants and animals are diverse with many of them as rare occurrence in the area supports the need of conservation for future use and sustenance.

Keywords: Flora, Fauna, composition, Species diversity, Concentration of dominance, IVI, Conservation.

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C - 079

ETHNOBOTANICAL KNOWLEDGE OF BIRHORE TRIBE OF JHARKHAND

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Jharkhand state is well-known for 2 things-its abundant mineral wealth and its variegated tribal population. Among 30 schedule tribes inhabiting Jharkhand, Birhores are one of the smaller tribe found mainly in old Hazaribagh, Ranchi and Singhbhum districts. Birhore people are a tribal/adivasi forest people traditionally nomadic living primarily in the Indian state of Jharkhand. This tribe having age old traditional knowledge through their long association with forests .They have accumulated valuable knowledge on the use of wild plants in their daily life for food,fuel,fodder,clothing,health care and other purposes. Looking to the intellectual property rights of indigenous people, documentation of such knowledge is necessary now a day. Ethanobotanical study attempts to underline intimate relationship between plants and ethnic tribes like Birhore .For instance ,use of *Butea monosperma* leaves are used to make kumbha(the traditional home of Birhores), plates and saucers [patal and donna], Basak for curing dry cough ,Satmuli for curing urinary disease and blood dysentery ,Dudhalata for curing eczema ,stomach pain and many more plants have been described .The idea behind the present work is to keep these valuable knowledge of Birhores sustained and alive and to apprise the society and younger generations of this knowledge and give them the confidence to go for a traditional way to good health.

Keywords: Birhore, ethanobotanical, wisdom, good health, palatability

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C - 080

AN ETHNOBOTANICAL STUDY OF MEDICINAL PLANTS USED BY TRIBALS IN JHARKHAND

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The state of Jharkhand is very rich in biodiversity it is inhabited by various tribal communities residing in the indigenous pockets of the area. It is the home of tribal people who reside in indigenous pockets of the entire are in association with the natural environment. The population consists of various ethnic groups and indigenous mass comprising of pahans, horopaths, vaidyas and tribal persons having traditional knowledge of medicinal plants. The tribal have practiced verbally the knowledge of medicinal uses from generation to generation. It has been found out that more than 70% of the total population of the state is dependent on herbs and traditional healers for maintaining the level of health. The process of medication has been carried out from ages and carried forward by their descendants. Thus ethno-botany is the study of the interaction between plants and the tribals with special focus on traditional tribal culture.

The population depends on plants for their healing property because of poverty and lack of medical facilities. The study area consists of total tribal population constituting 27% of Jharkhand population of 2.70 crore. Herbal medicines have been adopted from primitive times to cure and heal many diseases including skin infections, fever, dysentery, cold and cough, blood pressure, diabetes, joint pain, kidney stone etc. in Jharkhand. An interesting point to be noted is that Jharkhand comes under agro-climatic zone and therefore best suited for growth and cultivation of ethno-medicinal plants. Thus the objective of the present research is to study the medicinal plants commonly used by tribal population of Jharkhand for various ailments. It also focuses on identifying the plant part used for medicinal purposes the role of conservation and sustainable utilization of medicinal plants.

Keywords: Ethnobotany, medicinal plants, biodiversity, tribal, ethnic group, conservation

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C - 081

STUDIES ON ANGIOSPERMIC PARASITES AND EPIPHYTES OF PURULIA DISTRICT, WEST BENGAL

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Purulia is a part of Chotanagpur Plateau exhibits mixed dry deciduous forest in its northern side at Panchakot hill, Ajodhya - Matha at south, Bandwan and Rakab on the east and the Joypur- Jhalda on the west. In the present work a systematic investigation of 12 parasitic and 4 epiphytic angiospermic taxa were documented from the forest as well as from the grassland and border of the rice fields of different corners of this district. Among the 12 parasites 8are stem parasites and 4 are root parasites on different hosts. Apart from these natural populations, 8 hemi-epiphytic garden genera were recorded from personal gardens and parks of the town. A details record of their habitat, host range, nature of parasitism, flowering and fruiting time is discussed here and the voucher specimens are kept at S.K.B University, Purulia.

The stem parasites like *Dendrophthoe falcata* (L.f.) Ettingsh, *Viscum orientale* Wild, *Viscum articulatum* Burm. f., *Macrosolen cochinchinensis* (Lour.) Teigh. etc. are detrimental to forest trees and reduce the timber value, root parasites like *Sopubia delphinifolia* (L.) G. Don Striga angustifolia (D. Don) C.J. Saldana etc. kills the soil binding grasses and thus ecologically significant role in ecosystem. Some epiphytes with ethnomedicinal values and development of new garden epiphytic varieties need more research.

Keywords: Chotanagpur, Ecology, root parasite, stem parasite, grassland, Forest.

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C - 082

ANTHROPOGENIC THREAT TO THE FOREST BIODIVERSITY OF PURULIA, W.B., INDIA

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Purulia is the westernmost district of West Bengal exhibits characteristics undulated topography, scanty rainfall, laterite acidic soil with mixed dry deciduous forests. Recently a havoc loss in the forests flora and fauna of Purulia and Kangsabati (North & South) forest division is noticed. Apart from faunal diversity the forests also exhibit a variety of trees, medicinal herbs, climbers, ferns and fungi. We all know that the "Hunting festival" of Ajodhya hills – a symbol of masculinity among tribal people is reducing the population of forest mammals, reptiles and birds day by day. Animals are also killed for meat, skin, feathers and some are used in ethno-medicine. Birds are captured by different types of baits, intoxicants and using plant derived gums and latex. A preliminary survey of avifauna and trapping techniques for bird capturing has been thoroughly investigated and presented in this paper.

The herbal healers and some traders, using the tribal people, collect and sell medicinal herbs in an unsustainable way, neglecting W.B. Biodiversity Act, 2002. Villagers, mainly tribal peoples, lives around the forests collect havoc quantity of mushrooms and sell in the local market. Some are used as medicine by herbal healers. A few rare species of Fungi, Pteridophytes and Bryophytes will say good bye within a couple of decades if students /researchers remain an aggressive plant hunter or illegal trade continues.

A consciousness is required among the villagers, students, tourists are necessary to restore the forest wealth. Some villagers has recently started cultivation of mushrooms and inspired to cultivate the medicinal plants. An effective campaign to restore the bio-resources, ethnobotanical documentation and germplasm conservation of threatened taxa and cultivation of medicinal plants in the forest floor is the need of the day. Illegal capturing of birds and mammals should be stopped immediately by legal action to preserve this pristine ecosystem. More research is required to understand the impact of Deforestation, habitat destruction, establishment of factories including brick factories, stone crushers of this area and the changing climate on the flora and fauna of the forests.

Keywords: forest biodiversity, Purulia, threat, anthropogenic

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C - 083

DISCONNECT BETWEEN TAXONOMY AND ETHNIC GROUPS & THEIR SKILLS A THREAT TO BIODIVERSITY CONSERVATION

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The intimate relationship between the human and plant world has evolved over generations of experience and practices. Situated in the eastern part of India, Jharkhand as the name suggests it is rich in biodiversity and their traditional usage. There are 32 tribal groups, out of which Santhal, Munda, and Oraon are the most popular tribes. Ethnic groups live close in the vicinity of the forest and managed to converse the biodiversity. Plants are conserved in natural habitat and are being worshipped as home of God and Goddess. These are used as food sources as well as they have many herbal and medicinal uses. The unconventional knowledge has been and is being transmitted orally from generation to generation, may be decreasing gradually due to the indifference in the youth of the present day, in the light of electronic age advancement. Ethnotaxonomy deals with naming and classification of plants and animals by human societies in their language. For convenience, they have classified plants on different basis, for instance uses, pharmacognosy, appearance etc. Some of the plants mainly used by them are *Terminalia arjuna, Diosphyrous melanoxylon, Butea monopherma, Phyllantus niruri* etc*.* With the advancement of science and technology, taxonomists have devised different methods to classify plants on the basis of morphology, anatomy, genetics (cytology), phylogeny, chemistry etc. Modern taxonomists/botanists study about the identification, adaptability and abundance of different plants, which ethnic people may not know. If the knowledge of ethnic group and scientific knowledge come together in one frame, it may be a help to conserve biodiversity. Disconnection may lead to extinction of a particular plant, if it is less in number and is being overexploited. But in case of unawareness, this may be a threat to biodiversity and the road to a certain disaster.

Keywords: Ethnic group, Jharkhand, Ethnotaxonomy, Taxonomy, Biodiversity, Connect-Disconnect.

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C - 084

ENVIRONMENTAL SOCIOLOGY: PAST, PRESENT AND FUTURE

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Environmental sociology is an established subfield of sociology. Environmental sociology is typically defined as the study of relations between human societies and their physical environments or, more simply, "societal-environmental interactions"

The field examines a variety of topics, including environmentalism as a social movement; the ways in which inequality is related to environmental hazards, health, and other conditions; the relationship between population dynamics and the environment; and how politics, political systems, and policies affect environmental conditions and changes. Therefore, this subfield involves the study of intersections among environmental issues and inequality, migration, social movements, social change, and politics and policy.

In past sociology had relatively little to say about the natural environment. The three acknowledged founders of the discipline of sociology-Durkheim, Weber and Marx- addressed some aspect of nature and society.

At present environmental sociology deals in a more general manner in human causes and social factors of environmental pollution, as well as in the social impacts of this pollution and of diminishing natural resources that is in the reciprocal relations between human societies and their biophysical environment

The research paper is a genuine endeavour to explore the past, present and future status of environmental sociology, its role in analysing how humans interact with the various aspects of the environment and how people treat the various aspects of the environment such as pollution, conservation and recycling. The study of environmental sociology is vital when it comes to find better ways for both nature and mankind to interact, propagate and thrive.

Keywords: Environmental Sociology, environmental problems, pollution, society and solutions

C - 085

IMPACT OF CLIMATE CHANGE ON BIODIVERSITY OF SUNDARBANS

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Climate change is significant in respect of change in pattern of weather and changes in average weather conditions (i.e., more or fewer extreme weather events) over periods ranging from decades to millions of years. In the context of variation of climatic conditions, physical and anthropogenic factors (human activities) are responsible for climate change. Certain human activities have also been identified as significant causes of recent climate change, often referred to as "Global Warming". Earth's average temperature has risen by 1.4°F over the past century, and is projected to rise another 2°F - 11.5°F over the next hundred years. Small changes in the average temperature of this planet can translate to large and potentially dangerous shifts in climate of a region and weather of a definite place. Fauna and flora have adapted to many changes in temperatures over thousands of years. However, they normally do not have to adapt to changes so sudden as those brought about by global warming. Different species have physiological limitations that prevent them to survive in sudden weather changes, which may lead to the extinction.

The Indian Sundarban provides a unique ecosystem and a rich wildlife habitat. A total 245 genera and 334 plant species were recorded by David Prain in 1903. The Sundarban had balanced growth of flora and fauna in association with the fresh water of the Ganges and the salty sea water of the Bay of Bengal in past. But, this balance has now been changed due to some factors of climate change. Now this climate change due to global warming is predicted to cause an annual temperature rise of 32.7°F (0.4°C) at Sundarban, W.B. (India) and produce result in greater frequency and intensity of cyclone. It has been established by the scientists that, the sea level is also predicted to rise by 4 m.m. per year due to ice-melt. These phenomena may have the chance to result in an increase of salinity in Sundarban.

Keyword: Climate Change, Global Warming, Wildlife habitat

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C - 086

ECOLOGY AND CONSERVATION OF HORSESHOE CRAB IN CHANDIPUR COAST OF ODISHA

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Conservation of horseshoe crab is currently done by several ecological and biotechnological approaches. The species is considered a multiple-use resource, as it plays an important role as bait in a commercial fishery, as a source of an important biomedical product, as an important food source for multiple species of migratory shorebirds, as well as in several other minor, but important, uses. Concern has arisen that horseshoe crabs may be declining in number. In this report we have discussed the general biology, ecology, and population status of the horseshoe crab species inhabiting the shore of Chandipur (Odisha). We have also discussed the role played by the species in the commercial fishery, in the biomedical industry, as well as for the shorebirds.

Keywords: horseshoe crab, conservation, ecology, Chandipur (Odisha)

C - 087

INDICATORS OF CLIMATE CHANGE IN INDIAN SUNDARBANS

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Climate change can cause alteration of salinity profile in the estuaries, coasts, bays, inlands and creeks due to phenomena like retreat of glaciers, saline water intrusion etc. It has been observed that due to alteration of temperature, precipitation pattern, intensity of solar radiation etc., the physico-chemical variables of the aquatic ecosystem in the planet Earth faces significant changes.

On this background, an investigation was undertaken in the aquatic system of mangrove dominated Indian Sundarbans considering surface water temperature, salinity and dissolved oxygen as indicators. This deltaic complex is located at the apex of Bay of Bengal and is the only tiger inhabited mangrove ecosystem of the planet Earth. Our data trend since 1980 clearly indicates distinct dissimilarities between western and eastern parts of Indian Sundarbans in terms of hydrological parameters, which may be attributed to different geographical features. The western sector of Indian Sundarbans receives the discharge of Ganges contributed by the Himalayan glaciers; whereas the rivers at the eastern sectors have lost their connection due to siltation and several geotectonic processes. Possible adverse impacts on the human society have also been highlighted.

Keywords: Climate Change,aquatic system, Indian Sundarbans, impacts

C - 088

ECOSYSTEM SERVICES OF MARINE MICROBES

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The present paper aims to highlight the distribution of marine microbes in the estuaries, continental shelves and the deep sea. These habitats (except the deep-sea environment) are congenial for the growth and survival of marine microbes due to high nutrient, photon energy and optimum salinity. The application of marine microbes in the production of antibiotics, antitumour compounds, enzyme and also in the sphere of bioremediation has opened a new avenue for the benefit of mankind.

Keywords: marine microbes, distribution, services, benefit

C - 089

ECOSYSTEM SERVICES OF *IPOMOEA PES-CAPRAE*, A COMMON MANGROVE ASSOCIATE HERB

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Ipomoea pes-caprae (L.) R. Br., a plant species of sandy shores is distributed along the coastlines in pan-tropical areas worldwide and is a perennial, trailing herb. The plant species is commonly known as bayhops, beach morning glory, goat's foot vine or hare-leaf. This Goat's foot convolvulus is one of the primary coastal sand dunes colonizing plant that is specialized in sand binding in areas exposed to salt spray, sand blast, strong winds and flooding by the sea. It is one of the specialized pioneer plants that extend from the sea to the land wards in the area that are known as fore dune or frontal dune. Ipomoea pes-caprae has been long evaluated for its medicinal properties and ecological significance and sufficient literatures are available that provides knowledge of its characteristics. This short review aims to specify the plant's ecological, ethno-medicinal and phytochemical properties and highlight the most significant areas of research on the plant that are trending over the years globally.

Keywords: *Ipomoea pes-caprae,* medicinal properties, ecological significance, research

C - 090

IMPACTS OF CLIMATE CHANGE ON MANGROVES OF INDIAN SUNDARBANS

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The Indian Sundarbans at the apex of Bay of Bengal sustains about 34 true mangrove species and provide a multitude of important ecosystem services such as reservoir of various threatened species, breeding ground and nursery of commercially importance of finfish and shellfish, the provision of food, fuel and natural coast line protection from erosion due to tidal action *etc*. Apart from this, mangroves act as the store house of carbon and nitrogen. Mangroves also maintain the water quality by absorbing nutrients and various pollutants. Such unique ecosystems are now threatened by climate change like increase of temperature, CO_2, sea level rise *etc*. This paper discusses the impacts of these climate change induced threats on mangroves of the present geographical locale.

Keywords: climate change, mangroves, impact, threatened, Indian Sundarbans

C - 091

ICHTHYOFAUNAL DIVERSITY OF LOWER DUDHANA DAM, DISTRICT PARBHANI, (M.S.) INDIA

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Present study of Ichthyological fauna was carried out during the period of January 2013 to Dec 2014.This water body is useful for human consumption ,agriculture and fisheries to both districts Parbani and Jalna.The present study deals with the variety and abundance of fresh water fishes in Lower Dudhana dam of Parbani district (M.S.) India.The results of present study reveal the occurrence of the ichthyofauna belong to 03 order 6 families 17 genera and 23 species among which Cyprinidae family is dominant.

Keywords: Ichthyofauna, variety, abundance and dominant

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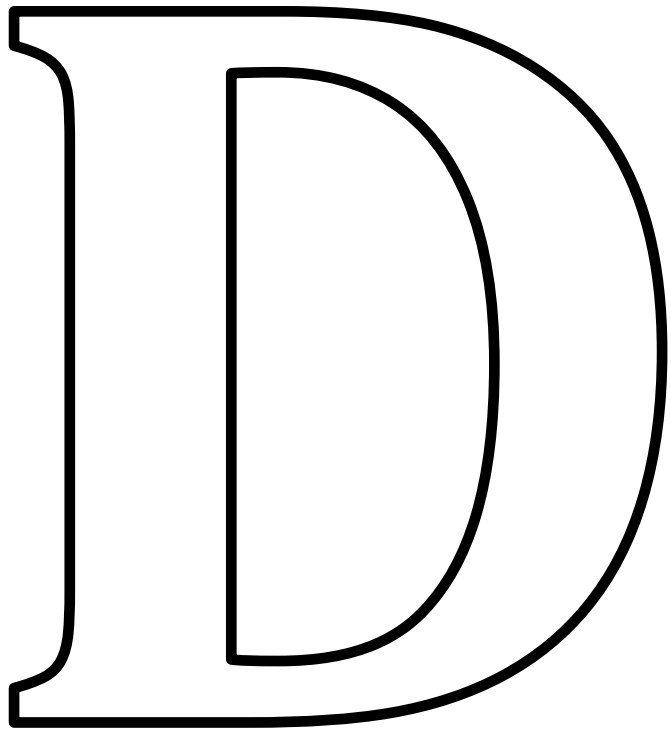

Air, Water, Soil & Noise Pollution and Control Strategies

D - 001

SOIL SALINITY AND ITS MANAGEMENT

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Soil is an important natural resource for crop production. Soil salinity is a major factor limiting plant productivity, affecting about 95 million hectares worldwide. The UNEP (United Nations Environment Program) estimates that 20% of the agricultural land and 50% of the cropland in the world is salt-stressed. In India they occupy nearly 8.6 million hectares and represent a serious threat to its ability to increase food production to meet the expanding needs. Excess amount of salt in the soil adversely affects the plant growth and development. The increasing use of water of poor quality, the continuous addition of waste salts to our environment, as well as the increasing contamination of under water resources lead to gradual soil salinization. The harmful effect of increased accumulation of salts in the soil on plant growth can be ascribed to changes in the proportion of exchangeable cautions, soil reaction, ionic balance in plants, physical properties of the soil, osmotic and specific ion toxicity effects. Many of these problems are caused by excessive use of water for irrigation due to inefficient irrigation distribution system, poor on-farm management practices and inappropriate management of drainage water. Management of saline soil depends more or less on the factors which have contributed towards the development of salinity. Excess soluble salts can be removed by various physical, hydro-technical and chemical methods. Growing salt tolerant varieties and nutrient management of crops in saline soil are also important solutions for crop production under saline soils.

Key words: Soil salinity, Plant productivity, Management, Salt tolerance

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D - 002

STUDY ON THE EFFECT OF FLY ASH ON THE WATER BODY OF POND WATER AND RIVER WATER NEAR KOLAGHAT THERMAL POWER PLANT, WEST BENGAL, INDIA

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We investigated the fluctuations of physico-chemical and microbial profile of pond water and Rupnarayan River water at different stations due to leaching of effluent and flying ash from Kolaghat thermal power plant (KTPP), West Bengal, India. The fluctuations of electrical conductivity, Water pH, water temperature, alkalinity, hardness, Dissolved oxygen (DO), Biochemical oxygen demand (BOD), Chemical oxygen demand (COD), heavy metals and coliform load was observed with respect to direction and distance from thermal power plant. We observed that all the studied parameters are higher in the North and South side pond water which are mainly due to directly connected with ash disposal line and fly ash throughout the year. On other hand, all the studied parameters of Rupnarayan River water at different stations are higher except coliform load in the kolaghat and Benapurkhal station. Therefore, proper monitoring is required to minimize the effect of fly ash and bottom ash originated from kolaghat thermal power plant, otherwise pose an adverse effect on socio-economic development in the kolaghat, purba Medinipur, West Bengal, India.

Keyword: Physico-chemical, Microbial profile, Kolaghat thermal power plant, Fly ash, Pond water, River water

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D - 003

BIO-MIMICRY AS A TOWNPLANNING TOOL TO COMBAT URBAN WARMING FOR NEW TOWNSHIPS

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This research is an advanced outcome of an intensive study carried out for highlighting existence of Urban Warming in Bangalore due to its urbanized landscaping features. An inadvertent effect of rampant urbanisation, rising thermal discomfort is due to the development of Urban Heat islands which have invariably deteriorated the natural micro-climate of Bangalore and accelerated the warming process. This is essentially due to enhanced application of cooling devices (AC and fan), rapid increase in built-up area (laden with cement concrete, bitumen & glass facades) and loss in natural surfaces (agricultural lands, green zones & surface water bodies). The degree to which the urbanized areas can seek advantage from urban warming reduction strategies, hence must rest on a multitude of corrective and preventive measures (within and outside a community's control) moderating the micro-climate. Yet, no remedial measures can succeed unless it's incepted in the town planning guidelines. However, the ability to manage Urban Heat Islands and simultaneously also preserve the natural environment of a township is still a matter of grave concern due to the ill-preparedness of policy makers to curb the demand of land for anthropogenic uses. Also most researches and literatures have ignored the aspect of disrupted natural wind paths. To overcome both aforementioned lacunae, this study attempts to advent the application of Bio-Mimicry as an Effective tool to develop an advanced climate-sustainable Township with Natural wind paths as prime feature. Bio-Mimicry is an emerging field which deals with 'observing the nature for its functions, and applying the same for human needs and demands. In this research, leaf structures of several plants were studied with the focus on distribution of the veins, for it's this alignment that's decides the yield efficiency for the basic functions of a leaf. After several deliberations, the present research advocates Bio-Mimicking the 'pumpkin leaf' for developing Natural Wind-paths while planning satellite towns and new Townships. This modification, along with climatically-planned distribution of natural and manmade landscaping attributes can facilitate better thermal comfort levels for its inhabitants. The final resultant master-plan and model prototype was prepared keeping in mind the orientation of the sun and wind direction, alongside distinctive horizontal and vertical growth alongside special land-uses to satisfy maximum climatic benefits without hampering human needs.

Keywords: Anthropogenic**,** Climate, Urban, Islands, Mimicry, Thermal

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D - 004

ASSESSMENT OF WATER QUALITY INDEX FOR DRINKING PURPOSES COLLECTED FROM DIFFERENT SOURCES IN CANNING BLOCK, COASTAL BELT IN SOUTH 24 PARGANAS, W.B.

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Water quality is a very important role play in the coastal areas for the irrigation and drinking purposes. Water quality is big issues in these areas due to the salinity, but for drinking purposes it's not much value. So thirty (30) ground and surface water samples were collected from difference sources, like Shallow (Ground water), Pond (Surface water), in each pre-monsoon and post monsoon. Use the standard analytical water quality method of APHA, for the water quality analysis we are analyse fifteen (15) different parameters, pH, COD, Electrical Conductivity (EC), Chloride (Cl^-), Carbonate (CO_3^{--}) Bicarbonate (HCO_3^{--}), Sulphate (SO_4^-) , Nitrate (NO_3^-), Fluoride (F^-), Calcium(Ca^{++}), Magnesium (Mg^{++}), Sodium (Na^+) , Potassium (K^+), Sodium adsorption ratio (SAR and) and Residual sodium carbonate (RSC). Using the thirteen (13) water quality parameters we were computed the water quality index. Analysed shallow water samples were found 53.33 per cent (%) good, 33.33 per cent (%) poor, 6.66 per cent (%) very poor and 6.66 per cent (%) found unsuitable for drinking purposes, but after the monsoon we are found 86.66 per cent (%) of shallow water found good and 13.33 per cent in poor category. Pond water samples were found in pre monsoon 73.33 per cent (%) in good quality, 20.0 per cent (%) poor, 13.33 per cent (%) very poor and 6.66 per cent (%) for the unsuitable for the drinking purposes.

Keywords: Water quality, Ground and surface water, WQI

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D - 005

MAGNETIC NANOMATERIALS IN WASTEWATER TREATMENT

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The application of nanomaterials in wastewater treatment is discussed with specific emphasis on the removal of both acidic and basic dyes. Both magnetic and non-magnetic nanomaterials were used and dye removal efficiency was compared, apart from investigating ease of separation of magnetic nanomaterials. Iron oxide nanoparticles were synthesized in both magnetic and non-magnetic forms using co-precipitation technique. CTAB surfactant was used in both the cases. Ammonia was used as reducing agent. The characterization of the nanomaterials was done using BET, XRD, FTIR, VSM, SEM and TEM. It was found that the synthesized nanomaterials were largely rod shaped, though spherical form could also be produced and the magnetic nanoparticles exhibited excellent magnetic properties as observed by VSM analysis. Two acidic dyes- Methyl Blue, Congo Red and two basic dyes- Rhodamine B and Auramine were used for dye removal studies. Except for Rhodamine B, practically 100% removal was obtained with all the dyes. The difference in the removal efficiency was evaluated on the basis of nature of dyes and removal of acidic dyes was found to be better as compared to basic dyes. The separation of magnetic nanomaterials could be easily accomplished using magnet where the particles get attracted and could be easily separated out. Apart from the conventional method of dye removal using nanomaterials, a modified process using process integration with acoustic cavitation for dye removal was also studied. The process integration not only increased the rate of dye removal in presence of nanomaterials but also indicated reduced loading for the nanomaterials. The cavitation process involves formation, growth and collapse of cavities and consequently creates highly localised high pressure/temperature conditions that are expected to alter the surface interactions, impacting dye removal mechanism. The acoustic cavitation, alone was not effective in the removal of these dyes, but when coupled with nanomaterials, the process effectiveness can be drastically altered. The results of the present work are thus important not only from the point of view of nanomaterials and their characterization or properties, but also for their application in industrial wastewater treatment, with or without process integration.

Keywords: Nanomaterial, Dye removal, Effluent treatment, Cavitation, Separation

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D - 006

WATER SECURITY WRT CLIMATE CHANGE IN RURAL AREAS OF BHARATPUR (RAJASTHAN, INDIA)

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Water insecurity could be a result of sole or collective impact of several factors for different regions of the world. These factors may be climatic or geographical factors; unsustainable consumption or overexploitation; economic aspects etc. Climate change has the more pronounced effects on the monsoonal areas due to altered precipitation and more frequent or intense disturbance events (droughts, storms, floods). Therefore, among all the factors, physical scarcity of water arising due to the climatic change is one of the focal issues of global community with a challenge for designing the adaptive strategies with the limitation of the resources and time.

Socio-ecological surveys were conducted in rural areas of Bharatpur (Rajasthan, India) to assess the knowledge level of the rural communities on the aspects of climate change and water conditions in 2007 followed in 2012 along with the perception on water conservation as well as traditional approaches for adaptation against such changes. Certain criteria were fixed for the respondents such as literacy (could read, write and understand in local language), age (above fifty years) and residential time (more than equal to thirty years of stay). The local interventions were carried out since 2008 till date in sixteen villages for improving the water conditions through CSR support. The interventions were mix of the traditional as well as modern techniques. The cases studies were briefed in the paper.

It was observed that people were aware of the changes occurring in the climate at local level due to their engagements with agriculture activities. Based on the observations from the respondents, the present investigation highlights the adaptive strategies executed to recoup the water availability. It also discussed the conflict of traditional and modern approaches related to conservation of natural resources focusing water. It raised certain challenges for the scientific community and the policy makers to design the fool proof adaptive strategies. The study gave the opinion of the people who need immediate solutions in the water sector with the least concern for future. Thus, the present investigation concluded with the remark on the short term and long term solutions in the pace of this information age.

Keywords: Water security, Climate change, Bharatpur and solutions

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D - 007

ZINC OXIDE NANOPARTICLES REMEDIATE MULTIPLE POLLUTANTS IN WATER

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Water pollution is still an unsolved menace and pose challenges to safe livelihood on earth. Among different forms of aquatic pollutants, chemical and biological agents create paramount threat to the water quality surpassing the safety standards. To address the above mentioned problems, experiments were conducted by applying nanoscale zinc to remediate different water polluting agent like organic dyes etc. It was observed that nanoscale zinc exhibited faster degradation of dye under the influence of sunlight and it has been occurred due to its unique characteristics of photocatalysis. Photocatalysis for environmental remediation depends on easy and widely available solar light and its mechanism involves the generation of electron-hole pairs under light irradiations at higher than their band gap energies. As a nano-photocatalysts, zinc oxide is proved as an active, cost effective, non-specific ingredient that can be synthesized in large scale, quicker in action and can be delivered against chemical and biological based aquatic pollutants. Zinc toxicity is also a major environmental issue and chemically synthesized nanoscale zinc is also shown hazardous property. To counteract toxicity problems, phyto-synthesized nanoscale zinc was synthesized and characterized as an environmentally benign alternative. Hence, phyto-extract mediated nanoscale zinc can be applied for nanoremediation of multiple aquatic pollutants.

Keywords: water pollution**,** nanoscale zinc, photocatalysis, nanoremediation

D - 008

STUDY OF INDUSTRIAL EFFLUENT ON FARM LAND AROUND SHARADA INDUSTRIAL AREA OF KUMBOTSO LOCAL GOVERMENT KANO STATE, NIGERIA

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This study assessed the heavy metals pollution and physicochemical parameters in salanta river valley of Sharada industrial area, with aim to study the industrial effluent on farmlands. Two sites irrigated with effluent at Medile and Sabuwar Gandu all located at Kumbotso local Government, Kano state, Nigeria were used as sample sites were for soil samples, vegetables and effluents were analyzed. Another site at Yahya Gusau was selected as control because Yahya Gusau used well water for irrigation which is not associated with waste water. Samples collected from that sites were analyzed for physicochemical characteristics (Color, Odour, Sediments, pH, Electrical conductivity, Total dissolved Solid and Temperature), Heavy metals concentration of (Cadmium, Chromium, Lead, Copper). The result were compared to the permissible limit of World health organization (WHO), Food and Agricultural organization (FAO), and United State Department of Agriculture (USDA) in order to assess whether the effluent contaminated the soil and vegetables of that area. The result indicate that there is substantial buildup of heavy metal in the effluent above WHO and FAO recommended value with respective mean ranged in Cd (0.0909-0.1455mg/l), Cr (1.3846-2.0000mg/l), Cu (5.0000-6.88182mg/l), and Pb (0.0596-0.0662mg/l). The concentration of the Heavy metal in the soil recorded the higher value in Cr which range (0.9231-1.0769mg/kg) and lowest value in Pb (0.0265-0.0464mg/kg).The pH value of the study area show the soil is slightly acidic to slightly neutral. Also based on WHO/FAO standard, the concentration of heavy metals in vegetables are all within the normal value. Data analysis show that there is no significant difference between concentration of metals in effluents, soil and vegetables of that area at confidence level of 0.05. The ingestion risk of the population was in the order Medile (site A)> Sabuwar gandu (Site B) and >Yahya Gusau (control) which has been recommended that farmers should use dug wells for irrigation purposes and industrial wastes should not be drained into rivers without prior treatment.

Keywords: Contamination, Effluents, Irrigation, Pollution

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D - 009

AIR POLLUTION AND CONTROL STRATEGIES IN DELHI

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Delhi

Pollution is one of the major current environmental problems worldwide. Pollution refers to the contamination of Earth's environment with materials that interfere with human health, quality of life or natural functioning of ecosystem. Pollution of air, water and soil requires millions of years to recoup. The air quality in Delhi according to the survey by W.H.O. is worse than any major city in the world. The most polluted area in Delhi is Anand Vihar. Industry and motor vehicles exhaust are the number one pollutants. Heavy metals, nitrates and plastic are toxins responsible for pollution. Combustion of fossil fuels also adds to it. This toxic pollution affects more than 200 million people worldwide, according to Pure Earth, a non-profit environmental organisation. Due to this pollution worldwide, babies in this worst polluted places are born with birth defects, children have lost 30-40 I.Q. points and life expectancy may be as low as 45 years because of cancer and other diseases. Air pollution kills more than 2 million people each year, according to study published in the journal Environment Research Letters. The air pollutant is known to affect human's health hazardously, causing many diseases like cardiovascular disease, respiratory illness and increase in asthma. The air pollutant may be carcinogenic [example: some volatile organic compounds] or biologically active [some viruses] or radioactive [radon]. Finally, air pollution can take form of greenhouse gases such as CO_2, SO_2 which are warming the planet through greenhouse effects.

Realizing the gravity of these problems government has taken many steps, for instance the Badarpur thermal power station, a coal fixed power plant built in 1973, is another major source of air pollution in Delhi. Despite producing less than 8% of the city's electric power, it produces 80-90% of particulate matter pollution from the electric power sector in Delhi. During The Great Smog of Delhi in November 2016, the Badarpur power plant was temporarily shut down to alleviate the acute air pollution but will be allowed to restart on February 1st 2017.

The government of National capital of Delhi has taken several steps to reduce the level of air pollution of city during the last 10 years. Participation of community is crucial in order to reduce pollution, but things will only change when we put our words into action.

Keyword: Pollutants, toxins, hazardous effects, birth defects, diseases, green house effects

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D - 010

QUALITY ASSESSMENT OF EFFLUENT DISCHARGED FROM SUGAR MILL AND ITS IMPACT ON *ORYZA SATIVA*

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Various physico-chemical characteristics like colour odour, pH, EC, total hardness, BOD, COD, TDS, Na, K, P, Chloride, Sulfate and metal concentration like Cr, Fe, Cu, Ni, and Pb were assessed in the effluent samples collected from sugar mill at Sekhupur, district Budaun (U.P.) India. The effect of sugar mill effluent was studied on biological nutrients in the grain of "*Oryza sativa*". In the present study, the seeds of *Oryza sativa* were raised through pot trials with percentage concentration of effluent ranged from 0 to 100. It was observed that concentrations of 25% and 50% had a stimulatory effect on biological metabolites, like crude protein, total nitrogen, albuminoid nitrogen, total free amino acids and ether extract. A further increase in effluent concentration after this showed a deleterious effect. This may be due to the presence of heavy toxic metals which would have caused inhibitation in the cereal nutrient growth.

Keywords: Sugar mill effluent, physico-chemical parameters and biological metabolites *Oryza sativa*

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D - 011

COMPARATIVE STUDY OF DIFFERENT TECHNIQUES TO RECOVER VALUABLE HYDROCARBONSFROM PETROLEUM SLUDGE

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An effort has been made to provide a brief insight into the immense energy potential of petroleum sludge which includes Refinery sludge, Crude oil sludge, Petroleum Storage tank sludge etc. and economically viable methods to extract valuable hydrocarbons from the sludge and using it as a fuel or crude blend which otherwise would be a potential threat to the environment. Recovering the remaining amount of oil from sludge which would otherwise be disposed off is the most effective alternative. Not only does it adds to the value of a hydrocarbon resource but also protects our environment from pollution.

According to a report by API, USA recycles almost 80% of the petroleum hydrocarbons generated and the rest 20% is disposed off by acceptable means.

Global Energy demand could triple in 2050 with respect to 2000's according to the present statistics. Renewable Energy can meet at most 30% of the demand then, leaving a huge gap to be filled. Therefore, oil and gas are expected to remain an integral source for future world energy demand. With the decline in oil field discoveries during the last few years, recovering valuable hydrocarbons from petroleum sludge which are disposed off can prove to be of immense potential in meeting the energy demands of the future.

Sludge is generated by the refineries in enormous amount and is going to increase further in the future as the demand for petroleum product is increasing. Oil Refinery sludge is one of the major hazardous sludge generated from the petroleum refineries which is disposed, nearly ten million barrels of unusable oil each year. It has become an important environmental and public health issue in all over the world therefore disposal of excess sludge will be barred in the near future.
Annual worldwide production of "Tank Bottoms/Sludge", a by-product of the oil fields also contributes to the sludge generated. Tank bottoms may also accumulate in tanks used for storage of fuels such as gasoline, fuel oil or diesel and jet fuel. There is hardly any tank in the world without bottoms. Sludge formed near the bottom of such tanks which is either dumped off or leaches into the ground and pollutes the groundwater.

The hydrocarbons from these "valuable wastes" can be separated and blended with the fuel. Most of the oil remains untreated and is disposed in waste pits around the world. Some of these waste pits can exceed 250,000 barrels storage. Waste pits contaminate local groundwater and cause unwanted health issues if found to contain Arsenic, Cadmium, Benzene, Barium, Lead, Selenium and Chromium. These environmental problems associated present a costly disposal and treatment problem. With appropriate treatments the water produced can be of drinkable quality and the oil produced can be used as a fuel blend.

Keywords: petroleum sludge, hydrocarbon, energy potential, appropriate

D - 012

AIR POLLUTION TOLERANCE INDEX (APTI) OF PLANTS NEAR BHUSAN SPONGE IRON INDUSTRY

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In this paper the Air Pollution Tolerance Index of twenty plant species near BSPL Rengali, Sambalpur were investigated .Screening of plants for their sensitivity/ tolerance level to air pollutants is important because the sensitive plants can serve as bio-indicator and the tolerant plants as sink for controlling air pollution in industrial areas. In order to evaluate the susceptibility level of plants to air pollutants, four parameters namely total chlorophyll, ascorbic acid, P^H of leaf extract and relative water content were determined and computed to signify APTI . The results showed that at experimental plot the most tolerant species with respects to APTI are *Mangifera Indica, Colotropis procera, Lantana camara*, and *Dalbergia sisoo*. The plant species like *Eucalyptas citriodora*, *Ficus religiosa, Delonix regia, ficus bengalnesis, Madhuca indica, Aegle marmelos, Liziphus julyuba, Ailanthus excels, Diospyros melanoxylon, Shorea robusta, Butea monosperma, Bombax ceiba, Azadirachta indica, Artocarpus heterophyllus* are intermediately tolerant whereas *Buchania lanzan* and *Tabernaemontana divaricata* where categorized as sensitive species. The same was recorded for plants of control plot but with a lower APTI value, except *Bombax ceiba* which was exhibited as sensitive species. The present study suggests that evaluation of plant tolerance and performance index might be very useful in selection of appropriate species for the development of green belt in the vicinity of industrial areas.

Keywords: APTI, bio indicator, tolerance sensitive, intermediate

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D - 013

BIO-MONITORING OF DUST LOAD AND THEIR PHYSICO-CHEMICAL CHARACTERIZATION IN SPACE AND TIME: A CASE STUDY FROM ALLAHABAD, OCCURRING IN PARTS OF INDO-GANGETIC PLAIN

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Environmental pollution is omnipresent, not specifically confined to megacities and heavily industrialized areas of the world today. The various forms of pollutants are not only degrading the land, water or air quality but also endangering the pristine climate and its dynamics in space and time. In last two decades, the densely populated arcuate stretch of Indo-gangetic plains, bordering the Himalayan mountain chains to its north, is severely affected by dense winter fog which brings life to a near standstill. Previous studies have tried to understand the areal spread of fog in space and time, role of climate variability, change in optical aerosol depth and possible effect of pollutants from anthropogenic sources (industrial and vehicular) mainly based on data acquired from densely populated and highly polluted cities of north India.

The present study is confined to Allahabad, which is one of the most severely winter fog affected cities of north India having very few industries and yet highly polluted. It occurs close to the confluence of two major Himalayan rivers (Ganga and Yamuna) and bound by Vindhyan Mountains to its south and Bundelkhand Craton to its southwest. Tree leaves are sensitive and highly exposed parts of a plant and act as natural collectors of particulate matter. For measuring mass and area relationship leaf area, leaf weight, aspect ratio and mass of dust on leaf from four different plant species in different sampling periods were measured. The aim of this study is to quantify the aerial spread of the dust load and to characterize particulate matter based on various physico-chemical methods to trace the source from sink. The pollution monitoring of 300 locations and sample collection of 1102 dust loaded roadside tree leaves between 2010 and 2013 and their physico-chemical characterization involving a number of techniques (optical microscopy, spectral reflectance, BSE-SEM, SEM- EDX) have been made. The suspended particulate matter (SPM) comprises inorganic (minerals and metallic phases) and organic (seeds, spores and pollens) irrespective of the season (fog, pre-monsoon and post- monsoon). The optical microscopic data shows varied particle size and shapes in different sampling seasons. The fractal analysis of grains in SPM clearly distinguishes samples of fog period, which follow modified power law function compared to simple power law pattern exhibited by the particles belonging to pre monsoon and post monsoon periods. The present study firmly establishes that the environmental pollution is not solely controlled by anthropogenic activities in the fog affected areas, especially in the study area. Similarly the pollutants are not singularly responsible for winter fog in north India and a better understanding of regional climatic changes in space and time may provide a plausible solution.

Keywords: Bio-monitoring, Suspended Particulate matter, Spatio-temporal pollution monitoring, Climate control on SPM

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D - 014

SIGNIFICANCE OF BENEFICIAL MICRO-ORGANISM FOR ENHANCING THE SOIL FERTILITY AND RAPID DISSIPATION OF INSECTICIDAL RESIDUES IN SOIL

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Insecticides are widely used against a range of pests infesting agricultural crops. Modern agriculture largely relies on the extensive application of agrochemicals, which includes insecticides. Indiscriminate, long-term and over application of insecticides has severe effects on soil ecology that may lead to alterations in or the erosion of beneficial or plant probiotic soil micro flora. Weathered soils lose their ability to sustain enhanced production of crops/grains on the same land. When insecticides are distributed in the environment, they become pollutants, with ecological effects that require remediation. The contamination has been found up to about 24 km away from the point of use. Therefore, to sustain the fertility status of soil, it becomes necessary to study the effect of different insecticides on the microbial transformation of different nutrients, especially nitrogen and phosphorus in soil. If the insecticide is not degraded or detoxified rapidly enough, the risk of its off-site migration may pose a health risk to humans. Catabolism and detoxification metabolism occur when a soil microorganism uses the insecticide as a carbon and energy source. Microbial degradation process to detoxify insecticide contaminants can be effectively used to overcome the pollution problems. Soil bacteria with the ability to degrade several insecticides have been isolated from soil showing enhanced biodegradation. Soil microorganisms have enzyme pools which allow them to degrade both natural and xenobiotic substrates. However, while microorganisms control to the fate of insecticides in soils.

Keyword: Beneficial micro-organism, soil fertility, rapid dissipation, insecticidal residues

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D - 015

ELECTROCHEMICAL ANODIC OXIDATION PROCESS FOR THE REMOVAL OF PHENOL FROM SYNTHETIC WATER USING GRAPHITE ELECTRODES: OPTIMIZATION USING BOX BEHNKEN DESIGN UNDER RESPONSE SURFACE METHODOLOGY

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The aim of the present work was to investigate the removal of phenol from a synthetic water by the electrochemical oxidation process using graphite electrodes. Box Behnken Design (BBD) under Response Surface Methodology (RSM) tool was used to investigate the effects of major operating variables viz. Current density (mA/cm^2): (2.27 to 4.54), pH: (5.5 to 7.5) and electrolysis time (min): (30 to 90). The effectiveness of the considered design parameters was well analyzed to get the optimum experimental condition. Moreover, Design model has also applied in the development of statistical analyses, modeling and interpreting the resulted treatment data of phenolic wastewater by electrochemical process. In addition, the response, surface and contour plots were achieved in respect of the response function. The predicted values of BBD responses obtained using RSM were found more significant in terms of phenol removal and power consumption. The optimal result shows that the BBD model predicted and experimental values of phenol removal and power consumption are 93.42 %; 2.15 kWh/m^3 respectively under optimized variable conditions, current density: 5.24 mA/cm^2, pH: 7.31 and electrolysis time: 72.32 minutes at high desirability level. The kinetic study was also performed at a constant reaction time at different current density and it was observed that the enhanced electrochemical oxidation process follows second-order reaction rate at an optimized current density.

Keywords: Electrochemical oxidation, Interaction effect, Kinetic study, Response Surface Methodology, Power consumption

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D - 016

ANTIFUNGAL EFFICACY OF AQUEOUS EXTRACTS OF SELECTED BOTANICALS AGAINST SCLEROTINIA SCLEROTIORUM

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Sclerotinia sclerotiorum, a destructive soilborne phytopathogenic sclerotial fungi caused white rot disease in several crop plants. Management of this dreaded fungus remained a tedious task as using load of synthetic fungicides results into disturbance of soil microbial world, extinction of several flora and fauna and imbalanced ecological phenomenon through food chain. Keeping these in view, thousands of researchers emphasized on surge of botanicals, an ecofriendly and safer alternative to synthetic pesticides for management of dreaded soil borne phytopathogens. In the present study, seven locally available botanicals viz., Garlic (*Allium sativum*), Ginger (*Zingiber officinale*), Nutmeg (*Myristica fragrans*), Black pepper (*Piper nigrum*), Ajowan (*Trachyspermum ammi*), Methi (*Trigonella foenumgraecum*) and Chebulic myrobalan (*Terminalia chebula*) aqueous extracts were selected to search their antifungal efficacy against *S. sclerotiorum*. Among the selected botanicals, Garlic, Nutmeg, Black pepper, Ajowan and Chebulic myrobalan showed 100% inhibition in mycelial growth and sclerotial formation at 3, 4 & 5% concentrations while Ginger was not effective on the mycelial growth of the fungus but inhibited sclerotial development of the test pathogen at 3-5%. However, Methi was least effective as compared to control at all test concentrations. As per results, these botanicals can be exploited in ecofriendly management strategies in plant diseases.

Keywords: Phytopathogen, Botanicals, Aqueous extracts, Eco- friendly.

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D - 017

AIR, WATER, SOIL AND NOISE POLLUTION AND CONTROL STRATEGIES: A HOUSEHOLD LEVEL STUDY IN HINOO, RANCHI

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Pollution is when something is added to the environment that is harmful to living things. And also Pollution is being of contaminations into the natural environment that cause adverse change. And because of the use of excessive non-renewable sources it is degrading the surroundings such as fossil fuel generate smoke-dust in the air, is the form of air pollution, sewage in drinking water is the form of water pollution, sound of loud speakers, vehicles is the form of noise pollution, bad waste disposal is the form of soil or land pollution.

This research paper is having objectives, to study about the use of fossil fuels in Hinoo locality and to study the resource dependence in Hinoo area through the process of primary survey conducted in the locality.

This research work is done in Hinoo, Ranchi. Ranchi is the capital of Indian state of Jharkhand and lies at the $23^0 24'$ N to $23^0 18'$ N latitude, and longitudinal extension is $85^0 24'$ E to $85^0 24'$ E near to the Tropic of Cancer and its average elevation is 651m above sea level. Ranchi is known as City of waterfalls because of its numerous waterfalls. As per 2011 census, Ranchi Municipal Corporation has a population of 1,120,374 and the city has an average literacy rate of 87.6%.

In this research paper primary and secondary data has been used where primary data is produced by making questionnaire and by conducting, such a survey on the people of Hinoo locality. Secondary data is obtained from government publication etc. Simple statistical methods with cartographic work are used to highlight the finding of the study. The study is focused on what are the forms of pollution and how people become the cause of pollution. As we know that people are dependent on resources, but because of its excessive use, pollution becomes the major problem. The impact of pollution is on human health and to find alternatives renewable energy to protect environment and resource for future generation. This study will show us that how people are aware and responsible for the conservation of the environment, optimum utilization of natural resources; minimize damage on environment, to control environment degradation and pollution in Hinoo.

Keywords: Pollution, Ranchi, Strategies, Conservation, Resource

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D - 018

ASSESSMENT OF VULNERABILITY OF POPULATION EXPOSED TO GROUNDWATER ARSENIC, ARSENIC CONSUMPTION AND SUSCEPTIBILITY OF AGRICULTURAL FIELD TO ARSENIC MENACE

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Drinking water constitutes a major and possibly dominant pathway of exposure to arsenic in human. Besides, a substantial amount of arsenic enters in human body through consumption of arsenic contaminated food grains and vegetables. Irrigation through arsenic contaminated groundwater poses a significant threat to agricultural field and contaminant takes entry into various crops and vegetables. In the present study, Behea block of Bhojpur district of Bihar has taken into consideration for assessment of groundwater arsenic contamination, agricultural land affected due to groundwater irrigation, average daily consumption of arsenic by inhabitants. Behea block is composed of 78 revenue villages. Out of 78 revenue villages, 16 villages were selected for assessment of groundwater arsenic contamination. Out of 16 revenue villages, 10 villages were severely affected by groundwater arsenic contamination. Maximum concentration of arsenic was obtained in hand pump of village Karnamepur where arsenic level was 110 ppb. Six villages namely Bandha, Kundesar, Kaneli, Rani Sagar, Shiupur, Itwa were arsenic free. Study findings reveals that 340.85 hectares irrigated agricultural land (6.01% of blocks irrigated land) of 10 revenue villages is extensively irrigated by arsenic contaminated groundwater especially during Rabi season. These agricultural land and crops cultivated in affected area are vulnerable to assimilation of groundwater arsenic through irrigation. Elevated level of arsenic in food grains may result since crops receiving arsenic contaminated groundwater as a source of irrigation can uptake arsenic during phyto-extraction process and bio-accumulate in different degrees in different parts of plants. Study findings also reveals that average per capita arsenic consumption by children, young person, adults and old persons are 0.172 mg/L, 0.362 mg/L, 0.419 mg/L and 0.427 mg/L respectively.

Keywords: groundwater arsenic, arsenic consumption, vulnerability and human health implication

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D - 019

REMOVAL OF HEAVY METALS FROM OVERBURDEN DUMP OF MINE SOIL USING ELECTROKINECTIC REMEDIATION

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Environmental impact of opencast coal mining are deterioration of landscape and aesthetic view of an area by producing large overburden dumps. The problem associated with this overburden dump are that they contain excess of heavy metals due to weathering of parent rocks which leach and percolate underground thereby contaminating underground soil, water regime thereby limiting root growth of biomass. The present report conducted a bench scale study remediation of mine soil by electro-kinetic remediation process using 0.1M hydrochloric acid as an electrolyte. The study designed to find out the physiochemical properties of mine soil, its operational parameters like pH, conductivity and current were noted periodically to examine the removal efficiency under constant voltage 2V/cm. 62.19-57.25% of chromium and 53.125%-45.23% of zinc were remediated with current reaching a maximum value of 0.13A within 3 days of experiment.

Keywords: Mine Soil, Hydrochloric Acid, Electro-kinetic Remediation

D - 020

ASSESSMENT OF AMBIENT AIR QUALITY WITH SEASONAL VARIATIONS OF ASANSOL SUB-DIVISION (ADDA), WEST BENGAL, INDIA

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Transboundary dispersion of pollutants over the entire world is the major issue globally in causing air pollution consequences. In present study, an attempt has been made to evaluate the status of ambient air and the impacts of air pollutants on the adjacent areas of Asansol sub-division under the jurisdiction of Asansol-Durgapur Development Authority (ADDA), West Bengal, India. Quality of ambient air was monitored with respect to Respirable Particulate Matter (RPM<10µ), Suspended Particulate Matter (SPM), SO_2, NO_2, and Carbon monoxide (CO) of two consecutive years (2014 and 2015). Monitoring was carried out at six chosen sites (in replica) marked as control or non-industrial, semi-industrial and industrial zone across the Asansol sub-division area in three seasons *i.e.,* winter, summer and rainy. Duration of sampling for RPM (<10µ), SPM, SO_2, NO_2, was 24 hr and 1 hr for carbon monoxide (CO) at each monitoring station. Meteorological parameters *viz*., air temperature, relative humidity, barometric pressure, smell or odour and weather conditions were also recorded. Present study revealed the seasonal variations of air pollutants of captioned areas and especially the concentration of pollutants was more in winter as compared to summer and rainy seasons at all the selected sites.

Keywords: Ambient air quality, ADDA, RPM, SPM, SO_2, NO_2, CO, Meteorology, Seasonal variation

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D - 021

CARBON SEQUESTRATION POTENTIAL IN TROPICAL SOILS OF CHHATTISGARH, INDIA

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The increase in atmospheric carbon dioxide (CO_2) concentrations due to emissions from fossil fuel combustion is contributing to recent climate change which is among the major challenges facing the world. The global mass of soil organic is greater than the combined mass of carbon (C) contained in the atmosphere and in the living biomass. Therefore, small relative changes in the mass of SOC can have profound effects on the concentration of atmospheric CO_2 and hence climate change. A good knowledge of the global SOC mass and its spatial distribution is necessary for assessing, where soils are most vulnerable to C losses or which land use/land cover types might provide the best opportunity for C sequestration to mitigate increases in greenhouse gas concentrations. To address the problem the present study was undertaken in tropical soils of Chhattisgarh to estimate soil carbon sequestration potential of four land uses and five land covers. The highest soil carbon storage potential was found in forestland (118.14 t ha $^{-1}$) followed by grassland (95.54 t ha^{-1}), agricultural land (75.70 t ha^{-1}) and least was found in the wasteland (57.05 t ha^{-1}). Among the different land covers, maximum soil carbon storage potential was found in the soils under mixed land cover (118.18 t ha^{-1}) followed by teak (76.64 t ha^{-1}), bamboo (67.21t ha^{-1}), sal (64.28 t ha^{-1}) and least under soils of open and scrub (48.72 t ha^{-1}) land cover.

Keywords: Carbon sequestration, Land use, Land cover, Tropical soils.

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D - 022

ELEMENT ANALYSIS OF GROUNDWATER IN FLOOD PLAIN OF GANGA AND GHAGHARA RIVER WITH SPECIAL REFERENCE TO ARSENIC CONTAMINATION: A CASE STUDY OF BALLIA DISTRICT, UTTAR PRADESH

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Arsenic is found in the natural environment in abundance in the Earth's crust and in small quantities in rock, soil, water and air. Arsenic contamination of groundwater may occur in two ways: anthropogenic activities and aquifer naturally contain. The presence of arsenic in groundwater and its consequential health hazards to the people has been described as the biggest natural calamities in the World. In India Arsenic contamination 1st foot print are reported in Punjab, Haryana, Himachal Pradesh and Uttar Pradesh. In 1984 groundwater arsenic contamination was identify in lower Ganga plain of West Bengal. In 1992 arsenic groundwater contamination in Bangladesh reported. In 2001 groundwater arsenic contamination in the lower Plain area (Terai) of Nepal came to notice. In 2002, June arsenic contamination located in Bihar in middle Ganga plain and at the same time apprehended contamination in Uttar Pradesh lying in middle and upper Ganga plain. During October 2003–August 2005 three districts of Uttar Pradesh namely, Ballia, Gazipur and Varanasi is present in the hit list. With every new survey, new arsenic affected villages and people suffering from arsenic related diseases are being reported. There had been several newspaper clippings indicating that arsenic contamination in drinking water sources in Ballia district of Uttar Pradesh is creating hardship to the local people and several people are suffering from arsenecosis disease. Arsenic above permissible limit in groundwater of phreatic younger alluvium of Ganga and Ghaghara rivers along meandering course and shallow aquifer, has reported as the main source of arsenic contamination. The overall objective of this study is to study the extent and magnitude of arsenic. A total of 120 water samples were collected from all available current and previous private and public hand pumps used for drinking and cooking purpose by each recruited household at random from Ballia district. The result shows that the presence of arsenic is very common in all blocks of Ballia district. Study has been undertaken on the sources, causes and health prospective, arsenic is likely to disastrous effects on human. Due to excess of Arsenic in ground water people are reported to be suffering from diseases like skin cancer, ulcer and pigmentation in skin and hardening in palm skin. This situation warrants immediate measures to be taken up for planning and implementation of various management program for arsenic mitigation.

Keywords: Arsenic contamination, Groundwater, Water pollution, GIS.

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D - 023

PHYSICO-CHEMICAL PROFILE OF SUKHANA RIVER, IN AURANGABAD, (M. S.) INDIA

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The present study deals with comparative study of past and present senario water quality of Sukhana River, Aurangabad [M.S] India. The physico-chemical characteristics were studied and analyzed during January - December 1987 and presently January - December 2010. Seasonal variations in the past and present study of Sukhana River in Aurangabad [M.S] India were observed. The results revealed that the condition of this River has been increased in pollution year by year because year values are highly significant conform by f test (ANOVA). Parameter of Sukhana River are pH, Total solids, Total dissolve solids, Total suspended solids, DO, BOD, COD, Alkalinity, Total Hardness, Chloride, Nitrate and Phosphate are 6.94, 567.58, 470.41, 97.16, 1.45, 44.58, 92.41, 437.66, 487.83, 106.33, 0.24 and 138.75 respectively beyond the permissible limits according to WHO and ISI standards for drinking purpose.

Keywords: physico-chemical parameters, seasonal variations, ANOVA, Pollution.

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D - 024

SOME ASPECTS OF WATER QUALITY PARAMETERS OF PARDESWADI LAKE, WALUJ MIDC AURANGABAD (M. S.) INDIA

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Water quality focuses on the various aspects off the physico-chemical parameters of water by which state of the water body can early be observed. Measurements of various water quality parameters play the key role in detecting the status of pollution and suitability of particular water body for various aquatic organisms and agricultural products. The present survey / study was conducted to measure the various physico-chemical parameters of the water at Pardeshwadi Lake, at Ramrai Jogeshwari and Kamlapur in MIDC area, waluj Aurangabad, Maharashtra, India.

In waluj MIDC area, sterlite colgate & Palmolive, Cosmo films, arpika engineering, Solidar Remedies, NRB baring, Graware Polyester and Foster industries lays chemical mixed water and sewage in drainage and in open ground channels, in waluj, Jogeshwari, Ranjangaon, Shenpunji. Optic fiber plant of Sterlite industries lays down its sewage water in stream which flows by the side of crop field contains water from colgate and Palmolive and cosmo films and then joins to Pardeshwadi Lake and Pollutes the water of lake which make harzard for the health of people in the area.

Keywords: Physico-chemical Parameters, Pollution and Pardeswadi Lake

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D - 025

CONTROLLING MEASURES OF MUNICIPAL SOLID WASTES EFFECTS ON SOIL PROPERTIES AND PRODUCTIVITY IN JAMSHEDPUR, INDIA

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Soil is the thin layer of organic and inorganic materials that covers the Earth's rocky surface. The organic portion, which is derived from the decayed remains of plants and animals, is concentrated in the dark uppermost topsoil. Soil pollutants include a large variety of contaminants or chemicals (organic and inorganic), which could be both naturally-occurring in soil and man-made. In both cases, the main soil pollution causes are the human activities. Municipal solid waste is one of the major factor of soil pollution and become a major environmental issue in India. The per capita of MSW generated daily, in India ranges from about 100g in small towns to 500g in large towns. Composting is one of the most favoured options for municipal solid waste recycling for waste streams with high content of biodegradable materials. Compost has many uses including its use in agriculture for soil structure and fertility improvement.

Tiquia *et al,* 2003 proved that compost does not only have benefits in the short term, but also in the long term. For instance, N mineralization from vegetable, fruit and garden compost is very limited in the short term. Moreover, repeated compost application improves soil physical properties and growing conditions for the crop. The germination test is a simple and reliable indicator of compost maturity. For seed germination test on field, prepared 16 beds of 4 square feet. The ratio of compost in each 4 replicates was 0kg, 6kg, 8kg and 10kg. 200seeds of *Fenugreek (Trigonella foenum graecum* L.*),* 200seeds of red chilli *(Capsicum annuum* L.*),* 12 seeds of bottle gourd *(Lagenaria siceraria* (Molina) Standl.*)* and 16seeds of lady's finger (*Abelmoschus esculentus* (L.) Moench) sowed on the compost treated field. The effect of the compost on the bottle gourd *(Lagenaria siceraria* (Molina) Standl.*)* was the highest at the bed of 8 and 10 kg. Compost application significantly increased soil pH due the reduced exchangeable acidity and the increased levels of exchangeable bases like K, Ca and Mg. Compost application also increased the nutrient content of P, K, Ca, Mg and Na in the topsoil. However, minerals which are requirement of the human body are found in all MSW compost, and there are obvious concerns about such elements entering the food chain through food crops to which compost have been applied as fertilizer.

Jamshedpur soil is low water holding capacity with little organic matter and nutrient content, the application of compost would be an investment in the long term for the health of soils and plants. The main objective of this study is to make an attempt to reduce the amount of waste going to the landfill and creating soil pollution.

As a botanist I feel that solid wastes are rich source of organic materials which helps in plant growth and by applying this in the field as compost, it can increase the productivity of soil. So, just because of these problems I am attracted towards it.

Keywords: Topsoil, Pollutants, mineralization, germination, productivity

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D - 026

ARSENIC CONTAMINATION OF GROUND WATER ITS PREVENTION, MITIGATION & SLUDGE MANAGEMENT WITH SPECIAL EMPHASIS ON SUSTAINABLE WATER RESOURCE MANAGEMENT

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With apparent abundance of water on planet earth, a critical analysis shows that human beings are left with only 0.77% of vast water availability only as fresh water resources. Unchecked extraction of ground water and contamination from agricultural field and pollution from untreated industrial effluent straining this meager "less than 1%" resources to a very critical position. With this came arsenic contamination of ground water in wide spread region of Ganga –Megna-Brahaputra plains putting more than 51 million people at risk of cancer and other related diseases resulting to medical, financial and social disability to a large population of rural & urban Bengal. Jharkhand and UP.

The arsenic contamination in ground water in the World and in Bangladesh & West Bengal in specific, may be termed as greatest environmental disaster in 20th Century and would be in 21st Century also, posing greatest public health problem if the preventive and mitigation measures are not carried forward as a mass community movement through NGOs and Government then the present estimate of 137 million people are at risk worldwide and will increase as new areas are identified and coming under arsenic contamination zones. Preventive & Mitigation means are discussed in this paper. With 50 ppb MCL (permissible standard by Govt. of India), the risk of dying in Cancer is estimated as 1 in every 100 persons who are drinking this contaminated water. The desirable contamination standard is set by W.H.O. at 10 ppb which reduces the risk to 1 in 500 in similar situation and parameters but officially increases the population at risk figure to a great extent.

Magnitude of arsenic contamination problem brought many technologies either indigenously developed or imported from developed countries which has got their own merits and demerits. When all the techniques or systems are more or less capable of removing arsenic from water but extent of usefulness for the purpose depends on the overall design of the systems ,its sludge character and community participation. Reject waste water and sludge from the arsenic removal plants posing threats to the present and future water resources with its quality deterioration and became a major cause of Arsenic in food chain. Bioremediation in treatment of Arsenic sludge has given a new direction.

The proven and field tested techniques and strategy, which is generating employment, creating awareness on water conservation, financial incentives and better health condition, have been discussed in details with visual presentation.

Keywords: Arsenic removal, Self-sustaining Rural Drinking water project, Prevention Ground water Contamination, Reverse Osmosis

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D - 027

WATER QUALITY MONITORING OF RIVER NEORA, WEST BENGAL

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River water is important replenishable resource of modern society. In present protection of river water from pollutants is a big challenge to modern society. Most of the rivers get polluted due to not only uncontrolled anthropogenic activities but lack of awareness. The water quality is controlled by different land cover and land use throughout the season. North Bengal is rich in different natural resources and the natural beauty attracts tourists not only from different parts of India but also from different countries of the world. In this respect, North Bengal is a blooming hotspot for tourism. But the thriving industry proves to be harmful to its virgin natural resources. The pristine rivers of North Bengal is also get polluted. Neora River is one of the important tributaries of river Teesta. Neora River drains out from National Valley National Park (NVNP) towards the south and flows through different land use of its catchment. Many tourist spots, tea garden, forest cover etc. are located on the both side of river Neora. The study have objective to monitor water quality parameters of river Neora under different land use throughout the seasonal change. The Neora valley is located on the terai and hilly region of North Bengal, where people depend more on surface water due to lower access to groundwater resource. For this purpose, the study is relevant to maintain a safer water quality parameter for daily use. For this study, a stretch of 34 km of Neora River is selected and three different sampling stations are delineated based on the land use. The three sampling stations represent three different land use i.e. tea garden, construction and transportation site and Lataguri Forest Range. Samples are collected during three different seasons- pre monsoon, post monsoon and winter in the year of 2015-2016. Numbers of parameters like pH, Total Suspended Solids (TSS), Total Dissolved Solids (TDS), Alkalinity, Total Hardness, Biological Oxygen Demand (BOD), and Chemical Oxygen Demand (COD) etc. are analysed using the standard methods of APHA 22nd Edition guidelines. The data has been compared with the norms for river water of Central Pollution Control Board (CPCB) to examine the level of pollutants of the river. The correlations of different parameters are also discussed in this study. It is observed that the water quality parameters are varied seasonally and also reflects variation under different land use. Under the forest cover the water quality is better than the other land use. It is studied that in winter the water quality is deteriorated under the land use of tea garden and construction site which may be increase in anthropogenic activities.

Keyword: Catchment, Neora Valley National Park (NVNP), Biological Oxygen Demand (BOD), Forest Cover, Water Quality

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D - 028

INTEGRATED WETLAND ECOSYSTEM FOR SUSTAINABLE TREATMENT OF WASTEWATER

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Nutrients like nitrogen and phosphorus are present in sewage effluents. Its removal is the final process in the treatment of waste water treatment. This require either additional of chemicals or other energy requirement process. Constructed wetland, a solar driven green technology can be used as an alternative for this. Nutrients in waste water effluent are also essential elements for plant growth and development. The present study is on an integrated wetland system at Jakkur, Bengaluru, where secondary treated water is fed to the system for further purification and nutrient removal. It consists of a free water surface constructed wetland and lake. The aim of the present study is to find treatment efficiency of an integrated wetland system by analyzing physiochemical parameters of water. It also focuses on analyzing nutrient content present in macrophyte sample covered in the wetland. Sampling was done during August to October 2016. Seven sampling sites (inlet to outlet) were chosen to understand the treatment efficiency of the integrated system. Onsite parameters like dissolved oxygen, total dissolved solids (TDS), pH, electrical conductivity (EC) were measured in situ and Further analyses of various physio-chemical parameters (nitrate, phosphate, COD and BOD) were carried out in laboratory. Macrophytes like *Typha, Eichhornia, Ludwigia, Alternanthera species* were collected from same sites where water samples were collected (random method, 0.5m^2 transacts) and total Carbon and Nitrogen in the samples were determined by using CHN analyser. Dissolved oxygen value ranged between 0 to 9.0 mg/l. The values of TDS ranged from 640 to 1044 mg/l. It was higher in the inlets and decreased in middle and outlets. Electrical conductivity showed a decreasing trend from inlet to outlet (1459 (inlet) to 893 µS (outlet)). In the present study the values of nitrate ranged between 0.25 to 0.07 mg/l. Total removal percentage of nitrate in the system was 72% (from inlet to outlet). Range of phosphate varies between 10.8 to 5.3 mg/l. A 50% of phosphate removal was observed for entire system. During this study period the values of BOD varied between 24 to 10 mg/l. Results show that, this integrated system removed 32% of BOD by the combined function of both wetland and lake system. Values of COD lie between 38mg/l and 20 mg/l in this study. The entire system had removal efficiency of 35 % for COD. *Alternanthera* species showed high carbon content of 40% and *Ludwigia* species showed high nitrogen content of about 4%. Among all the species, *Typha* species showed low carbon content and low nitrogen content. Samples from inlet *Typha* species showed significant variation in nitrogen content between mature and young. Highest phosphorus content is observed in *Ludwigia* species with ~ 0.9% and lowest with *Typha* species ranging between 0.2 to 0.6%. In *Alternanthera s*pecies, those at outlet has less phosphorus content than at after wetland. *Typha* at the inlet has only low phosphorus in its tissue, though it was present in high phosphate water. This confirms that, main source of phosphate uptake by rooted emergent is from sediments than water.

Keywords: Bangalore, Macrophytes, Wetland, Nutrient

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D - 029

EFFECT OF GROUNDWATER FLUCTUATIONS ON WATER RESOURCES IN THE EAST SINGHBHUM DISTRICT, JHARKHAND, INDIA

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Water is a precious natural resource. Rapid industrialization and urbanization have increased the demand of water in all spheres. Water is definitely physically scarce in densely populated arid areas. This water scarcity relates to the food production but not for domestic purposes that are small at this scale. In most of the world water scarcity at a national scale has as much to do with the development of the demand as the availability of the supply. Therefore, the conservation and efficient water resource management is essential. Groundwater is widely distributed under the ground. It is the largest source of fresh water in the earth and unlike other mineral resources. Ground water is the rest portion of water during percolating into the soil and after meeting the necessary soil moisture deficiency, occurs at various locations below the earth's surface depending on the physical properties of various formations that exist. Such as aquifer, unconfined aquifer, confined aquifer aquiclude, aquitard, aquifuge etc. Groundwater condition of an area are mainly depends on abstraction, recharge, soil properties, hydrological characteristic of aquifer, storage capacity etc. The groundwater in the shallow aquifers gets replenished annually, and therefore, the status of water levels and its fluctuation play a key role in the assessment of groundwater. The fluctuation of groundwater level may be different in magnitude for different locations depending on the abstraction and recharge. The water level fluctuation of pre monsoon and post monsoon period in the East Singhbhum District is in between 0.01 to 6.73 m which generally varies from time to time. Therefore measurement of water level fluctuations will help to know about the different trend of increased or decreased level of water. The problem of water scarcity than can be mitigated by applying different techniques like rainwater harvesting, integrated water resources management etc which is a essential task for proper assessment and management of water. Declining water level trends and yields of wells and drying up of shallow wells are common in many parts of India. The present study has attempted to understand the behavior of water level fluctuation by selecting a small watershed viz. Subharnarekha watershed in the East Singhbhum District, Jharkhand. The average pre- monsoon groundwater level in the Subharnarekha watershed is 2.01 mbgl to 16.27 mbgl and the average post-monsoon groundwater level ranging from 0.01 mbgl to 8.58 mbgl. The annual rainfall is this district ranges from 1200 mm to 1400 mm with high spatial variation. Rainfall from the basin directly converts to overland flow due to lack of tree cover, water harvesting structures and flows out of the basin. For the effective water conservation plans in the Subharnarekha watershed area, the water conservation treatment structures like gully plugs, continuous contour trenches (CCT), earthen check dams, percolation tanks are recommended. The implementations of such structures will definitely help to combat over the scarcity situation in the area.

Keywords: Groundwater, Post-monsoon water level, Water level fluctuation, Subharnarekha watershed, Water Management

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D - 030

WASTE WATER MANAGEMENT: A COMPARATIVE ANALYSIS OF SEWAGE WATER FROM TREATMENT PLANTS AND OTHER SOURCES IN DELHI

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With the rapid growth and uncontrollable urbanization in Delhi, there has emerged a tremendous pressure over the natural resources, basic infrastructure to sustain the ever growing population in Delhi. With 11 million residents, Delhi has been experiencing the fastest urbanization rate in the world, as per the 2011 census with 4.1% increase in population from2001.Also, Delhi stands second in terms of highest population after Mumbai. Population migration, urbanization and industrialization are some of the crucial factors determining the surging demand and dwindling supply of water. Clean water is the most necessary resource needed to sustain the people living in the society. The water required for drinking undergoes various stages of treatment before it is made available for drinking by people living in the society.

This process of treatment is done in various Water treatment plants and Sewage treatment plants. Water from sewage treatment plants can further be used for purposes like washing, cleaning etc. Improved water quality enhances the productivity of humans. The benefits which accrue to households on the account of treatment pertains to costs saved from abstaining from falling ill. Along with the health benefits, social benefits occur in form of increased employment, environmental benefits of clean water would be able to sustain water life and save environment from degradation. According to the estimate of CPCB (2009), 3800 million litres per day (MLD) of sewage is generated in Delhi. Only 2330 MLD of sewage water is treated out of the total water generated from sewage. Around 39% of sewage water is left untreated. Thus, the waste water management has been of paramount importance in the present scenario. The present study is an integrated approach to tackle the problem of treatment of waste water and involves comparative physico-chemical and economic analysis of waste water samples from two Sewage Treatment Plants (Okhla sewage treatment plant located at Okhla sub-locality, South Delhi District, Delhi and Kondli sewage treatment plant located at Pragati Marg, Kondli) and from various other parts in Delhi City including the Delhi University North Campus area. The Cost- Benefit Analysis involving socio-economic assessment of impact of chemical pollution along with the determination of physical properties viz., pH, Conductivty, Viscosity and Surface Tension has been undertaken to make a comparative assessment of these treatment plants and different waste water samples. The chemical analysis is in progress for further study. The present study is a first step towards the larger aim of exploring long term, affordable, accessible and eco-friendly approach to waste water treatment that provides not only clean drinking water but also produces sustainable and cost effective source of energy.

Keywords: Clean water, Integrated Approach, Cost-Benefit Analysis, Physico-chemical Analysis, Sustainable energy

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D - 031

A STUDY ON THE ALTERED DEPICTION OF LAKE WATER QUALITY IN JHARKHAND STATE THROUGH MODELLING APPROACH

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Surface water is a vital source of fish culture as fish production is the significant source of food. Nowadays contaminations of water become a severe global issue as the intake of heavy metal and poisonous constituents by fishes. As a result, water pollution is turning significant with respect to human health and food security. Water pollution occurs due to industrial wastewater and urban sewage into water bodies. On contamination of pollutants, the quality of such water bodies deteriorates at the higher intensity of pollutants and cause serious impact on aquatic cultures and the people around through food chain. The main objective of the present study was to measure the intensity of the pollution level in a lake selected nearby the area where the industrial and domestic activities prevail by comparing with another lake selected in non-industrial area as a baseline in Jharkhand state. Therefore, an attempt was carried to evaluate the contamination level which is responsible for deterioration of the lakes. The sampling and analysis were carried out for five consecutive months from July to November. The Physico-chemical parameters such as turbidity, BOD_5, COD, DOM, phosphate hardness, oxygen, chloride, alkalinity, carbon dioxide, conductivity, light intensity, pH value and temperature were analysed. During the entire study, higher concentrations of BOD_5, COD and more salinity were observed in the month of July and November at Ranchi Lake. An appropriate modelling approach based on different standards widely followed for surface water quality analysis in India has been adopted to compute the intensity of the contamination level of the selected lake to compare with another one situated in non-industrial area. The results reveal that there is a significant impact on the quality of lake situated nearby industrial area due to diversified sources of water contaminations in such ecosystems, which is unfavourable for living organisms, particularly for the fishes and its productivity.

Keywords: Surface water contamination, water resource management, intensity of water pollution issue, eutrophication

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D - 032

THE THREAT OF SPACE POLLUTION: CONTAMINATION BEYOND THE AIR, WATER AND SOIL POLLUTION

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Over the past six decade there has been increasing global concern over the negative impact on environment attributed due to pollutions. The use of technology in the space has brought unavoidable environmental impacts like space debris. Space debris represents a growing threat to the operation of man-made objects in space. In the past years, significant debris-generating events as well as improved tracking abilities have encouraged the recognition of space debris as a significant threat. Space pollution is orbiting debris consisting of satellites, solar panels, rocket bodies, fragments from space shuttles and disintegration, erosion and collisions which have polluted the space environment. The study of space pollution is an unknown topic in comparison to the air, water, land and noise pollution. The impact of space debris on space security is related to a number of key issues, including the amount of space debris in various orbits, space surveillance capabilities that track space debris to enable collision avoidance, as well as policy and technical efforts to reduce new & old debris.

The pollutants of space environment is a matter of urgent importance as it has many negative impact like increase in the velocity of atmospheric drag which has increased the re-entry of debris in earth's atmosphere. It affects the space weather, earth's rotation and changes the ionospheres currents leading to the decrease of velocity and atmospheric pressure. Nuclear fuel used in the space mission and it also adds to the enhancement of ozone hole. This orbiting debris is significant issue in this space age. The space use has benefitted every living being in this liberalisation, privatisation and globalisation era. The technology advancement has integrated different societies. These societies rely very much upon the facilities provided by the use of space. But these facilities are coming at the cost of natural environment which has deteriorated even the space after earth's air, land and water. The future exploration will add more of debris. Only Russia, China, Japan, USA, Europe is preparing to tackle it. Ironically they are not sure of it. No nation can blame anyone as there is no authentic evidence.

While the existing international space law is widely considered outdated and insufficient to address the current challenges to space security posed by space debris. Dependency on satellite for communication and other human activities has added more quantity of space waste. As such given birth to space pollution. There is uncertainty of debris mitigation and cleaning of debris. This paper outlines the problem of space pollution and gives an overview of the current event of space debris. It also gives the possible solution to solve the issue of space debris and why it is important as an environmental concern 8km/sec in the earth's orbit and problem that have come with creation of debris in space. The paper focuses on the negligence of environment concern of waste orbiting

Keywords: space debris, Kessler syndrome, electrodynamics tether, space weather, space environment, thrust, magnetic coupling

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D - 033

STATUS OF POTENTIAL GROUND WATER AND LAND USE PATTERN IN BARNADI RIVER BASIN, ASSAM: INDIA

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Abstract - The pattern of Land-use and land-cover changes is one of the main human induced activities altering the groundwater system (Calder, 1993). The relationship between existing land use pattern and aquifer system is communicated by a number of socio-economic, cultural, political, industrial and other aspects. The major changes in land use that impact groundwater are taking place, as a consequence of population growth, increasing and changing food demands. The pattern of Land-use changes are known to impact the hydrology of the catchment area (Tang et al., 2005). The pattern of land use and aquifer system is also highly determined by the existing lithological, geological and physiographic setting of the study area. The importance of this precious natural resource in the Indian context can be gauged from the fact that more than 85 percent of India's rural domestic water requirements, 50 percent of urban water requirements and more than 50 percent of irrigation requirements are being met from the Annual Replenishable Ground Water Resources. The net annual ground water availability in Assam is 24.89 bcm out of which utilizable GWR is 49.106 mcm, the minimum water level (WL) depth of ground water resource (GWR) in Assam is 0.04 meter below ground level (m bgl) against the maximum one which is 19.03 m bgl (Ground water Year Book, 2012-13). The proper assessment of ground water prospect and land use pattern in the study area will help anyone to have a better understanding of the relationship in between these two aspects in terms of Isopermeability zones, water Table contour lines associated with varied lithological conditions as well as the varied pattern of land use in the area. The Barnadi River basin, mastered by the river Barnadi, is one of the major northern tributary river basins of the Brahmaputra. The basin of the river covers an area of 680.97 square km between $26^0$14/30// N to $26^0$49/ N latitudes and $91^0$44/40// E to $91^0$53/15// E longitudes. This paper attempts partly to evaluate the existing pattern of ground water potentiality and land use in the study area based on the collected data.

Keywords: Isopermeability, Aquifer system, Water Table Contour, Replenishment, Lithological

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D - 034

DURABILITY STUDIES OF (FA+BA+GBFS) AND (FA+ETPS+GBFS) BASED GEOPOLYMER

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Geopolymerization is a process first termed by J. Devidovits in 1970. Geopolymerization includes chemical reaction between various aluminosilicates, oxides and silicates under highly alkaline condition, yielding polymeric Si – O – Al – O bonds. Fly ash based Geopolymers have attracted more attention since 1990. The recent trend in geopolymer reaction is to use fly ash for the development of cement and concrete. Recently a few paper reported in the combined use of fly ash, bottom ash, ETPS and GBFS for making geopolymer concrete. However little information available in this area. The objective of present work was to develop geopolymer concrete using class F fly ash, bottom ash, ETPS and GBFS and studies their durability in adverse condition. The product was made with coal bottom ash as a replacement of sand (fine aggregates or filler material) and fly ash as replacement of cement. Compressive strength test were carried out at the ages of 28 days curing. The variable parameters were 6M, 10M& 14M sodium hydroxide along with varying amount of Silica/ Alumina ratio in FBG and FEG based geopolymer products on compressive strength has been studied using automatic compressive testing Machine. The reaction product has been characterized using X-ray diffraction (XRD) and scanning electron microscopy (SEM) and assessing their durability in 1% and 3% of Sulfuric acid, acetic acid, sodium sulfate, magnesium sulfate and sodium chloride. All the experimental results show that FBG & FEG based samples were comparatively improves the strength of concrete and more resistant in acid, sulfate and chlorides attacks. The use of geopolymers as an OPC replacement represents the potential for a substantial reduction in world CO_2 emissions, as the cement industry is responsible for an estimated 5% of global CO_2 emissions. The present study completely eliminates the use of ordinary Portland cement and sand in making concrete, but using FBG & FEG based geopolymerised samples reducing considerably the carbon foot print.

Keywords: Geopolymer, Fly ash, Bottom ash, GBFS, ETP sludge, Compressive strength and durability

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D - 035

ASSESSMENT OF HEAVY METAL POLLUTION IN SURFACE WATER OF AJAY RIVER, WEST BENGAL (INDIA)

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In the aquatic environment, heavy metal contamination has attracted global interest due to its great quantity, persistence and their toxicity. It is regarded as a global crisis with a great share in countries like India. This study aims to investigate the spatial and seasonal variations in concentration of heavy metals in the surface water of Ajay River. Surface water samples from Ajay River of West Bengal were collected for two seasons, winter and summer of 2015-2016 to examine the concentration of eight heavy metals, *viz*., Cadmium, Chromium, Copper, Iron, Lead, Manganese, Nickel, and Zinc using Atomic Absorption Spectrophotometry as per APHA (2005) guideline. For this study, four sites were selected along Ajay River, out of which two stations are situated within Burdwan district and other two stations are under Birbhum district. The maximum mean concentration of Fe (175.967 µg/l) was observed in summer, Mn (85.655 µg/l) in winter. Cd (16.545 µg/l) and Cr (921.855 µg/l) exhibited their maximum during the winter season. The concentration levels of certain heavy metals *viz.*, Cd, Cr, Pb, Ni are alarmingly high in all the considered sampling stations.

Keywords: Ajay River, Heavy metal, Spatial variations, and Seasonal variations

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D - 036

REJUVENATION OF GANGA: NEED OF INTEGRATED GANGA CONSREVATION MISSION THROUGH NAMAMI GANGE

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In the Ganga basin approximately 12,000 million litres per day (mld) sewage is generated, for which presently there is a treatment capacity of only around 4,000 mld. Approximately 3000 mld of sewage is discharged into the main stem of the river Ganga from the Class I & II towns located along the banks, against which treatment capacity of about 1000 mld has been created till date. The contribution of industrial pollution, volume-wise, is about 20 per cent but due to its toxic and non- biodegradable nature, this has much greater significance. The industrial pockets in the catchments of Ramganga and Kali rivers and in Kanpur city are significant sources of industrial pollution. The major contributors are tanneries in Kanpur, distilleries, paper mills and sugar mills in the Kosi, Ramganga and Kali river catchments.

The Ganga Action Plan or GAP was a program launched by Rajiv Gandhi in April 1986 to reduce the pollution load on the river. But the efforts to decrease the pollution level in the river became abortive even after spending Rs. 9017.1 million. This plan is described as failure by many scientist and NGOs in their studies. After getting elected, India's Prime Minister Narendra Modi affirmed to work in cleaning the river and controlling pollution.

Accordingly, an Integrated Ganga Conservation Mission called “Namami Gange” has been proposed to be set up and a sum of Rs. 2,037 crores has been set aside for this purpose. In addition a sum of Rs. 100 crores has been allocated for developments of Ghats and beautification of River Fronts at Kedarnath, Haridwar, Kanpur, Varanasi, Allahabad, Patna and Delhi in the current financial year. Accordingly, Namami Gange approaches Ganga Rejuvenation by consolidating the existing ongoing efforts and planning for a concrete action plan for future. The interventions at Ghats and River fronts will facilitate better citizen connect and set the tone for river centric urban planning process.

Recognizing the multi-sectoral, multi-dimensional and multi-stakeholder nature of the Ganga Rejuvenation challenge, the key Ministries comprising of (a) WR, RD&GR, (b) Environment, Forests & Climate Change, (c) Shipping, (d) Tourism, (e) Urban Development, (f) Drinking Water and Sanitation and Rural Development have been working together since June, 2014 to arrive at an action plan. The paper attempts to draw out the need of new clean Ganga mission project under Narendra Modi’s government. With the background study of failure of Ganga action plan. And why it is matter of concern for environment and ecology.

Keywords: Nirmal dhara, Aviral dhara, Char dham yatra, Ganga vahani

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D - 037

ANTHROPOGENIC AND ENVIRONMENTAL FACTORS INFLUENCING THE WATER QUALITY OF WAHUMKHRAH RIVER

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The river WahUmkhrah, once a crystal clear water, originates from natural springs in the south eastern part of Shillong peak range near Damthring (91° 54 .30° E and 25° 34.30° N) at an altitude of about 1600 meters above mean sea level. In recent years the river WahUmkhrah is under serious threat and pressure from both anthropogenic and natural factors and the river has lost its unique characteristics.

The significance of river WahUmkhrah for Shillong is quite immense since it passes through various important locations of the city like Nongthymmai, Pynthor Umkhrah, Polo Market, Wahingdoh, Mawprem etc. Several streams/drains also join the River WahUmkhrah at its origin up to the point it meets Lake Umiam. There are no treatment plants in Shillong, all the sewage and wastewater enters directly into the river.

WahUmkhrah River receives its water from Demthring which is the purest form of water in Shillong. Today as sewage is drained in the river small fishes have been killed and the river is lifeless. No attempt has been taken to clean the water body. In many places heavy walls have been constructed on both the banks which has reduced the size of the river resulting in to inundation of its surroundings causing damage to life and property. People of Shillong are not allowing the normal flow of the water as a result during the rains the low lying areas are flooded e.g. polo ground.

In this research, the levels of physico chemical and bacteriological parameters were determined in water samples collected from the river. After the analysis of the data, it can be said that the river water at present is highly polluted. All the hydrological and physico chemical parameters studied showed noticeable seasonal variation. All the water samples collected during the study were positive with respect to the coliform occurrence well above the permissible limits though the counts were variable. The results indicated that most of the parameters from the river are beyond the WHO limits for drinking and sustainable use.

The study gave a vivid picture of the ecological status of the water body and sustainable water management schemes that can be implemented for restoration of the water quality. Water sources are of major environmental, social and economic value. The findings clearly indicate the challenges and opportunities for improvement of the water quality so that the eco-system is restored and can be used for farming, fishing etc.

Keywords: WahUmkhrah River, physico chemical, bacterial, anthropogenic

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D - 038

ELECTROKINETIC TREATMENT OF METALS AND ORGANIC IMPURITIES FROM SOIL/SLUDGE: A REVIEW

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Electrokinetic remediation is an innovative and promising technology suitable for fine grained soil is being used in recent years to remediate contaminants from soil/sludge to reduce soil pollution, as well as groundwater problems. Electrokinetic process is the application direct current to extract heavy metals, organic, inorganic, radionuclides compounds by using different electrolyte. This review focus on the experimental work carried out in metals contaminated soil electrokinetic remediation its comparison based on cost effectiveness with various other remediation technique, comparison evaluation aiming to systemize use of weak and strong acid as electrolyte and their impact on soil/sludge health. The primary objective of this review paper is to examine the principals of electrokinetic remediation, its design, theoretical aspects, operational parameters and soil/sludge health after electrokinetic process. The research findings suggested that electrokinetic remediation with weak acid has a substantial impact on remediation of contaminants with increment of soil fertility, less impact on soil microbial biomass carbon, nitrogen, microbial activity and could hold a possible solution over strong acid with better cost benefit ratio.

Keywords: soil pollution, Electrokinetic remediation, metals, soil fertility

D - 039

ENVIRONMENTAL NOISE POLLUTION MONITORING AND IMPACTS ON HUMAN HEALTH IN RANCHI AND HAZARIBAGH, JHARKHAND, INDIA

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Environment has been described as that surrounds as an individual or community, including both the physical and cultural surroundings. Sound is an integral part of both of them. But when this integral part becomes annoying, irritating and unnecessary, it takes the form of noise. Besides the growing level of air and water pollution, road traffic noise pollution has been recognized rising as a new threat to the inhabitants. Noise pollution is one of the major environmental pollutants that are encountered in daily life and has direct effect on human performance. This noise pollution monitoring and environmental impacts on human health in Ranchi city and Hazaribag town of Jharkhand, India are discussed in this paper. Major source of noise pollution includes transportation and frequent use of horn in vehicles. Traffic noise is probably the most rigorous and pervasive type of noise pollution. Traffic noise has become a serious problem nowadays because of inadequate planning of the city in the past. The problem has been compounded by increase in traffic volumes (two wheelers, heavy motor vehicles and other vehicles). Ranchi being the capital is densely populated with vehicles, houses airport and various industries, while Hazaribag, being situated cross roads is always busy. It houses many small scale industries such as crushers which work as a noise factory. On the other hand both the places are known for their natural beauty. Noise pollution levels in Ranchi (52.5 – 85.3dB) and Hazaribag (51.2 – 83.6dB) more than recommended permissible limits (30 – 75) are observed in the spotted areas of both the places. Exposure to high level of noise cause stress on human health such as auditory, nervous system, insomnia, hearing loss, reducing efficiency, sexual impotency, cardio-vascular, respiratory, neurological damages and limiting human life. The execution of an appropriate management strategy for limiting noise pollution on affected sites is recommended

Keywords: Noise pollution, Monitoring, Impact, Ranchi, Hazaribag

D - 040

EFFECT OF SOIL REACTIVITY ON THE PROTEIN PROFILE OF *RHIZOBIUM* ISOLATES FROM *CAJANUS CAJAN* OF ACIDIC SOIL REGIMES OF JHARKHAND

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As a commercial crop *Cajanus* (Arhar) has immense market the world over because its seeds provide the best quality curry. But some paradoxes do exist apart from being expensive. In some of the varieties of *Cajanus* the seed preparations also produces flatulence. Soil acidity is one of the most serious problems affecting growth of *Rhizobium* in the soil of Jharkhand. Most of the legume requires neutral or slightly acidic soil for symbiotic nitrogen fixation. Environmental factors influence all aspects of nodulation and symbiotic N_2 fixation, in some cases reducing rhizobial survival and diversity in soil; in others affecting nodulation or nitrogen fixation and even growth of the host. Factors that are important include acidity, temperature, mineral nutrition, salinity and alkalinity. So, it becomes worthwhile to begin an extensive work on *Cajanus* to identify unique protein expressed in *Rhizobium* isolates collected from strongly acidic soil regimes of Jharkhand and comparing its protein profile with *Rhizobium* residing in neutral pH. The present study showed presence of spots which were common to both the isolates which may be the house keeping genes. Housekeeping genes are those genes which are expressed in a cell all the time because it is essential for survival of organism eg- respiratory proteins, transport proteins unlike unique proteins which are expressed in a cell only during conditions like stress eg acidic stress, salt stress etc. The analysis of the proteins in this study was carried out using highly-sensitive methods such as silver staining of proteins. The differential protein spots pattern identification and analysis of both isolates (8 BAU, 43 Arhar) was carried out by 2D gel electrophoresis. The intense and prominent spots were selected as candidate spot which could be used for MS analysis for protein identification in near future. Unique spot are the one representing expression of that protein under pH stress condition. Common spots are almost common to all *Rhizobium* isolates. Soil pH affects the nodule formation in leguminous plants as in Cajanus, thus limiting the crop productivity and influences geographical distribution of many crop plants. Plants under such abiotic stress adapt themselves by expressing certain unique proteins. From ongoing research, biological information about understanding of molecular basis of adaptation of leguminous plant, *Cajanus cajan* under abiotic stress (soil acidity), will get highlighted using proteomics, which will have fruitful impact on the future management of crop practices especially for Arhar to survive in acidic soil regimes of Jharkhand.

Keywords: Abiotic stress, *Cajanus cajan*, Housekeeping Genes, *Rhizobium*, Two- Dimensional Gel Elecrophoresis

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D - 041

REHABILITATION POTENTIAL OF CERTAIN INDIGENOUS AND EXOTIC WOODY SPECIES RAISED ON DEGRADED COAL MINE HABITATS IN A DRY TROPICAL ENVIRONMENT, INDIA: A CASE STUDY ON ECOLOGICAL RESTORATION OF DEGRADED LANDS

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Accumulation of significant C stock in redeveloping soils of mine spoil depends upon the quality and rapidity of biodiversity reconstruction in a short span of time. Developing young forests on any particular degraded ecosystems play a significant role in mitigating effect of global climate change. But, restructuring of vegetation on such ecosystems are not an easy task. It needs careful scientific consideration prior applying ecological restoration principles. Present study was conducted on a degraded ecosystem in a dry tropical region of India where mining is one of the serious problem. Due to this, not only degrading the forest covers even degrading whole environmental conditions including soils too. Thus, degraded soils have poor ability to provide essential nutrients for vegetation development because soil-plant relationships and nutrient circuit in the soil medium has been damaged. Hence, ecological restoration is a really challenging ecological problem; moreover, their recovery by natural succession is very slow. Therefore, biological soil restoration by establishing desirable plant species is cost-effective and more stable technique than physical and chemical rehabilitation procedure.

We selected eighteen plantation sites as a total in different ecological models (mono- and mixed culture) for assessing restoration potential on coal mine spoil for this study. Fourteen plantation stands selected as mono-cultured and four (*1: Albizialebbeck + Acacia catechu, 2: Azadirachtaindica + Phyllanthesemblica, 3: Dalbergiasissoo + Tectonagrandis and 4: Dendrocalamusstrictus + Tectonagrandis)* were selected as mixed cultured. Of which, eight woody species were indigenous in nature, and in which, four of them (*Albizialebbeck, Pongamiapinnata, Dalbergiasissoo, Albiziaprocera*) were leguminous tree and short stature in size; and four (*Azadirachtaindica*, *Tectonagrandis, Dendrocalamusstrictus and Shorearobusta*) were non-leguminous. While remaining four woody species (*Acacia auriculiformis*, *Casuarinaequisetifolia*, *Eucalyptus hybrid* and *Gravilleapteridifolia*) were exotic in nature. The objective of the present study was to assess restoration potential as intensive investigations applying several soil and vegetational parameters with respective time.

Results indicated that influence of planted species for accumulation of soil organic C in belowground component was more pronounced with increasing time. In comparison to mono-culture plantation stands, mixed culture either legume or non-legume combinations showed a strong inclination in soil restoration confirming accretion of carbon in soil may in turn more strong enhancement of biological fertility as C act as structural backbone and source of energy for Saprotrophs. Hence, accretion of soil organic carbon is a significant indication of developing biological fertility under rehabilitated ecosystem promoting ecological restoration.

Keywords: Ecological restoration; coal mine spoil; biomass; NPP; Indigenous plantations; Carbon sequestration; soil redevelopment.

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D - 042

STUDIES OF EFFECTS OF VARIOUS CATEGORIES OF POLLUTANTS ON THE RATE OF PHOTOSYNTHESIS IN *HYDRILLA*

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Man has been the harbinger of development in all parts of the world. But anthropogenic activities have affected the environment in unfathomable ways. The use of different chemicals in our daily lives has shown some surprising and alarming results affecting the plants. In our experiment, we worked with different parameters and it was sought to find out whether they had any bearing on the rate of photosynthesis of an aquatic plant, *Hydrilla*, using a Wilmott's Bubbler and by counting the number of oxygen bubbles evolved.

Five organic solvents viz., aniline, benzene, 1-butanol, benzaldehyde, and acetic anhydride were used for our study. While aniline, 1-butanol and benzaldehyde showed some rises in rate of photosynthesis by 20.51%, 21.42% and 9.8% respectively, benzene and acetic anhydride dropped the rate by30%and 27.5% respectively.

Hydrilla was treated with samples of Indian brands of soaps and detergents viz., Tide, Dove, Clean and Clear face wash, Lifebuoy and Surf Excel bar. Dove shampoo plummeted the rate by 80.6%, followed by Lifebuoy at 80.0%. Clean and Clear face-wash, Surf Excel bar and Tide led to a drop by 62.9%, 55% and 48% respectively. Then, five industrial pollutants viz., strontium chloride, barium chloride, lead nitrate, chromium trioxide and mercurous sulphide were used to find out their effects on the rate of photosynthesis. Only barium chloride showed a rise by 48.8%. Strontium chloride showed a moderate drop by17.8%. Mercurous sulphide, lead nitrate and chromium trioxide dropped the rate of photosynthesis by 90.1%, 28.9% and 54.2% respectively.

Lastly, five leading brands of automobile lubricants viz., Servo, 4T, Castro, Max and HP were taken for consideration. Servo showed a nominal increase in the rate of photosynthesis by 27.2%. Max had the highest impact by 458%. In between, 4T, Castrol and HP showed some rises by 70%, 80% and 275% respectively.

Although a lot more work is needed to come to the final conclusion, it has become quite clear that the unchecked use of all the above chemical substances has created a serious imbalance in nature. Plants form the basis of nature and are the torch bearers of a clean environment. Neither a major increase, nor a decrease in the rate of photosynthesis is good because it creates havoc in the plant system. So there is an urgent need to implement the judicious use of these substances so that a minimal interference to the environment is allowed in course of our development planning and execution.

Keywords: detergents, lubricants, heavy metal, photosynthesis, solvents

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D - 043

BIOMONITORS OF POLLUTION: BRYOPHYTES

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Bryophytes have been employed as a major biomonitor for pollution by providing both quantitative and qualitative information about the pollution. Air pollution inhibits gametangial formation and sexual reproduction in bryophytes. They also reduce photosynthesis by degrading chlorophyll and growth of plants and eventually cause their death. When metals absorbed by the bryophytes enters the cell, it inhibits the photosynthetic activity and the enzymes and membrane are poisoned. The common symptoms of metals in bryophytes include plasmolysis and chlorophyll degradation in the leaf cells, brownish spots on the chloroplasts, necrosis, premature ageing and senescence.

Keywords: Bryophytes, bio-monitors, air pollution, plasmolysis, chlorophyll degradation.

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D - 044

IMPACT OF GEOTHERMAL ENERGY EXPLOITATION IN ICELAND

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Geothermal energy coming from deep within the earth's core is the hottest green energy. It is a promising clean energy option and it can lessen the use of fossil fuels in the near future. Geothermal energy is constant and independent of weather conditions unlike wind, solar and hydro. Its source is about 6000 km underground at the earth's core where the slow decay of radioactive elements produces continuous temperature hotter than the earth's surface .Our work comprises of positive and negative impacts of Geothermal energy exploitation and ways of harnessing the energy.

Keywords: geothermal energy harnessing, clean energy, continuous energy

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D - 045

OBSERVATIONS ON PHYSICO-CHEMICAL PROFILING OF GANDHISAGAR RESERVOIR

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Gandhisagar, the second man made reservoir of India is located in Mandsaur district of Madhya Pradesh. Ten study sites were selected on the left and right banks of reservoir but Dam site represents the most important study area having depth of 35m. Vertical physico-chemical profiling of water temperature, conductivity, pH, dissolved oxygen, inorganic total carbondioxide, total hardness, chloride, calcium, phosphate and silicates were conducted monthly at the depth of unit interval for two successive years. The seasonal maximum values ranged for water temperature 29.5-26.2^{0}C, pH 8.5-8.8, inorganic total CO_2 181-198 mg/l, total hardness 126-134 mg/l, chloride 31.9-32.9 mg/l, calcium 30.0-33.0 mg/l, phosphate 0.58-0.75 mg/l and silicate 12.0-16.0 mg/l were recorded in the month of June (summer season) whereas maximum DO 9.4-7.6 mg/l and transparency 284 cm were obtained in winter and spring season respectively. Minimum values of these factors were observed during rainy season.

Vertical stratification of temperature, DO, pH, conductance total alkalinity, phosphate and silicate reflected chemocline nature of the reservoir.

Keywords: Physico-chemical profiles, Vertical stratification, Gandhisagar

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D - 046

SOIL CARBON SEQUESTRATION IN WESTERN HIMALAYAS THROUGH DIFFERENT LAND USE SYSTEMS

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The present investigation entitled "Soil carbon sequestration in Western Himalayas through different land use systems" were carried out at two locations (i) Dhaulakuan that lies between 30° 29' N latitude and 77° 31' E longitude with an elevation of 468 asl in sub-tropical sub-montane and low hills, Zone-I (ii) Nauni, Solan (30° 51' N latitude and 76° 11' E longitude) at an elevation of 1250 asl in sub-temperate sub-humid mid hills, Zone-II of Himachal Pradesh during 2004-05 to 2005-06. The experiment was laid out in Randomized Block Design (Factorial), using eight land use systems and two agro-climatic zones replicated thrice. The eight land use systems selected were: horti-pastoral (HP), silvi-pastoral (SP), agri-silviculture (AS), agri-horticulture (AH), agri-horti-silviculture (AHS), pure agriculture (PA), pure grassland (PG) and pure plantation (PP). The plot size of each land use system was 50m x 10m. Existing biomass production, carbon stocks and carbon sequestration potential of each land use systems were evaluated. The maximum Soil Organic Carbon pool (197.60 Mg ha^{-1}) was reported in agri-horti-silviculture system, whereas minimum (71.38 Mg ha^{-1}) in horti-pastoral system. In all the land use systems the Organic Carbon Pool declined from Soil layer 0-10 cm up to Soil layer 30-40 cm in each of the two zones. Maximum SOC was observed in silvi-pastoral system at 0-10 cm soil layer in zone-II i.e. 310.40 Mg ha^{-1}. Soil layer 30-40 cm in zone-I had the minimum SOC pool value i.e. 53.79 Mg ha^{-1}, in horti-pastoral system. Soil organic carbon pool decreased with the increase in soil depth. It was reported higher in each soil layer in zone-II over zone-I. Higher soil organic carbon pool in the pure grassland system can be ascribed to greater incorporation of litter and addition of decayed roots to the upper soil layers than in the other land use systems. In addition to it, the intensity of cropping in other land use system which otherwise is negligible in pure grasslands also contributed to the reduction in SOC pool inventory.

Keywords: Carbon Sequestration, Soil Organic Carbon, land use, SOC Pool

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D - 047

IS INDIA REALLY SUSTAINING OR DEGRADING TO A FURNACEISLAND? ANALYSING THE ENERGY CONSUMPTION PATTERN OF INDIAN HOUSEHOLDS

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Due to rapid economic expansion, India has one of the world's fastest growing energy markets and is expected to be the second-largest contributor to the increase in global energy demand by 2035, accounting for 18% of the rise in global energy consumption. Household sector is one of the largest users of energy in India, accounting for about 30 per cent of final energy consumption (excluding energy used for transport) reflecting the importance of that sector in total national energy scenario. The pattern of household energy consumption represents the status of welfare as well as the stage of economic development. As the economy develops, more and cleaner energy is consumed. Household energy consumption is expected to increase in future along with growth in economy and rise in per capita incomes. The projected increases in household energy consumption are expected to result from changes in lifestyles. This paper analysis the manifold aspects of anthropogenic activities with focus on household characteristics influencing the residential carbon dioxide emissions. Data on expenditure incurred for purchase used for both indoor and outdoor use as well as the socio-economic indicators have been taken into account to estimate their contribution to the level of emissions. We have tried to look at the state wise comparisons to arrive at the Indian average expenditure through a graphical analysis. The various indicators of household expenditure have been categorised separately under technological innovations, affluence, household demographics, biophysical characteristics and control variables. The three theories of Ecological Modernisation, Political Economy and Human Ecology have been highlighted to discuss the significance of various variables if or not they support the theories. Household income in India has increased considerably in line with economic growth over the last decades. In line with Indian urban wages also household expenditure has been rising especially in the urban areas were richer households are located. We expect a large share of households to pass the critical income level of 2 dollars per day and we expect that carbon emissions from Indian households will account for a significant share of global greenhouse gas emissions (GHG) in the future. The policies which affect urbanisation and urban development play important roles in determining household energy use as well as some of political economic factors. These issues which are extremely essential have not been taken into account while carrying out the study. Moreover, we could not account for the difference between the rural and urban areas within India which could have made our analysis much simpler. It can be seen that many studies which have been conducted earlier have considered set of predictors which was not enough. But in our study, we have used household data which makes it an expanding literature to anthropogenic environmental degradation.

Keywords: Degradation, Household income, Ecological Modernisation, Political Economy and Human Ecology

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D - 048

CURRENT STATUS OF PESTICIDAL POLLUTION IN GANGA RIVER BASIN

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The Ganga River is the most importanttrans-boundary perennial river of India. It covers more than 26 % of the country's area and serves as a lifeline for 40% of the population. It is a continuous source of freshwater for domestic, agricultural and industrial purposes. However fast urbanization, industrialization and steep demand for water have led to deterioration of surface water quality. The river water and the basin is heavily contaminated with various types of pollutants from varied sources viz, industries, domestic wastewater disposal, agricultural run-off etc. This study presents a comprehensive status on the contamination level of organochlorine pesticides in River Ganga. Organochlorine pesticides (OCPs) have been extensively used in the past due to its effectiveness and cheap cost. OCPs were seen uniformly along the river course. It was observed that there was dominance of specific OCPs in different stretches of the river owing to the land use practices and agricultural runoff generated in these stretches. The upper stretch of Ganga encountered high concentration of dieldrin, heptachlor epoxide, isomers of hexachlorocyclohexane and DDT followed by HCH in middle stretch and lindane in lower. The probable sources of these could be glacial melt, intensive agriculture and industrial activities in upper, middle and lower stretch respectively. It can be concluded that despite being banned the OCPs are there is illegal uses in agricultural sector. The restricted use in vector control is also an ongoing source of OCPs contamination. The contamination of OCPs might affect the ecosystem around the river. Also the river is no longer fit for 'outdoor bathing' or holy dips and strict actions need to be taken by government to save the river from further contamination.

Keywords: Ganga River**,** organochlorine pesticides,pollution, contamination

D - 049

SOLID WASTE MANAGEMENT IN JHIRI: A PLAUSIBLE WAYOUT

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Ever since the state of Jharkhand came into the existence, the populations here have been subjugated with a plethora of unseen problems. Apart from the water scarcity, the menace of solid waste loomed large over large areas. To manage this situation, a new area called JHIRI, largely a vast tract of agricultural land was earmarked for solid waste disposal. It led to a series of problems like air, water, soil and heavy metal pollution in the area. Plus the disease incidence spiraled up. In our current work, we conducted an extensive survey of the area and contacted the local people if they had any clue to overcome this quagmire. The following were our observations, as they revealed-

To overcome this insanitary situation, certain accountable measures must be undertaken (62%). As the main aim of Solid Waste Management is to minimize the adverse effects of solid waste before it becomes too difficult to rectify in future (51%).

Domestic waste was difficult to manage as they are 'milal-julal' or heterogenous (88%). Also, there was an urge to follow the proper steps: Collection, Segregation, Disposal and Utilization of types of waste. More man power should be emphasized on the proper management of waste and awareness should be created at individual level via NGOs, local bodies and better planned education.

Keywords: menace, quagmire, solid waste, survey

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D - 050

ECONOMICS OF ENVIRONMENT & POLLUTION IN BCCL AREAS

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Economics of environment lays stress on pollution and economic development. According to it Pollution is the introduction of contaminants into an environment, that causes instability, disorder, harm or discomfort to that causes instability, disorder, harm or discomfort to the ecosystem. It is undesirable change in Physical, chemical or biological characteristics of air, water and land that may or will harmfully affect human lives, lives of desirable species, living conditions or will deteriorate raw materials resources. Pollution becomes an expense when the result of an activity causes damage to someone else. When producing goods, a factory can inflict cost on a population if it doesn't take on accountability for polluting. There is a direct relationship between the rate of pollution and the cost of damage. Air Pollution is the presence of materials in air in such concentration, which are harmful to man and his environment. Air pollution is the contamination of air by the discharge of harmful substances. Air pollution can cause health problems and it can also damage the environment and property. It has resulted in Ozone Depletion which is leading to climate change. Air Pollution in India can broadly be attributed to rapid industrialization, energy production, urbanization, commercialization and an increase in the number of motorized vehicles. Vehicles increase in the number of motorized vehicles. Vehicles are the major sourced of pollutants in cities and towns. In the Coal Mines Areas of Jharkhand have been affected by Air water and sound pollution. Death rate is very high due to dust and smoke in Dhanbad, Kathara, Phusro and Kathras etc. on the other hand Polluted water of Damodar Brakar and other revers of Jharkhand is devastating to people Animals and Birds water pollution diminishes the aesthetic quality of lakes and rivers. More seriously, contaminated water destroys aquatic life and reduces its reproductive ability.

Keywords: Environmental degradation, Pollutant, industrialization, Ozone Depletion, contaminants

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D - 051

IDENTIFICATION OF LAKE WATER QUALITY BY MULTIVARIATE STATISTICAL ANALYSIS METHODS IN ALPINE HIMALAYAN LAKE PRASHAR, INDIA

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The Prashar lake is situated in the Mandi district of Himachal Pradesh (Latitude 31°45′30″N; longitude 77°06′04.30″E) at an altitude of 2,730 m above sea level in the Alpine Himalayan region. The present investigation has been carried out with the objectives to assess the seasonal variation as well as water quality status based on some physico-chemical characteristics of Prashar Lake. Multivariate statistical methods including cluster analysis and principal component analysis was used with the help of SPSS 16.0 and PAST software. Hierarchical CA was applied to 16 water quality parameters for five seasons (winter, spring, summer, monsoon and autumn). Bray-Curtis cluster analysis showed that there is a maximum similarity of 93% between monsoon and autumn and 80% between winter and summer clusters. Spring shows 91% similarity with monsoon and autumn summer and winter clusters showed only 80% similarity with monsoon and autumn clusters. The generated dendrogram grouped the sampling sites and seasons into three groups.

Keywords: Prashar, Alpine Himalaya, Multivariate, principal component analysis, cluster analysis

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D - 052

NATURE AND GROWTH OF SOLID WASTE POLLUTANTS IN JAMSHEDPUR TOWN

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Small towns are more polluted in India and in Southeast Asia. The level of pollution become more hazardous in case of small and industrial towns. The proportion of solid wastes rise above the danger level in such towns. The generation of various types of wastes continuously increases. The wastes are mainly industrial, residential, commercial and medicinal in nature.

Jamshedpur an industrial town produces large amount of pollutants every day and every year. The proportion of industrial wastes is always higher than the other towns. The volume of high industrial wastes is due to the concentration of thousands of small scale industries within Jamshedpur urban agglomeration. The industries located in this region are mostly mineral based and engaged in processing of various types of raw materials. These mineral based industries dealing with heavy metals produces voluminous amount of waste materials.

The primary and secondary sources of information collected are used in this study. Interview and sample collection method is applied to collect the primary data from the space on systematic random basis throughout the town. Secondary data is collected from different reports. The collected data is further calculated, averaged and converted into percentile form. Again it is presented by the chart and table.

Keywords: Environment, pollution, small towns, solid wastes, industrial wastes

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D - 053

POLYCHLORINATED BIPHENYLS IN THE INDUSTRIAL REGIONS OF CHENNAI AND SURROUNDING AREAS

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The State Industries Promotion Corporation of Tamil Nadu (SIPCOT) is formed to promote industrial growth and development in Tamil Nadu in year 1971. Mambakkam and Cheyyar is major industrial areas and have capacity of 7000 t of production capacity. Industrial persistent organic pollutants like polychlorinated biphenyls (PCBs) were investigated in soil from these industrial areas using Gas Chromatography Mass Spectrometry. Surface soil sampling was conducted in the industrial region of Mambakkam and Cheyyar along residential, industrial and agricultural transects. Cheyyar is relatively new industrial belt compared to Mambakkam. Σ_{28} PCBs concentration in the soil range from 0.3 to 9 ng/g with an average of 3.75 ng/g. 4CB-6CB congeners were predominant in this study. Among the 4CBs, PCB-52 (50%) and 6CBs PCB-157 (57%) was the most prevailing congener. Average PCB concentration followed the following order: Industrial (5.38ng/g) > Residential (4.1 ng/g) > Agricultural (1.75 ng/g). It was observed that 4CBs were more prevalent in the residential sites. PCB-52 was the dominant congener. PCB-52 has no correlation with source type and it presence is ubiquitous. Concentration of Σ_{28}PCB in Mambakkam belt is three times higher than Cheyyar.

Keywords: polychlorinated biphenyls (PCBs), Gas Chromatography Mass Spectrometry, industrial region, Tamil Nadu

D - 054

WATERSHED MANAGEMENT FOR ENVIRONMENTAL SUSTAINABILITY A CASE STUDY OF THREE MAIN SOURCES OF WATER IN THE CAPITAL CITY OF JHARKHAND, RANCHI

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Water is a liquid gold which is one of the major structural components of the human body. It is the basic requirement for the survival of all forms of life on earth. Cities are gifted with innumerable number of water sources (like lakes, reservoir etc.) but being affected by the anthropogenic activities e.g. urbanization and lack of concern for the natural resources, these assets are getting depleted. For managing the quality and quantity of water at command level (level at which the water is begin consumed) Watershed Management must be practiced by the authorities with the aim to stop and conserve water where it falls. The purpose of the present paper is to analyse the trend in quality parameters for one year of the water for the study area along with the analysis of the deficit in quantity of the water for the same study area i.e. Ranchi, the capital city of Jharkhand through use of ArcGIS 9.3 software . By adopting the watershed management we will be able to fulfil the requirement of water for the catchment population with quality and quantity. There will be increase in, in–situ moisture and groundwater table. There will been enhancement in biomass cover of the catchment.

Keyword: Quality, Quantity, Catchment area, Population, Water.

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D - 055

TREATMENT WETLANDS: A SUSTAINABLE APPROACH FOR WASTEWATER MANAGEMENT

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The major pressure on global water quality is the continuing growth of population, urbanization, rapid industrialization, expanding and intensifying food production. Therefore alternative methods for wastewater management and treatment employing natural methods are being constantly gaining importance. Treatment wetlands are man-made structures designed for treatment of municipal, industrial, agro-industrial, surface runoff, sludge dewatering, leachate, acid mine drainage and help in prevention of eutrophication as well as restoration and rehabilitation. The performance of treatment wetlands (TW) depends on the plant species, type of substrate, optimal operating conditions as water depth, feeding mode, hydraulic retention time and load. Simultaneously, sedimentation, adsorption, filtration affects the temperature, pH, organic carbon source, and dissolved oxygen in TW. Microbial augmentation, artificial aeration, step feeding and hybridization improve the performance. The major drawbacks related with TW are that they are influenced by a variety of biological and biogeochemical processes and it is a challenge to reduce their footprint. Pre-treatment and polishing of treated effluents is also needed along with the management of biomass. However, in the rapidly developing countries like India, where cost and time issues limit the construction of conventional treatment plants to only class-I and few Class-II towns, TWs offer great potential to be used in several configurations for multiple applications. The present study primarily focuses on treatment of wastewater in Jharkhand using constructed wetlands and related studies and SWOT (strengths, weaknesses, opportunities and threats) analysis.

Keywords: Treatment wetlands (TW), wastewater (WW), contaminants of concern (COC), aquatic plants, SWOT analysis

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D - 056

THE STUDY OF CHEMICAL NATURE OF GROUNDWATER IN THE WESTERN PARTS OF JHARKHAND WITH FOCUS ON FLUORIDE

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The present study aims to find the groundwater chemical nature with respect to the fluoride in the groundwater. The sample data analysis indicated that fluoride content in groundwater increases with depth. The comparison of fluoride concentration of ground water from the shallow dug wells and deeper bore wells from the same location indicated that the deeper aquifers have higher concentration of fluoride than the shallow aquifers. Due to continuous rock water interaction in aquifers the fluoride concentration is found higher in dug well and hand pump than in shallow aquifers. The shallow aquifers have more discharge and recharge rate but is prone to anthropogenic pollution.

The pH of the study area belongs to the alkaline in origin. An alkaline pH ranging from 7.4-8.8 resulted in high fluoride concentration (1.7-6.1 mg/L) in groundwater sources. The high pH of water displaces fluoride ions from mineral surface. In this study minimum 330 μmhos/cm to maximum 2580 μmhos/cm is observed. Thus all samples have high electrical conductivity.

In this sample analysis, total hardness has minimum value of 105 mg/l and maximum of 890 mg/l. So in hard water, calcium and magnesium carbonate and bicarbonate are found. Therefore water will be calcium deficient and fluoride leeching will be more. The carbonates are completely absent in the study area which suggests the occurrence of bicarbonates due to weathering of silicate minerals. In this study calcium content has minimum-maximum value range as 36-198 mg/l. Magnessium content has minimum-maximum value range as 2.4-353mg/l. Sodium content has minimum-maximum value range as 14-565 mg/l. Sodium and calcium are the major cautions who influence the fluoride level in groundwater. The average chloride content of sedimentary rocks is about the same as the evaporate rocks 150 ppm and indicating sedimentary depositional environment in the study area.

The significance of this study is that it helps in understanding the fluoride mobility in groundwater of the study area.

Keywords: Depth, Rock-water interaction, pH, Electrical conductivity, Chloride, Carbonates and bicarbonates.

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D - 057

AN APPROACH TO DETERMINE CHANGE IN HYDROLOGICAL FLUXES ON UPPER WATERSHED OF RIVER SUBARNAREKHA USING HYDROLOGICAL MODEL SWAT

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The increasing demand of ground water and its over exploitation is a matter of concern. In context of ground water resource management, there is a need to integrate various technologies to deal with the issues related to its conservation and utilization. The phenomena of climate change, driven by anthropogenic activities have a direct impact on availability of water resources. Long-term strategies are needed to be developed to address the current stress on water resources. Hydrological models can be useful tools to address various scenario related to ground water resource planning. This paper deals with the preliminary study of hydrological fluxes of groundwater module using SWAT (Soil and Water Assessment Tool). The study area selected for the analysis is upper watershed of Subarnarekha in state of Jharkhand, India. SWAT model is set up in monthly time step and the evaluation and interpretation of result is done with the help of statistical tools. According to the study, the Nash-Sutcliffe coefficient value and PBAIS is evaluated to judge the model performance before simulating it to various scenarios. The preliminary model result suggests that the model performance is satisfactory. The output from model can be used to ascertain the change in hydrological fluxes with respect to various parameters like study stream flow, transmission loss, surface run off and groundwater recharge. Result can also be computed to produce the groundwater balance and fluctuation tables using modelling application. This study also underscores the urgent need to adapt appropriate measures to foster resilience to climate change to address various issues related to water security.

Keywords: Subarnarekha, SWAT, climate change, watershed, global climate models (GCMs).

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D - 058

DOMESTIC WATER DEMAND MODELING FOR RANCHI: A MULTIVARIATE ECONOMETRIC APPROACH

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Domestic water use/demand is a complex function of climatic factors of any region (such as rainfall, temperature, and wind speed), surface water table variation, demographic components (like population, density, and household size), economic characteristics (Gross Domestic Product and workforce participation ratio) and available household water connections. This study, therefore, develops a model based on the multivariate econometric approach which considers these parameters to forecast and manage the domestic water use/demand. The model applies statistical tools to select suitable demand function and most relevant explanatory variables that have strong relationship with water use/demand. The model applicability is demonstrated with the time series data of Ranchi, the capital of Jharkhand, which is situated in the eastern part of India. The results indicate that household size, Gross Domestic Product, workforce participation ratio, average annual temperature of the city and average wind speed are significant variables of domestic water use/ demand. The developed model is used to forecast the water use/demand in future in the study area.

Keywords: Multivariate Econometric Model, explanatory variables, water demand forecast, Ranchi city

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D - 059

STUDIES ON PHYSICO CHEMICAL PARAMETERS OF 5 WATER BODIES OF RANCHI

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Aquatic ecosystems are particularly vulnerable to environmental change and many are, at present, severely degraded. The availability of good quality water is an indispensable feature for preventing disease and improving quality of life. The physico-chemical properties will also help in the identification of sources of pollution, for conducting further investigations on the ecobiological impacts and also for initiating necessary steps for remedial actions in case of polluted water bodies. Therefore, the nature and health of any aquatic community are an expression of quality of the water. The present study has been undertaken to evaluate physico-chemical parameters (pH, temperature, dissolved oxygen, free carbon dioxide, sulphate content, chloride content and nitrate content) in 5 water bodies in and around Ranchi – Patratu Dam, Kanke dam, Dhruwa dam, Ranchi Lake, Line-tank Lake.

Keywords: pH, dissolved oxygen, free CO_2, chloride, sulphate, water bodies, Ranchi

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D - 060

PHYSICOCHEMICAL ANALYSIS OF SOIL OF MINING AND NON-MINING AREAS OF DHANBAD DISTRICT AND ITS RESTORATION BY EARTHWORM *EISENIA FOETIDA* L.

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Coal being a prime conventional source of energy used primarily in thermal Power Plants has a wide utilization but coal mining specially done by open cast method is one of the most destructive activities that severely affect the soil characteristics. Restoration of degraded land is therefore necessary after mining activities. Therefore, soil sample analysis and its restoration were done from mining and non-mining areas of Dhanbad District, Jharkhand, India to elucidate the impacts of coal mining on soil. In experimental setup Earthworm *Eisenia foetida* was introduced in 3 replica of soil of 3 different locations of mining areas, soil collected from non mining areas was kept as control. Physicochemical parameters such as pH, nitrogen, phosphorous, potassium (N, P, K) and organic matter contents were taken into consideration. Results obtained are presented and discussed in detail in research paper.

Keywords: coal mining, NPK, open cast mining, Organic matter, *Eisenia foetida*

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D - 061

USE OF SOCIO-ECONOMIC DATA IN WATERSHED PLANNING- A STUDY IN KUMACHAHALLI -1 MICRO WATERSHED OF CHAMARAJANAGARA DISTRICT OF KARNATAKA

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The present study was conducted in Kumachahalli-I micro watershed of Chamarajanagara district with the following specific objectives 1. To characterize the socio-economic status of the farm households of Kumachahalli-1, 2. To assess the land and water use status and 3. To prioritize the farming constraints and suggest suitable measures for enhancing the crop productivity. In order to make comprehensive and reliable generalization of the findings, suitable representative sample was selected for the study. Thirty per cent of the farmers representing each soil phase were selected using simple random sampling technique. About 54 farm households were interviewed using a structured schedule. The results indicated that the sampled households possessed 40.14 acres of irrigated land and 176 acres of dryland in Kumachahalli-1 Micro-watershed. Majority of the area was dryland. Hence, Dissemination of information on Dryland crop technologies to the area is recommended. Among all categories of farmers, majority were illiterates. It indicated that 68.52 % of the household heads in Kumachahalli-1 were illiterates. The educational status of the households indicates that adoption of extension methods such as demonstration, exhibition, role play and video documentary films for technology dissemination is feasible in the area. The results indicated that 66.67 % of marginal, 71.43 % of small farm households, 23.08 % of semi-medium farm households and 50 % of medium farmers possessed Yashashwini cards. More than half of the households have Yashashwini cards hence, the utility of the cards should be conveyed to the households to get maximum benefit of the cards. The card would also helps in creating awareness regarding the life insurance coverage of farm households. The results indicated that the participation of the households' particularly small and marginal farmers is very less (7.41 %). The household members should be sensitized on advantages of participating in NREGA activities. The job security and the income security especially for marginal and small farmers can be ensured and the developmental activities can be taken up with the help of enrolled members. The household members in Kumchahalli-I micro watershed are receiving more than 50 % of annual income from livestock production. Livestock Production technologies should be made available in the area. The technologies such as 1. Fodder crops 2. High yielding cross breed cows, 3. Animal disease and their control measures would help them to enhance their income. The results on institutional participation of household members in Kumchahalli-I micro-watershed indicated that except in diary cooperatives (25.93%) the participation is very minimal. Household members in the micro watershed should be encouraged to have maximum participation in local Community Based Organization which ensures the active participation of local people in developmental activities. The results indicated that only six farmers have adopted the drip irrigation system in their farms. Promotion of drip irrigation in the micro watershed and information on subsidy on drip/sprinkler irrigation and advantages of adopting drip irrigation must be conveyed to the households in the micro watershed. The adoption of soil conservation methods is minimum hence, advantages of adopting the soil and water conservation methods must be conveyed. The results indicated that 43 farmers did not have the knowledge of the measures and could not adopt them. Thus lack of knowledge was the major reason expressed by 13 marginal farmers (72.22%), 16 small farmers (76.19%), 12 semi-medium farmers (92.31%) and 2 (100%) medium farmers. The adoption can be increased if the knowledge level of the farmers is enhanced hence, the information on different soil and water conservation practices along with its advantages must be conveyed to the farmers in the micro watershed.

Keywords: Dryland crop, NREGA, micro watershed, drip irrigation

D - 062

SOIL CHARACTERISTICS OF INDIAN SUNDARBAN MANGROVES

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Soil profile in the mangrove dominated lower Gangetic delta plays a crucial role in regulating floral and faunal distribution. Soil organic carbon, pH and salinity were monitored in mangrove ecosystem of Indian Sundarbans in five successive years (2011 – 2015). Samplings were carried out at 14 stations in four different depths (0.01-0.10 m, 0.10-0.20 m, 0.20-0.30 m and 0.30-0.40 m) through three seasons (premonsoon, monsoon and postmonsoon). High organic carbon load is observed in the stations of western Indian Sundarbans (mean = 1.04%) which is near to the highly urbanized city of Kolkata. The central and eastern sectors under the protected forest area shows comparatively less soil organic carbon (mean = 0.61%). Soil pH exhibited a lower value in reserve forest zone (central and eastern sectors) compared to western sector. The soil salinity increased with depth, while organic carbon and pH decreased with depth in all the stations.

Keywords: Soil profile, Indian Sundarbans, mangrove ecosystem, three seasons

D - 063

AQUATIC HEALTH INDEX: A POTENTIAL INDICATOR OF COASTAL WATER QUALITY

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The coastal and estuarine zone of West Bengal is noted for its rich biodiversity owing to the presence of Sundarbans mangrove ecosystem. However, due to intense industrialization and urbanization, many of the pockets have become ecologically sensitive. The present paper is an attempt to evaluate the Ecologically Sensitive Zone (ESZ) through enumeration of Aquatic Health Index (AHI). In the present programme, three stations in and around Indian Sundarbans namely Canning, Junput and Sagar Island were selected and the aquatic health index value of these stations varied as per the order Sagar Island > Canning > Junput. The lower value of the index reflects deteriorated condition of the coastal water due to excessive industrial, agricultural and domestic run-off. The high values of the index are the indicators of congenial coastal environment.

Keywords: Indian Sundarbans**,** Ecologically Sensitive Zone (ESZ,) Aquatic Health Index (AHI), coastal water

D - 064

HEAVY METAL LEVELS IN GREEN SEAWEED *ENTEROMORPHA COMPRESSA* INHABITING INDIAN SUNDARBANS

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Zn, Cu and Pb were analyzed during 2015-16 in the thallus body of *Enteromorpha compressa* through three seasons covering three stations (Gosaba, Bali Island and Jharkhali). These three stations are located in the central part of Indian Sundarbans. The order of heavy metal accumulation is Zn > Cu > Pb. The seasonal sequence of accumulation is monsoon> postmonsoon> premonsoon. ANOVA carried on the observed data reflects significant spatio-temporal variation.

Keywords: *Enteromorpha compressa,* Indian Sundarbans, heavy metals, levels

D - 065

WATER QUALITY ASSESSMENT OF LOWER DUDHANA DAM, AT SELU DIST PARBANI (M. S.) INDIA

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The present paper deals with the assessment of the water quality of Lower Dudhana Dam at Selu Dist Parbhani (M.S.) India.The good water quality always produces a good health of human beings than poor water quality. An analysis on the physico-chemical parameters of Lower Dudhana Dam was carried out during January 2013 to Dec 2013.The use of water is mostly for irrigation ,drinking and fishing purpose only.The monthly changes in physical and chemical parameters such as water temp, air temp, TDS, pH, colour, Odour, TS, TSS, Electric Conductivity , Total hardness, Chlorides , Alkalinity, Phosphate, Sulphate parameters were within permissible limits.The present results indicated that the dam is non polluted and can be used for Domestic , irrigation and fishing purpose.

Keywords: Physico-chemical parameters, Lower Dudhana dam, monthly variation

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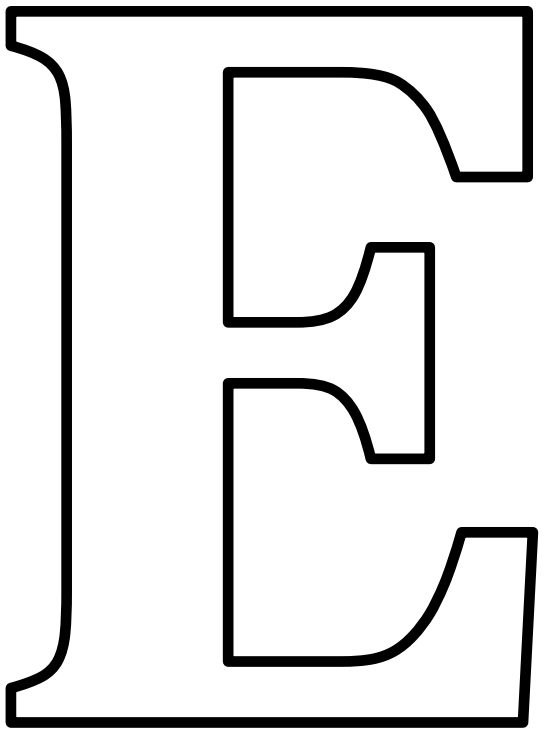

Environmental Toxicology & Human Health Issues

E - 001

MEDICAL TOURISM, BIOMEDICAL WASTES AND HEALTH HAZARD

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The term hazard means occurrence of an event exceeding threshold point or tolerance limit. The hazard may be classified as natural, quasi-natural and man-made or anthropogenic among which the third one is considered to be the most critical one developed as a direct consequence of illogical man-environment interaction system. Biomedical waste has the potential to create hazardous environment. These wastes, generated in both government and private health care units, pathological laboratories, research laboratories, etc. refer to different types of biodegradable and non-degradable, hazardous and non-hazardous materials. Traditionally, all such types of wastes would be dumped into common municipality vats and would be mixed with other types of municipality wastes. Such disposal system of biomedical wastes would create a threat to the health of not only of the persons engaged in health service related activities, but also of other people living in adjacent areas. A framework for biomedical waste disposal system, formulated by the Government of India in 1998, has been implemented and in use in the State of West Bengal. However, due to lack of perception among different stakeholders, implementation of such a system cannot prevent health hazard created by disposal of biomedical wastes. In recent times, the problem of hazard has become very critical mainly due to increasing flow of patients from foreign countries in the form of medical tourism. In fact, medical tourism in India contributes an extra inflow of patients at the rate of about 30% per year. As a resultant effect, a huge amount of biomedical wastes are generated every year by migrant patients imposing an additional load to both environmental threshold and environmental cost. The present study is aimed to estimate the biomedical wastes generated by medical tourists as well as to find out the types, causes and magnitude of health hazard problem generated by biomedical wastes. As a remedial measure, an environmental service tax needs to be imposed on the medical tourists to solve the problem of extra environmental stress created by them.

Keywords: Biomedical wastes, Stakeholders, Health hazard, Medical tourists, Environmental service tax

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E - 002

ESTIMATION OF CHLOROPHYLL CONTENT IN FRUIT VARIETIES OF CITRUS AURANTIFOLIA DURING PATHOGENESIS.

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Citrus aurantifolia is an important edible medicinal plant used in traditional medicine as an antiseptic, antiviral, antifungal, anthelminthic, astringent, diuretic, mosquito bite repellent, for the treatment of stomach ailments, constipation, headache, arthritis, colds, coughs, sore throats and used as appetite stimulant. Citrus bacterial canker disease (CBCD) caused by *Xanthomonas campestris* pv. *citri* (Hasse) Dye is common in this plant. It causes alteration in wide range of physiological, biochemical and molecular processes in plant resulting in leaf defoliation, premature fruit drop, tree decline and reduced fruit marketability. In addition, it has a negative impact on the international trade. Chlorophyll the most abundant pigment on the earth, is a key component of photosynthesis required for the absorption of sunlight, its concentration is also severely affected by such stress. Chlorophyll and carotenoids in the fruits of citrus are the important pigments which distinguish the immature and mature fruits. Chlorophyll is also an important constituent for assimilation of carbohydrate in plants. Any change or damage to these photosynthetic pigments caused by such biotic stress may reduce the overall photosynthetic capacity of a green plant.

This disease is of common occurrence in the lime orchards and dooryards in and around Ranchi. This disease has also been found to be present in the orchards of Central Horticultural Reasearch Institute Palandu. It was therefore, planned to find out post-harvest changes in chlorophyll content of the fruits during disease development especially of varieties grown here. Keeping this into mind changes in chlorophyll content was investigated specially during development of disease separately after natural infection, and in laboratory inoculated fruits. Comparative and contemporary studies of this parameter was taken under healthy, naturally infected and artificially- inoculated conditions.

With an increase in infection index, colour of the fruit changes from green to greenish yellow within 24h and to pale brown during 96-120hr. Concurrent to change in colour there is vigorous loss in the amount of chlorophyll a and chlorophyll b and total chlorophyll in the peel extracts of inoculated and diseased 'Kagzi nimbu' fruits of both the varieties. At the end of 48h their amounts became almost negligible with complete replacement of chlorophyll by carotenoids pigments. The infection index also increased considerably during 72-120h becoming 80 percent. It can be concluded that with increase in infection index chlorophyll content uniformly diminished and changes to carotenoids after 48h of pathogenesis. Details of the stress-induced adverse effect on chlorophyll pigments involved in the mechanism of photosynthesis, are considered in this paper.

Keywords: Medicinal plant, *Xanthomonas campestris* pv. *citri*, Carotenoids, Biotic stress

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E - 003

EFFECTS OF PLANT LEAF EXTRACTS ON THE MORTALITY OF MOSQUITOES

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"Mosquitoes" are found all over the world. At first glance, mosquitoes do not seem to be dangerous, but in actuality, they may expose people to great danger since they can transmit serious diseases such as *malaria*, *dengue*, *and encephalitis*. Killing the adult mosquitoes with the use of biomosquitocides is the most effective way to prevent the problem from spreading. Thus, as biomosquitocides the effect of leaf exacts of *five* different plants was investigated using different concentrations. The plants taken for investigation are widely available in the vicinity. The main target of this research was to highlight the beneficial use of biomosquitocides over the chemical mosquitocides generally used for controlling the mosquitoes. The present study was aiming to safeguard the environment thereby, creating a healthy environment for society.

Keywords: plant extract, ethanol, biomosquitocides, morality

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E - 004

EVALUATING MONETARY BENEFITS FROM REDUCING AIR POLLUTION IN NORTH DELHI REGION

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With excessively growing urbanization and development, environmental quality deterioration has become a major issue of concern. Air pollution which is a by-product of urbanization and growth causes severe damage to health status of individuals due to which a major proportion of their income is spent on medical expenditure. Health of an individual holds a great significance as it contributes effectively in building up human capital, making individuals more productive and efficient. Therefore the efforts should be majorly towards securing good health. One of the severe threat to health of individuals in today's time is greater degree of air pollution. Delhi has experienced highest level of air pollution recently and North Delhi region being the region signifying old commercial set up of Delhi, the paper therefore involves the study of health impact due to air pollution in North Delhi area. The main objective of the study is to determine the factors which affect health of individuals captured by number of days an individual falls sick. The research methodology is based on a household production function model which involves household survey of areas within half a kilometre distance from the main air pollution monitoring stations of CPCB (Central Pollution Control Board) and DPCC (Delhi Pollution Control Committee) located at Pitampura, Delhi College of Engineering (DCE) and Civil Lines during the winter season. The study constructs various indices like Indoor Pollution Index, Nutrition Index, Health Stock Index, Awareness Index and Habit Index. The impact and correlation of these indices on the health status of individual measured by number of sick days is then evaluated to assess the relationship of these variables with health status. The paper also overviews the trends in the indicators of outdoor air pollution in the North Delhi region. Further, the study suggests that the indoor pollution, ambient air pollution, poor health stock along with the nutrition status of an individual are some of the crucial factors determining the sick days of an individual. By controlling these variables an individual can reduce the number of sick days and hence attain monetary benefits. The study prominently highlights the role of indoor pollution, nutrition status and habit index in reducing the sick days of individuals. The study plays a substantial role in spreading awareness about air pollution among the people in Delhi identifying the significance and factors determining indoor pollution in North region of Delhi. The results of this study hold a great significance in terms policy implications for government to provide cleaner energy in form of clean source for cooking to households who are the end users, reducing the lobbying of vested group in provision of LPG gas, pipelines etc.

Keywords: Human Capital, Indoor Pollution, Health Stock, Household Production Function

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E - 005

RADON IN DRINKING WATER: A SURVEY AROUND TANTLOI GEOTHERMAL REGION IN JHARKHAND

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Presence of radon in drinking water can be a cause of cancer as it is a radioactive gas. So survey ofradon (^{222}Rn) concentration in ground water and assessment of health risk resulting from consumption of ^{222}Rn contaminated water is essential. Exposure of human beings to radon and its progenies for prolonged period may lead to various pathological conditions including cancer.

^{222}Rn concentration is determined in ground water samples collected from randomly selected hand pumps at different locations of Tantloi geothermal region, Jharkhand, India using AlphaGUARD radon monitor. ^{222}Rn concentration as high as 803Bq/lhave been found with an average value of 132Bq/l.

It is found that all of the samples have radon concentration values above the safe limit as proposed by USEPA (11.1 Bq/l). On the other hand about 42% of the water samples have crossed the WHO prescribed maximum permissible limit of 100 Bq/lfor drinking purposes.
For the present study we have estimated the dose of the water samples taking into account the WHO and ICRP suggested water intake of 2liter per day. The estimated total annual effective dose from the water samples ranges between 0.11 mSv/y to 4.08mSv/y with a mean value of 0.67mSv/y. All of the water samples of this geothermal area are found to be higher than the safe dose limit of 0.1 mSv/y as proposed by WHO.

Proper measures should be taken by the local authorities where contamination level is significantly above the recommended safe limit.

Keywords: ^{222}Rn, Ground Water, AlphaGUARD, Dose, Geothermal Area

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E - 006

MASS TRANSFER CONTROLLING MECHANISM FOR ADSORPTION OF CR (VI) FROM AQUEOUS SOLUTION

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Hexavalent chromium is present in the effluents produced during the electroplating, leather tanning, cement, mining, dyeing and fertilizer and photography industries and causes severe environmental and public health problems. Hexavalent chromium has been reported to be toxic to animals and humans and it is known to be carcinogenic. Its concentrations in industrial wastewaters range from 0.5 to 270.000 mg l^{-1}. The tolerance limit for Cr(VI) for discharge into inland surface waters is 0.1 mg·l^{-1} and in potable water is 0.05 mg·l^{-1}(EPA, 1990). In order to comply with this limit, it is essential that industries treat their effluents to reduce the Cr(VI) to acceptable levels.

The present work is aimed at exploring sorghum bicolor husk as low cost adsorbent for removal of Chromium (VI) from aqueous solution. Adsorption is one of the important industrial processes used for removal of color, odor, turbidity, metal ions and reduction of COD. In adsorption, the solute present in dilute concentration in liquid or gas phase is removed by contacting with suitable solid adsorbent so that the transfer of the component first takes place on the surface of solid and then into the pore of the solid. Sorghum bicolor carbon Adsorbent used in present study is prepared at Laboratory scale is observed to be very effective for removal of chromium from its aqueous solution. This study describes the various methods of investigation and the detailed experimental procedure to obtain the adsorption kinetics, Adsorption Equilibrium and the Effect of various parameters on batch Adsorption and Column adsorption system. It is revealed that the maximum removal efficiency is observed up to 85% for bio sorbent prepared from sorghum bicolor husk.

Keywords: Adsorption, Chromium, Sorghum bicolor husk, adsorbent, Efficiency

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E - 007

EFFECT OF ENVIROMENTAL AND OCCUPATATIONAL FACTORS ON NUTRITIONAL STATUS OF COAL MINE WORKERS OF DHANBAD DISTRICT

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Occupational exposure to coal dust lead to coal worker's pneumoconiosis (CWP), which has enormous social medical and environmental importance of many countries in the world where coal mining is the major industry. About 10% of the coal mine workers suffer from pneumoconiosis who is working in coal mine for more than 20 years that can diagnosed by simple X-ray and if more sophisticated equipment are used than it is much higher. The anthracite miners have graver situation, they have much more than 50% positive X- ray on plain radiography. The prevalence of coal workers pneumoconiosis is much lower in bituminous mines, in US and most western nations. With prolonged exposure to coal dust for 15- 20 yrs, rounded opacities similar to those of silicosis develop in coal workers pneumoconiosis. Almost all the symptoms of CWP are due to development of COPD due to effect of coal dust on lung tissue. The present study was planned with following objectives: (i) To assess health related complications of coal mines worker's. (ii) To observe nutritional status of the coal miners. Putki project colliery (under Bharat coking coal Ltd.) from Dhanbad district was selected for the present study. 100 respondents were selected by random sampling process. All the respondents were between the age group of 30- 59 years. By using pretested proforma the data was collected on (i) general information, (ii) Anthropometric measurement, (iii) Dietary survey, and (iv) Clinical sign and symptoms. It was found that the mean age of the respondents surveyed was 44.5 yrs. All were male and majority (71%) of them were from joint family, 38% respondents were illiterate and only 7% were graduate. 92% of the respondents were married. Per capita income of the respondents was Rs 2000. 82% of them were non- vegetarian. 56% respondents were having normal BMI, 12% were Grade –I obese, 3% were Grade – II obese and only 18% were Grade -I underweight, 7% were Grade II underweight and 4% Grade – III underweight. It was observed that the cereals and cereal products, green leafy vegetables, roots and tubers, and fats and oils were present in daily diet. On applying ANOVA test significant result was found in intake of protein, fat , β – carotene and folic acid (at 2,2 d.f and P≤ 0.05), whereas there was non- significant difference in intake of iron, calcium, Vitamin –C, and Riboflavin (at 6,2 d.f and P≤ 0.05) when compare to the RDA. 40% of the respondents suffer from asthma, 35% were lethargic and other suffer from various symptoms like weakness, impaired vision, loss of appetite, breathlessness, fatigue, dislike working, pain in muscle and joints and giddiness. One of the most prominent symptoms of consuming inadequate and ill balanced diet was the reduction in working capacity; the workers were tired out easily after short periods. Muscular work needs energy so it was recommended to consume more energy and protein rich foods in the diet for coal mine worker's as their diet are nor adequate in calories and more protein are required to maintain working capacity. Deficiency of folic acid in the diet results in marocytic anemia which is likely to reduce the working capacity of coal miners. Workers were suggested to use mask on their nose and mouth to prevent themselves from respiratory tract diseases caused by coal dust.

Keywords: Pneumoconiosis, coal mining, radiography, BMI, Macrocytic anemia

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E - 008

EFFECT OF ORGANOPHOSPHATE INSECTICIDE (ROGOR) ON PROTEIN CONTENT OF *CHANNA STRIATUS* FROM SUKHANA RIVER, AURANGABAD (M.S)

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The pesticidal effects on biochemical parameters of fresh water fishes are well illustrated from the recent research in the field of toxicology. Among the major biochemical components proteins are of prime importance as they are determine nutritive value of fresh water fishes.

Activity of a few biomarkers have been investigated on fresh water fish *Channa striatus* exposed to three sub – lethal concentrations of rogor (1/5, 1/10 and 1/15 of 96hrs LC_{50} value). The alteration in protein contents of muscle, liver and kidney were investigated. The protein levels were found to be depleted in all the tissues after exposure to rogor over the control. Therefore the detailed result and observations are summarized in the present investigations.

Keywords: Organophosphate insecticide, Sukhana River, rogor*, Channa striatus,* proteins

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E - 009

CLINICAL ASSESSMENT OF ALUMINIUM TOXICITY AMONG WORKERS OF THE ALUMINIUM FACTORY (HINDALCO), MURI (RANCHI), JHARKHAND

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Aluminium is the world's most abundant metal and is the third common element, comprising 8% of the earth crust. Pure aluminium is relatively soft, durable, light weight, ductile and malleable metal with appearance ranging from silvery to dull grey, depending on the surface roughness. It is good thermal and electrical, while having only 30% copper density. Exposure to aluminium, unfortunately, is common with some occupations like mining, factory work, and welding. Absorption of aluminium from gastro intestinal tract appears to be in intestine. Aluminium penetration in skin is very shallow and be able to enter the brain from nasal cavity by direct route, by passing systemic circulation the volume of distribution of aluminium is initially slow with blood volume and increased with time. This study was undertaken with the aims (i) Anthropometric assessment to observe the health status of workers (ii) to observe the presence of aluminium toxicity related Clinical sign and symptoms. (iii) to provide case detection so that those affected could be treated. Total no. of 100 Respondents (Male/Female) aged between 25-60years were randomly selected. The selected respondents were interviewed regarding their General information, Health status and clinical assessment with an intension to observe the consequence of the exposure of aluminium ores toxicity of their Health. The mean age of aluminium factory worker surveyed was 40years. Majority of the respondents 40% from the age group 25-35 years, 32% and 28% were from the age group 25-35 years and 45-60 years respectively. About 91% respondents were male and rest 9% was female. Majority 90% of respondents were belonged to Hindu religion while 9% Muslim and only 1% were christened. Majority 76% of respondents were from nuclear family whereas only 29% were joint family background. The maximum no. 24 % of the respondents were illiterate whereas 76% were literate. The majority 85% was married and remaining 15% were unmarried. It was found that the majority 65% of respondents were earned rs.20,000-30,000 , were 20% and 15 % earned rs.10,000-20,000 and 30,000-40,000 respectively. It was found that 90% of respondents were having normal BMI, 5% were grade I obese and 2% were grade II obese. Among all the workers only 3% were grade I undernourished. Majority of the respondents 89% had skin irritation, 82% had Dermatitis, 78% were suffering from Dementia, 58% have Fatigue, in 42% of respondents vision problem was found, 39% were having breathing problem, 37% have Depression, 29% have Bone pain, 16% have confusion, 11% have sleeping disorder & only 7% have difficulty in speaking. All the respondents were asked to follow safety measures to avoid complications of aluminium ores toxicity. They were suggested to use full sleeves cloths, mask to cover the face, to use hand gloves and to avoid direct contact with the ores. They were also suggested to include antioxidant rich food such as green leafy vegetables, citrus fruits, carrot etc. in their diet so that their immunity system may increase. They were also emphasized to have balance diet to increase their work capacity.

Keywords: BMI-Body mass index, Dermatitis, Depression, Dementia and Fatigue

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E - 010

A STUDY ON THE IMPACT OF TEMPERATURE ON UPTAKE OF HEAVY METAL (LEAD NITRATE) AND THE RELATED DISTRESS CAUSED IN AQUATIC INSECTS (DRAGONFLY NYMPHS AND CHIRONOMOUS LARVAE)

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The effects of aquatic pollution are massive and quite dreadful. Aquatic ecosystems are a home to a rich diversity of living organisms inclusive of the vertebrate as well as the invertebrate groups. The aquatic community has a good proportion of insects that play a vital role in maintaining the food web as well as the food chain of the ecosystem. The diversity of aquatic insects are at a risk of declination because of the increasing effects of temperature in the water bodies. Increasing temperature leads to depletion in oxygen that causes a major threat to the respiratory strategies of aquatic animals. Not only has this, the presence of heavy metals in aquatic ecosystems as a result of industrial sewage disposal, and soil erosion have also led to substantial toxicity in the aquatic world. The present study examined combined effects of the heavy metal Lead Nitrate and a elevated temperature, as a physical stressor, to study the water permeability and metal uptake rates in two aquatic insects namely, Dragonfly nymphs and Chironomous larvae at temperature range of 10 º,15 º,20 º,25 ºC. The insects were exposed to different concentrations of Lead nitrate and their Lc 50 values were calculated by Probit Analysis at 72 and 96 hours, respectively, at the four different temperature regimes.At 72 hrs LC 50 values were 1.12±0.11 at 10º C and 0.81±0.09 at 25º C. whereas LC_{50} value after 96 hours was 1.02±0.09 at 10°C and 0.74±0.11 at25°C.Chironomus showed a value of 3.69±0.30 at 10ºC and 2.82±0.25 at 25º C. At 96 hrs the values were 3.015 with standard error of -0.237 at 10°C and 2.277 with -0.274 at 25º C.This effect was probably due to an increased metabolism upon exposure to the pollutant. It was observed that metal uptake rates increased with rise in temperature and duration of exposure. SEM investigations were done on dragonfly nymphs to study the sub lethal effects won respiratory tissue like deformities in the trachea, erosoion of surface epithelium, and distortions in muscular tissue. Increased temperature leads to increased metabolic rate in both air breather and water breathers. However, water breathers are at distinct disadvantage in these situations because oxygen availability decreases and water fluxes increases substantially as has been evident in the present study. There are literatures that suggest the changes in physical state of insects, like for example, in cell membrane fluidity or decreased tightness in cell junctions, consequently affect the respiratory rates and water uptake. Exchange epithelia are directly involved in osmoregulation, as water (passively) and ions (actively and passively) pass in both directions through exchange. These fluxes can be altered by environmental stressors in insects. Assessment of Toxic effects on Aquatic insects has gained significance not only because they are suitable organisms for such studies but also act as indicator species for many toxicants including heavy metals. Biological monitoring, the study of biological organisms and their responses, is used to determine environmental conditions. The present study is an effort to study the responsive behavior of test insects as bioindicators towards effect of heavy metal (Lead nitrate) toxicity.

Keywords: Aquatic Ecosystem, Temperature, Heavy metal, Toxicity, Bioindicator

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E - 011

HISTOLOGICAL DISTURBANCE CAUSEDBY ARSENICTRIOXIDE INRABBIT MODEL

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Arsenic is a long-term poison of environmental and industrial origin. Prolonged exposure is associated with vascular disease, liver injury, kidney damage, skin lesions and cancer. The animals were divided into three groups. Group I: treated as control. Group II: treated with 0.2mg/kg of As_2O_3 for 15 days and Group III: treated with 0.6mg/kg of As_2O_3 for 7 days. Effect of arsenic trioxide was studied on the liver, kidney and testicular tissues of rabbit. Histopathological results revealed mild to severe type of necrosis and degenerative changes in liver, kidney and testis of arsenic feed animals. Kidney of the 0.6mg/kg group showed severe type of necrosis and degenerative changes in tubules. Glomeruli cells were contracted and increased the bowman's spaces. Varied degrees of changes were also observed in 0.2mg/kg group. Necrosis of hepatocytes and cytoplasmic blebbing were also observed. The sinusoidal spaces were expanded due to shrinkage and necrosis of hepatocytes. The section of testis showed ruptured follicles showing reduction in the number of spermatozoa and degenerated inter follicular septa, degeneration of follicles along with loss of stroma and degeneration of germinal epithelium.

Histology in a precise sense is the study of the cytoarchitechtural change of the body, which envisages the anatomy and gives the insight into the functioning of tissues and organs. Thus, histology is a structural science and serves to complement the knowledge gained from the anatomy, physiology and pathology. In view of this, an attempt has made to study the effect of arsenic trioxide on the histological changes in liver, kidney and testis of rabbit at sublethal concentration.

Keywords: Arsenic, Liver, Kidney, Testis

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E - 012

PHYSIOLOGICAL RESPONSES OF MUD CRAB *SCYLLA SERRATA*TO WATER SOLUBLE FRACTIONS (WSF) OF GEAR OIL

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Petroleum oil &its components are known to remain in water for a prolonged period of time. Most of the times oil is washed ashore but the water soluble fraction remains in the water leading to deleterious effect on marine flora & fauna. It is not only known to bring about alterations in physiological & biochemical parameters of animals but also known to damage structural integrity of various organs in marine animals leading to impairment of vital functions in them.

During present investigation the Mud crab *Scylla serrata* was exposed to sublethal concentrations of Water Soluble Fractions (WSF) of Gear oil for 15 days & one month & effects of the toxicanton respiratory function was studied by checking the oxygen consumption rate in the crab at the end of exposure period. The result indicates that the pollutant caused dose dependent decrease in oxygen consumption rate. Furthermore it was noticed that increase in exposure period also leads to further decrease in oxygen consumption rate.

Keywords: Oxygen consumption, structural integrity, biochemical, vital functions

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E - 013

ASSESSMENT OF TOXIC HEAVY METALS IN *DROSOPHILA MELANOGASTER* HEALTH AND IMMUNITY

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Heavy metals are an important constituent of our environment. Some of them act as cofactor in biological system which makes it essential where as many are non-essential. Excessive exposure of living systems toheavy metals can adversely affect the normal physiological functions. We have studied the impact of life time oral ingestion of lead (Pb) on various behavioural and immunological responses in *Drosophila melanogaster.* Behavioural analysis showed noticeable effecton their developmental stages, eclosion ratio, life span, length and weight possibly due to non-degradability and accumulative nature of heavy metals in soft tissues. We also studied immune responses of metal fed flies to bacterial infections. Our results may be further used in more accurate assessment of noxiousness of heavy metals as they are accumulating in our food chain and remedial measures to be taken.

Keywords: *Drosophila*, Metal toxicity, Development, Immunity

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E - 014

CONCENTRATION OF LEAD AND CADMIUM IN COMMON VEGETABLES CONSUMED BANGALORE AND THE HEALTH EFFECTS

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Bangalore is a growing metropolitan city with a population of 8.52 million for a city of only 741km^2. Known to be the silicon valley of India, it attracts residents from all over the world. Situated at a height of 3000ft from ground level, this results in no source of water body other than the lakes and vrishabhavati river present on the plateau but due to the exponential increase in population, there is dire need to convert the lakes into residential areas and usage of the river as a sewage disposal method, not only blocking the water sources but also increasing the demand on food. Bringing in another factor caused due to the increase in residents is the improper treatment of wastes before sent for processing and the irregular discard of the waste into the remaining water bodies and into the soil.

Lacking a source of water, there is a situation that entails the use of waste water from toxic lakes such as Varthur and Ulsoor Lake and Vrishabhavathi River for the growth of vegetables being grown for human consumption. The increase in heavy metal contents in the human body obtained directly from the primary source of nutrition can only cause health problems as seem in the generations born in Bangalore after the year 2000.

The most populated regions present in Bangalore mainly being areas such as kengeri, Malleswaram, Bannerghatta road, Indranagar and areas surrounding them according to the survey conducted by Bangalore BBMP. The major or the staple vegetables being grown in these areas were found to be capsicum, lemons and carrots which were grown in the waters of the toxic infested river and lakes. These vegetables are sold in the markets present in all other regions of Bangalore, both densely and sparsely populated.

Due to excess of waste disposal there is an increase, there is a percolation of heavy metals into the soil, specifically an increase in the lead and cadmium content due to the effluents of industries into the water bodies. The concentration of the cadmium content ranged from .1ppm to > .7 ppm and the lead content ranged from .3 ppm to >.8 ppm.

This increase in toxicity content causes imbalances in the body especially if the source of intake is the primary and essential form. The younger generations are currently dealing with hormone imbalances, depression, anemia, weakness which is causing the sluggish behavior impairing their ability to achieve.

Finally, this rise in demand versus produce is causing an increased amount of burden on the soil due to which there is improper growth of the plants, attributing to pollution too and sudden change in the rain forecasts. Further stress would only cause the life in Bangalore less in quality that is needed for a normal and healthy life, soon making Bangalore unlivable.

Keywords: toxicity, population, wastewater, kengeri, varthur, lead, cadmium

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E - 015

INDUSTRIAL EFFLUENT EFFECTS ON PLANT

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The present study is concern about effluent of Tinplate Company of India Limited at Kadani Road, Jamshedpur and their effects on plant. Chromium is usually found in plating shop and paint shop rinse water in the form of the dichromate anion and can be removed by both cation and anion resin. The chromate or dichromate ion can be removed by the anion resin. Although in large concentrations, it will oxidize the resin shortening the resins life. As chrome 3 or chrome 2, it can be removed effectively in a weak base cation resin in the sodium form. Chrome cannot be removed by reduction to the metal since it has a high oxidation potential. Contamination of soil and water by chromium (Cr) is of recent concern. Due to its wide industrial use, chromium is considered a serious environmental pollutant. Toxicity of Cr to plants depends on its valence state: Cr(VI) is highly toxic and mobile whereas Cr(III) is less toxic. Since plants lack a specific transport system for Cr, it is taken up by carriers of essential ions such as sulfate or iron. Toxic effects of Cr on plant growth and development include alterations in the germination process as well as in the growth of roots, stems and leaves, which may affect total dry matter production and yield. Cr also causes deleterious effects on plant physiological processes such as photosynthesis, water relations and mineral nutrition. The potential of plants with the capacity to accumulate or to stabilize Cr compounds for bioremediation of Cr contamination has gained interest in recent years. Having revised the overall picture of Cr toxicity in plants, it is clear that the species of Cr are toxic at different degrees at different stages of plant growth and development and also that the toxicity is concentration and medium dependent. The toxic properties of Cr(VI) originate from the action of this form itself as an oxidizing agent, as well as from the formation of free radicals during the reduction of Cr(VI) to Cr(III) occurring inside the cell. Cr(III), on the other hand, apart from generating reactive oxygen species (ROS), if present in high concentrations, can cause toxic effects due to its ability to coordinate various organic compounds resulting in inhibition of some metalloenzyme systems. Cr(III) can be endogenously reduced to Cr(II) by biological reductants such as cysteine and NADPH. In turn, the newly formed Cr(II) reacts with H_2O_2 producing hydroxyl radicals and causes tissue damage. Thus, one of the future challenges to understand Cr toxicity would be to unravel the complete picture of interconversion of the Cr species within the plant system, after its uptake, on a time course at environmentally relevant concentrations with emphasis at different stages of plant development.

Keywords: Cr(III), Cr(VI), Kadani Road, toxicity, plant, ROS

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STRAY NOTES ON THE FEEDING HABITS OF AN AMBLYCERAN PIGEON LOUSE, *COLPOCEPHALUM TURBINATUM* (PHTHIRAPTERA: INSECT)

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An examination of the crop contents adults and nymphs of an amblyceran Pigeon louse, *Colpocephalum turbinatum* did not indicate the presence of red content compatible to host blood. The crops were found packed with only feather barbules. Occasionally, pieces of egg chorion and epidermal tissues were detected. Presence of any triturating agent was also not noticed. Furthermore, SEM studies of the ventral side of the head of the louse do not indicate the presence of any pointed gear which can be used to pierce the skin of the host bird.

Keywords: Amblycera, *Colpocephalum turbinatum*, Phthiraptera, Pigeon louse

E - 017

IMPACT OF FLY ASH ON INDIAN MAJOR CARP: A CASE STUDY IN RIVER GANGA NEAR SAGARDIGHI THERMAL POWER PLANT, WEST BENGAL IN INDIA

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In India the increasing demand for electricity and combustion of fossil fuels is one of the major sources to fulfill our need of energy. Coal is the top of the list. In thermal power plant combustion of coal produce flyash and bottom ash. One of the major environmental pollution associated with the use of coal as fuel in thermal power plants, the production of flyash and discharge of flyash containing waste water into the river Ganga from the Sagardighi Thermal Power Plant causes changes in physio-chemical parameters of water, such as- pH, DO, BOD, COD, temperature, alkalinity, hardness, color, odor, conductivity, total solid and silica, Fe, Al, Mn, Zn, Cu, P, Na etc and trace amount of heavy metal such as- Molybdenum, Mercury, Selenium, Cadmium, Chromium etc. increase above the threshold limits, measured by APHA method. That resulting loss of aquatic biodiversity, reduction of Indian Major Carp and extinction of some rare sp, and natural fish food and aquatic plant. Different types of diseases had outbreak in fishes. Fish is the top of the aquatic level. Bioaccumulation of heavy metal occurs in the liver, gill, kidney, muscle and blood that changes in fish physiology, early reproduction. Histological analysis of liver, kidney, muscle shows this change. To exceed the permissible limits set for water quality for ecosystem and human health also. Present study to draw attention on Government should intact laws which will ensure of standard waste treatment plants before discharged into water bodies. Periodic monitoring programme should be organized to minimize discharged of waste water in valuable water resources to check their water quality status and restore for welfare society and to protect the natural environment.

Keywords: Fly ash, River Ganga, Indian major carp, bioaccumulation, laws

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E - 018

POTENTIAL OF PTERIDOPHYTES IN HEAVY METAL PHYTOREMEDIATION

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Heavy metal pollution of water, air and soil is becoming a common global environmental problem. Industries dealing with battery, metal plating and paint, military and agriculture activities are the common sources of heavy metal pollution. Plants and animals are highly susceptible to heavy metal poisoning. Heavy metals cause severe damage to living systems due to their ability to bind with protein molecules and prevent replication of DNA and subsequent cell division. Metal pollution has harmful effect on biological system and does not undergo biodegradation. Toxic heavy metals such as pb, co, cd can be differentiated from other pollutants, since they cannot be biodegraded but can be accumulated in living organisms, thus causing various diseases and disorders. Conventional processes employed are extremely expensive. So this research led to the discovery of phytoremediation of heavy metal pollution through the pteridophytes. phytoremediation is a cost effective environmental friendly technology to remove toxic metals using green plants. many pteridophytes like *Pteris vittata, Pteris cretica, Salvinia natus, Asplenium australasium, Adiantum cappilus veneris, Nephrolepis cordifolia, Azolla* etc. exhibiting normal growth in area having high deposition of Boron, Copper and Arsenic. Easy availabity, resistance and rapid reproduction are the characteristics that promote their application as heavy metal accumulators and adsorbers. The root of these pteridophytic plants exudates to stabilize, demobilize and bind the contaminants in their soil matrix, thereby reducing their bioavailability. Hence pteridophytes should be considered for application in phytoremediation.

Keywords: Phytoremediation, Pteridophytes, Heavy metal, Pollution, Toxicity

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E - 019

SURVEY OF BREEDING SITES OF DIFFERENT SPECIES OF MOSQUITOES IN PMC AREA AT PUNE, MAHARASHTRA

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Mosquitoes are very common insects of the family Culicidae. There are about more than 3000 different species of mosquitoes throughout the world. The three most common mosquitoes found in India are Aedes ageypti, Culex pipens, andAnopheles.Mosquitoes go through four life stages that include egg, larva, pupa, and the adult. The female mosquitoes lay their eggs on the water, where they can sit anywhere from 24-36 hours. The disease like Malaria, Splenomegaly, dengue, cerebral haematoma, Filariasis spread due to mosquitoes.female mosquitoes can detect a host to feed on from up to 40 yards away because they are drawn to the smell of lactic acid as human perspire the air like carbon dioxide and lactic acid. There are an estimated 300 chemicals emitted from human skin. It is dark coloured which capture heat that make people more attractive to Mosquitoes. Thermal sensors on the Mosquitoes' antennae and around its mouth detects heat emanating from warm-blooded bodies, allowing it to land on exposed skin and find capillaries closest to the surface.. Then, the mosquito pierces the skin with a serrated proboscis containing two tubes. Through one, it injects saliva that numbs the area and keeps the blood from clotting. Through the other, it begins to suck blood into its abdomen. The mosquito will drink until it is full, withdraw the proboscis and fly away.

We have taken survey in the PMC area about the breeding sites of Ades ageypti the most dangerous disease Dengue. Mosquitoes are found all over the world. The four important groups of mosquitoes in India are related to disease transmission are the Anopheles, Culex, Ades and Mansonia, thrive in moist areas, and in fact, need them to thrive and breed. They have poor vision, sense receptors are present due to these they can detect their pray.

We have taken survey of breeding sites of mosquitoes in Pune Municipal corporation areaspecially the vector of most dangerous disease Dengue that is Ades ageypti and malaria spreading vector Anopheles so we have obtain very simple and common breeding sites in which these Mosquito breed. These sites we can destroy easily individually.

Keywords: Mosquitoes, *Ades ageypti*, Pune Municipal corporation, breeding sites

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E - 020

COMPARATIVE STUDY OF AMELIORATING EFFECT OF SILICON DIOXIDE AND CALCIUM ON ERYTHROCYTES IN ACID ALUMINIUM INDUCED TOXICITY IN *CHANNA PUNCTATUS* (BLOCH)

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Solubility of aluminium is affected by the water pH. Al concentrations can be substantially enhanced in acidic or poorly buffered environments subjected to sustained or periodic exposure to strong acidifying inputs. It is mobilized in its soluble form from soil to aquatic ecosystems under acidic condition. SEM studies of red blood cells of acid alone treated fish revealed negligible alterations while treatment with sublethal aluminium (140 mg/l) along with acid exhibited abnormal erythrocytes. It revealed presence of poikilocytic form, the codocyte along with another morphologically abnormal erythrocyte, the stomatocyte. Surface wrinkling and excessive roughness was seen on erythrocytes. Distorted plasma membrane, which had ruptured in few of them. Any morphological alteration or abnormality occurring in erythrocytes due to physiological stress will rapidly impair the physiological functions like gaseous exchange, resulting in hypoxemia, hypercapnia, blood acidosis, etc.

The toxicity of aluminium on the erythrocytes of fresh water fish *Channa punctatus* (Bloch) reduced with the application of silicon dioxide (150 mg/l) and calcium carbonate (100 mg/l). Erythrocytes resumed the normal architecture with ameliorating agents and also revealed the restoration of normal pear shape of erythrocytes with less corrosion and smooth outlines. Ameliorating effect of silicon dioxide was more significant than calcium.

Keywords: Acid, Aluminium toxicity, erythrocytes, Silicon dioxide, Calcium ions, Amelioration

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E - 021

INFLUENCE OF DIETARY CHITOSAN EXTRACTED FROM FRESHWATER CRAB *SARTORIANA SPINIGERA* ON LDL AND HDL BLOOD CHOLESTEROL LEVEL IN ALBINO RATS

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Presently, hypercholesterolemia is one of the biggest health issues in human population leading to obesity and various liver and cardiovascular diseases. It is basically caused due to bad food habits and high fat intake. Increased cholesterol and LDL level in the body leads to visceral fat deposition which thereby releases toxins into the bloodstream. Presently, there are a number of fibres which can be used for controlling blood cholesterol level such as pectin, guar gum, lignin, but in this experiment a different fibre, chitosan extracted from a freshwater crab, *Sartoriana spinigera* has been used and compared with cellulose (plant source) and hypolipidemic drug (synthetic drug) on LDL and HDL blood cholesterol level in hypercholesterolemia induced albino rats. Contrary to the use of synthetic chemical based medicines, zootherapy has gained keen interest as a natural remedy against many health issues. Chitosan is one such zootherapeutic medicine. It is a deacetylated form of chitin which is found in the exoskeleton of marine and freshwater crustaceans and cell wall of fungi. In the present experiment ,chitosan was extracted from freshwater edible crab *Sartoriana spinigera* which is locally found in Jharkhand. Experiment was conducted on 15 albino rats for 30 days. They were divided into 3 groups A, B and C and were given respective diets:-Group A (high fat diet+5% cellulose), group B (high fat diet +5% chitosan) and group C (high fat diet+5% hypolipidemic drug Ezetimibe). Blood of rats was collected on 1st(initial) and 30th (final) day by retro-orbital puncturing to measure the HDL and LDL cholesterol level of all groups. The difference between initial and final HDL values of group A, B and C was 25.92% decrease, 20% increase and 11.53% increase respectively. Statistical analysis of the difference obtained was done by Students t test .It was observed that HDL level was significantly increased in group B treated with chitosan at 1% level indicating that chitosan is a potent agent for increasing blood HDL level. Cellulose showed no significant effect on HDL.Statistical analysis for HDL between group B and C showed significantly increased concentration of HDL in group B than in group C at 5% level indicating that chitosan was more effective than the reference drug in this experiment.The difference between initial and final LDL level of group A,B and C was 8.33% increase, 18.91% decrease and 2.70% increase respectively.Statistical analysis for LDL level in blood between group A and B showed that in group B LDL was decreased significantly at 0.1% level.Similarly,statistical analysis for LDL between group B and C also showed significantly decreased level of LDL in group B at 0.1% level indicating that chitosan has the capacity to lower down LDL concentration in blood and is more potent hypocholesterolemic agent than cellulose and the reference drug Ezetimibe in this study.

Keywords: Hypercholesterolemia, Zootherapy, Ezetimibe

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E - 022

MIMUSOPS ELENGI LINN EXTRACT: A HERBAL MOUTHWASH

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Gingivitis is one of the most common inflammatory diseases in humans associated with dental plaque. It has been found that phytochemicals, derived from plants have antibacterial, anti-inflammatory, anticariogenic and astringent properties of varying degrees, which can be exploited in the treatment of oral diseases. *Mimusops elengi Linn.* is a tree of Sapotaceae family the bark, fruit and seeds of which possess important medicinal properties. Bark extract of *Mimusops elengi Linn*. has anti-microbial property against the oral micro flora as well as anti-inflammatory and astringent properties. The objective of present study was to investigate the oral hygiene and gingival health benefits of the mouthwash prepared from this herb and to compare the clinical efficacy of this mouthwash with that of Listerine., Though, slightly less effective than Listerine, however, it can serve as good alternative for the society as it is easily available and economic with no side- effects at all.

Keywords: inflammatory diseases, *Mimusops elengi Linn.,* mouthwash, gingivitis

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E - 023

EFFECT OF ARSENIC TOXICITY ON BIOMASS IN HYDROPONIC *SALVINIACUCULLATA* ROXB.

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The ground water and surface water contamination with arsenic (As) is challenging problem to resolve the water scarcity issues. Phytoremediation is green and sustainable technology to find the solution of arsenic decontamination. In this experiment, the toxic effect of arsenic on biomass in *Salviniacucullata* Roxb. was examined. The effect on biomass was analyzed in response to different concentration of arsenic (As) in hydroponic condition. The test plants were grown 0,0.05,0.25,0.5,1.0,1.5,2.0,3.0,4.0,5.0,6.0 mg/L arsenic solution with nutrients solution. The different concentration of arsenic (As) solution was prepared by sodium arsenate (Na2HAsO4).7H2Oand the Hoagland solution was used for nutrition for the test plants. Each pot contains one liter of As solution with 60 gram of *Salviniacucullata* Roxb. Each pot with different concentration of arsenic was grown for five days. The average temperatures during the experimental period were recorded and it was 28.5 ^{0}C. The remaining biomass of test plant was directly correlated with production of biogas energy and finally decontamination of ground water or surface water from arsenic. The experimental results shown that when the plants were exposed to initial concentration of arsenic the biomass of plants increased by 8.33%, 11.33%, 12.16%, 13.16%, 13.16% after providing 0.05, 0.25, 0.5, 1.0, 1.5 mg/L arsenic solution respectively and after that when arsenic concentration was increase gradually then the plants biomas decreased by 1.66%, 29.5%,42.5%, 52.5%, 65.83% by providing the arsenic concentration 2.0,3.0,4.0,5.0,6.0 mg/L respectively. The plants did not survive after providing 5.0 mg/L arsenic solution. The present investigations revealed that lower concentration of arsenic influenced the growth in biomass at 0.05 to 1.0 mg/L As solution and from 1.0 to 1.5 mg/L As concentration there was equilibrium stage in plant biomass. At the concentration of 2.0 to 6.0 mg/L of arsenic, the biomass was inversely affected.

Keywords: Arsenic, Biomass, Biogas, Hydroponic, *Saviniacucullata* Roxb.

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E - 024

OCCURRENCE, SOURCES AND RISK ASSESSMENT OF PHTHALIC ACID ESTERS (PAES) IN HOOGHLY ESTUARY

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A broad spectrum of application has led to an exponential increase in the worldwide production of phthalic acid esters (PAEs) from 1.4-1.8 million tons per year in 1975 to 4.9 million tons per year in 2010. PAEs have gained attention in recent years due to their ubiquitous presence in all the environmental compartments and endocrine disrupting ability. PAEs are not chemically bound to the polymeric matrix resulting in direct or indirect release in the environment during usage, manufacturing and disposal. Studies on the fate and flux of PAEs in riverine system is lacking in India hence we studied the distribution of PAE in water, wastewater and sediment of the Hooghly estuary using Gas Chromatography-Mass Spectrometry (GC-MS). Diethylhexyl phthalate (DEHP) was the major contributor in surface water and sediment followed by Di butyl phthalate (DBP) whereas in wastewater the major contributor was Diethyl phthalate (DEP). High concentration of DEHP in sediment could be due to the ability of its wide application, strong sorption, and low degradation in sediment environment. Principal Component Analysis showed that the potential sources were identified as emissions from additives of plasticizers in the polymer industry and the productions of adhesives, treated and untreated wastewater, building materials and vinyl flooring. Ecotoxicological risk assessment revealed the adverse impact on the lower order aquatic organisms due to DEHP.

Keywords: phthalic acid esters, DEHP, Ecotoxicological risk, principal component analysis

E - 025

BISPHENOL A (BPA) - AN EMERGING POLLUTANT OF CONCERN

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Bisphenol A (BPA) is a synthetic organic compound which is used asan intermediate material for the production of polycarbonates, epoxy resins and thermalretardantsdue to its toughness, high elasticityand thermal resistance. 4.7 tonnes of BPA was produced globally in the year 2015 of which Asia Pacific contributed to 43.5%. Environmental sources include pre-consumer sources such as manufactures BPA and effluent from manufacturing plant and post-consumer sources include municipal waste, water treatment plant disposal, landfilling, and combustion of domestic waste and degradation of plastic in environment. Previous studies reveals that wastewater treatment plant have treatment efficiency of 76-92% hence a lot of BPA find its way to the surface water everyday making it a "pseudo persistent" compound.BPA has been reported to have various toxic effect on wildlife especially reproductive. Studies revealed that BPA can mimic human body's hormones and disrupts cell function and cause endocrine disruption. Printed Circuit Boards are an integral part of all electronic items and it mainly contains epoxy resin which is made of 82% BPA.Indiais the 5th largest producer of e-waste in the world generating 16 % of total BPA concentration in the world. In India due to poor sewage disposal guidelines and high waste production little or no attention is received for BPA.This studygives an overview ofBisphenol A as an emerging pollutant of concern.

Keywords: Bisphenol A, endocrine disrupting compound, epoxy resin, e-waste

E - 026

CURRENT SCENARIO OF DICHLORO-DIPHENYL-TRICHLOROETHANE (DDTS): A BRIEF REVIEW

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Dichloro-diphenyl-trichloroethane (DDT) is an Organo Chlorine Pesticide that was largely used to control various pests in agricultural sector and to control diseases like malaria and typhus in public health sector. India has been a major producer of DDT in the world. Presently DDT has been banned for agricultural use, but India has sought exemption under Stockholm convention for use of 10000 tonnes of DDT for restricted use in the public health sector. Before the ban, there was an indiscriminate use of DDT in the agricultural sector. Despite the ban and limited use, it can be noticed that DDT and its metabolites are among the prime organic pollutants which still finds its residue due to its persistent nature especially in areas where it was once used. India being the only country which has applied more than 1,00,000 tons of DDTs since its inception can be selected as a crucial area to study about the bioaccumulation of DDT in environment. DDT is found to accumulate in organic matter of soil due to its hydrophilic, lipophilic properties and affinity to particles, thus its concentrations are more in soil and sediments than in water or air. The main health effect of DDT is on the nervous system and is also identified as a possible carcinogen by the International Agency for Research on Cancer (IARC) and EPA. The classification of DDT under Persistent Organic Pollutants due to its toxic effects and health effects makes them a pollutant of prime concern. This study focuses on the chemistry, toxicity, usage pattern and the contamination status of DDT and its metabolites, in India.

Keywords: Dichloro-diphenyl-trichloroethane, hydrophilic, lipophilic

E - 027

AIR-WATER EXCHANGE PROCESS OF ORGANOCHLORINE PESTICIDES IN RIVER HOOGHLY

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Hooghly River forms the lower stretch of the River Ganges and serves as a lifeline for Kolkata city. It supplies roughly 493 million gallons per day to satisfy water demanding the surrounding region. It has been evident from previous studies that the river belt is contaminated with various organic pollutants. Organochlorine pesticides are the organic pollutants of prime importance owing to their persistence nature and health impacts. It is important to understand the air-water exchange process of these pesticides so as to elucidate their fate in the riverine environment. In this study, air samples and surface water were collected from the lower stretch of River Ganges and were analysed for selected OCPs. ∑OCPs ranged from 2800 – 10800 μg/m^3 and 2800 - 10800 ng/L in air and water respectively. HCH, Heptachlors and Endrins were predominant in both the matrices. Fugacity fraction approach was used to determine the air-water exchange process. It was observed that majority of the pesticides showed Fugacity fraction less than 1 indicating net volatilization of OCPs from water to air. With surface run off, a major portion of OCPs from different matrices are eventually getting drained in the river. The river water is acting as a new source for OCP sinthe atmosphere.

Keywords: Hooghly River, organochlorine pesticides, air water exchange process, Fugacity fraction approach

E - 028

TICKS OF KAZIRANGA: A PUBLIC HEALTH CONCERN

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Vector-borne diseases have affected human population since the beginning of time and are a major public health concern. Ticks are second only to mosquitoes as vectors to zoonotic pathogens, while transmitting a greater variety of pathogenic micro-organisms than any other arthropod vector group. According to World Health Organisation (2016), more than 17% of all infectious diseases are tick-borne and accounts for more than 1 million deaths annually. The increasing emergence of tick-borne zoonosis has been the result of dramatic changes in human demographics, land use practices, dependence on forest resources, human and livestock movements as well as changes in the environment at both large and small scales. A study was carried out to assess the prevalence of tick-bites in humans and related symptoms in the human-wildlife interface of a Protected Area from February-August, 2016. A cross-sectional Questionnaire Survey on tick-bite prevalence was conducted among the livestock owners in the fringe villages of Agoratoli Range, Kaziranga National Park, Assam. To this end, 270 livestock owners were interviewed with the objectives of investigating tick-bite prevalence, land holding near the forest, dependence on forest resources, livestock movements inside the forest, clinical symptoms post tick-bite, veterinary or medical interventions, other tick control methods, and prevalence of other vector-borne diseases. Tick samples were collected from livestock of these fringe villages and identification was done based on morphological keys (Walker et. al 2014). Tick-bite cases were recorded among the livestock-owners (35.5%, n=96) with almost everyone reporting allergic reactions and other symptoms due to tick-bites (97.91%, n=94). Tick-bite was more prevalent in livestock owners who were dependent on forest firewood and routinely venture into the forest. Percentage of tick-bite cases in livestock owners was found to be highest in Tamuli Pathar village (65%, n=12) followed by Bheluguri (59%, n=19), both having their periphery nearer to the park than other villages (<1 km), thus greater wildlife-human interface. A total of 590 tick samples were collected from livestock during the study period, and based on the morphological keys two tick Genera were recorded, *Rhipicephalus* (79.6%, n=470) and *Haemaphysalis* (20.3%, n=120), both being vectors of many zoonotic pathogens. This study demonstrates that livestock owners can be a valuable source of information with regards to the importance of tick-borne zoonotic pathogens as a public health concern.

Keywords: Vector-borne disease, pathogens, zoonosis, wildlife-human interface

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E - 029

STUDY OF *PILA GLOBOSA* AFTER ORGANOPHOSPHATE PESTICIDE INTOXICATION

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Environment in which organisms of present time live is not free of pollution. Grains, fruits, poultry meat, fish etc. are treated with pesticides and drugs for proper growth and to endow protection from various infestations. Beside this, non-target organisms are also eliminated due to surface run-off, bio-concentration, through contact due to sharing same habitat as that of target animal and by other means. In the present investigation, *Pila globosa* is selected. The reason of selection is its edibility, high nutritive value, greater tolerance to exogenous factors due to presence of shell and operculum of *Pila globosa*. The exogenous factor applied here is organophosphate pesticide dimethoate. Adult *Pila globosa* of average weight 10-12 grams were selected for study. The environment for their habituation in laboratory was aquatic. Tubs were filled with 10 liters of water in which 10 animals were put for habituation. Animals were grouped as control and treated. In another set control and recovered (those animals that survived after treatment) groups were formed. Doses 1/20th of LC50 value were given. Treatment period was of 15 days and recovery period were of 15and 30 days. Biochemical analysis of protein and glycogen was done. Analysis showed level of both protein and glycogen declined. After recovery period of 15 days, level of protein and glycogen increased slightly. After recovery period of 30 days, increase of protein and glycogen was recorded but was insignificant. It showed that recovery from dimethoate intoxication is fast during initial period but their protein and glycogen level is not found to be near control level even after 30 days of recovery. In wake of present study, it is advisable to people to avoid consuming those snails that are caught from pesticide sprayed fields.

Key words: Non-target animal, dimethoate, protein, glycogen, recovery

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E - 030

E-WASTE: TECHNOLOGICAL ADVANCEMENT OR HIDDEN MONSTER (IT'S TIME TO THINK)

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This study is on the status of waste from electronic and electrical equipment (WEEE) in Ranchi, Ranchi Municipal Corporation (RMC) is providing civil services to an estimated population of 12 lakhs of citizen in the capital city of Jharkhand. The project covers 37 municipal wards spread over in area about 176sq km. The overall focus of the paper is to point out the volume of e-waste generated and dumping status. Our studies observe that present RMC has MSW Private Limited Company for solid waste management includes collection and dumping of waste without extraction of e-waste. It highlights that Jharkhand being the18thmost e-waste generating state of India and the status of Jharkhand is that there is no specific state government initiative for tackling the problem of e-waste and its management. From the present study, we get to know that the company (MSW Pvt. Ltd.) collect around 200tone waste everyday across the city and dump it without any disposal process at Jhiri, around 15 km away from centre of the city Ranchi.
Another issue with e-waste over worldwide is that there is no any global definition of e-waste. In general e-waste is an electronic waste which has been acquired from electronic equipment after its end-of-life such products may contain toxic materials. These materials are complex and have been found to be difficult to recycle in an environmentally sustainable manner and causes health hazard. The paper tries to give a global definition of e-waste.

The involvement of the uneducated, unaware poor people living close to dumping areas or landfills of untreated e-waste and working without any protections is more destructive for their life. The goal of the present study is to show the penniless lives of these people, to highlight the involvement of children and their health issue and to show the toilsome effect of the hazardous toxic chemicals on these people.

Keywords: WEEE, Ranchi Municipal Corporation (RMC), MSW Pvt. Ltd., Solid Waste Management, Electronic Equipment, Toxic Chemicals, Hazardous Elements

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E - 031

AMELIORATIVE EFFECT OF C*LERODENDRUM. INFORTUNATUM LINN*. ON ARSENIC INDUCED SUB - ACUTE TOXICITY IN ALBINO RATS

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To calculate the oxidative stress parameters like LPO and SOD in liver, kidney and spleen in rats on arsenic treatment alone and in combination with methanolic extract of *C. infortunatum* Linn. leaves.

18 albino rats weighting 140-200g were used and divided into 3 groups representing control and treatment groups [treated alone with sodium arsenite (3 mg/kg b.w of rats) and in combination with methanolic extract of *C. infortunatum* leaves (100 mg/kg b. w.)] ; named group I, II and III respectively. Sodium arsenite and *C. infortunatum* extracts were administered orally, once daily over a period of 28 days. At the end of treatment period rats were sacrificed; liver, kidney and spleen as tissue samples were collected.

The mean values of MDA level in liver of group II and Gr. III were 89.46±0.50 , 82.56±0.60 ; in kidney were 52.83±1.21 47.63±0.58 and in spleen were 109.90±2.12 , 97.43±0.72 (nM .MDA produced / mg protein) respectively. The LPO values of Gr. I (control) in liver (74.13±0.7), kidney (43.15±0.43) and spleen (79.98±0.61) differ significantly from treated groups. Significant (P≤0.001) increase in LPO values in Gr. II as compared to Gr. I were observed in all organ samples. There were significant decrease in LPO in liver, kidney and spleen of Gr. III as compared to Gr. II. The mean values of SOD in liver of Gr. II and Gr. III were 12.01±0.41 and 13.20±0.23 ; kidney were 4.90±0.19 , 6.25±0.21 and spleen were 18.09±0.36 , 24.49±0.29 (U/g of tissue) respectively. There were significant decrease in SOD values in Gr. II as compared to Gr. I (liver - 14.22±0.25; kidney - 8.34±0.32 and spleen - 34.07±0.43 U / g of tissue). Significant increase in SOD were observed in Gr. III as compared to Gr. II in all the three organs.

The Results demonstrated that *Clerodendrum infortunatum* has potent anti-oxidant activity against arsenic induced toxicity

Keywords: Ameliorative, *Clerodendrum infortunatum*, Arsenic, sub-acute, toxicity

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E - 032

ASSESSMENT OF STRESS ENZYMES AND PROTEIN LEVELS IN *LABEO ROHITA* EXPOSED TO TOXICITY BY INSECTICIDE

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The present investigation is about change in antioxidant enzymes and profile in *Labeo rohita* due to toxicity induced by application of insecticides in paddy-cum-fish ecosystem in India. Antioxidant enzymes like Lactate dehydrogenase (LDH), Malate dehydrogenase (MDH) and Peroxidase (Pox) are used as biomarkers for toxicological study. Rohu *(Labeo rohita)* may be considered as major carp of India with high mortality rate under toxic environmental conditions and very much responsive to presence of pesticide in aquatic system. Flubendamide 20%WDG (Trade name Takumi) was used as insecticide for this research purpose. These chemicals were obtained by courtesy from the Rallis India Ltd., a Tata Enterprise. Takumi (Flubendamide 20%WDG) being frequently used against stem borer against sucking pest in paddy crop. 10 samples of Labeo rohita were randomly selected from the stock and were exposed to ten different concentrations of takumi for 96 hr to determine mean lethal concentration (LC_{50}). Takumi application was restricted from 1ppm-10 ppm (1, 2, 3, 4, 5, 6, 7, 8, 9, 10 ppm). LC_{50} was found 2.99 ppm using SPSS Vs.17. In case of Labeo rohita 1/2, 1/4th and 1/6th of LC_{50} (0.498ppm, 0.747ppm and 1.495ppm) was selected for chronic sub-lethal study. After 30 days, 60 days and 90 days of exposure, the toxicated fish were sacrificed and stress enzymes and protein profile were checked in gill, heart, liver, kidney, muscle and spleen. Native PAGE (10% native polyacrylamide gel) was performed for qualitative study of LDH, MDH and Peroxidase and SDS-PAGE was followed for protein profiling in gill, heart, liver, kidney and spleen. Overall result revealed a gradual increase in LDH and Peroxidase but decrement in level of MDH in all organs for both the fish species. All the three doses, 0.498ppm, 0.747ppm and 1.495ppm of takumi caused a gradual increase in lactate dehydrogenase (LDH) and peroxidase (Pox) in gill, heart, kidney, liver, muscle and spleen for all three exposure periods (30d, 60d and 90d). The percentage change over control of lactate dehydrogenase was found in range (92.3-143.59%) in gill, (128.57-150%) in heart, (73.58-128.30%) in liver, (105.71-125.71%) in kidney, (65.11-74.41%) in muscle and (96.26-155.55%) in spleen. Hence, the range of increase of antioxidant enzyme was found to be highest in spleen followed by liver and gill. Protein profile due to stress showed lower molecular weight bands in contrary to control. Pesticides greatly reduce food organisms' abundance in aquatic bodies and ecosystem which is necessary for fish survival which may serve a highly nutritive balanced food for human. Thus, the present work is extremely signinificant to determine the level of toxicity induced in non-target organism and find a way for controlling the toxicity by supplement in fish food.

Keywords: Antioxidant biomarkers, Protein profile, Labeo rohita, Takumi, Native PAGE, SDS-PAGE

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E - 033

QUANTIFICATION OF OCCUPATIONAL HAZARD ASSOCIATED WITH COAL MINING: A CASE STUDY OF DHANBAD DISTRICT, JHARKHAND, INDIA

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Coal mining contributes largely towards economic development of the nation although it has a great impact on human health. It not only has adverse effect on poverty stricken coal miners but also for the environment. Coal mining is associated with emission of coal dust which is largely suspended particulate matter (SPM) and respirable particulate matter (RPM or PM10). To quantify the health impact of coal dust on coal miners, an empirical study was conducted in district Dhanbad, Jharkhand, India. A sample survey was done in the form of questionnaire to access the health status of coal miners. In most of the cases it was found that the coal miners were suffering from various respiratory ailments like, asthma. The data was subjected to statistical analysis (correlation study) to determine the relation between coal dust and occurrence of respiratory diseases.

Keywords: suspended particulate matter (SPM), respiratory ailments, correlation, cold dust, statistical analysis.

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E - 034

HEPATOPROTECTIVE AND THERAPEUTIC EFFICACY OF SOME INDIGENOUS MEDICINAL PLANTS OF TAMILNADU

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Medicinal plants are one of the most grate values in the field of treatment and cure of diseases over the year, scientific research has expended our knowledge of the chemical effect and composition of the chemical constituent, which determine the medicinal properties of the plants. It has now been universally accepted fact that the plant medicines and remedies are far more safer than that of synthetic drugs for curing the serious diseases like Cancer, AIDS, Hepatitis, Epilepsy etc., Enormous number of alkaloids, glycosides and antibiotics have been isolated, identified and used as the curative agents. The modern developments in the instrumental techniques of analysis and chromatographical methodologies have added numerous complex and rare natural products to the armony of medicine like Artemissinin as antimalarial, Toxal as anticancer, Forskolin antihypertensive, Rutin as vitamin P and capillary permeability factor, and piperire and bioavailability enhance are the some recent development.

In the western world as the people are becoming aware of the potency and side effects of synthetic drugs, there is an increasing interest in the plant based remedies with a basic approaches towards the nature, mother earth has given vast resource of medicinal flora and fauna both terrestrial and marine. It largely depends upon the forthcoming phytochemistry to explore the wonder drug molecules from this unexploited wealth.

The present investigation in focusing on the therapeutic efficacy of *Pisonia alba*, *Delonix elata and Cardiospermum halicacabam,* against toxic hepatitis, healing of the wound, analgesic,, anti-convulsant and CNS depressed activity in the rat *Rattus nervogicus* .

Keywords: Medicinal plants, *Pisonia alba,* natural products, anticancer

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E - 035

TRACE ELEMENTS IN THE GROUNDWATER OF A TROPICAL RIVER BASIN, SOUTH INDIA: IMPLICATIONS ON HUMAN EXPOSURE RISK THROUGH ORAL AND DERMAL PATHWAYS

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This study investigates the concentration of trace elements in the groundwater of Tamiraparani river basin, South India. 124 groundwater samples were collected representing diverse landuse condition over the study area. The results reveal that the mean concentrations of Fe, Mn, Cu, Cr, Pb, Zn and Ni were 0.269, 0.02, 0.007, 0.007, 0.003, 0.066, and 0.004 ppm respectively. The decreasing trend of trace element content shows the following order: Fe > Zn > Mn > Cu > Cr > Ni > Pb. Significant positive correlation ($p < 0.05$) is found between most of the variables such as water level and Fe, Pb; EC and Ni; Fe and Pb; Mn and Pb; Cu and Zn, Ni; Cr and Pb; Zn and Ni. The studied trace elements are found below the international drinking water guidelines except Fe, Mn, and Pb. The Empirical Bayesian Kriging (EBK) model is used to interpolate the studied metal concentrations in the groundwater of the study area. A health risk assessment was carried out using exposure dose index (CDI) and hazard quotient (HQ). The CDI values of trace elements for oral and dermal pathways shows the following order of Fe>Zn>Mn>Cu>Cr>Ni>Pb and Fe>Zn>Mn>Cr>Cu>Ni>Pb respectively. The Hazard quotients suggest that the risk of contamination through oral and dermal pathways is feeble as all the elements show values less than one. The multivariate statistical analysis reveals that the source of trace elements in the groundwater is through natural origin except copper, chromium and lead as these contaminants are derived from anthropogenic activities.

Keywords: Trace elements; groundwater; contamination; human health risk assessment; Tamiraparani river basin; South India

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E - 036

HOW HEAVY METAL LEVELS IN EDIBLE FIN FISHES AND SHELL FISHES ARE AFFECTED BY COOKING?

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Five edible species of finfish (*Polynemus paradiseus*, *Tenualosa ilisha*, *Liza parsia*, *Liza tade* and *Stolephorus commersonii*) and two species of shrimps (*Penaeus monodon* and *Penaeus indicus*) were analysed for Zn, Cu, Pb and Cd. For each species, two composite samples were prepared for metal analyses, whose levels in raw and cooked (boiled, steamed, fried and curry) samples were determined by Perkin-Elmer Sciex ELAN 5000 ICP mass spectrometer and expressed as ppm dry weight. The heavy metal content in all fish species decreased on cooking (except for lead in fish curry). In fish curry the concentration of Pb increased significantly. The reduction in metal content on steaming was much greater than on boiling and frying. In summary, the results of the present study show that, the cooking process greatly influences the quality of fish and plays a major role in altering metal concentrations.

Keywords: heavy metal content, fin fishes, shell fishes, cooking

E - 037

CONTAMINATION OF FRESH WATER PRAWN OF INDIAN SUNDARBANS WITH ENDEMIC MICROBES

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Prawns are the delicious food items and have high market value. Freshwater prawns, *Macrobrachium rosenbergii* were reared in four ponds selected in the eastern part of Indian Sundarbans at a density of 2 individuals/m^2 for 90 days. The average initial weight of the seed was 0.08gm. Culture of this species in contaminated water system has resulted in the deterioration of the flesh quality. The present paper reflects the contamination of prawn tissue with microbial strains like *Salmonella, Shigella, Vibrio cholerae, Vibrio parahaemolyticus,* total coliform and fecal coliform.

Keywords: Contamination, prawns, Indian Sundarbans, deterioration, flesh quality

E - 038

BIOACCUMULATION FACTOR (BAF) OF SELECTED GRASSY SPECIES IN MEJIA THERMAL POWER PLANT, WEST BENGAL

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Pollution from fly ash is one of the principle environmental and public health problems in recent times. Concentrations of toxic metals of Zn, Cu, Pb were determined in the grassy vegetation around Mejia Thermal Power Station, West Bengal, India during November, 2015. Simultaneously the biologically available heavy metals in the fly ash were also estimated to evaluate the bioaccumulation factor (BAF) in the selected grass species. The study reveals that BAF is more in *Typha elephantia* as compared to *Phargmites karka*. The present study is a probable road map for natural bioremediation of fly ash using producer community of the area.

Keywords: Fly ash, Pollution, toxic metals, grassy species, bioaccumulation

E - 039

ARSENIC INDUCED ALTERATION IN THE HEMATOLOGICAL PROFILE IN FINGERLINGS OF COLISA FASCIATUS (BL & SCHN.)

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Voluminous literature exists on the toxicity of heavy metals viz; zink, cadmium, led, copper, mercury etc. However, literature on the toxicity of arsenic on the fishes in general and fingerlings in particular is meager. Present study has been therefore has been undertaken to record alterations, if any, on the hematological profile of fingerlings of *Colisa fasciatus* (Bl & Schn.), a freshwater perch under sub lethal concentration of trivalent arsenic. The total erythrocyte count and hematocrit value where significantly elevated when compare to control after long term exposure (30 days). The number of thrombocytes per thousand cells where significantly depressed. Significant reduction was also noticed in the leucocytes count under trivalent arsenic stress.

Keywords: Trivalent arsenic, erythrocytosis, hematology, leucopenia, Colisa Fasciatus (Bl & Schn.), fingerlings

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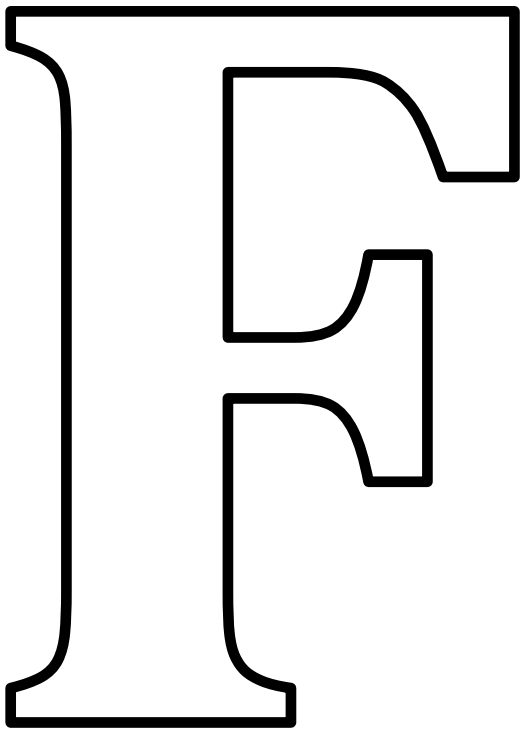

Environmental Impact Assessment, Environmental Auditing & Life Cycle Assessment

F - 001

INVESTIGATION ON A COMPREHENSIVE CHARACTERIZATION OF FLY ASH PARTICLES (SPHERULES) AND ITS IMPACT ON ENVIRONMENT

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One of the major environmental problems that can be associated with the coal which is used as a fuel in thermal power plants is the production of fly ash. The fly ash particles include spherules causing deleterious effect. This study focuses on the characterization of ash samples and its impact on environment from Bandel thermal power station (BTPS) and Durgapur power limited (DPL), West Bengal, India. The microscopic study reveals their spherical morphology in both fly ashes. The spherules identified are both glassy and dark with amorphous particles. Glassy spherules are silica-rich while dark spherules are iron-rich. In addition, physical and chemical characterization of fly ash has also been studied. Physical characteristics were established using magnetic study which depicts high magnetic fractions in fly ash from DPL (magnetic susceptibility: 878x $10^{-8}m^3kg^{-1}$) than BTPS (magnetic susceptibility: 716 x $10^{-8}m^3kg^{-1}$) while chemical parameters include pH, electrical conductivity and oxidation-reduction potential (ORP). pH was found 5.7 and 6.8, conductivity was found 371 µS/cm and 277 µS/cm while ORP varies from 72.8mV and -214.8 mV in case of BTPS and DPL, respectively. The above parameters can be easily applicable to detect the load of anthropogenic pollution since the ultrafine particulate matter of the fly ashes can easily get deposited in air, water and sediments. Silica is a carcinogenic agent (I) and the fly ash silica-rich spherules are potent carcinogen which has deleterious effect to the environment. The finer fly ash spherules act as major air-borne particles can cause respiratory disease in human. Therefore, proper environmental management of fly ash particles is today's need.

Keywords: Glassy spherule, characterization, particulate matter, magnetic, pollution

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F - 002

ENVIRONMENTAL AND HEALTH REPERCUSSION OF COAL MINE FIRE IN JHARIA COALFIELD: EMPHASISING THE ROLE OF CORPORATE ENVIRONMENTAL RESPONSIBILITY

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Coal mine fires are a global problem, and there are thousands of coal field fires are burning globally. The history of coal-mine fire in India's backbone of power generation Jharia coalfield can be traced back to 1916 when the first fire was detected. Coal mine fire has made major alteration in the overall environmental and social scenario in the Jharia coal field. The study has been incepted from the critical analysis of the environmental and health impacts of coal mine fire. The present paper is based on primary as well as secondary sources of research.

This paper has examined the environmental and health impacts of coal mine fire in Jharia coal field. In terms of environmental impacts, the perception shared by local communities is that Coal mine fire has caused air pollution, depletion of ground water table further it also affects its quality and foster land degradation. Excavation of coal from the Coal mine fire affected zone caused excessive vibrations by repeated explosions for excavation have resulted in the cracking and collapsing of public as well as private infrastructures near to mine sites further it also affected the health and quality of life amongst the community. The impacts of the coal mine fire have restricted the environmental and social sustainability of local community. The impacts being hazardous, affects every facet of the natural and social environment. Corporate Environmental Responsibility proves to be an eminent tool to nip in the bud and enable enterprises to adopt a mid-way out for the attainment of sustainability.

Keywords: Coal Mine Fire, Environment, Health, Corporate Environmental Responsibility

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F - 003

ENVIRONMENT IMPACT ASSESSMENT

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The impact of the changes in environment in respect of socio-economic and biophysical characteristics of environment that may propose action and their principle was accepted at the united nation conference on the human environment held in 1972 at Stockholm. In that conference generated for the environment which resulted the 1988 publication of a world conservation strategy by IUCN, the UNEP and WWF and recommended to design a series of national policies regarding environmental conservation and control, EIA an activity designed to identify and to found out the impact on human health and wellbeing of programs, projects, policies, proposals and operational procedure which communicate information about the impact environmental changes must be estimated must be fall or graded in three classes– (1) Socioeconomic: demographic and social value (2) Biological: wild life and endangered species. (3) Physical: water quality in ground water river and air quality, earthquake probabilities there for it is necessary to measure the impact which is very difficult in the form of quantitatively. But using the checklist method for environmental parameter related to parameter class can be done.

Keyword: Socio–economic, human health, IUCN, the UNEP and WWF, checklist method, environmental parameter

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F - 004

ENVIRONMENTAL IMPACT OF OVER FORIGN DUST POLLUTION IN PRESENT SCENARIO BY ROAD ON DOMOHAN AMBA,AURANGABAD DISTRICT IN BIHAR STATE, INDIA

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Environmental O_2 and CO_2 gases in secure of life for man, animals and plants. Mixture of gases in binding by gravitational force on the earth. 90% part of Environmental volume on the earth over 30km height.

According to geography for monsoon changing– very important of water vapour. Dust particle, CO_2 and O_2 one, avoid in rainy day, at Domuhan (sangam of Batre and Batane River), Amba, Aurangabad (Bihar). Passenger suffer at Road transport and very difficult condition. Due foreign dust particle (because all dust particle 0.2.mb came other side of place make road) than burst of road three after effective near plants, man, and other animals. Mostly plants are effective in west side near road. Environmental condition with dry air by dust particle. And effective of humidity than decreases rate of transpiration in plants. Effective of plants near river Batare & Batane (when & batany river combined Domohan) than stomata are effective.

(1) Alfalfa type stomata: - effective of stomata by dust particle- radish, Bean pea & mustered etc.
(2) Potato type stomata: - effective of plants by dust particle, onion, pumpkin, etc.
(3) Barley type plants: - effective of cereals plants by dust particle.

Silicosis symptoms are effective some people three home near road side at Dumuhan.

Kinetic road transport passenger suffers through dendrites dust pollution and some people and animals recorded. Suffer on haematosis & Bronchitis for this day.

Keyword: O_2 and CO_2, water vapour, foreign dust particle, humidity haematosis & Bronchitis

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F - 005

STUDY OF TRAFFIC NOISE STATUS IN DHANBAD TOWN AND ITS IMPACT ON ENVIRONMENT

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Environmental noise is an undesirable by-product of industrialization and urbanization. Although it is not noticeable, this unwanted or excessive sound makes a significant damage to human beings and has a hazardous impact on our environment. Transportation and horn used in vehicle are the major source of road traffic noise pollution. Noise health effects are both health and behavioural in nature. Noise pollution can cause annoyance and aggression, hypertension, high stress levels, hearing loss, sleep disturbances. The present traffic noise study was carried out during September to November, 2016 of 15 locations in varying intervals viz. morning (9 Am – 12 Pm), afternoon (2 Pm – 5 Pm), evening (5 Pm – 8 Pm) & night (8 Pm – 11 Pm) hours at different road networks of Dhanbad town by using Sound level meter. A road map of Dhanbad town was prepared by GIS (Geographical Information System) using latitude and longitude to visualize the monitoring locations. The monitoring results indicated that the highest and lowest average noise levels (LAeq) were 86.3 [Govindpur] and 77.1 [Memko more] dB (A) during morning hours, 86.9 [Govindpur] and 74.6 [Vinod Vihari Chowk] dB (A) during afternoon hours, 87.2 [Govindpur] and 74.2[Vinod Vihari Chowk] dB (A) during evening hours and 82.5 [Govindpur] and 64.2 [Vinod Vihari Chowk] dB (A) during night hours. From the study, it was observed that noise environment of the Dhanbad town is deteriorating and unsafe in various locations for human and it exceeds the noise standards suggested by the Central Pollution Control Board (CPCB) and Bureau of Indian Standards (BIS). It was also observed from the study that, places with high road traffic congestion, narrow roads, heavy constructional activities and poor traffic management areas are more vulnerable to high noise levels. Some of the educational institutions, hospitals and nursing homes are also in the grip of high noisy environment.

Keywords: Noise, urbanization, transportation, GIS, monitoring, intervals, road traffic, LAeq, dB(A), deteriorating

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F - 006

UNDERSTANDING RELATIONSHIP BETWEEN LAKES AND URBAN COMMUNITIES

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Ancient civilizations have always shown the significance of aquatic ecosystems in people's livelihood. These civilizations gradually grew into urban and rural areas. But the ecosystems in urban areas are unable to cope up with the continuous increase in pressure of urbanization. Bangalore, a city in south India is also facing the similar problem. The haphazard growth of the city has polluted the lakes which was once the perennial source of water for the city. Communities depending on these lakes for water source have started intervening with the governing bodies in the restoration of the polluted lake.

The relationship between the lakes and communities has a vital role to play with the current scenario. To assess the community participation, a Socio ecological framework has been adapted by Dr. Elinor Ostrom that helps to indicate the importance of the community involvement. Four lakes in Bangalore were chosen to study the interactions between the communities and between the community and the governing agencies. The framework was decoded into variables that helped in understanding the involvement of the communities in restoring the lake and also their extent of willingness to restore the lake based on the occupation, frequency and purpose of visit. Along with the community participation, the involvement of the governing bodies and the collaboration with the communities were also studied.

One lake lacked the community participation aspect and it was surveyed in depth by conducting primary interviews in the vicinity of lake. These interviews resulted in findings that showeda cultural and livelihood dependency of communities on lakes.

- Livelihood dependency showcases a need for a mutual beneficial program to the fisherman
- Local festivals showed the cultural dependency on lake which was carried through generations as tradition

The proposal for government to safeguard and improvise the current scenario requires alake development committee, consisting of panel of the experts pertaining to the field, who develop the lake by studying the lake and its characteristics. This involves-An ecologist, a strategist, an ornithologist, an architect/ landscape architect, a resident, a documentary film maker and involving the local communities and guardians to ensure that the lake is safe.

Other findings were the non-existence of the Tippanis (a document containing the limnological details of the lake) that was responsible for the loss of many lakes in the urban areas. The lakes in Bangalore are interlinked to each other through huge storm water drains called the Rajakaluves. Construction on these Rajakaluves blocked the natural flow and resulted in drying up of the lakes.

Keywords: Urban areas, aquatic ecosystems, participatory planning, Rajakaluves, Socio ecological Framework

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F - 007

AN ALGORITHM FOR IMPACT ASSESSMENT OF MINING ON SOIL ARTHROPODS

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Biodiversity decline, in general, is attributed to anthropogenic activities or technological advancements. But in new habitats formed after technical deposition of mine spoils there are interactions between immigrating animals and abiotic life along with interrelations between species with different abilities to use actual life situations. To measure these interactions Marc Nerlov (1991) developed a mathematical model of population environment interaction, which had limitations. Followed by Swanson (1994), Hartwick (1995), Rowthrorn and Brown (1995) and Croushan and Requate (1997) developed an approach to include environmental damage index variable in production function or in utility function. Based on these models an algorithm for impact assessment of mining on soil arthropods have been developed. The equation is I = PAT. Where, I stand for impact of mining, which is equal to the product of "P" Population growth "A" available energy in the system and "T" technological advancements.

Keywords: Technological advancements, impact assessment, carrying capacity, population dynamics, ecosystem

F - 008

STUDIES ON FISH PRODUCTION AND SOCIO-ECONOMIC STATUS OF EAST KOLKATA WETLAND WITH SPECIAL REFERENCE TO WATER QUALITY PARAMETERS

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The present study was aimed to observe and understand the pollution status as well as socioeconomic status of fishermen and fish production of East Kolkata Wetlands, the Ramsar site. One year seasonal sampling were done to study the diversity of fish and 10 water quality parameters like hardness, calcium, magnesium, alkalinity, pH, chloride, dissolved oxygen, temperature, nitrate, phosphate and organic carbon in soil along interaction with fishers were reflected the ecological and socioeconomic conditions of East Kolkata Wetlands. Indian major carp like *Labeo rohita, Catla catla and Cirrhinus mrigala* mainly rearing at East Kolkata Wetlands but some others fishes like Punti, Nilontica, Kholisa, Folui etc. are also cultured. Our investigation revealed a medium variation of economic status among different fisherman families are BPL status, fish production is not satisfactory with the abrupt effect on the food availability. Water qualities have the adverse effect on the fish production of natural fish food which on the contrary affected the fish production in the wetland.

Keywords: Sewage fed fishery, East Kolkata Wetlands, water qualities, Indian major Carp, Ramsar site, Fish production

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F - 009

SOCIO -CULTURAL CHANGES OF SANTHALS AND THEIR IMPACTS ON ENVIRONMENT IN JHARKHAND

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A tribe is a group of people living under primitive condition and still not popularly known to more modern culture. Santhal is an important tribe which contributes more than 50% of the Indian tribal population. The paper tries to explain heartening situation of Indian tribes with reference to Santhal communities in Dumka, Godda, Rajmahal, Sahabganj districts of Jharkhand. Santhal are the largest Hindu religious believer adivasi community in India and can be found mainly in the states of Jharkhand, Bihar, West Bengal, Madhya Pradesh, Assam, Tripura and Orissa. According to the 2011 census, India has 8.10% of tribal population. In India, 90 million people belong to the indigenous communities known as adivasis or tribals. According to Oxford Dictionary "A tribe is a group of people in a primitive or barbarous stage of development acknowledging the authority of a chief and usually regarding them as having a common ancestor. Social changes refer to change of society and change of social relationship through. According to M.D. Jenson, "Social change may be defined as modification in ways of doing and thinking of people. They are facing problems like deforestation, soil erosion, Irrigational difficulties, lack of bio fertilisers, low productivity, cyclone etc.in and around their habitat. With the use of fertilizers and the impact of new technology the environment is getting affected in these regions. The paper tries to examine the impact of environment on culture, habitat etc. in that area and also suggests remedial measures.

Keywords: Primitive, Santhal, Social Change, Deforestation, Biofertilisers, Culture

F - 010

ECOLOGICAL ANALYSIS OF A LITTLE MILLET CROP ECOSYSTEM EXPOSED TO CHLOR-ALKALI SOLID WASTE EFFLUENT, V. TOTAL NET PRODUCTION

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The little millet (*Panicum sumatrense* Rath ex. Roem and Schult) crop variety SS. 81-1, exposed to chlor-alkali solid waste effluent @ 100 g m^{-2} (treatment - 1),200 g m^{-2} (treatment - 2), 300 g m^{-2} (treatment - 3) and 400 g m^{-2} (treatment - 4) was studied in vivo at the Agriculture Research Station, Ankuspur in the District of Ganjam, Odisha at an interval of 15 days starting from 30 days after sowing (DAS) till harvest of the crop following the ICAR technology proposed by Seetharam (1994) with little modification depending upon the soil condition and climate of the locality. Short term harvest method proposed by Odum (1960) was employed for the determination of various compartmental biomass (dry weight) values. The productivity of various compartments i.e. live green, standing dead, grain and root were determined by taking the increment value of concerned biomass from the successive sampling period and was expressed in g m^{-2}. Above ground net production was estimated by summing the increments of live green, standing dead and grain biomass values whereas increment of roots was taken as below ground production. Total net production was obtained by summing the value of above ground net production and below ground net production. The total net production increases with the increase in sampling period and attained a peak at harvest (87 DAS). Control and treatments showed a trend of control < treatment -1 < treatment -2 < treatment – 3 > treatment – 4 at 45,60,75 and 87 DAS whereas a gradual decline in production value from control to treatment – 1 then to treatment – 2, treatment – 3 and less in treatment – 4 was observed at 30 days after sowing.

Keywords: Chlor-alkali factory, solid waste effluent, little millet, total net production

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F - 011

ANALYSIS OF ENVIRONMENTAL IMPACT ASSESSMENT (EIA) NOTIFICATION AND INTERNATIONAL GUIDELINES IN CONTEXT TO INFRASTRUCTURE PROJECTS IN INDIA

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The environment impact process was integrated into the Indian legal system in 1994 when the Environment Impact Assessment (EIA) Notification came into existence. The objective of the Notification was to push forward more sustainable industrialization process in the country after giving due consideration to the environmental and social impacts. The Act made it mandatory for all projects listed in schedule 1 to get an environmental clearance from the Central government, be it for setting or expanding any plant anywhere in the country. The EIA notification 1994 was amended 12 times in 11 years. While most of the amendments diluted the process of environmental clearance process, there were some, which also strengthened the process. There was a wide spread opinion that the EIA notification was not able to address all the concerns and had several weaknesses which was making the entire clearance process weak. This was the reason Union Ministry of Environment and Forest (MoEF) initiated the process of bringing in some significant modifications in the environment clearance process and EIA notification was notified on 14th September 2006. According to the notification, the responsibility of granting clearance to projects were shared between the authorities of the State and the Central government. Analysis of the EIA notifications 2006 and its amendments up to 2016 reveals the fact that this notification failed to consider the important infrastructure projects based on their impacts on environment rather diluted the environmental clearance processes of the infrastructure projects based on Government of India programs of infrastructure implementation. Sometimes large infrastructure projects which are not considered in EIA notification 2006 are viewed seriously by international funding agencies on safeguard angle. A detailed EIA is prepared and Environment management plans are further implemented. A review of the EIA notification and guidelines of international funding agencies in relation to infrastructure development in India will be discussed in the paper.

Key words: Safeguard, Environment, Impact, EIA

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F - 012

CLIMATE CHANGE IMPACT ON WATER RESOURCES AVAILABILITY IN THE BRAHMANI RIVER BASINUNDER PROJECTED CLIMATE CHANGE SCENARIOS

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Changes in temperature and precipitation pattern due to global climate change are likely to alter regional hydrological conditions, affecting water resources availability and flow regime of river. Change in amount, intensity and frequency of the precipitation will not only affect magnitude of stream flow, but will also impact the frequency of occurrence of floods and droughts. Studies conducted in different River basins of India have projected varied magnitude of changes in stream flow in different river basins. The spatial variations in changes water resources availability in different river basins suggests need for site specific climate change impact studies for developing suitable adaptation plans. This paper presents the results simulation studies conducted to investigate the impact of climate change on water resources availability in the Brahmani River basin for three different future period of 2020s (2010-2039), 2050s (2040-2069) and 2080s (2070-2099 under three different emission scenarios of A2 (high emission), A1B (medium emission), and B1 (low emission). The Brahmani River basin, with a total catchment area of 39313 km^2, is located in the eastern part of India. We used distributed parameter hydrological model Precipitation Runoff Modelling Systems and multi-model ensemble climate change scenarios, derived from the Fourth Assessment report (AR4) GCM (Global Climate Models) projections for simulating climate change impact on stream flow. Analysis of projected changes in mean temperature under different emission scenarios, indicated increase in annual mean temperature in the range of 0.8 to 1.0°C, 1.5 to 2.0°C and 2.0 to 3.3°C during 2020s, 2050s and 2080s, respectively as compared to the baseline period of 1961-1990. Monthly analysis showed increase in the mean temperature during different months of the year in the range of 0.7 to 1.3, 1.2 to 2.5, and 1.7 to 4.0°C during 2020s, 2050s, and 2080s, respectively. There is increase in the annual rainfall in the basin during all the three future periods, and it varied in the range of -1.6 to 1.6%, 1.6 to 3.1%, and 4.8 to 8.1% during 2020s, 2050s and 2080s, respectively. The mean monthly rainfall changes under different emission scenarios varied in the range of -20.4 to 16.1%, -20.3 to 25.5%, and -17.3 to 29.5% during 2020s, 2050s, and 2080s, respectively. There is decrease in rainfall during December- February for all three emission scenarios. Simulation results indicated changes in annual stream flow in the range of -2.2 (A2) to 2.5% (A1B), 2.4(A2) to 4.65% (A1B), 7.3 (B1) to 12.6% (A1B) during 2020s, 2050s, and 2080s, respectively. With ensemble of all GCMs, annual stream flow changes are projected as 1, 5.5 and 10% during 2020s, 2050s and 2080s respectively. Monthly analysis revealed changes in stream flow in the range of -28.2 to 31.5%, -25.9 to 46.7%, and 25.8 to 69.2% during 2020s, 2050s, and 2080s, respectively. There is large temporal variation in stream flow change with adecrease in stream flow during winter months (January and February) in all the three future periods. The temporal variation in the stream flow in the basin suggests the need for developing different irrigation water management adaptation strategies for crop planning.

Keywords: Climate change, Stream flow, hydrological model, Global climate models, Emission scenarios

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F - 013

IMPACT OF ROAD WIDENING ON ENVIRONMENT

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We all have good length (Approx.: - Six Million Kilometres) of road on our own earth out of which only 5472144 kilometres of road is there in a country named India. These roads are being made to provide transportation of humans and goods on this earth of ours with varied needs requirement with a small claim that it is leading to our own development.

Look at the length of roads on our earth. Is it not horrible considering the fact as to how much fertile land has been lost for construction of roads? How many huge trees lost against the backdrop of utilizing vehicles for producing pollution which can only be got rid of by trees because humans are not at all developed to prevent degradation of their environment which is degraded through their own development processes. On the contrary we all have a feeling that better roads are a signal of our own better progress.

Is it true by any means and measures?

Looking beyond roads, look at one more small aspect we should have a look on and that is widening of present roads. Can it be called well under any circumstances?

I feel no not at all.

Analyse your own town and just calculate that on the process of widening roads how many trees have been cut off. You must be sure to find out that it is horrible and simply because it is horribly great in numbers despite a hugely bigger number of roads being built by cutting a huge numbers of Huge Trees.

We all can, definitely look at a number of other aspects too which are causing degradation of our environment, but for a starting process I am trying to concentrate on Roads because every journey, being it small or big, starts with a small step which leads to success. How much fertile land of our own earth have we killed and how much more do we desire to kill in our own proclaimed peripheral of ourselves proved development for our own, self-claimed, benefit.

Can the peripheral of destroying God's gift to us all be called development by us all?

I feel this is not development but it is simply destroying God's gift to us all i.e. the living beings on our own planet. Look at the effectiveness of roads and the kind of air we are made to breathe due to pollution made by our own, self-proclaimed development.

So please think about our development before taking any step with a claim of its development peripherals only as per our own understanding.

Keywords: Million, Backdrop, Fertile Huge, Aspect, Peripheral

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F - 014

SUSTAINABLE PERFORMANCE INDEX OF OUSTERI WETLAND: EVALUATING THE ECOLOGICAL, ECONOMIC AND SOCIAL CHARACTERISTICS

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Wetlands play a key role in the ecological conservation, in environmental quality improvement, and in human habitat environment improvement. Primer field investigations, primary survey and series of stakeholder meetings were utilised to evaluate the performance of the wetland. It was done using the complex index system covering wider aspect to correlate the comparative status of both Tamil Nadu and Puducherry zone of the Ousteri wetland. Compared with the researches applying the ecosystem service evaluation method, the proposed scoring method in this study can evaluate on some important performance indices (aquatic vegetation coverage, plant community integrity, integrity of management operating system, stakeholders feedback on the wetland protection, public satisfaction) that cannot be ignored and unable to be transformed to a monetary form. The Delphi method was used to screen preset 35 sub-indicators prior to evaluation. By using Delphi and Analytic Hierarchy Process method, as well as the weighted linear combination model, the ecological-economic-social performances were obtained. This indices system was applied to the case of Ousteri wetland with respect to Puducherry and Tamil Nadu scenario separately. With the help of the Evaluation Index system (EIS) established in this study, decision makers can obtain more omni-visual information so that an ecological subsidy policy by incorporating rewards and punishments mechanisms according to the performance evaluations can be formulated to enable the greatest returns on investment in the wetland conservative measure.

Keywords: Delphi method, linear combination model, Analytic hierarchy process, Conservation

F - 015

ENVIRONMENTAL SUSTAINABILITY CONCERN IN PILGRIMAGE/HERITAGE CENTRES, CASE STUDY OF VARANASI, UTTAR PRADESH

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Urbanization brings many transformation of nature, including pollution, river channel diversion, changes to local ecosystem, altering natural flow of energy, water, food & materials (Douglas 1989). Environmental impacts become the central theme in the move towards global sustainability with growing population & economic wealth of activity. Due to urbanization and transformation pilgrimage centres and heritage cities of India are facing distress in local prosperity, economic &employment quality, social equity, visitor fulfilment, community wellbeing, cultural richness, biological diversity and environmental cleanness. To be more specific the environmental sustainability concern for the pilgrimage centres are: (i) water & air pollution; (ii) slums; (iii) solid-waste generation &management; (iv) open defecation;(v) access to basic infrastructure; (vi) religious activities, cremation; (vii) resource base depletion of flora, fauna and ground water.

Varanasi is known as the religious capital of India and attracts a lot of pilgrims, floating population each year. It is the place of intersections between religious life, urban life, and the environment in contemporary India. This increase in population along with religious practices has had serious environmental implications over the years. The river eco-system needs to deal with the increasing population whose sewage flows directly into the river. About 80% of the pollution in the River Ganga in Varanasi is due to urban waste. The river faces additional load on religious festivals when millions of devotees bathe in the Ganga. Other than these, offerings into river, cremation on ghats, use of coal and wood as fuels, disposal of solid waste on streets, are few of the many environmental problems faced by the city today. The city has around 11.98 lakh population, with decadal population variation of 2011 as 8.89%. In terms of temporary population, Varanasi has majorly 8-10 heritage areas which are the pull factors for domestic and international tourists. The city also has the burden of slum and unplanned growth. City has around 37.6% of slum population which is one third of total population. In terms of pollution level of the Ganga River, at present 138 main drains carrying industrial as well as domestic waste water with an average BOD load 999 tons/day.

Issues in Varanasi: (i) congestion & choking of streets; (ii) practice of open garbage disposal; (iii) neglected heritage areas; (iv) environmental degradation; (v) unregulated development and its pressure on infrastructure; (vi) dichotomy of growth and decay. In order to resolve these problems, policy initiatives are required which must be supported by firm implementation, monitoring and impact evaluation of environmental laws. In order to confront these problems, comprehensive policy initiatives are required which must be supported by firm implementation, monitoring and impact evaluation of environmental laws. The focus of the paper is: (i) to identify the existing environmental resources of pilgrimage centre; (ii) to assess the current status of the resources and analyse the cause-effect relationship between environment & humans; (iii) to identify key environmental issues; (iv) to formulate policies and strategies to ensure qualitative improvement of environment and its sustainability.

Keywords: Pilgrimage/Heritage Centres, Sustainability, Pollution Levels, Infrastructure

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F - 016

SOLID WASTE MANAGEMENT IN JHIRI: A PERCEIVED HAZARD

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The state Jharkhand was formed 16 years ago, in year 2000, 15th of November. The state's name is derived from two hindi words 'Jhar' meaning Bush and 'Khand' meaning Section. However, with the passing years this beautiful state is losing its Greenery and moving towards the state of waste. Our team focusing on the present scenario of Jharkhand has come to a case study of Jhiri which is the dump yard for wastes generated in the city of Ranchi.

On estimation, approx 450 metric tonnes per day of municipality waste from all over Ranchi is being dumped in Jhiri. There is persistent foul smell in the area and locality around. Even though the Ranchi Municipal Corporation (RMC) have taken some implications towards maintaining the city but a delinquent negligence is observed when it comes to proper disposal of solid waste. This has given rise to a number of problems that the people living in that locality have to go through every day.

In our present work we surveyed the larger segment of the population in and around Jhiri with a view to assess the knowledge status of the people with regard to the impending danger. We were quite surprised to find that the people were aware (86%) about the situation. Even the children (45%) were conscious about the hazard. Moreover, they were eager to suggest the ways to better manage the garbage.

Keywords: Jhiri, Impact on Health and Environment, RMCs' Role, Waste Management

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F - 017

E-WASTE: AN ENVIRONMENTAL IMPACT

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The Information and communication Technology has become the power of the global economy. Software and hardware parts of the Information Technology has entered most of the parts of the social, technical and natural environment. Obviously the increase in production of electric and electronic components and especially computer hardware manufacturing companies. Currently usage, dumping and recycling of all these electric and electronic components are directly affecting to human life and environment. The men, women and even the children using the ways which are not only environmentally harmful but also life frightening. The electronic market particularly computers hazardous impact of different chemicals disposed in environment in the process of computer usage, disposal and inefficient recycling.

Keywords: IT, economy, electric and electronic, e-waste, hardware and software, manufacturing, environment, hazardous

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F - 018

IMPACT OF PHYSICAL INTERVENTION ON INDIGENOUS RICE CULTIVATION OF JHARKHAND AND ITS NATURAL SOLUTION

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Jharkhand is a land of indigenous people, knowledge and culture. Here there are about 32 indigenous tribal groups who have the traditional knowledge of more than 100 varieties of indigenous rice. The major agricultural land of the state is under rice cultivation and it is the main occupation of the tribal people of the state. Sources of TEK reveal that these varieties are rich in nutritional, medicinal and economic value. These varieties in course of time have adapted themselves endo-edaphically to the local climate of Jharkhand. Three major physical interventions mining, construction and industrialisation has led to a drastic change in the soil ecology of the rice growingarea of the state. This in turn is effecting the indigenous rice cultivation and its use. Mining, construction and industrialisation is narrowing the agricultural land .To meet the increasing demand of rice, cultivation of hybrid varieties is replacing indigenous varieties whose cultivation requires lots of inorganic fertilizes which a have many negative consequences environmentally, economically and socially. Cultivation of Hybrid varieties have not only created seed problem among the tribes but are leading to the depletion of vast indigenous rice gene pool of the region. The only solution to the problem is the use of natural, improvised technologies to enhance the productivity in the sustainable manner. In this regard role of microbial diversity, and its careful selection and successful utilisation can solve the major agricultural and environmental problems of Jharkhand. This paper focuses on the natural way i.e. role of entophytic bacteria to conserve indigenous rice variety and bring its cultivation into main stream cultivation.

Keywords: TEK, Biodiversity, indigenous variety, hybrid variety, gene pool, endophytic bacteria

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F - 019

IMPACT OF THE TOURISM ON THE HYDRO CLIMATIC RESOURCES OF UDAIPUR CITY (RAJASTHAN)

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Udaipur city better known as the city of lakes and the Venice of the east is adorn with a large number of fresh water lakes which adorn this place as a centre of international and national tourism. The present study is based on a comparative study of the water quality of three fresh water lakes of Udaipur which are major tourist hubs of southern Rajasthan. Although Udaipur is situated in a semiarid zone, still the presence of these manmade lakes of Udaipur gives it panoramic scenery with immense aquatic and terrestrial biodiversity which attracts travellers from all over the globe. In fact the economy of this city basically depends on the tourism sector. The climate of Udaipur is pleasant throughout the year except extreme summers in May and the June. The tourist load in the city begins in the month of august and continues to increase till November and December. Besides these beautiful lakes there are many historical places like Haldighati and Chittorgarh which are the catchment of travellers. All the year around due to constant travel visit and water recreational opportunities the lakes have immense anthropogenic interference which deteriorate the physiochemical characteristics of lake water which may ultimately affect the aquatic flora and fauna and degrade the water ecosystem. The geographical position of Udaipur city is such that it is surrounded by Aravali hill range on all the sides. The present study focuses on the effect of the tourism on water quality of three major lakes of Udaipur city. The results clearly depict that the water quality deterioration is directly proportional to the tourist load. However, the constant monitoring of water quality and other cleaning procedures can help us to reduce the pollution load by various technical methods. So that the convergence of tourists is always enchanted and they are constantly increasing without much change in air, water and land quality through proper environmental management system.

Keywords: Ecotourism, water pollution, physicochemical, monitoring

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IMPACT GENERATED SPHERULES: A CASE STUDY FROM LONAR IMPACT STRUCTURE, MAHARASHTRA, INDIA

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To date, the significance of impact cratering as a planetary process, as a catastrophic process that may severely affect biodiversity on our planet has been greatly recognized and investigated worldwide. Since, large scale impact events recognized as biologically resetting events as they cause huge devastation of the nearby area of the impact as a result of the intense heat and pressure and probably alter the global environment, in particular by generating stratospheric dust and/ or soot loading with ensuing global environmental effects. Since, melting of the target rock is the characteristic feature of impact cratering that leads to the formation of glassy material and tiny melt droplets of varied aerodynamical morphology. The ~1.88km diameter Lonar impact structure, Maharashtra, India centered at 17°58′82.5″N 76°30′24.80″E is one of the youngest and well preserved simple impact structure on Earth serves as an excellent terrestrial analogue for the study of impact craters in basaltic crusts of the rocky planets like those which exist on Mars, Moon and other planetary bodies in the solar system. The present study focuses on the postimpact environmental consequences and additionally discusses the magnetic suscesptibilty variations among spherules and impact melts separated from the soil samples collected around the Lonar impact structure with an aim of investigating the magnetic minerals associated with variation contributing to the magnetic susceptibility. In addition, finding the most magnetic glass samples possibly played role in impactor-rich material, opening new perspectives to identify the type of impactor responsible for the glass generation. The result shows that the mass magnetic susceptibility (χLF) value for spherules ranges from 14.11 to 2820.51x10^{-8} m^3 kg^{-1} with an average value of 367.65 x$10^{-8}m^3$ kg^{-1}. While impact melt and target basalt samples showing χLF value from 80.75 to 1785.52 65x10^{-8} m3 kg^{-1} (avg=802.93x10^{-8} m^3 kg^{-1}) and 298.72-1871.83 x$10^{-8}m^3$ kg^{-1} (avg= 1098 x$10^{-8}m^3$ kg^{-1}) respectively. Thus, χLF measurements showed an extreme range of values for spherules with some cases two orders of magnitude; high and low values correspond to magnetic mineral fractions thus providing a rough measure in terms of the concentration of all magnetic minerals having high magnetic remanence. Since, it has been already reported that the target basalts of Lonar impact crater consist of nearly 20-30 vol. % of magnetite while iron-titanium oxides (Fe-Ti oxide) constitute 10 to 20 vol. %, acting as dominant mineral phase that contributed higher susceptibility values to the Lonar impactites that results from shock melting of target basalt during impact. However, the distribution of the Fe bearing mineral phases has been found heterogenous among spherules and impact melt as reflected in the magnetic susceptibility values. In the present study, significantly higher χLF value has been observed in few smaller sized spherules (2-3mm) in contrast to larger once (>3mm) reflects the higher magnetic fractions which is dominantly large amount of magnetite and other Fe-bearing mineral phases. In addition possible contribution of extraterrestrial component also might be leads to the higher susceptibility value.

Keywords: Impact cratering, impact melt, spherule, magnetic susceptibility

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IMPACT OF ENVIRONMENTAL DEGRADATION ON TRIBAL ECONOMY: A STUDY OF JHARKHAND STATE

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The tribal people live in the heart of the nature. The environment nurtures the tribals and they conserve the environment. According to the census 2011, tribal population consisted 8.6 per cent in India. In Jharkhand tribal population represented 24.80 per cent. Environmental degradation has become a major issue of concern during recent years. It has affected the life, livelihood and economy of the tribal people and threatened their survival. The emission of Green House Gases and decline in forest coverage has resulted into the climate change and environmental degradation. It has caused discomfort for the tribal people, increased their cost of living and threat for survival, decline in crop production, social stress and conflict on sharing resources. It is believed that present state of environmental degradation and climate change is human induced. The incidence of drought has increased in entire Jharkhand. The tribals are mainly dependent on natural resources and rain-fed agriculture. Therefore, they have been adversely affected due to climate change and environmental degradation. In this study an attempt is made to find out the impacts of environmental degradation, assess its negative effects on the tribal economy, livelihood insecurity, evaluate the existing coping mechanism and practices including indigenous methods adopted by the tribals for dealing with the adverse consequences of the environmental degradation and recommend policy to set action plans for the adaptation by tribals of Jharkhand for their sustainable development.

Keywords: Environment; tribal; Jharkhand; degradation, sustainable; development

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ASSESSMENT ON PHYSICAL AND ANTHROPOGENIC ACTIVITIES AND ITS IMPACT ON COASTAL SAND DUNES, WEST BENGAL

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Sand dunes are topographical height in the low-lying coastal plain of West Bengal. They protect wave attack in the low-lying areas, shelter land ward communities and assist in the retention of fresh water tables against salt water intrusion .Sand dunes are developed along the coast belt with three basic processes. Supply of sand to the beach plain, aeolian sand transport from the beach to the backshore region and interaction between sand transport by the wind and vegetative growth or distribution .It is useful to regard a dune like a savings account of a bank. At present of the entire coastal ecosystem, sand dunes have suffered greatest degree of human processes. Many dune system have been irreversible altered through the activities of man, both by accident and design. Ecosystem components of the sand dunes are affected by the intensive use of dunes in the coast. Artificial structures like houses, hotels, fishery etc. are disturbing the normal growth of the dunes. Removal of sands by road cutting, grazing the dune in Shankarpur, Mandarmoni areas. The level of grazing pressure is instrumental in determining species composition. Dune plants are destroyed by growth of urbanization, agriculture and coastal defence programme. Through the field investigation and measuring of erosion data it is have been remarkable increasing in last decade. The dunes are totally destroyed by increasing wave action at many places. Accelerated dune erosion by the cyclonic storm, tidal bore and wave action at many places. It has been observed that the front dunes are eroded and also shifted landward at the rate of 6m to 12m/year of this area. Certain conservation measures have been recommended including mechanism of dune maintenance by artificial simulation, dune recreation and control of coastal water pollution from hotel sewage and fisheries waste water.

Keywords: Coastal dunes, coastal erosion, shifting of sand dunes, conservation measures

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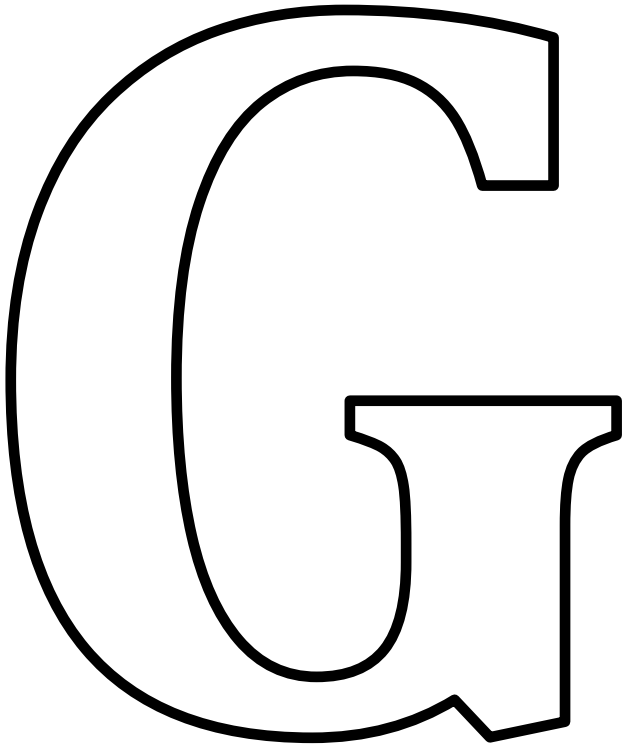

Green Chemistry and Technology

G - 001

MICROWAVE ASSISTED SYNTHESIS: AN APPROACH EMBRACING SUSTAINABLE DEVELOPMENT FOR BIOLOGICALLY POTENT METALLOMACROCYCLES

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Green inventions are environmentally friendly inventions that often involve: energy efficiency, recycling, safety and health concerns, renewable resources, and more. The adoption and use of green technologies involves the use of environmental technologies for monitoring and assessment, pollution prevention and control, remediation and restoration. The emerging area of green chemistry envisages minimum hazard as the performance criteria while designing new chemical processes. Rather than end-of-the-pipe remediation approach, which involves cleaning up of waste after it has been produced, the main objective is to avoid waste generation in the first place. There are different shades of greener processes being developed as we continue exploring alternatives to conventional chemical synthesis and transformations. The desired approach will require new environmentally benign syntheses. The chemistry of macrocyclic complexes has witnessed an outline by individual scientific backgrounds and individual interest due to their analytical, industrial, agricultural and medicinal. The anticancer properties of square-planner platinum compounds have fueled an interest in the chemistry of all the metal complexes. Keeping all these factors in mind we aimed to synthesize and characterize macrocyclic compounds with N_4 –tetraamide ligands. The main emphasis has been given on in vivo studies on male rats by performing biochemistry and fertility test. The aim is also to prevent the toxic effect or abnormal observations of the pesticides and antifertility agents. Good antimicrobial complexes have been selected for antitumour activity. The positive findings will be discussed in detail.

Keywords: green chemistry, waste, macrocylclic**,** N_4 –tetraamide ligands

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G - 002

CARBON DIOXIDE CAPTURE- A CHALLENGE FOR GREEN ECONOMY

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Carbon is in the heart of all life on earth. Yet, managing carbon dioxide releases is one of the greatest social, political and economic challenges of our time. An emerging innovative approach to carbon dioxide management involves transforming it from a liability to a resource. Carbon dioxide capture and utilization (CCU), a concept of turning a greenhouse gas into a useful feedstock, is gaining much attention in recent years. Increasing CO_2 emission into the atmosphere, from fossil fuel combustion and other anthropogenic activities, has forced us to advance for more sustainable and economical routes of chemical syntheses. Instead of developing new chemical catalysts and CO_2-based chemistry, we should perhaps learn from nature. Over the past billions of years, nature has evolved sophisticated mechanisms for carbon concentration, fixation and utilization, manifested through autotrophy. Many organisms, such as photosynthetic and chemolithoautotrophic organisms, display excellent ability in assimilating CO_2 and converting it into complex molecules. Through the use of enabling technologies such as genetic engineering and protein engineering, the range of CO_2-derived bio-based products is expanding at a rapid pace. Chemicals that can be synthesized biologically include bio-plastics, bio-alcohols, biodiesel, to name a few. Continued research on multiple fronts and closed collaboration between scientists and engineers are required to further develop biological systems into viable chemical production platforms. This study is dedicated to exploring both the opportunities and the challenges of applying biological systems in CCU.

Keywords: carbon capture and utilization (CCU), CO_2, protein engineering

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G - 003

E-WASTE A MAJOR ISSUE FOR GREEN CHEMISTRY AND TECHNOLOGY

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Green chemistry and technology deals with the idea to lesser the dispersion of chemicals that are harmful and maximise the recyclability, reusability and durability of a chemical. According to this context there is a major issue that is to be dealt sincerely is e-waste. E-waste or electronic waste is the term used for loosely discarded, surplus, obsolete, broken, electrical or electronic devices. The e-waste has major contribution in the wastes in few past decades. Rapid advancement in science, technology and media has brought enormous changes in the way we organize our lives, our economies, industries and institutions and this results in vast consumer increment as well as production of electronic gadgets. These production takes place without the awareness of the after use consequences and knowingly or unknowingly created a new kind of destructive source for ecology. E-wastes contain many toxic and hazardous elements in it which are dangerous and harmful to health and environment and are posing threats to the mankind by increasing the pollution.

In worldwide 50 million tons of e-waste are produced each year and US EPA report estimates that only 15 to 20% are recycled and rest are burnt or landfills. According to UNEP there will be a rise of approx. 500% from initial date in e-waste in worldwide. India is the 5th largest country of e-waste producer globally and discard roughly 18.5 lakh tons of e-waste per year in which contribution of computer devices are 70%, telecom sector 12%, medical equipment 8% and rest are of electrical equipment. Because India is a developing country with extreme poverty and has vast unskilled manpower ready for doing any work without knowing the hazards is more liable to risks of the E-wastes specially the children involved in this. The paper focuses on the current situation of e-waste in Ranchi; capital of Jharkhand, a developing state of India and suggests the ideas to improve the management of e-waste. Jharkhand is the state with 67.6% literacy rate which produces 1.5% e-waste of India, and the position of Jharkhand is 18th in e-waste producers and very less number of people are aware about the e-waste. We focus the effect on the people specially on the children involved in collecting and dumping process of e-waste and the conditions of the dumping yards of Ranchi. Basically, there is nothing happening related to the recycling process of the e-waste in Ranchi. The status of Jharkhand is that there are no specific state govt. initiatives for tackling the problem of e-waste. We are comparing the situation of Ranchi (population 1,073,440) and Navi Mumbai (population 1,119,477). The case study of e-waste management process in Mumbai is carried out. Also, the future plan of Jharkhand State Pollution Control Board and the rules introduced by the Ministry of Environment, Forest and Climate Change (Govt. of India) and State Govt. are included in this paper. The paper shows the condition that how poor users and common man suffering from the illusion of technology upgradation and producing lot of e-waste.

Keywords: Electronic equipment, Dumping, Recycle, Manpower, Environment Pollution, Toxic Chemicals, Hazardous Elements, E-waste Management

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G - 004

LOW CARBON INCLUSIVE GROWTH KEY TO SUSTAINABLE DEVELOPMENT

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The main objective of public policies in India is to propel India to a global leadership position, while ensuring that no Indian is left behind in the quest for a significantly better quality of life. It is also intended to leverage the massive explosion of talent, entrepreneurship and indomitable energy to catapult this great country to the status of a developed nation. This is the main concept in Inclusive Growth which strongly ensures that every Indian is included in the growth regardless of his caste, creed, gender, sex, economic class and religion. Inclusive Growth focuses on productive employment rather than merely direct income redistribution as a means of increasing income for excluded group. It does not propose a faster growth but a growth which ensures broad based improvement in the quality of life of every citizen especially the poor and downtrodden persons of the society. Equality of opportunities should be provided to all. The main concept of Inclusive Growth is the type of inclusion of the excluded group of the society into the main stream of the society so that they are able to enjoy the benefits of faster economic growth. This concept expands upon the traditional economic growth models to include equity of health, social protection, food security, human capital, environmental quality and other basic needs which are essential for survival. The goals of Inclusive Growth cannot be achieved unless we have a new society with equity at all levels social, economic, political and cultural. Generation of employment of livelihood opportunities, removal of regional & social disparities, poverty alleviation, agricultural & industrial growth and environmental sustainability are the key factors of inclusive growth. Inclusive Growth encompasses a growth process that is environment friendly growth. India's effort in this regard is praise worthy as it is one of the lowest Green-House Gas (GHG) emitters in the world. Low carbon Inclusive Growth is the priority in 12th five years plan. India can reduce its emission intensity by 25% by 2020 as proposed by India at Copenhagen; with a more aggressive effect even 35% reduction is possible even with 8 or 9% growth. Energy efficient appliances, Vehicles, buildings & Industrial processes are needed. Solar, wind & nuclear Technology required for electricity generation sector in future. In 1987 the world commission on Environment and Development to the United Nations (UNCED) was established. This commission published famous Burndt land Report which defined sustainable development as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'. This has been interpreted as meaning that each generation must rely on the use of renewable resources, and to reuse and recycle waste materials before considering taking 'virgin' resources from the earth which cannot be replaced. In this way we must adopt a way of life which passes on the earth's resources undiminished to the next generation. This encompasses the concepts of 'stewardship' of the earth, and living within its' carrying capacity'.

Keywords: Inclusive Growth, Poverty alleviation, Agricultural Growth, Sustainable Development Renewable Resources, Carrying Capacity

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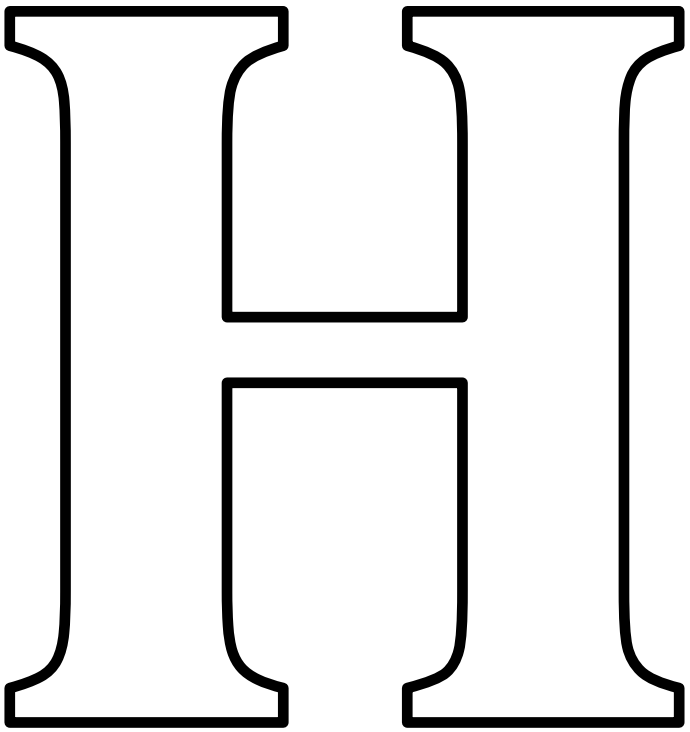

Aquatic Resource Management

H - 001

EVALUATING THE ECOLOGICAL QUALITY STATUS OF INTERTIDAL HABITATS: AN APPROACH TO ADDRESS THE ANTHROPOGENIC STRESS OF PORT BLAIR COASTAL WATER

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Macrobenthic survey is inexpensive and commonlyadopted practice for monitoring of pollution effects worldwide. Based on short term survey conducted in dry period, study address the adverse effect of human activities (sewage disposal, urban, tourism and population) on macrozoobenthic communities. Threeexisting marine benthic biotic indices (AMBI, M-AMBIand BNETIX) owing to common ecological principles, implied to evaluate the health of three, homogeneous (tidal mud and sand flats, narrow range of mean grain size of very fine sand and fine sand)soft bottom habitats of Port Blair coast. Subjective analysis illustrate that, benthic community, commonly present in stressed environment, were associated with urban proximity (Phoenix bay and Junglighat). Tolerant/resistant (*Orbinia* sp. 508 mean ind./m^{-2}), second orderopportunistic (*Polydora ciliata* and *Armandia* sp. 114 mean ind./m^{-2}) and first order opportunistic (*Capitella singularis* 85 mean ind./m^{-2}) to organic matter enrichment were important species at Phoenix bay and together contributed 38.5% of total faunal abundance. Species insensitive to organic matter (*Glycera* sp., *Goniada* sp., *Nephtys* sp., and *Ancistrosylis* sp.) correspond to least disturbed siteJunglighat while species sensitive to organic matter disturbance were found associated with undisturbed and distant site Wandoor. Polychaete (*Axiothella* sp., *Ophelia* sp. *and Scoloplella* sp.*)* and amphipods (Urothoidae, Hyalidaeand Eusiroidea) were dominant and contributed approximately 15% of total faunal abundance. Relatively low mean grain size of fine sand composition (119 micron) and low sand proportion (74.5%) while high silt (19%), clay (6.3%) and organic matter (2%) in Phoenix bay draw distinct line of human induced disturbances which vividly reflected in to biological component. AMBI/ M-AMBIqualify the benthic Ecological Quality Status from undisturbed/high (WD), slightly disturbed\good (JG) to moderately disturbed\moderate (PB). BENTIX took severe notice and qualified the WD good, JG moderate and PB in to poor status. Evaluation of benthic quality by biotic indices were in accordance to the stress gradient of various magnitude. Result suggest that application of marine biotic indices in tropical habitats have ability to give surrogate information of anthropogenic stress and become reliable tools as far as monitoring and restoration of coastal marine environment habitat degradation are concern. However, indices applied in the present study were originally developed to assess the quality status of European water and algorithm are based upon biotic component correspond to cold water. Information of benthic community responses against organic matter disturbances and their inherent natural shift in tropics are largely lacking,in particular intertidal habitats. Their community trend, fashion and structural dynamics are substantially theorized on studies inducted at higher latitude. Though the result of indices gave insight of habitat quality and can be correlated with stress caused by urban and human activities. However, for an effective monitoring and assessment of human pressure, a long term studies including chemical, physical and biological component in to consideration are utmost required and need to be properly addressed.

Keywords: Tropics; Intertidal; Anthropogenic stress; Organic matter; Biotic Indices; Ecological assessment

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H - 002

HYDROBIOLOGICAL AND -CHEMICAL RISK ASSESSMENT OF OPERATION OF SHPs IN ARMENIA: CASE STUDY OF LAKE SEVAN AND ARPA RIVER CATCHMENT BASINS

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Due to the increasing growth in hydropower sector, aquatic ecosystems are seriously threatened by the impact of small hydropower plants (SHPs). Giving priority to the development of economic sphere, the possible environmental effects of SHPs operation have been ignored or little attention has been paid. A similar situation is also observed in the Lake Sevan and Arpa River catchment basins, Armenia. For assessing the hydrobiological and –chemical impacts of SHPs on river ecosystems, phytoplankton, zooplankton and fish studies in the Karchagbyur and Vardenis Rivers of the Lake Sevan catchment basin and organic (BOD_5) and salt (EC) pollution investigations in the Arpa River were carried out. Observations, measurements and sampling were done in the river sites situated upstream and downstream (where certain volume of water was taken in tubes) from the SHPs located on the rivers in different seasons of 2013, 2014 and 2016. The laboratory analyses and field measurements were done by the standards methods accepted in hydrology, hydrobiology and –chemistry.

In the Vardenis River site located downstream from the SHP, the aquatic ecosystem within a distance of a few kilometers was destroyed due to the intake of almost all the quantity of the water by the SHP, and the fish passage system of the SHP had formal nature. Due to the operation of the SHP on the Karchaghbyur River, decreased river velocity and increased water temperature in the site located downstream from the SHP caused changes in the growth rates of planktonic organisms: an increase in the growth of zooplankton led to a decrease in the quantitative and qualitative parameters of phytoplankton in Fall, 2013 and Winter, 2013–2014. In Spring of 2014, the growth rate of phytoplankton according to the observation sites located upstream and downstream from the SHP increased because the river velocity in the site located downstream from the SHP was more favorable for the growth of phytoplankton.

Although no obvious regularity in changes of organic matter pollution degree according to the observation sites situated upstream and downstream from the SHPs located on the Arpa River was observed, however mineral salt pollution degree in the observation site located downstream from the SHPs increased which was probably conditioned by an increase in anthropogenic salt content in the conditions of a decrease in the river velocity and discharge.

The operation of SHPs in the Lake Sevan and Arpa River catchment basins caused unpredicted changes in the quantitative and qualitative compositions of hydrobiological communities in the Karchaghbyur River section, the deterioration of the Vardenis River section as well as the increased level of anthropogenic pollutants in the Arpa River sections. Fish passage systems of SHPs didn't ensure the free migration of fish species along the rivers and negatively affected their natural reproduction.

Keywords: Lake Sevan catchment basin, Arpa River catchment basin, small hydropower plants, hydrobiological effects, hydrochemical effects

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H - 003

Zn, Cu & Pb CONCENTRATIONS IN THE EDIBLE CRAB (*SCYLLA SERRATA)* COLLECTED FROM LOWER GANGETIC DELTA REGION

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The intertidal mudflats of Indian Sundarbans host population of edible crab (*Scylla serrata)* which is harvested in other tropical countries. We investigated the occurrence of three heavy metals (Zn, Cu and Pb) in tissues of this crustacean species as well as in the water of Sundarban ecosystem. The stations in the western sector of the deltaic ecosystem are affected by industrial effluents in their catchments making the area an ideal site for such study as the central and eastern sectors are in the Reserve Forest Area. A study was conducted to assess the concentrations of heavy metals, such as zinc, copper and lead in estuarine water as well in the muscle of a very popular and commercially important crab species of Gangetic delta region namely *Scylla serrata* (commonly called mud crab) for twelve consecutive years (2005-2016). The programme was undertaken in and around the Indian Sundarbans mangrove forest at the apex of Bay of Bengal. This is a unique ecosystem with significant spatial variation of aquatic salinity between the western and central sectors. The western sector is relatively less saline owing to freshwater discharge from the Farraka barrage constructed in 1975 in the upstream region of the Hooghly estuary. The central sector, on the other hand is characterized by high aquatic salinity due to complete obstruction of the fresh water flow through Ganga-Bhagirathi-Hooghly channel. The obstruction is caused due to heavy siltation in the Bidyadhari River since late 15th century. We observed significant spatio-temporal variations in dissolved heavy metal and muscle metal of mud crab collected from four different sampling stations (two each in western and central sectors) during the study period of 12 years span ($p < 0.01$). The low salinity and intense industrialization in the Hooghly estuarine stretch is responsible for high concentrations of heavy metals in the mud crab muscle sampled from the stations in the western Indian Sundarbans. In both the sectors, heavy metals accumulated in the mud crab muscle as per the order zinc > copper > lead, which is similar to the order in the ambient estuarine water.

Keywords: *Scylla serrata*, zinc, copper, lead, Indian Sundarbans

H - 004

POPULATION COUNT AND CONSERVATION STRATEGIES OF CROCODILE *CROCODILUSPALUSTRIS* (LESSON, 1831) FROM WARANA BASIN, WESTERN MAHARASHTRA, INDIA

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In recent ten to twelve years, crocodile *Crocodyluspalustrius*(Lesson, 1831) was reported from Warana basin by farmers, newspaper reporters and others. There are also reports of nesting of this species in River Kadavi at Sarud, Tal-Shahuwadi, Dist-Kolhapur, Maharashtra, India in May 2007 (Patil et al 2012). In present investigation, we have tried to count the crocodile population from Warana basin, by two survey methods Daylight Ground Counts and Night Counts. Similarly, survey is conducted to frame strategies for protection and conservation of the same. Thesurvey is conducted for two years from January to June 2013 and 2014. Total 198.8 km of the Waranabasin including its three tributaries Kanasa, Kadavi and Moranaare surveyed. Total 29 crocodiles by Daylight ground count method and 52 crocodiles by Night counts method are reported. During survey, local farmers were asked about the presence of crocodile in Warana basin. By the interviews of number of peoples, it is concluded that the farmers are frightened by the presence of crocodile as there are few human-crocodile conflicts happened in the basin. Hence it is very necessary to frame strategies for protection and conservation of the crocodile *Crocodyluspalustrius.*For the protection and conservation of crocodile *CrocodilusPalustris* from Warana basin, awareness in the society is must. To build an inclusive constituency for the conservation of this species, it is essential to communicate a clear and, perhaps even more important, sincere conservation ethic.

Keywords: Warana basin, Population count, Crocodile Survey, Daylight Ground Counts, Night Counts, Conservation strategies

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H - 005

SEASONAL DYNAMICS AND DIVERSITY OF PHYTOPLANKTON WITH CORRELATION OF WATER QUALITY PARAMETERS OF LOWER DUDHANA DAM, DIST-PARBHANI (M. S.) INDIA

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The present study deals with phytoplankton diversity, density and there correlation with water quality parameter of lower dudhana dam at eight different sampling station (A, B, C, D, E, F, G and H) from January to December -2013. The total 23 species were recorded from 04 orders belongs to Chlorophyceae, Bacillariophyceae, Cyanophyceae and Euglenophyceae among these Chlorophyceae was found dominant followed by Bacillariophyceae, Cyanophyceae and Euglenophyceae. The phytoplankton shows seasonal dynamics, maximum population recorded in summer season and minimum population recorded in monsoon season. Diversity indices indicated that lower Dudhana dam although not immaculate, was not polluted.

Keyword: Chlorophyceae, Bacillariophyceae, Cyanophyceae, Euglenophyceae, Lower dudhana dam, Diversity indices.

H - 006

MORPHOLOGICAL AND ANATOMICAL EFFECT OF SODIUM DODECYL SULPHATE ON THE AQUATIC PLANTS *HYDRILLA* AND *ECHORNIA*.

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Among the water pollutants detergents contribute a major part since detergents are used for domestic purposes, washing clothes, vehicles, and pesticide formulations. Detergents enter into water bodies via sewage works. Detergents have poisonous effects in all types of aquatic life if they are present in sufficient quantities. They lower the surface tension of water leading to increase absorption of chemicals, phenols and pesticides. Phosphate in detergent leads to algal bloom which release toxins and deplete oxygen in the water bodies. There have been reports that Sodium Dodecyl Sulphate (SDS) affects growth of plants and the chlorophyll content. *Lemna* is more tolerant to SDS. in this research the morphological and anatomical effect of Sodium Dodecyl Sulphate has been studied. It was found that SDS affects the growth, discolouring of leaves, chlorophyll content and cell damage leading to death to plants.

Keywords: Sodium Dodecyl Sulphate, Effect, anatomical, morphological, aquatic plants

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H - 007

FISH DIVERSITY OF BHIMA RIVER

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The present study deals with the fish diversity of Bhima River (District Pune, Maharashtra) during January 2013 to December 2014. The study revealed occurrence of 28 fish species belonging to 5 orders, 11 families and 18 Genera. The predominant orders were Cypriniformes, Siluriformes and Perciformes. Eleven species were recorded from order Cypriniformes.

Keywords: Bhimariver, Cypriniformes, Bhigwan, Fish fauna

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H - 008

ICHTHYOFAUNAL STUDY OF KASURA DAM, DISTRICT JALNA, (M.S.) INDIA

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Present Ichthyofaunal study was carried out during January 2014 to Dec 2014. This Fresh water body used for drinking, domestic, agriculture and fisheries purposes by Tq-Partur Dist-Jalna. The results of present study reveal the occurrence of ichthyofauna belong to 07orders 10 families, and 21 species, out of 21 species Cyprinidae family was dominant of all with 9 species.

Keywords: Ichthyofauna, Variety, Abundance, dominant and Kasura dam

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H - 009

BIOMAGNIFICATION: CAUSES AND EFFECTS ON AQUATIC ECOSYSTEM

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Discharge of toxic chemicals and contaminants including heavy metals like DDT, polychlorinated biphenyls, mercury and arsenic etc. causes accumulation of toxic chemicals in tissue of organism at successive higher levels in food chain is called biomagnification. The major sources are chemicals present in pesticides (i.e. heavy metals like Cu, Pb and Hg) mining generated elements like selenium & sulphide, organic contaminants, industry discharged effluents, automobile emissions that return as rainfall etc. Process starts when phytoplanktons absorb affected water and with time toxin accumulates and reach high concentration of 200 parts per trillion. When zooplanktons consumes concentration of toxin increases upto 2 parts per billion. Small fishes when consumes it toxic concentration increases to 20 parts per billion. Further when large fish feeds upon it toxicity concentration increases 80 to 100 parts per billion. Finally in top food chain toxicity is increased by 10,000 to 15,000 parts per billion. Disastrous results occur because it readily destroys ecosystem by damaging flora & fauna. In waterbodies there are many plants, phytoplanktons and algae with enriched medicinal values but due to biomagnifications they are on edge to be lost. Even fauna are being harmed due to accumulation of Se, Hg which induces sterility. It seems in future we will tell fables of fishes to generations. Birds are also becoming prey as quality of egg's shell is getting thinner and instead of being incubated they are crushed. Birds like bald eagle, peregrines are extinct in some part of world. Coral reef is destroyed hence related activities like spawning, dwelling and food of aquatic members are limited too. It causes loss of biodiversity and culture too.

Sanctity of food chain is blemished when chemicals reach water bodies and are taken up by various marine organism which results in disruption of interconnected relationship within food chain. When water reaches to plant via evaporation it gets toxicated too and if consumed by top animals lead to deadly diseases. Thus top carnivorous are great sufferer. All over world total 31 countries are facing biomagnification. Severe case has been reported from California which lost great hue of biodiversity. Japan lost many life due to minamata. In Jharkhand Subernarekha is also contaminated with heavy metals. Study revealed presence of zinc (20.6/kg) in planktons and in molluscs zinc (4.6g/kg). Remedies of it are effluents should not be discharged into waterbodies, avoid chemical fertillizers and switch over to bio fertilizers, sewage water should not be discharged into waterbodies, mycorrhizal treatment system. Thus for survival we need to cease biomagnification.

Keywords: Ecosystem, Effluents, Mycorrhizal treatment, Bio fertilizers.

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H - 010

AQUACULTURE PHYSICO-CHEMICAL PARAMETERS OF NIZAM SAGAR DAM WITH RESPECT TO FISH PRODUCTION PHYTOPLANKTON, ZOOPLANKTON

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The main purpose of Nizam sagar dam is fish culture, irrigation, drinking, agriculture and also for domestic purpose. The present investigation deals with the physica-chemical parameters of Nizam sagar dam for fisheries management and culture of fish. The study was carried out for a period of twelve months during the academic year 2014. The parameters such as water temperature. pH, total alkalinity, dissolved oxygen and carbon dioxide were estimated. The pH shows alkaline trend in Nizam sagar dam. The water of Nizam sagar dam is found to be more suitable for fish culture.

Keywords: Reservior, Physico-chemical parameters, fish culture

H - 011

COMPARATIVE STUDY OF SYNTHETIC HORMONES OVAPRIM AND CARP PITUITARY EXTRACT USED IN INDUCED BREEDING OF INDIAN MAJOR CARPS

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In present study during 2008- 2009 observed the spawning response of ovaprim compared with pituitary extract in Indian major carps, at fish breeding center at Jaikwadi, Paithan Dist. Aurangabad (M.S) India. Total ten trial doses of ovaprim were used in induced breeding and ten trial doses of Carp Pituitary Extract (CPE) used for induced breeding in Indian major carps i.e *Catla catla, Labeo rohita and Cirrhinus mrigala.* The percentage of fertilization ranged (88.11 - 97.94%) was found with ovaprim treatment. and (53.19 - 85.48%) with pituitary extract treatment. The percentage hatchling ranged (74.70 - 95.92%) with ovaprim treatment and (60 - 58.82%) with pituitary extract treatment.

Keywords: Carp Pituitary Extract, Ovaprim

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H - 012

CYCLIC CHANGES IN OVARIAN MATURATION AND HISTOLOGICAL OBSERVATION IN INDIAN MAJOR CARP CATLA CATLA [HAM]

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Annual reproductive cycle of female *Catla catla* was studied during the (January 2009 December 2009) through gross and histological studies. GSI was observed (13.00±9.30 %). On the basis of gross and histological studies, seven ovarian stages namely, i) immature/resting ii) regenerating iii) developing iv) maturing v) mature/gravid vi) regressing and vii) regressed were distinguished. Based on GSI studies, spawning seem to for a period (late June-early September). Histological studies revealed six stages of oocyte development namely i) chromatin nucleolar ii) perinucleolar iii) cortical alveolar iv) early vitellogenic v) late vitellogenic and vi) early germinal vesicle movement. The present studies describe the morphological and histological changes in the ovaries of *Catla catla*. The annual breeding cycle of the fish has been divided in to four stages in the following month of year i.e i) the preparatory phase (January – march) ii) pre spawning phase (April – June) iii) spawning phase (July – September) iv) post spawning phase.

Keywords: *Catla catla*, Morphological, histological changes, GSI, annual breeding cycle

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H - 013

ROGOR INDUCED HISTOPATHOLOGICAL CHANGES IN THE GILLS OF FRESHWATER FISH *PUNTIUS STIGMA* FROM SUKHANA RIVER, AURANGABAD (M.S) INDIA

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Histological biomarkers of toxicity in fish organs are a useful indicator of environmental pollution. The histological effects of rogor, an organophosphate insecticide, on the gill tissues in *Puntius stigma* were determined. The fishes *Puntius stigma* were exposed to lethal concentrations at 96 hrs LC_{50} and sub lethal concentrations at (1/5, 1/10 and 1/15 ppm) of rogor for 30 days. The fishes shows severe histological changes in the gill lamellae such as bulging, epithelial hypertrophy, fusion of secondary lamellae, hemorrhage, curling of lamellae, swelling of pillar cells, swelling of chloride cells.

Keyword: Rogor, Histopathological changes, gills, *Puntius stigma*

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H - 014

PHYSICO-CHEMICAL CHARACTERISTICS AND ZOOPLANKTON DIVERSITY IN THE RESERVOIRS (DAMS) OF DHARMAPURI DISTRICT, TAMIL NADU, SOUTHERN INDIA

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The present study dealt the hydrobiological investigation in a selected reservoirs (Dams) of Thoppaiyar, Nagavathy and Panchapalli of Dharmapuri District, Tamil Nadu, Southern India. The seasonal variations in physico-chemical characteristics, species composition and diversity of zooplankton were studied for a period of one year from December, 2014 – November, 2015 on monthly interval covering four seasons viz. summer, pre-monsoon, monsoon and post-monsoon. In the present study, totally 55 species of zooplankton include 19 species of rotifer, 13 species of cladocera, 15 species of copepoda and 8 species of ostracoda were recorded at Thoppaiyar reservoir. A total of 29 species of zooplankton was noticed at Nagavathy reservoir which includes 11 species of rotifer, 7 species of each cladocera and copepoda and 4 ostracoda. At Panchapalli reservoir, 31 species of zooplankton were recorded which include 10 species of rotifer, 9 cladocera, 7 copepoda and 5 ostracoda. The zooplankton percentage composition was found to be in the following order at Thoppaiyar (rotifera 41% > copepoda 29% > cladocera 22% > ostracoda 9%), Nagavathy (rotifera 39% > copepoda 30% > cladocera 26% > ostracoda 6%) and Panchapalli (rotifera 33%, > copepoda 29% > cladocera 28% > ostracoda 9%). The physico-chemical characteristics of reservoir water were positively correlated with zooplankton population. The present study concluded that the distribution, diversity and population of rotifera was found dominant in all the three reservoirs. The maximum population was found in summer season while minimum incidence was noticed in monsoon season.

Keywords: Thoppaiyar reservoir, Nagavathy, Panchapalli, Rotifera, Copepoda

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H - 015

CHEMICAL COMPOSOTION OF A FEW AQUATIC PLANTS IN ASSOCIATION WITH ANIMALS IN FRINGE AREA OF KAZIRANGA NATIONAL PARK, ASSAM

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A study was conducted to observe the chemical composition of seven different aquatic floras to evaluate nutritional potential on few fauna. The study area was fall under eastern aquatic fringe area of Kaziranga National Park, Assam. Here the associated aquatic plants with their respective fauna were (i) *Nymphaea* (ii) *Azolla* (iii) *Trapa* (iv) *Pistia* (v) *Hydrilla* (vi) *Hymenachne* grass and (vii) Water Hyacinth. Regarding association few fauna have been observed common to few flora and few others were particular. In *Nymphaea* lesser whistling ducks association, the faunal growth seen as degraded year by year. In association of cattle, duck and carp fish with *Azolla*, the existence of these floras remain same. Like this way cattle and birds with *Trapa* the associational existence were gradually decreased. Uses of *Pistia* by duck and waterfowl the population of duck increased and the rate of existence of *Pistia* remain almost same. Use of *Hydrilla* plant by carp fish, it is revealed that the rate of *Hydrilla* plant become less although markedly water Hyacianth used by cattle is more, yet the succession of these species growing rapidly during their growth season and they may disturbed on other aquatic vegetation. In consumption of *Hymenachme* grass by cattle and other grazing animals the existence of these grass species also remain same as year by year due to the cattle association. In context with the floral and faunal association a proximate analysis reveal that all the seven (7) plants had dry matter below 19%. Crude carbohydrate content in *Nymphaea , Azolla, Trapa, Pista, Hydrilla , Hymemachne* grass and water Hyacinth grass were 15.8%, 14.0%, 15.0%, 12.0%, 12.7%, 18.1%, 11.0% respectively.

Keywords: Fringe-area, Flora, Fauna, Existence, *Hymenachne, Nymphaea*

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H - 016

FISH AND FISHERIES OF GOVINDGARH LAKE, REWA (M.P.) INDIA, IN REFERENCE TO HYDROBIOLOGICAL PARAMETERS- A CASE STUDY

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This study has been performed in 2004- 2015 for fish and fisheries of Govindgarh lake of Dist. Rewa, Madhya Pradesh, India (24° 24'N and 81° 15'E), a reservoir of small category having 285 ha water spread area used for irrigation, fisheries and peoples' easement purpose. Nitrate 2.8-4.32 mg/l, phosphate 1.85 to 4.35 mg/l and Chloride was 57.18-92.28. Range of BOD was 3.2 to 5.8 and COD 13.2 to 44.4, GPP 5.72 gCm^3d^{-1} – 6.24 gCm^3d^{-1}. Fish catch statistics reveals fluctuations in yield rates varying from 0.4 to 26.4 kg /ha at an average of 15.92 kg /ha. Percentage composition of plankton was 80.51% of phytoplankton comprising Bacillariophyceae (30.42%) followed by Cynophyceae (29.41%), Chlorophyceae (18.73%) and Dinophyceae (2.44%) and 19.49% was zooplankton as Protozoa (3.02%), Copepoda (6.03%) Cladocera (3.74 %) and Rotifera (5.81%). Abundance of Azolla, Pistia, Eichornia, Hydrilla, Chara and Myriophyllum and species of Spirulina, Microcystis and Anabaena among the plankton is an indication that the lake is on its road to eutrophication. Cypriniformes was the dominant order constitutes (71%), out of them family Cyprinidae represents (56.14%), family Balitoridae and Cobitidae both represents (1.75%) each, family Bagaridae (8.77%), Siluridae and Schilbeidae (3.50%) each, followed by order Perciformes represents (8.00%) including Amabssidae (3.50%), Percoidae (5.01%), Nandidae (3.50%) while Gobidae represents (1.75%). Clupeiformes (5.00%) Cyprinodontiformes constitute (3.0%) Synbrnchiformes (3.0%), Beloniformes (3.0%). Study on fish catch statistics reveals fluctuations in yield rates varying from 0.4 to 26.4 kg /ha at an average of 15.92 kg /ha. Decline in fish yield from the lake (26.52kg/ha -18.36kg/ha till 2005 and 4 to 6 kg/ha in 2006 to 2008. After the study, it is felt that there is the need of important steps to be initiated as per WHO guidelines for an effective result.

Keywords: Govindgarh Lake, Fish fauna, primary productivity, Secondary productivity, Physico-chemical factors

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H - 017

INTERACTIVE EFFECT OF SOME HEAVY METALS ON OXYGEN CONSUMPTION OF FRESH WATER FISH: RASBORA DANICONOUS

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Changes in oxygen consumption have been measured as a response to toxicant that the rate of respiratory movements increased in the presence of hydrogen sulphide showed that the initial reaction of fish might be an increase or decrease in rate of opercular movements depending on the pollutants. In conclusion rate of oxygen consumption can be used as a biochemical parameters to assess the impact of heavy metal pollutant on the freshwater fishes. In the present investigation therefore impact of Zn, Pb, Ni, exposure on oxygen consumption of *Rasbora daniconious* lethal concentration of heavy metals (LC_{50}values of 96 hrs.) the concentration of lead acetate, zinc sulphate, nickel chloride, lead acetate, nickel chloride and lead acetate and zinc sulphate and nickel chloride were 4.22, 6.26, 29.22, ppm respectively. The rate of oxygen consumption was at 24 hrs. of exposure to lead acetate, zinc sulphate, nickel chloride, lead acetate and zinc sulphate, lead acetate and nickel chloride were0.1752, 0.1795, 0.1852, ml/gm/hrs/lit respectively. It was found that oxygen consumption decreased after acute treatment as compare to that of control fishes. The rate of oxygen consumption ranged from the oxygen consumed by fish was measured at an interval of 24, 48, 72 and 96 hrs. of interval was found that oxygen uptake significantly decreased. The kinetics models of rate of oxygen consumption can be developed to correlate the levels of metal pollutants in the aquatic ecosystems and rate of oxygen consumption of bioindicator species such as *Rasbora daniconious.* It is a quite clear that all the heavy metal treated fishes *Rasbora daniconious* showed in decreasing manner in oxygen consumption after acute treatment.

Keywords: Heavy Metals, Oxygen Consumption, *Rasbora daniconious*

H - 018

A COMPARATIVE STUDY OF FLUCTUATION IN PHYTOPLANKTON ABUNDANCE DUE TO WATER POLLUTION OF SOME PONDS OF DALTONGANJ, PALAMU- JHARKHAND

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Pond is one of the most important water bodies, which regulate the existence of aquatic flora and fauna and finally regularizes the human beings. It shelters different types of phytoplankton, zooplankton, aquatic plants and animals. Pond has wide implications on human population as well as the flora and fauna of the area. Due to release of municipal and domestic sewage, garbage dumping, washing of cloths, bathing and cattle movement, water of the studied ponds is subject to contamination. The quality of water affects the species composition, abundance and productivity and physiological condition of aquatic communities. The present study deals in the physico-chemical nature of two Ponds and availability of phytoplankton in these ponds. The change of water environment due to pollution brings about rapid changes in individual organism, population and communities. A special kind of phytoplankton may become dominant in a particular water environment. The effect of pollution may lead to eutrophication that can be traced out by the study of growth of phytoplankton and by their production potentialities.

Keywords: phytoplankton, pond, water pollution, Jharkhand, eutrophication

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H - 019

STUDY OF HAEMATOLOGICAL PARAMETER OF SOME FRESH WATER FISH OF LOHOPE LAKE VASAI DIST. PALGHAR INDIA

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Present study was designed to investigate seasonal (winter, summer and rainy) fluctuation in hematological parameters in the blood of fresh water fish *Catla catla*, *Oreochromis mossambicus* and Libero *rohita*. The Haematology of fish of Lohope Lake in Palghar district, Maharashtra, has been studied from the period february 2012 to january 2014. No significant change have been observed in RBC Count, Hb, MCHC, MCV, ESR and while Significant change in WBC in winter and rainy season was observed.

Keywords: *Catla catla, Oreochromis mossambicus, Labeo rohita,* hematological parameters, Lohope Lake

H - 020

ACCUMULATION PATTERN OF CHROMIUM (VI) IN DIFFERENT TISSUES OF *LABEO ROHITA* (HAMILTON, 1822) IN SUBLETHAL DOSES

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A 96 hours semistatic bioassay was done to estimate the LC_{50} value of *Labeo rohita* (Hamilton, 1822) fingerlings (12.3±2.74 g) for hexavalent chromium. The mortality percentage ranged from "zero'' to 90 during acute exposure at different experimental concentrations. 96 hours LC_{50} value of *Labeo rohita* (Hamilton, 1822) fingerlings was found to be 30.364 mg L^{-1} (at 95% confidence level). MATC (Maximum Allowable Toxicant Concentration) value of chromium for *Labeo rohita* (Hamilton, 1822) or Rohu fingerlings was found to be 0.607 mg L^{-1}. After this, fish samples of same weight group were exposed to sub lethal concentrations ($1/10^{th}$ and $1/50^{th}$ 96 hours LC_{50}) to determine the accumulation pattern of chromium (VI) in the experimental organism. The accumulation pattern was found to be as follows: gill>intestine>kidney> liver> muscle. The highest value of chromium has been found in gills after 60 days' exposure for the 1/10th LC_{50} induced experimental group. One way ANOVA ($p<0.05$) tests revealed that there are significant differences between the accumulation rate of chromium in different tissues *viz.,* gills, muscles, kidney, intestine and liver of *Labeo rohita* (Hamilton, 1822) when exposed to different concentrations *viz.,* control (0 mg/L), $1/10^{th}$ and $1/50^{th}$ of 96 hours LC_{50} value. Pearson's correlation matrix between the accumulation rate of chromium in experimental organs in different concentrations *viz.*, $1/10^{th}$ and $1/50^{th}$ of 96 hours LC_{50}, revealed that strong positive correlation is there between all the organs viz., gill & muscle (0.838), gill & kidney (0.898), gill & intestine (0.922), gill & liver (0.925), muscle & kidney (0.950), muscle & intestine (0.918), muscle & liver (0.903), kidney & intestine (0.979), kidney & liver (0.968) and intestine & liver (0.989). Thus, it can be said that muscular part of Rohu fingerlings is comparatively safe to consume as speciation of chromium is less in muscle.

Keywords: semistatic bioassay, *Labeo rohita* (Hamilton, 1822), MATC, Pearson's correlation, LC_{50}, gill, muscles, kidney, intestine, liver

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H - 021

A STUDY ON THE VULNERABILITY OF THE RIVER SARASWATI AND ITS FISHING COMMUNITY AT TRIBENI, HOOGHLY, WEST BENGAL

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A profilistic study has been done on the socio-economic status of the scheduled caste fishermen community of Tribeni (22.9901° N, 88.3943° E), Hooghly, West Bengal, who depend on the rivers Saraswati and Ganges for their livelihood. The river Saraswati receives industrial and organic effluents throughout the year resulting in deterioration of water quality and reduction of fish availability. The survey was conducted for collecting the primary data directly from the fishers through personal discussion and a pre-tested questionnaire on various aspects of the socio-economic conditions, *viz.* age composition, educational status, fishing equipments, availability of fish species and economic condition etc. Sampling of surface water of Saraswati river from three different sites (Sites 1, 2 and 3 are near the confluence of Ganges and Saraswati, 100 m and 200m apart from the confluence, respectively) at Tribeni, Hooghly was done during January, 2016 to December, 2016 for monitoring of pH, dissolved oxygen, organic carbon and chemical oxygen demand following the standard methods (APHA, 1998). It was observed that pH, dissolved oxygen, organic carbon and chemical oxygen demand of three sampling sites of the river at Tribeni were in the ranges of 5.0-6.3, 2.6-4.5 mg/L, 12.78-18.4 mg/L and 70-150 mg/L, respectively, during winter season. The values were comparatively better during the monsoon due to the effect of dilution. The result suggested that the water quality of the river is not conducive for growth and reproduction of fishes, sensitive species in particular. Most of the respondents were facing a huge financial crisis due to reduction of fish species diversity in the river Ganges and non-availability of fishes throughout the year in the river Saraswati and in addition to that the odour of water of the river due to pollutant and microbial overload are causing health hazards to those people. After taking the interview of some senior fishers we came to know that about 15 years ago a huge variety of fish species for example Singhi *(Heteropneustes* sp*.)*, Bele *Glossobius* sp*.)*, koi *(Anabas testudineus)*, rohu *(Labeo rohita)*, magur *(Clarias batrachus)*, catla *(Catla catla),* Tengra *(Mystus vittatus vittatus)*, lata *(Channa punctata)*, Mrigal *(Cirrhinus mrigala),* Gule *(Pseudapocryptes lanceolatus)*etc. were abundant in this river but in recent years availability of fish fauna reducing remarkably. The study has confirmed that proper steps should be taken by the policy makers for restoration of water quality of the river and thereby supporting the vulnerable fishers for their livelihoods and uplifting the socio-economic condition.

Keywords: River Saraswati, Socio-economic status, Pollutant, Fishermen community, Fish availability

H - 022

OSTEOLOGICAL CHARACTERIZATION OF GENUS *PUNTIUS* RECORDED FROM SIX RIVER SYSTEMS OF SOUTHERN WESTERN GHATS, INDIA

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Around the world the importance of freshwater cyprinid fish community and their fossil history are greatly interested to many ichthyologists and other scientists. Well-preserved fossils can increase knowledge concerning the primitive or derived morphology of osteological characters used in systematics. The osteological characters clearly exhibit themselves and also exhibit the variation within and between the species of ambiguous genera, further helping to validate or refute claims of species identity. This paper provides information on the osteological characterization of Genus *Puntius* with respect to six river systems of Southern Western Ghats. Fishes were collected using cast net, dip net, gill net and drag net from various streams and rivers of Southern Western Ghats. At most care was taken not to damage the species while collecting. Osteological study was carried out by the method described by Taylor & Van Dyke (1985). After clearing and double staining, the specimens are observed under the stereo microscope and photographed using digital camera. 29 morphometric and meristic osteology characters were taken based on the methods described by Rainboth (1996) and Harrington (1955). Principal component analysis and cluster analysis were performed using the data to group the species and to know the similarity between the species. XLSTAT and SPSS software were used for statistical analysis. Comparing all the species it was observed that the species were grouped into three groups. The first class has 10 species *P. mahecola, P. chola, P. bimaculatus, P. dorsalis, P. melanampyx, P. fasciatus, P. ticto, P. denisonii, P. sophore, P. conchonius.* The second class has 4 species; *P. filamentous, P. saranaspirulus, P.amphibious and P. ophicephalus.* The third class has only one species *P. carnaticus* well supporting the observations of Shantakumar&Vishwanath (2006) in regard to the placement of *P. sarana*and *P. sophore*under two groups and Jayaram (1991) stating that species of *Puntius* were classified under 10 groups where the larger *Puntius* species group is distinct from the smaller brightly and beautiful coloured species.

Keywords: osteological, Genus *Puntius,* six river systems, Southern Western Ghats

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H - 023

DIVERSITY INDICES OF THE FRESHWATER PHYTOPLANKTON COMMUNITY IN RANCHI LAKE, JHARKHAND

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The present work deals with the population and limnological study of phytoplankton community in Ranchi Lake collected monthly during March 2009 to February 2011. Phytoplankton have always been considered as the prime group for the study of ecology and all the physical, biological and chemical changes taking place within the water body. Phytoplankton are the autotrophic organisms which carry out photosynthetic activity on earth forming the base level in an aquatic ecosystem. The physico-chemical environment of phytoplankton in Ranchi Lake, its seasonal periodicity and interrelationships of some parameters are primarily associated with sewage contamination. Present investigation deals with the the qualitative and quantitative structure of the algal community in Ranchi Lake comprising 126 species of phytoplankton belonging to 58 genera (12 Cyanophyceae, 34 Chlorophyceae, 7 Bacillariophyceae, 2 Euglenophyceae and 3 Dinophyceae). Estimation of values of various diversity indices like Shannon-Weaver diversity index, Evenness index, index of Dominance and Species Richness index also include an informative awareness to detect the trophic state of the water body. As a result of the present investigation it was concluded that sewage contamination causes a change in concentration of physico-chemical factors. The fluctuations in these physico-chemical parameters affect the quality of water and seasonal fluctuation in the phytoplankton composition.
The data present here can be used for biomonitoring the pollution level in this region. The author is of the view that the present report will help in taking suitable measures to check damage to biodiversity and other natural values. The study will also give additional information leading towards better ecological management of the aquatic assets.

Keywords: Limnological, ecological, seasonal variation, pollution, species richness

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H - 024

SEASONAL VARIABILITY OF ZOOPLANKTON SPECIES IN THE KAVARATTI LAGOONS OF LAKSHADWEEP ARCHIPELAGO, INDIA

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Kavaratti is one of the coral lagoons having major primary productivity in the Arabian Sea. The distribution of zooplankton communities were studied along with the environmental influencing factors through in-situ survey and water sampling analysis. Samples were taken from various locations of the study area during pre and post monsoon for the year 2014 and 2015.The growth of zooplankton communities are mainly response to availability of nutrients and primary productivity (Phytoplankton) and their spatio- temporal dynamics. The result reveals that the zooplankton assemblages of copepods are dominated in major parts of the area at the rate of 38.35%.Their communities contain the following species include *Accrocalanus gibber, Nannocalanus minor* and *Acartia danae.* Maximum concentrations of species diversity were found during premonsooon and summer that shows a positive correlation with salinity and sea surface temperature. Silicate and nitrate loadings having a significant contribution in determination of copepodan distribution.The Pearson correlation analysis shows a significant impact of nitrate, temperature and salinity on zooplankton growth and productivity.Hierarchial cluster analysis also proves above the result. The pattern of silicate loading (7.5 to 9.2 μmol L^{-1}) in associate with higher salinity and lower sea surface temperature is considered as favorable condition for higher productivity of zooplankton in the study area.

Keywords: Zooplankton, Copepods, Lagoon

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H - 025

STORED CARBON IN *EXCOECARIA AGALLOCHA* IN AND AROUND INDIAN SUNDARBANS

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Excoecaria agallocha, a common mangrove widely distributed in Indian Sundarbans was considered in the present study to estimate biomass and stored carbon for five successive years (2011 – 2015). The two sectors (western and central) in and around Indian Sundarbans are drastically different with respect to salinity on account of massive siltation that prevents the flow of fresh water of the River Ganga to the central sector of Indian Sundarbans. The biomass and carbon content of the above ground structures (stem, branch and leaf) of the species vary significantly with locality ($p < 0.01$), the values being more in the high saline central sector on account of higher stem biomass. The tolerance of *Excoecaria agallocha* to high saline environment of lower Gangetic delta is confirmed.

Keywords: *Excoecaria agallocha,* carbon content, Indian Sundarbans, salinity

H - 026

HYDROLOGICAL AND GEOLOGICAL STATUS OF OUSTERI WETLAND: TO CONSUME OR TO CONSERVE?

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Ousteri Lake is a seasonal wetland which receives water from Suthukeni dam by Suthukeni canal and also as run-off from the lake basin. The present paper examined the hydrological and geological status of the ouster wetland to identify whether the wetland is in a condition to be conserved or to not. The surplus water from the Veedur dam located in the Villupuram District of Tamil Nadu State is the main source of water to the Suthukenni channel. Based on the details available from the Public Works Department the area belongs to free catchment and intercepted catchment of the lake in total work out to 15.54 km^2 and the circumference is 7.3 km. The total capacity of the lake is 540 million cu. ft. and the full tank level is 14.2 m. The average of rainfall over the 100 years is 1461.17 mm. Apart from agriculture the Ousteri lake recharges the major aquifer of Vanur – Ramanathapuram sandstone, which is one of the important aquifers from where the total population in Puducherry getting its drinking water. The Landsat satellite image of Ousteri lake having 30 meter pixel resolution was taken and classified into four land use/land cover classes namely, water body, settlements, vegetation/agriculture and scrub/fallow respectively. An area of 5 to 8 km all around the Ousteri wetland was considered for comparison and assessment of land use changes. The land use/land cover status of Ousteri lake and its environs showed that vegetation/agriculture class occupied more area followed by scrub/fallow. The settlement class seen at the mainly at the south-east side of the lake occupied considerable area. Apart from Ousteri Lake few more natural tanks also occupied considerable amount of area in this region. The Gingee River is flowing at the south west of the lake.

Keywords: Wetland, Performance Evaluation, Evaluation Index System, Conservation

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H - 027

CURRENT SCENARIO OF PHARMACEUTICAL AND PERSONAL CARE PRODUCTS (PPCPS) IN INDIAN WASTEWATER TREATMENT PLANT (WWTP) AND SEWAGE TREATMENT PLANT (STP) EFFLUENT- A REVIEW

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Pharmaceutical and Personal care products (PPCPs) are the type of chemical compounds that refers to products used by individuals for personal health/well-being or for cosmetic purposes. The detection of PPCPs in different environmental matrices such as sediments, surface water and soil has instigated great environmental concern due to toxicological effects associated with them. India is the world's second most populated country. Due to its economic growth and population, production and import for PPCPs is inevitable. The mal-handling of such compound may lead to PPCP contamination in different environmental media. This review aims to present an overall contamination status of the Indian environment based on the past studies done in this regard. Previous risk assessment studies shows that releases into surface water is majorly from WWTPs and STPs which acts as the major path way. Other exposures include manure application and disposal of unused medicines to landfills. By this literature survey we can come to a conclusion that though data on PPCPs contamination across the world is available, Data on the Indian ecosystem is quite limited. Hence such a study is quite urgent ,with special emphasis on their environmental behavior and abatement measure. Furthermore Acute and chronic toxicological effects should be investigated for assessing their potential ecological health risks.

Keywords: PPCPs, treated and untreated wastewater, STP, WWTP

H - 028

BIOSORPTION OF LEAD (II) FROM AQUEOUS SOLUTIONS BY DRIED WATER HYACINTH (*EICHHORNIA CRASSIPES*)

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The contamination of wastewaters, river sediments and soil with toxic metals is a complex problem. The removal of these contaminations has received much attention in recent year using conventional methods such as chemical reduction, ion exchange and electrochemical treatment. The alternative methods is discovered which is biosorption, refer to the physico-chemical binding of metal ions to biosorbent. It is a relatively new process that has been very promising in the removal of contaminants from aqueous effluents. It has been shown to be an economically feasible alternative method for removing the heavy metals. Water hyacinth is considered a scourge in many parts of the world, choking waterways and hindering transport upon them. The usefulness of the bio sorbent of water hyacinth roots in removing metal being used as a cheap source of bio sorbent for metal ions. The purpose of this study is to investigate the ability of dried water hyacinth (*Eichhornia crassipes*) as biosorbent dosage, initial concentration, pH and contact time were investigated. The analysis was done by using Atomic Absorption Spectroscopy. From the result obtained, the removal of Pb (II) ions was optimum when initial lead concentration was almost 40 mg /L bio sorbent dosage at 0.225 g, pH 5.5 and at 8 minutes contact time. Other process conditions were optimized. In this study, it is shown that a biomaterial produced from dried water hyacinth can provide a simple, effective and yet cheaper method in removing from contaminated water.

Keywords: alternative method, biosorption, contamination, ion exchange

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H - 029

ICHTHYOFAUNAL DIVERSITY, ABUNDANCE AND DISTRIBUTION AND ITS PRESENT CONSERVATION SCENERIO OF RUPNARAYAN RIVER OF WEST BENGAL STATE, INDIA

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During the last century, riverine ecosystems have affected from intense human interference resulting in habitat loss and degradation and as a consequence, many fish species have become highly endangered, especially in rivers. In my present study three sampling stations were selected along the stretch of river Rupnarayan at Kolaghat. Moreover, Kolaghat thermal power station (KTPS) is situated on right pool of the river Rupnarayan at Kolaghat in Purba Medinipur district of West Bengal. Monthly sampling was collected at three sampling stations (S_1, S_2 & S_3) during July 2015-June 2016 by using gill nets and brought about to the laboratory and analyzed with the standard methods. Total 38 species of fishes belonging to twenty four sub- families and ten orders were collected from the selected sampling stations. The Shannon- Weiner diversity index of three different sampling indicated a strong relationship with overall species richness, showed variation and ranged from 3.052 –3.278 . Simpson 1- Lambda' were also used to assess the richness of biodiversity of all the three fish landing centers. The highest fish diversity were recorded at station –I followed by station – III and II. The low fish diversity at station II may be due to impact of thermal power fly ash as compared to the other station I (upper stretch 7 km.) and station II (lower stretch 5 km.). The most abundant fish species was *Ambly pharyngodonmola (8.3%)* and *Polynemus paradiseus* (7.7%) were recorded. The order Siluriformes (29%) found to be dominant with 12 fish species followed by Cypriniformes (21%) 5 species and Perciformes (18%) 10 species. For this changing revering quality especially Hilsa (*Tenualosa ilisha*, Hamilton, 1822) production gradually decreases day by day. Conservation status revealed that there are only four species that was under near threatened (NT) category. Apart from this remaining species represented least concerned (LC) and only few species are not evaluated (NE). In this study an attempt has been made to evaluate the ichthyofaunal diversity in the region and suggests mitigating measures.

Keywords: Abundance, conservation status, fish diversity, Rupnarayan River, Thermal Power Station, West Bengal.

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H - 030

BIOACCUMULATION OF HEAVY METALS BY AQUATIC FERNS: AN UNEXPLORED AREA IN ASPECT OF PHYTOREMEDIATION

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Environment is drastically affected by a large number of anthropogenic factors and industrial effluents are major of them. In plant system, the heavy metals are not much abundant as good as other essential elements. It is well admitted that the release of heavy metals in the environment is available predominantly from anthropogenic activities which causes damage the natural ecosystem. Lead (Pb), cadmium (Cd), aluminium (Al), mercury (Hg) are well-known heavy metals which cause adverse effects on food safety and their phytotoxic effects manifests altered metabolic activities. These metals enter aquatic systems through weathering and erosion of soils, direct discharge from industrial operations, and from contaminated sites. It is well-established that different plants have metal accumulation potential and some plants are hyper-accumulators of specific metals. Researches are on progress on the metal accumulation aspect of different ferns. The terrestrial fern, *Pteris vittata* is reported as an arsenic hyperaccumulator (27 mg As/g). But scanty of work has been done on phytormediation aspect of aquatic ferns. Our investigation reveals that the aquatic fern *Salvinia natans* can accumulate almost 1400 ppm Al maximum from industrial wastes of different sources whereas the fern *Marsilea minuta* accumulates 791.6 µg/g Cd of DW maximum from varied industrial effluents. Atomic absorption spectrophotometric (AAS) studies reveal that *Salvinia* and *Marsilea* can intake 3000 ppm of Al and 262.1 µg/g of Cd maximum respectively. Polyamines, which are generated out of biotic and abiotic stresses, act as stress reliever after external application up to a specific dose. The polyamine putrescine (Put) and spermidine (Spd) minimized the metal accumulation 30% and 17.89% in case of *Salvinia* and *Marsilea* respectively. Free radicals and reactive oxygen species (ROS) are produced profusely by induction of these metals. Nitrogen metabolism and carbohydrate metabolism are largely impaired by external application of these heavy metals. The stress enzymes like guaiacol peroxidase (GPX), ascorbate peroxidase (APX), glutathione reductase (GR), catalase (CAT), superoxide dismutase (SOD) activity significantly affected and upregulated by application of Al and Cd at their highest doses. Both of enzymatic assays and *in gel* analysis exhibited the increased activity in dose-dependent manner. The metal stress made significant impacts on the non-enzymatic antioxidants like chlorophyll, anthocyanin, phenolic and flavonoids contents and application of polyamines resulted ample amelioration. Works are in progress in the phytoremediation aspect of *Azolla* sp. Further molecular researches are needed to confirm this hypothesis.

Keywords: Phytoremediation; heavy metals; aluminium; *Marsilea*; catalase; *Salvinia*, cadmium; polyamine

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H - 031

EFFECT OF SALINITY ON PHYTOPIGMENT AND PROLINE LEVELS OF *RHIZOPHORA MANGLE* SEEDLINGS

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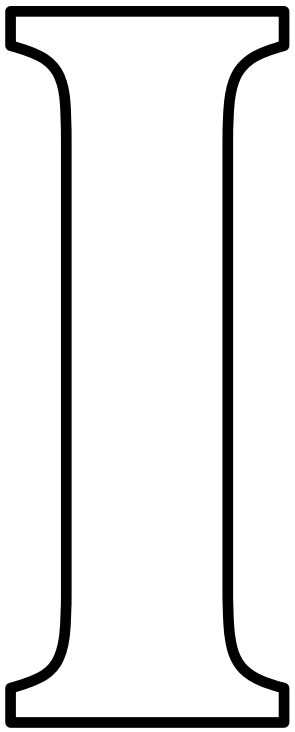
This study conducted during August 2015 assessed the effect of salinity on chlorophyll *a*, chlorophyll *b*, total chlorophyll, carotenoid and proline content of hydroponically grown seedlings of *Rhizophora mangle* with the aim to observe its tolerance to changing salinity. The selected seedlings were exposed to five different salinity levels (2, 5, 10, 15 and 20 psu) for a period of 30 days and observations were done at a regular interval of 7, 14, 21 and 30 days respectively. The concentrations of chlorophyll exhibited significant positive correlations with salinity ($p < 0.01$). The chlorophyll *a:b* ratio in the plant varied between 2.63 to 4.35 throughout the period of investigation. The salinity fluctuation did not affect the carotenoid level and proline content in the leaves of the species as evidenced from the insignificant *r* values. The results show that *Rhizophora mangle* of Indian Sundarbans region can tolerate and adapt to high saline condition as witnessed in the central sector of the deltaic complex around the Matla River.

Keywords: salinity, *Rhizophora mangle,* chlorophyll, Indian Sundarbans, Matla



Environmental Geography, Remote Sensing & GIS in Environmental Management

I - 001

SPATIO-TEMPORAL TRENDS OF NATURAL & ANTHROPOGENIC ACTIVITIES INDICATING LOCAL CLIMATE CHANGE IN KULLU VALLEY, HIMACHAL PRADESH, INDIA

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In Himachal Himalaya there are very few studies pertaining to the settlement rooftop, snow cover and glacial lake inventory have been conducted to investigate the long term climatic status in the Himalayas. Remote sensing techniques in combination with Geographic Information Systems (GIS) can satisfy the needs for large area detection and monitoring of snow cover pattern and glaciers. In the present study, we have monitored the snow cover extent, snout position of glacial deposits, local snow line shift and increasing urbanization in Kullu valley with reference to spatio-temporal aspect during the period 1968-2014.

The current study is based on optical remote sensing data LANDSAT series (1-8) for mapping of snow cover and ASTER (30m) data for DEM. The glacier inventory has been generated namely Barwa (Lat 32° 18′ 50″, Long 77° 03′ 04″), Indrasan (Lat 32° 12′ 45″, Long 77° 23′ 45″) and Sosan (Lat 31° 54′ 12″, Long 77° 35′ 05″). To study the spatio-temporal analysis for snow cover (Pre & post monsoon) snot positioning shift and local snowline shift are analysed using GIS tools. The temporal data set has been taken for the study snow cover (1978, 2001, 2009 & 2015), snow line (1976, 1991, 1999, 2009 & 2014) and snot position of individual glacier (1976, 1991, 2001 &2014). The snow cover for two time periods per year i.e. June and January has been observed. The snow line shift and snout position are observed for the month of October-November which is the end of the melt period and onset of fresh snowfall. The settlement rooftop analysis has been carried out to observe the temporal changes in anthropogenic activities from 1968 to 2014. It is observed that the aerial extent of the settlement rooftop has been increased from 13.82 km^2 to 27.78 km^2. The increasing trend of settlement rooftop has also been reflected in temperature profile in this area. The average temperature and precipitation data are analysed to validate these variations in climatic parameters.

The analysis of different domain and dynamics of natural and anthropogenic parameters within the Kullu district reveals that the drastic changes in the local climate during 1976 to 2015 has been occurred. The use of satellite imaginary is the effective tool to address rapid spatio-temporal changes in snow cover pattern, snowline, glacial environments, settlements and its assessments can determine the probable prospect zone for related hazards.

Keywords: Glaciers, Settlement rooftop, Remote sensing, Snot, GIS

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I - 002

HIGHER INTENSIFICATION OF TROPICAL CYCLONE IN BAY OF BENGAL COAST THAN ARABIAN SEA COAST: AN ANALYTICAL ASSESSMENT AND REASONING OF VULNERABILITY

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The Indian subcontinent is one of the worst cyclone affected areas of the world with about six percent of the worldwide cyclones. Amongst the countries of the subcontinent the Republic of India shares highest coastline with about 7,517 kilometres (4,700 miles) in length. About eight percent of the total land area of India, particularly along the eastern coast is more vulnerable to tropical cyclones. In fact, Indian Ocean is one of the six major cyclone prone regions of the world. On an average, about five to six tropical cyclones are formed in the Bay of Bengal and the Arabian Sea every year, out of which two or three may be severe. As such, the eastern coast is more prone to cyclones and about 80 percent of the total cyclones generated in the Indian Ocean strike the east coast i.e. Bay of Bengal coast of India. The entire east coast from Orissa to Tamilnadu is vulnerable to cyclones with varying frequency and intensity. Along the west coast, Gujarat and Maharashtra coast are more vulnerable as compared to the southern part of the western coast. However, the east coast or Bay of Bengal coast is found to be more susceptible to tropical cyclones. In this context, an attempt has been made to compare and contrast of cyclone proneness in the eastern and western coast of India and to analyse the reasons and processes behind the more vulnerability of eastern coast than western coast considering the severity of tropical cyclone. In this regards the statistical data of Indian Meteorological Department for the decade 1999 to 2010 has been analysed. It is observed that the studied decade experienced a higher number of cyclones particularly in the Bay of Bengal except in the year 2004.

Keywords: Tropical Cyclone, Bay of Bengal Coast, Arabian Sea Coast, Higher Intensification and Susceptible

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I - 003

APPLICATION OF GIS AND REMOTE SENSING IN DISASTER MANAGEMENT WITH SPECIAL REFERENCE TO TROPICAL CYCLONE IN SUNDARBANS

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Natural Disasters are the events that cause widespread disruption of the normalcy of nature creating situations that exceed the ability of the society to cope up with the losses & cause colossal loss to human lives & property. Disasters—be it natural or anthropogenic is a serious threat to man. However, if the forthcoming danger can be forecasted at a proper time, the damages can be averted. The 7516 Km long coastline of India is highly prone to tropical cyclones. The largest delta of the world, the Ganga-Brahmaputra delta popularly called Sundarbans in West Bengal is one of the major tropical cyclone prone areas of the country. It has been severely affected by tropical cyclones that have turned out to be catastrophic causing huge loss of life & property, disturbance of the ecology of the area as well as destabilization economic balance of India in general & West Bengal in particular. Presently, increasing trends of urbanization, industrialization & population growth has caused massive destruction of the mangroves that acted as natural protectors of tropical cyclones. As a result, the Sundarban region has been facing many problems owing to the frequent outbreak of cyclones in the Bay of Bengal Basin. Considering the bright future prospect of Geographical Information System (GIS) & Remote Sensing & advancement in the field of computer & communication technologies, strategies have to be undertaken to forecast the cyclone warnings in advance so that these losses can be averted. Mapping of tropical cyclone prone areas, vulnerability assessment, damage assessment with the help of GIS & Remote Sensing should be encouraged in the Sundarbans region.

Keywords: Tropical Cyclones, Sundarbans, GIS, Remote Sensing, disaster management

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I - 004

SATELLITE REMOTE SENSING OF PHYTOPLANKTON (CHL-A) BIOMASS VARIABILITY IN THE GULF OF MANNAR, SOUTH INDIA

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The phytoplankton primary productivity is at the base of food web that represents fundamental food source for marine ecosystem. Mapping of phytoplankton variability is used to demarcate the potential fishing zone. In the Gulf of Mannar (GoM), spatio-temporal variability (phenology) of the phytoplankton (*Chlorophyll-a)* is one of the major determinants influencing the abundance of micro and macro fauna, eventually being regulated by marine hydrodynamic forces like wave, current, salinity, sea surface temperature and seasonal trophic interactions. The Gulf of Mannar extends for a length of 140 km in the SW-NE direction between 78º 05' 00'' E and 79º 30' 00''E longitude and 8º 47' 00'' N and 9º 15' 00''N latitude which covers an area of about 10, 500 km^2. Distribution of phytoplankton in marine ecosystem is subjected to impacts of anthropogenic activities that affect the chlorophyll concentration (Chl-a) and phytochemical behaviour. In the GoM marine reserve area, 21 small coralline islands are distributed in various locations in the offshore area, wherein they have various combinations of floral and faunal ecosystems consisting of mangroves, sea grasses, seaweeds and zoo planktons, crabs, fishes and turtles, etc. Spatio-temporal satellite images are used in the study for the retrieval and mapping of seasonal variability of phytoplankton concentration rendering new insights into the spatial-temporal distribution and dynamics of Chl-a concentration based on spectral characteristics in the image. The present study utilized temporal images from Landsat namely TM (Thematic Mapper) and ETM+ (Enhanced Thematic Mapper Plus) to estimate chlorophyll-a concentrations (phytoplankton biomass) with the help of regression algorithm based on band combination indices. The most successful method of Chl-a estimation is performed using multivariate algorithms of band combination with coefficient of determination factor (R^2= 0.677). Consequently, the regression algorithm analysis is executed on the bands to separate the Chl-a components from the inorganic components in coastal water. The multivariate analysis of spectral reflectance of images shows the high Chl-a concentration (25.88 – 48.48 mg/m^3) at wave length of 550 – 600 nm for a reflectance of 0.25 % in the post-monsoon (February). This shows high productivity of phytoplankton in the coastal waters. Seasonal distribution of Chl-a in the coastal water is mainly regulated by changing salinity and sea surface temperature. Sea surface temperature (SST) plays an indispensable role in the seasonal dispersal of phytoplankton (Chl-a) concentration in the coastal water. The productivity of phytoplankton increases up to 33.33 – 48.48 mg/m^3 at the SST ranges from 21.7 to 28.07 ºC, however it decreases to 17.10 – 26.85 mg/m^3 at the SST level of 19.27 - 20.65 ºC. It is observed that the phytoplankton production reaches higher rates during the post monsoon than the periods of monsoon and pre-monsoon due to prevailing hydrodynamic forces and optimum climatic conditions. Phytoplankton (Chl-a) concentration generally decreases with increasing depth and distance from the shoreline and have direct bearing on the wave direction, littoral currents, salinity and SST prevailing in the Gulf of Mannar region.

Keywords: Coastal water, Phytoplankton biomass, Spectral signature, Remote sensing, Gulf of Mannar

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I - 005

IMPACT OF ANTHROPOGENIC ACTIVITES ON LAND USE AND ESTIMATED WATER VOLUME OF A FLOOD PLAIN WETLAND: A CASE STUDY OF BHALUKA BEEL, WEST BENGAL

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Wetlands are a major feature of the landscape in almost all parts of the world. Although many cultures have lived among and even depended on wetlands for centuries.Wetlands are playing very important role not only to maintain ecology but also it provides goods and services to the stakeholder. They provide a range of interrelated environmental functions and socioeconomic benefits, which support a variety of livelihood strategies for different members of the local community. India is very much rich in wetland recourses. The network of Ganga River system that flows into the flat plains of West Bengal provides one of the largest wetland regime in the country. These wetlands are playing an important role not only it works for natural recharge but also gives better livelihood and as a whole maintaining the eco-system with regard to environmental issues. Bhaluka beel is a natural perennial wetland, located at Krishnanagaar- I block in the districts of Nadia (under Bhaluka Gram Panchayet), West Bengal.The total area of the beel is 50.6 ha and total wetland water area is 25.5 ha. This wetland is originated from the Bhagirathi River. The average length and width of the wetland is 1.5 km and 0.5 km. The primary survey has been done to identify the main functions, threats and ultimately estimation of water area through land use maps and also highlights how could management options using wise use of wetland be more important in the long run. The land use map of Bhaluka beel has been done through GIS of different years to identify the change in land use of wetland area. Keeping in view, the ultimate goal of this paper is to estimate the water budget of Bhaluka beel and to find out rate of changes in land use pattern of the wetland system. Hydro-meteorological, physical and socio-economic data for last forty five years are collected from primary and secondary sources. Catchment area and land use map is prepared with the help of Arc GIS 10.3. After analysis of data, the result shows that the water area of Bhaluka beel has been changed due to anthropogenic activity of surrounding villagers .Water budget has been calculated with the help of empirical equation by knowing hydrological parameters. The results show that mainly monsoon months (June-Sept) with a magnitude of 433 mm of water could be considered as available water resource which might be utilized for agriculture and pisiculture. This paper concludes about 48 ha, which comes 30, 000 m^3 of water during non-monsoon period, could be irrigated with varieties of crops and also the growth rate of fish production is increased by 5% for the last fifteen years.

Key words: Wetland, water budget, Water area demarcation, GIS, Human interference, Fish yield, Threats

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I - 006

RESPONSE OF SOIL EROSION TO THE TEMPORAL VARIATION IN RAINFALL IN THE IRGA WATERSHED, JHARKHAND

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Rainfall is one of the most dynamic factors that initiates and affects soil erosion over space and time. The impact of rainfall on the soil matrix is quantified by the erosivity index (EI) factor in the Universal Soil Loss Equation (USLE) for soil erosion estimation. The USLE, however, lacks spatial and temporal dimension. Application of the USLE in GIS environment helps to overcome these lacunae. The present study assesses the response of soil erosion in the Irga watershed in Giridih, Jharkhand to the temporal variation in rainfall in the area during 1970-2010. Annual rainfall erosivity (A_{EI}) for the three raingauge stations – Dhanwar, Birni and Jamua – within the watershed was estimated using a power equation developed for the study area. The average A_{EI} of the three stations varied from 134.1 to 475 MJ mm ha^{-1} hr^{-1}. Raster layer of A_{EI} for each year was generated and multiplied separately with the other model parameters of USLE; the other parameters being considered as constant over time for the present analysis. Average annual soil erosion rate in the Irga watershed under 2005 land use/land cover conditions was estimated to be 3 t ha^{1} yr^{-1}. The erosion rates, however, varied annually, as well as spatially, due to variation in rainfall. Correspondence between annual rainfall and annual average soil erosion rate was established statistically that can help to estimate future rates of soil erosion in the study area.

Keywords: soil erosion, rainfall erosivity, USLE, GIS

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I - 007

SITE SUITABILITY ANALYSIS OF BIO-MEDICAL WASTE MANAGEMENT OF HUGLI-CHINSURAH MUNICIPALITY OF HUGLI DISTRICT, WEST BENGAL: AN APPLICATION OF GIS TECHNIQUES

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Bio-Medical Waste (BMW) includes any waste generated during diagnosis, treatment or immunization of human beings or animals. It includes anatomical, pathological and clinical infectious/hazardous organic or inorganic wastes. Disposal of untreated bio-medical waste poses an environmental and public health risk. The present study includes detailed ground investigation in various health care units of Hugli-Chinsurah Municipality, viz. Government Hospital, and Nursing Homes with several pathological centres to highlight per bed per day waste generation, present mode of BMW management and an effective management of proper disposal adopting various techniques of Geographical Information System (GIS). The study has employed weighted overlay analysis to select a suitable disposal site of BMW management to adhere to the Government safety norms and to ensure no risk to the environment. The advanced technique of GIS has integrated several environmental as well as socio-economic criteria to select the most suitable site for BMW management in the study area.

Keywords: GIS, bio-medical waste, weighted overlay analysis, landfill site selection

I - 008

LOCATION ALLOCATON FOR URBAN SOLID WASTE DISPOSAL SITE USING REMOTE SENSING AND GIS TECHNIQUE: A STUDY OF ASANSOL MUNICIPAL CORPORATION, WEST BENGAL, INDIA

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The present paper deals with the selection of suitable site for proper disposal of municipal solid waste generated from Asansol Municipal Corporation of Burdwan district of West Bengal using the advanced Remote Sensing and GIS technique. The uncontrolled growth of urbanization as well as mushrooming of various commercial establishments like shopping malls, etc. increase disposal of untreated waste matters and toxic hazards in a haphazard way posing threats to the human health and environment in the study area. The present study have adopted weighted overlay analysis to support spatial decision making for selection of the most suitable site for urban waste disposal considering the Government safety norms and ensuring no risk to the environment. The Geographical Information System (GIS) has unfolded the opportunity to integrate field parameters with population and other relevant socio-economic aspects in selecting suitable disposal sites in the study area.

Keywords: Solid waste management, landfill site, multi-criteria, GIS technique

I - 009

CRIME MAPPING AND ANALYSIS OF MYSURU CITY USING GIS

Smitharajesh, Research Scholar
Rajesh Y.P, Technical Staff

The traditional and age – old system of intelligence and criminal record maintenance has failed to live up to the requirements of the existing crime scenario. Manual processes neither provide accurate, reliable and comprehensive data round the clock nor does it help in trend prediction and decision support. It also results in lower productivity and ineffective use of Information Technology.

Geographic Information System (GIS) uses geography and computer-generated maps as an interface for integrating and access massive amounts of location-based information. GIS allows police personnel to plan effectively for emergency response, determine mitigation priorities, analyses historical events, and predict future events. GIS can also be used to get critical information to emergency response. GIS helps identify potential suspects to increase investigators suspect base when no leads are evident.

GIS plays an important role in crime mapping and analysis. Response capabilities often rely on a variety of data from multiple agencies and sources. The ability to access and process information quickly while displaying it in a spatial and visual medium allows agencies to allocate resources quickly and more effectively. In the 'mission-critical' nature of law enforcement, information about the location of a crime, incident, suspect, or victim is often crucial to determine the manner and size of the response. GIS software helps co-ordinate vast the data and view the data most critical to the particular issue or mission. It is used world over by police departments, both large and small, to provide mapping solutions for crime analysis, criminal tracking, traffic safety, community policing, Intranet/Internet mapping, and numerous other tasks.

Keyword: Geographical Information System, crime mapping, analysis, Mysuru City

I - 010

ASSESSMENT OF LULC AND FOREST TREE DIVERSITY IN SOUTH KHARANG FOREST SUB RANGE, CHHATTISGARH THROUGH REMOTE SENSING & GIS

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Tropical forests are major repositories of biodiversity. In South Kharang Forest Sub Range, Chhattisgarh LULC and forest tree diversity has been analysed by using remote sensing. The LULC analysis for 2013 through remote sensing technique indicates that dense sal forest has covered 17.69% area followed by mixed deciduous forest 15.50% and moderately dense forest 13.71% respectively. There are total 24 quadrates have been studied in six compartments of the study area. The Shannon -Weiner diversity index of forest trees have been calculated between range of 4.04782 -0.73241 in the compartments whereas Simpson index of dominance was recorded between 0.943333333 - 0.679738562. *Shorearobusta* has found the dominant forest tree species followed by *Terminaliatomentosa, Semecarpusanacardium, Anogeissuslatifolia* in the study area.

Keywords: Tropical forest, remote sensing, Chhattisgarh, South Kharang Forest

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I - 011

LANDUSE – LANDCOVER CHANGE DETECTION USING BHUVAN DATA: A CASE STUDY OF BRAHMANI RIVER BASIN

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Earth surface cover type and the use of land surface has an important role in regional, social and commercial development and global environmental change. Local land-use and land-cover(LULC) change influence the environmental and ecological changes and contribute to global environmental changes. It effects significantly to the earth atmosphere and biodiversity. For better understanding relationships and interactions between human and natural phenomena to management and use of natural resources in a sustainable manner studying the effectof the landuse/landcover changes is of utmost importance. Satellite remote sensing provide a better platform to study a spatial as well as temporal change over the earth surface within the required time period. This study presents the LULC changes within the Brahmani River basin using the temporal remote sensing data obtained through "Bhuvan" - a portal of National Remote Sensing Centre (NRSC). The BrahmaniRiver, with a total length of 799 km, is one among the perennial rivers of East India.The river starts from Chhotanagpur hills and pore down it to Bay of Bengal. The basin has a total drainage area of 39,313.50 km^2. Complete basin, extending between 83°52'55"E - 87°00'38"E longitude and 20°30'10"N -23°36'42" latitude, is spreads across the states of Chhattisgarh, Jharkhand and Orissa. The general flow of the river basin is toward east. It. For change detection analysis, state wise imageries of year 2004-05 and 2011-12 were collected from Bhuvan portal of NRSC and analysed using Remote Sensing (RS) and Geographical Information System (GIS) software. The imagerieswere mosaicked using GIS software Arc View v 9.3. Contours were digitized and interpolated to develop Digital Elevation Model (DEM) using Geomatica v 10.1. Generation of watershed and re-classification were done using above GIS software. Brahmani basin outline was developed with the help of DEM and the same was use to extract the area of basin from the mosaic images. LULC class merging was performed through the "re-classify" utility of Arc View. Bhuvan images has 18-19 sub-classes of different LULC. Classes having similar characteristics were merged together as urban and rural settlement to develop settlement class. Finally the five classes, namely, Forest, Cultivated, Settlement, Water Body and Barren Land were developed for the study. Settlement had a maximum and positive change (48%) and cultivable land had a minimum change that is -0.53%. Water body showing a huge shrinkage and it reduced by 34% wherein Barren land increased by 21.43%. This LULC change will have significant influence in basin hydrology affecting water resources availability and sedimentation in the river. Results of this analysis will be helpful in proper planning and management of land and water resources of the basin.

Keywords: Bhuvan,Brahmani River basin, Digital Elevation Model, GIS, LULC.

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I - 012

LAND USE CHANGE OF THE OUSTERI WETLAND: ECOLOGICAL ECONOMIC EVIDENCE USING GEOLOGICAL DATA

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Land use/cover change is a major factor for global change because of its interactions with climate, ecosystem processes, biodiversity, and, even more important, human activities, research on land use/cover change has become an important aspect of global change. The present research paper aims to investigate the land use changes over the time period, 2005 to 2014, in the Ousteri wetland. The information collected through the ecological, hydrological and geological analysis was used to carry out the quantitative research on Ousteri wetland land use/cover change. The temporal changes of land use characteristics were quantitatively analyzed and then the driving forces of land use changes were examined based on natural and artificial factors. As the result of natural factors and human disturbances, the area of wetland shrunk, bringing the conversion from wetland to terrestrial land use type. The annual conversion rates indicated the land use changes in Ousteri wetland.

Keywords: Terrestrial land pattern, wetland conversion, biodiversity change, Ecosystem modification

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I - 013

GEOSPATIAL TECHNIQUES FOR DEMARCATION OF GROUNDWATER POTENTIAL ZONES AND THEIR SUITABILITY ANALYSIS IN ALLUVIAL AQUIFERS OF GANGETIC PLAIN, SONIPAT DISTRICT, HARYANA

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Overexploitation of groundwater resources due to expansion of industrial and agricultural sector pose a great threat to availability of this precious resource in Sonipat District of Haryana. A total of seven thematic layers viz, Landuse/Landcover, Geology, Geomorphology, Drainage density, Lineament density, Slope (Digital Elevation Model) and Water table depth were prepared using integrated approach of remote sensing and geographic information system for the exploration of groundwater resources of the district. The thematic layers were selected, based on literature, discussion with experts and other field observations. The thematic layers and their features were assigned suitable weights and ranks on Saaty's scale according to their influence on availability of groundwater. The thematic layers were integrated using weighted overlay analysis technique to create the final groundwater potential zonation map. For validation and suitability analysis of groundwater for drinking and agricultural purposes, a total of 53 groundwater samples were collected during October-November (2014) and total of 21 physico-chemical parameters of water were analysed to generate the water quality index of the district. Finally, data was exported into GIS environment for the generation of water quality index map. Agricultural indices like Sodium Percentage (Na%), Sodium Absorption Rate (SAR), Magnessium Hazard(MH) and Residual Sodium Carbonate (RSC) were used to test the suitability of groundwater for irrigation purpose. The ground water potential areas were demarcated into five zones 1-very poor, 2-poor, 3-moderate, 4-good and 5-very good. The very good groundwater potential zones were found in the areas where there were high lineament density, and were mostly found in the central part of the district, which is mostly the plain area. The area in the central part and south eastern part of the district has shown highest decline in water level in last 2 decades. Water quality index confirms that, 56.6%, 33.96%, 5.66% and 3.77% comes under good water, poor water, very poor water and water unsuitable for drinking purpose category, respectively. Some areas in the central part and south eastern part of the district has shown highest decline in water level in last two decades. Good water category include North-Western part, Most of the Central part and South-Eastern part(Yamuna strip) of the district. Moreover, North-Western part and Central part have abundant potential zones of groundwater, whereas, the South-Eastern part comes under poor category of potential zonation. Most contaminated sites were found in Gohana and Khaurkhuda blocks where groundwater was found to be unfit for drinking purpose. These areas have good groundwater resources, but without proper treatment procedures, are unit for drinking purpose. For irrigation purposes, it was observed that 11.32% of the sample with respect to Na%, 1.88% with respect to SAR, 43.39% with respect to MH and 9.43% samples with respect to RSC were found to be unfit for agricultural purposes. Groundwater potential map developed in the present study is very useful for policy makers, planners, engineers and researchers seeking suitable locations at which to implement resource exploitations and treatment procedures.

Keywords: Weighted overlay analysis, Saaty's scale, Water quality index, GIS, GWPZ.

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I - 014

AN OVERVIEW OF SITE SUITABILITY STUDY FOR DISPOSAL OF URBAN SOLID WASTES

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There has been a significant increase in solid waste generation in India over the years from 100 gm. per person per day in small towns to 500 grams per persons per day in large towns. As regards Jharkhand, solid waste management is in its nascent stage. In urban centres like Ranchi, the local municipal bodies have taken some initiatives. However, there is a long way to go, before it takes final shape.

Solid waste dumping is a serious problem in the urban centres because most solid wastes are not dumped in the suitable locations. There is no scientific method for selection of landfill sites. Open dumping is the most common method of solid waste disposal. Appropriate landfill site selection is important to minimize negative impacts associated with open dump sites. Thus, identifying proper sites for solid waste disposal and selecting appropriate landfill site far from residential areas, environmental resources and settlement is the main issue for the management of solid waste. The most common problem associated with improper management of solid waste include health and fire hazards; odour irritants; soil, air and water pollution; aesthetic nuisance and economic losses. The unscientific disposal of solid waste results in the emission of carbon dioxide (CO_2), methane (CH_4) and other trace gases, such landfills may adversely affect the quality of the drinking water and cause the diseases like jaundice, nausea, asthma etc.

Remote sensing can provide information about the various surface features such as lithology, and structure; land use and land cover; drainage density; slope; settlement scenario etc., therefore the technology will be of great help in selection of suitable site for waste disposal in urban areas, thus will minimize the risk of ecological and human health problem.

As far as Ranchi and the adjoining areas are concerned, they are in general dominated by granitic rocks and gneisses of various types. These rocks no doubt are characterised by their hard, massive, compact and crystalline character, but few weak planes in the form of fractures, joints, fault planes etc. are present in them, which provides avenues for percolation of contaminants. Identification of such planes of weaknesses at the landfill sites is of paramount importance to avoid any kind of leaching effect. Remote sensing technique will no doubt help in identification of weakness planes in the country rock and will be a guiding factor in selecting a risk free landfill sites.

Extraction of planes of weakness in the country rocks with the help of satellite images is one of most widely used application of remote sensing in the field of geology. Such features may easily be identified on the basis of sharp tonal contrast in the satellite images. A suitable and risk free site for waste disposal will ultimately minimise the environmental as well as health threat and use of modern techniques like remote sensing will no doubt solve the problem.

Keywords: Solid waste, remote sensing, site suitability, disposal, Ranchi

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I - 015

GEOINFORMATICS IN URBAN GEOENVIRONMENTAL HAZARD AND RISK ASSESSMENT: A CASE STUDY OF RANCHI CITY, INDIA

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The increasing pace of urbanization and the growing scale of urban-industrial activity exacerbated environmental degradation in cities of developing countries and also increase the vulnerability of urban dwellers to both natural and technological disasters. In the present study an attempt had been made to map various geoenvironmental hazards and resultant risk in municipal wards of Ranchi urban area utilizing temporal satellite images and collateral data sets in GIS. Select factors influencing urban environment *viz*., population density, built-up density, tree cover density, aerosol concentration, ambient noise level, drainage density, road network groundwater depth and groundwater fluctuations, were analysed to ascertain their geoenvironmental hazard impact at ward level. The multi-thematic overlay analysis based geoenvironmental hazard (GH) zonation exhibit that 11 wards located in the central and western parts were in very high GH zones (13.1%). The geoenvironmental risk (GR) deduced by employing select spatial maps representing various GH and geoenvironmental vulnerability zones in GIS environment revealed that the 8 wards located in central, western and north-eastern parts (8.8%) were falling under very high GR zones. On the contrary, wards in the outer area mainly in the northern, and southern parts of RMC were falling under low (19.6%) and very low (40.3%) GR zones. The study demonstrated very high geoenvironmental hazard, vulnerability as well as risk in four municipal wards (no. 11, 12, 13 and 15) of RMC located in city core and entails adoption of suitable urban management and renewal methods to diminish deteriorations of geoenvironmental conditions of the city.

Keywords: Geoenvironmental hazard, Urban Risk, Geoinformatics

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I - 016

WATERSHED MANAGEMENT FOR ENVIRONMENTAL SUSTAINABILITY A CASE STUDY OF THREE MAIN SOURCES OF WATER IN THE CAPITAL CITY OF JHARKHAND, RANCHI

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Water is a liquid gold which is one of the major structural components of the human body. It is the basic requirement for the survival of all forms of life on earth. Cities are gifted with innumerable number of water sources (like lakes, reservoir etc.) but being affected by the anthropogenic activities e.g. urbanization and lack of concern for the natural resources, these assets are getting depleted. For managing the quality and quantity of water at command level (level at which the water is begin consumed) Watershed Management must be practiced by the authorities with the aim to stop and conserve water where it falls. The purpose of the present paper is to analyse the trend in quality parameters for one year of the water for the study area along with the analysis of the deficit in quantity of the water for the same study area. i.e. Ranchi, the capital city of Jharkhand through use of ArcGIS 9.3 software . By adopting the watershed management we will be able to fulfil the requirement of water for the catchment population with quality and quantity. There will be increase in in–situ moisture and groundwater table. There will been enhancement in biomass cover of the catchment.

Keyword: Quality, Quantity, Catchment area, Population, Water

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I - 017

EMERGING TRENDS ON ECO TOURISM AND SUSTAINABLE TOURISM IN INDIA

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This article focuses the growth of tourism through proper coordination with local community and culture under environmental constraints. Tourism can help generate supplementary income at the local, grass-roots level. It is also argued, however, that tourism causes the deterioration of local culture, results in inequitable income distribution and leads to dependence upon outsiders. Ecotourism is an alternative form of tourism whose sole purpose is holiday activities and the core element of this type of tourism is natural-based. The basic intention of this type of tourism is to raise awareness amongst travellers about the natural setting or place that they visit for and at the same time minimize any corrosive (in terms of negative impact on environment) impact of the human activity. The idea of Ecotourism was raised and evolved during the 80s where the necessity for environmental care became more imperative, in order to protect the natural habitat from human intervention for the future generations. Sustainable tourism is the form of tourism that meets the needs of present tourist and host regions while protecting and enhancing opportunities for future. From this study, it was found that the impact of trekking tourism varies from locale to locale. Contact between the tourist and the villager is often largely mediated by the tour guides who play the role of cultural broker. The distribution of income earned from trekking in a local community may not always be widely distributed. Data collected studied indicate that they all face economic problems which are closely associated with a scarcity of land resources. The way in which trekking tours are organized also threatens the environment by causing damage to the farmers' fields, using up scarce bamboo resources and contributing to pollution by improper disposal of waste. The recommendations in the study are made in order to contribute to the development of a sustainable trekking tourism. Cooperation among all parties involved will be important. Community organizations must be involved in planning and servicing the visitors. The constraints and measures to remove bottleneck have been dealt and analysed for sustainable development of tourism. Thus, it is important that the tour agencies should work hand-in-hand with the community organizations. This will lead to a situation wherein tourists can gain an understanding of the interrelationship between the environment and the local people and their culture. The hospitality industry by taking into consideration the aforementioned figures and fact and the emerging trends on Ecotourism and sustainable tourism, is feasible to achieve maximum profits.

Keywords: environment, culture, community, development

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I - 018

CURBING THE COAL CONSUMPTION– A STEP TOWARDS GREEN ENVIRONMENT: RAMGARH, A CASE IN POINT

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Black diamond of Jharkhand has delivered fortune to the state, but excessive use may adversely affect, causing the environmental degradation. Carbon emission has become a major issue of concern during the recent years. Jharkhand possesses 36% of the total coal deposits and 90% of coking coal deposits of country's coal reserve. Ramgarh has 1263.94 million tonnes of coal reserves. Strip mining techniques used for extracting coals pollute the atmosphere. Mining tunnels are not properly filled with sand stones leading to land wrecks. Strip mining destroys landscapes, forest and wildlife habitats. The present technique of Ramgarh mining extract only 70-75% coal which is below the extraction capacity of International Mining Companies (i.e. 98%). New techniques like remote sensing and GIS could be emphasized in mining areas of Ramgarh. This study attempts to secure availability of coal, to promote optimal and equitable use, to enable the sustainable development and to suggest policy for environmental conservation and preservation.

Keywords: environment, carbon emission, Ramgarh, equitable, sustainable, development

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I - 019

NEED FOR SUSTAINABLE LAND RESOURCE MANAGEMENT IN JHARKHAND: A CASE STUDY OF RANCHI CITY

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Land use includes any given area of land that is usually used to satisfy multiple objectives or purposes. The study of land use is important as desirable land use pattern should be adopted urgently for further development of the capital city. This research shows different spatio-temporal land use change patterns in Ranchi city from 1961 to 2012. It also indicates the growth of population in the state, district and city from 1961-2011.

The study is based on secondary data obtained from Ranchi Municipal Corporation and Master Plan of Ranchi city. The study has used various maps to show the land use patterns in Ranchi city and to show the areas of future possibilities of expansion of Ranchi city. The land use change analysis over time for the entire study areas provides and overall picture of the change trends. A comparative analysis of the growth in population and land use has been done.

The results show that there is a floating population of about 10% which comes to Ranchi planning area for day time activities. The land use study discovers that Ranchi (City+Rural) lacks planned residential colonies. Recreational land area is very less as it is only 0.44% of the total planning area. Road network studies show that there are no pedestrian facilities and inadequate parking area in the entire city. Traffic and transportation infrastructure accounts for about only 1.79% of the total planning area.

Smart City projects are coming up in the Ranchi city for which sustainable management of land resources is essential otherwise it would result in adverse environmental changes such as drought and desertification.

Keywords: Land Use, Ranchi, Urbanisation, Population, Development, Planning

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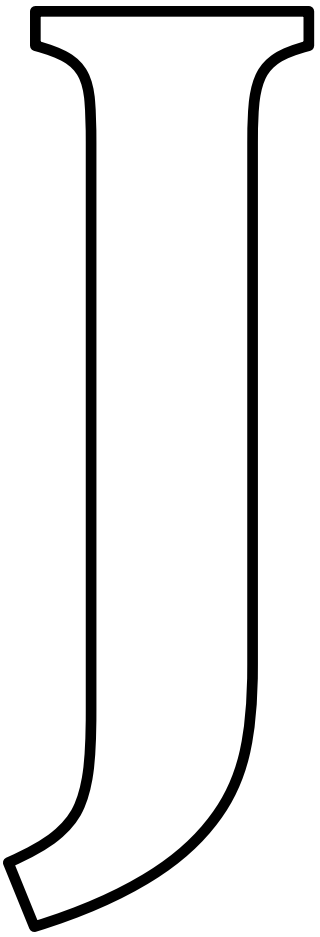

Environmental Policies, Laws and Legislations

J - 001

LEGAL REGIME FOR FISHERIES MANAGEMENT IN KUWAIT BAY

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Kuwait Bay serves as a primary nursery ground for shrimps and numerous fishes of commercial importance. In the light of dwindling fish stocks, managers and legislators have taken various stringent conservation measures to get the fisheries industry back on the rails. Recently, the Kuwait Parliament has passed Law 42/2014, amended by Law 99/2015, thus enacting the Environment Protection Law. Articles 108, 109 and 110 under Chapter 3, Section 5 are pertaining to Kuwait Bay. In addition, a part of the Bay was demarcated as Marine Protected Area (MPA) and is managed under the Kuwait Environmental Remediation Program (KERP), supervised by the United Nations (UN) and funded by Iraq in compensation for the environmental damage caused during the 1990/1991 illegal occupation of Kuwait.

The sustainability of fisheries is of great significance due to its contribution to the socioeconomic welfare and food security of the country. Article 108 of the Environment Protection Law will help sustainable fisheries development along with its other intended benefits. Article 108 prohibits in Kuwait Bay, an area of special nature, the practice of any activity that may harm the environment. Activities prohibited under Article 108 are 1) disposal of sewage or industrial waste or throwing any type of waste 2) carrying out reclamation operations using dredged materials from deepening works of navigational waterways 3) fishing of all types of marine living organisms and erection of fishing areas and fish farms 4) building chalets on the Bay shores. This being in addition to other existing fisheries laws in the country since 1980 and include regulations that address, *inter alia* 1) A closed fishing season for shrimp that starts in February or March depending on the catch rates during January. Since 2002, the season has opened on 1st August 2) Closed areas to protect spawning as well as recruitment of both shrimp and finfish 3) Effort limitation 4) A minimum mesh size for shrimp trawls 5) Minimum marketable sizes for commercially important fish species 6) Minimum mesh size of drift gillnets according to the targeted species.

While the already existing fisheries laws in the country were directed solely at the harvesting process, the more recent fisheries management approach in Kuwait has considered aspects beyond size of fishery resource, clearly implying an ecosystem approach. This holistic approach that balances both human well-being and ecological well-being will ensure sustainable development of fisheries in Kuwait.

Keywords: Conservation, MPA, Sustainability, Food security

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J - 002

ENVIRONMENTAL LEGISLATIONS AND ENFORCEMENT ISSUES

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A 'quality environment' is essential for healthy and happy living. The environment has several components that are interlinked in a complex manner. Each component has a large number of parameters and change in any one of them has a bearing on the quality of environment. Future of mankind on Earth will not be determined by the fact that what resources are available and how much but by the fact that how efficiently and judiciously they are used and with what technology, so that it remains in the same form and in sufficient quantity for the future generation. We need to address the various issues pertaining to the maintenance and enhancement of environmental quality and explore newer individual as well as collective ways for addressing the various environmental problems.

One very valuable tool to address these issues, and for the assurance and maintenance of environmental quality is through the enactment of legislations. Numerous legislations have been enacted at national and international levels. The paper tries to discuss the important environmental legislations. The scope of the paper includes the Indian legislations called Acts and Rules, and the international legislations in the form of Conventions, Protocols and treaties and also address issues pertaining to their enforcement. Despite these legislatives measures, the state of the environment continues to be gloomy as these environmental legislations are essentially "social code of conduct" that should automatically be a part of a better civic sense instead of a legal framework. Thus, environmental education and public awareness together can considerably reduce the needs for multitudes of environmental legislations since enforcement under the Indian context will continue to be difficult in foreseeable future.

Keywords: Acts, Conventions, Enforcement, social code

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J - 003

PENAL PROVISIONS FOR ENVIRONMENTAL PROTECTION: AN ANALYSIS

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Protection of environment is mentioned under Fundamental Duties enshrined under Article 51 A of the constitution of India. As said these fundamental duties are not enforced by the courts of India but only put forwards that these duties are mere that ought to be followed by the citizens of India. Now there exists an ample gap between the enforcement of these aspects under Article 51 and various laws made or existence in India. Fundamental duties mentioned in our constitution do not obligate any citizen to do or abstain from doing any particular act. The fundamental duties were not enough to bind the citizens and for that sole reason Legislatures and Administrators were bound to pass many new laws for the regulations of the environment. The environment protection is now also one of the basic Fundamental Rights provided by the Constitution of India as scope of Article 21 has been uplifted by the Hon'ble Supreme Court of India. Now the debate which has gained prominence from last two decades is that, the development on the cost of damage to environment is it acceptable? The concept of sustainable development was the answer, but limits of these so called sustainable developments have not been provided. The limits tend to change every passing year so sustainable development concept has to be redefined every passing year. The concept of sustainable development has been doing the rounds for quite some time but the environment is being polluted at a very high rate and development at the cost of damage to environment is not something that we want at any point of time. At least each state shall have a forest cover of at least 33% but most of the states in India have a forest cover less than the required percentage and whole of India has forest cover of only 21%. Development in our country has overtaken the need for maintaining the requisite cover of forests and for that the government agencies shall be held responsible. Government agencies are responsible for not implementing the existing laws and their concern for the environment is negligible.

The direction from Ranchi Municipal Corporation has prohibited deep borings more than 300 feet's in a household, limiting to one boring per house hold and a boring of 1000 feet's for commercial residential purposes but with prior permission of the civic authorities, but as we all know how these guidelines are being implemented in our city and how these authorities are giving permissions without taking into account the environmental degradation. The other example is from our neighbouring state Orissa wherein mining was one of the popular business activities and forests were being totally brought down to grounds, along with these tribal populations were also dislocated from their ancestral places, is this example of sustainable development. The questions still haunts us. The laws passed by the Legislature are adequate but the implementation of those laws is a matter of concern. The law enforcing agencies are engulfed in corrupt practices, resulting in environmental degradation. Every corrupt official thinks what difference would it make but the reality is that it does make a difference and a huge difference has already appeared in the form of global environmental change.

In this paper I would like to concentrate on penal provisions for degrading the environment and also for the implementation for the existing laws for preventing the environmental from further deterioration of it.

Keywords: Fundamental Rights, Article 21, Article 51 A, Fundamental Duties, Environmental Laws, Environmental Protection, Legislation, Enforcement of Existing Laws, Sustainable Development

J - 004

ENVIRONMENTAL KUZNETS CURVE HYPOTHESIS AND THE CASE OF INDIAN STATES

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A quest for Sustainable Development is now a compulsion rather than a choice for all the Nations of the world. Paris Agreement under the UNFCCC which is into effect since 4th November, 2016 is a first-ever universal (signed by 194 and ratified by 132countries), legally binding global climate deal suggests that along with all other differences, the countries of the world are unanimous on the issue that the ongoing developmental activities are degrading the environment, creating ecological imbalance and compromising the aspirations of future generations. India is also a party in this agreement and has committed to achieve targets like reducing Green House Gas emission per unit of GDP by 33-35%, at least 40% of electricity generation from Non-fossil Fuel and increasing Forest Cover to create additional carbon sink of 2.5-3 bn. tonnes, etc. by 2030. These are difficult but necessary and hence the action has already started in terms of various schemes such as *Ujjwala Yojna*, Solar Power Parks, Social Forestry, etc.

Just to have a glimpse of the level of difficulty of the targets for such a vast and diverse country like India which is the home of world's 17% population with significant degree of poverty, income inequality, illiteracy, unemployment and dependence on nature for livelihood, etc., this paper has attempted to assess the current status and past trend of environmental and social variables as a function of economic variables in the county at a consolidated level as well as State wise. For integrating the variables standard theoretical models are available and here one of them- Environmental Kuznets Curve (EKC) Hypothesis has been used. EKC is an inverted U-shaped curve which integrates the trend of per capita GDP with environmental damage and shows that there exists a turning point where increase in per capita GDP improves environment instead of damaging it which is the case in the beginning.

Today India is the fastest growing economy of the world and its per capita GDP which was around 300 USD in 1985 has increased to more than 1700 USD in 2016 registering an overall growth of more than five times in around thirty years but its per capita forest cover is one of the lowest at 0.08 hectares as contrasted with the world average of 0.64 hectares. In 1960-61 it was 0.123 hectares and then a nonstop fall indicates that India is yet to reach to that turning point of EKC. However in case of States the findings are mixed as some of the States like Kerala, Tamil Nadu, West Bengal, Goa and a few others are on the right side whereas many of the States like Bihar, Punjab, UP and many others are clearly on the left side of the turning point on EKC.

Keywords: Sustainable Development, Non-fossil Fuel, Solar power, Per capita Forest Cover

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J - 005

A COMPARATIVE PERCEPTION OF ENVIRONMENT RELATED POLICIES AND LAWS IN INDIA AFGHANISTAN AND AMERICA

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Human activities and fast rate of growth has posed a threat to the very vital surroundings of living organisms. Termed as global commons by the Kyoto protocol the environmental resources require the combined efforts of the world community to protect them as an irritation or damage in the resource would have an adverse impact on entire earth along with all the living and non-living forces either directly or indirectly. The governments of all the countries are under compulsion to make laws and formulate policies for the protection of environment. These laws and policies play a very important role in shaping the actions of individuals as well as other organisations towards a better environment. These environmental resources are the very base for life on earth and destruction in these would mean the destruction of the entire life on earth. Here comes the necessity for conserving the resources and formulating policies and enacting laws which act as guiding and compulsive force for individual actions. The research is a genuine effort to analyse and understand the environment related policy set up and laws and their impact. The research aims at providing innovations to these laws and suggests India specific sustainable policies which can be adopted by the Indian government for ensuring better environmental conditions for the future generation.

Keywords: Environmental Impact Assessment, global commons, legislations, sustainable

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J - 006

JUDICIAL ATTITUDE TO PROTECTION OF ENVIRONMENT IN INDIA

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Environment refers to the biotic and abiotic factors which surround us
The concept of environmental protection and preservation is not new. It has been intrinsic to many ancient civilizations. Ancient India texts highlights that it is the dharma of each individual in the society to protect nature and the term 'nature' includes land, water, trees and animals which are of great importance to us.

In the wake of the Bhopal gas tragedy, the Government of India enacted the Environment (Protection) Act, 1986. The laws that existed prior to the enactment of EPA (Environment Protection Act) essentially focused on specific pollution (such as air and water). The need for a single authority which could assume the lead role for environmental protection was answered through the enactment of EPA. It is in the form of an umbrella legislation designed to enable the Central Government to coordinate the activities of various central and state authorities.
Indian Judiciary has played very important role in the protection of environment. It has expanded and stretched the existing legal provisions to address the environmental issues. It has evolved new doctrine and principles to deal with conflicting interests of various group of the society.
But despite of these legislations, rules and regulations, protection and preservation of the environment is still a pressing issue. Hence there is a need for an effective and efficient enforcement of the constitutional mandate and the other environmental legislations.

Keywords: Environment, India, laws, judiciary and pollution

J - 007

A CRITICAL REVIEW OF ENVIRONEMNTAL PROTECTION ACT 1986: A CASE STUDY

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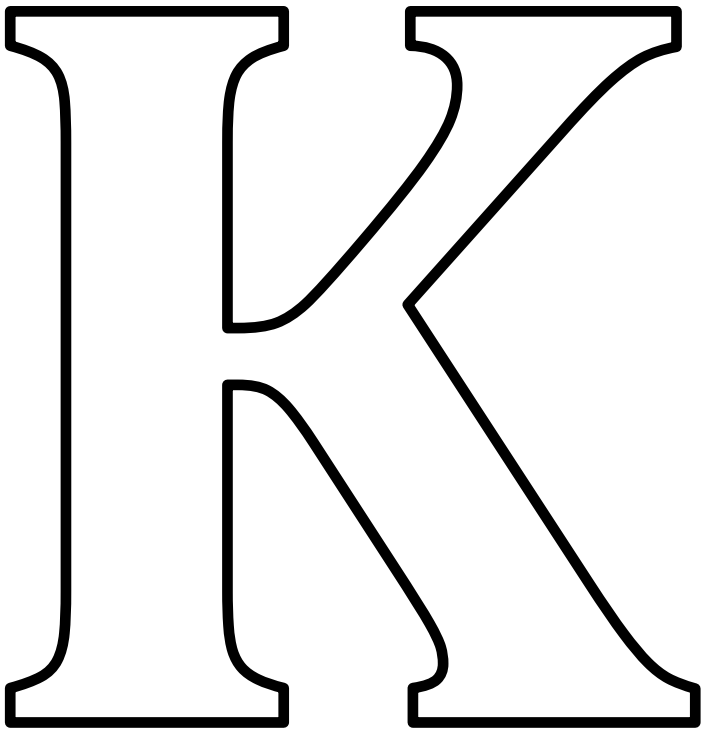
The Environment (Protection) Act was enacted in 1986 with the objective of providing for the protection and improvement of the environment. It empowers the Central Government to establish authorities charged with the mandate of preventing environmental pollution in all its forms and to tackle specific environmental problems that are peculiar to different parts of the country. The Act was last amended in 1991.

The Act is a seminal enactment which strengthens the hands of the Central Government in overseeing environmental protection. But while at certain points it pretends to be an operative legislation, essentially it is only an enabling legislation. From present appearance it is perhaps an inadequate beginning. It contains none of the intricacies of the Water (Prevention and Control of Pollution) Act, 1974 or the Air (Prevention and Control of Pollution) Act, 1981.

There is an urgent need for a strong inspectorate under the Act, consisting of experts who can understand and find solutions for the problems as and when they arise. Such an inspectorate will be helpful in not only filling the gap existing in the act but also making the board itself to understand the problems in a more objective manner.

This paper is an attempt at examining whether the Environment (Protection) Act, 1986 will help us to realise the objects for which it has been brought into being.

Keywords: environmental protection, act, legislation and review



Role of NGOs to Protect Environment

K - 001

ROLE OF JOURNALIST & NEWSPAPER TO PROTECT ENVIRONMENT: AN ENQUIRY

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Environmental journalists are expected to be protectors of environment by educating people about the serious condition of the environment by using the power of the newspapers to bring about changes to improve the quality of the air, water, wildlife and natural resources. The purpose of the paper is to investigate the role of journalist and newspaper to protect environment. Trying to convince people about the importance of protecting the environment sometimes falls on deaf ears. A large section of the society tends to assume that the resources they depend upon for the livelihoods will always be there. Protecting environment as a core issue for society sets numerous challenges for journalists and newspapers. Unfortunately, the environment pages or sections of most of the newspapers are suffocating today due to lack of finance, manpower, vision, editorial policy and guidance. Protection of environment does not figure nowadays as one of the main components of news and features in the newspapers of the country. It is a matter of deep concern that even when pollution, booming population, e-waste, global warming etc. are being felt in all walks of life, the journalists and newspapers choose to remain silent over various environmental issues and problems. What is important is not the adverse effect of pollution or the crisis of e-waste or the degradation of bio-diversity. Journalists can play a major role in protection of environment by projecting responsibly the problems of environment of the country. The newspapers can play a key role by highlighting any deficiencies in environmental schemes, maladministration and corruption in respect of protection of environment acting as watchdog. Today's newspapers especially the mainstream are preoccupied with urban issues and the lifestyles of the rich and affluent. For such a market-driven newspaper, the problems of environment are not matters of serious concern. Various newspapers devote very little space for coverage of environmental issues. Today no daily has an 'environment correspondent'. Environment comes much lower down in the priority list of newspaper unless something dramatic happens. The paper has recommended some suggestions like need of vernacular specialized agencies and feature services exclusively for environment, establishment of forum for interaction between environmentalists and reporters, establishment of 'environment media centre', environment correspondent is a must in all newspapers, establishment of mandatory environment bureau in each newspaper etc. It is, therefore, the need of the hour that journalist and newspaper should be the part and parcel of the culture of protection of environment. If journalist and newspaper become the party of the culture, diseases like pollution, environmental degradation will be eradicated soon. The "social responsibility" theory of the press will be succeeded if journalists and newspapers of the country come forward in protection of environment as partner of the progressive thought.

Keywords: Environmental journalist, Responsibility, Journalism, Protection, Ecology, Investigation, environment

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K - 002

THE ROLE OF A NGO - RAMAKRISHNA MISSION LOKASIKSHA PARISHAD (RKMLSP) IN PROMOTING LAND SHAPING PROJECT FOR ENVIRONMENTAL PROTECTION IN SUNDERBANS, WEST BENGAL

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Sundarban considered as backward area is separated from the mainland by enumerable tidal creeks. The area has a rich natural resource base. But the people here are extremely poor and intensively depend on these natural resources for their livelihood. They are solely dependent on traditional agriculture and fishing. Majority of the population do not have a sustained living condition compare to other parts of the state. The survival need of the poor people in this area has forced them to degrade the environment. Else resource conflicts are often about access to and control over natural assets that are fundamental to the livelihood of many poor people. Therefore, the shocks caused by these conflicts can increase the vulnerability of the poor (Nath Bhadra and Khan 2015). Historical data on adverse climatic condition in the area indicate that almost every year the rainfall is associated with cyclonic storms (Mondal 2010). During the cyclonic storms saline water gushes in through breaches in the river dykes and inundates houses and lands. Under these types of conditions, large areas render uncultivable and become unsuitable for cultivation. Moreover, during rainy season water logging in the agricultural field becomes a great problem which affects the farming operation as well as the crops. Ramakrishna Mission Lokasiksha Parishad (RKMLSP), the Rural Development Unit of Ramakrishna Mission Ashrama, Narendrapur, Kolkata – A NGO (Non-Governmental Organisation) persuaded the farmers to dig a larger area and raise their land for cultivation. Initially the response was slow, after several rounds of discussion with the farmers on pros and cons of the concept; finally the idea of 'Land Shaping' (LS) was accepted by them. The Land Shaping Project (LSP) has been developed by the SRAN through the Krishi Vigyan Kendra to enhance land use plan in coastal part of Sundarbans. This intervention helped in creating year round crop production, aqua-culture, generating income throughout the year, controlling migration, better diet and balancing the mono-cropping risk.

Keywords: Tidal creeks, natural resource, livelihood, traditional agriculture, sustained living condition

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K - 003

KEY ROLE OF NGO IN THE PROTECTION OF ENVIRONMENT

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The NGO's constitute a worldwide network interacting with Governments and Internal intergovernmental organization in shaping international environmental policies; creating awareness among the public on current environmental issues and solutions. Facilitating the participation of various categories of stakeholders in the discussion on environmental issues. Being involved in the protection of human rights to have a clean environment. Protecting the natural resources and entrusting the equitable use of resources. Transferring information through newsletters, brochures, articles, audio visuals, etc. Organizing seminars, lectures and group discussion for promotion of environmental awareness. Working in collaboration with the government for capacity building and promotion of community participation in environmental awareness and protection. Working out at the grass root level and reaching far – flung areas with or without the government invitation.

It is an acceptable fact that no government can enforce environmental laws to keep cities clean. They rely heavily on NGOs to provide the infrastructure for monitoring, creating awareness and taking action. NGOs are playing a very effective role in presenting the various environmental issues before the people and those in positions of authority. It is also an accepted fact that the civic agencies are more amenable to suggestions and advice by people who work in the field of environment.

The NGO's described and discuss the common characteristics of health system functioning in the given socio-economic, socio-cultural, political, environmental protection and social services to protection of world environment, not only above said list they have so many social services conducting by NGO's. It would also help the Government to obtain relevant information for promoting and facilitate the implementation of major environmental programs. Having due regards to the importance of the role of NGOs in motivating the society for participation in environmental conservation programmes the Ministry has launched several programmes, which are being implemented with their active participation.

Keywords: NGO, Environment, Participation, Awareness, Protection

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K - 004

ANALYSING THE ROLE AND PERFORMANCE OF NGOS IN FACILITATING ORGANIC FARMING IN KOLKATA METROPOLITAN AREA, INDIA

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The widespread commercialisation of agriculture has substantially augmented the agricultural productivity worldwide but at the cost of environment. Accordingly, the increasing use of chemical pesticides and fertilisers has led to enormous levels of chemical build-up in the global environment including human bodies. Moreover, the use of hybrid seeds and the practice of extensive monoculture have contributed to the severe degeneration of local and indigenous varieties of crops thereby causing biodiversity losses. Organic farming, on the contrary, is widely believed to have the potential to reduce environmental pollution and quality of food. Organic farming refers to a group of means of farming that does not involve usage of chemical fertilizers and chemical pesticides and uses local resources in a sustainable way. Besides the obvious immediate and positive effects, it also greatly helps a farmer to become self-reliant in his requirements for agro-ecosystem management in a substantially reduced cost in late years of farming initiation.

In India, the concept of organic farming is not new and it had been followed since ancient times. The practice continued till the early 1970s but the onslaught of the Green Revolution wiped out these indigenous agro ecosystems with the introduction of chemical fertiliser and HYV based contemporary agricultural practices. Coupled with lack of basic infrastructural facilities in rural areas and low educational and technical skills of the farmers, these phenomena actually aggravated the environmental degradation. Consequently, considerable challenges are present towards adopting an environmentally and economically sustainable method of organic farming. This is where NGOs with a penetrating capacity at the very grassroots of local agrarian communities can play a highly positive role to bridge the ever widening gap between technology and farmers.

In this paper, an attempt had been made to analysethe role of NGOs in and around the Kolkata Metropolitan Area towards the development of sustainable organic farming. Three NGOs operating at the fringe parts of Kolkata which used to supervisethe production, certification and marketing of organic farming produces were studied. Both qualitative and quantitative methods were applied to analyse their role and contribution in the spread and prosperity of organic farms in the study area. This study also attempted to find out the strengths, weaknesses, opportunities and threats of these organic farms in the current socio- political set up. It was inferred that a change in the orientation in outlooks of government, farmers, and urban mass consumers are necessary to flourish organic farming with the appropriate assistance from local NGOs.

Keywords: Environmental pollution, Farmer perception, Local resources, Sustainable farming

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K - 005

ROLE OF ETF A STUDENT BODY IN BIOREMEDIATION OF SOLID WASTE AND WATER CONTAMINANTS THROUGH VERMITECHNOLOGY

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Environmental pollution is one of the greatest challenges that the world is facing. In metropolitan cities, waste disposal have become a great problem due to increasing population, pollution and urbanisation. The usual methods of handling organic wastes are incineration, land filling and composting. But for agro and kitchen waste, the best method can be vermicomposting. Incineration and land filling are not ecologically sustainable methods. ECO task force an NGO mainly having students committed to protect Mother Earth uses ECO friendly methods at the local level to combat global environmental problems One such activity involves vermitechnology in sustainable management of solid wastes and water contaminants for a greener earth. Millions of tonnes of animal waste, agro and kitchen waste are produced annually and cause pollution. All technology centred on utilization of earthworms are called vermitechnology. Two very important aspects of vermitechnology are vermicomposting and vermifiltration, which are better options for waste management. The earthworm species like *Eisenia fetida* (Red wriggler), *Eudrilus eugeniae* (African night crawler), *Perionyx excavatus* (Indian blue worms), etc. can be used for bioremediations of domestic wastes. These worms can be used effectively for composting a heterogeneous mixture of decomposing vegetables, food wastes etc. which is vermicomposting .Vermifiltration is an innovative wastewater treatment method using earthworms (Manyuchi et al, 2013). Most organic wastes can be broken down by earthworms, though some wastes have to be pretreated (Dash, 2013). This is due to the remarkable physiological properties of the earthworms which enable them to decompose these organic wastes. The coelomic fluid of earthworms have many remarkable properties, like antibacterial properties (Milochan et al, 1997), agglutinating activities (Mohring et al, 1996) etc. In the present studies two sets of experiments were conducted to find out the efficacy of two earthworms species *Eisenia fetida* and *Eudrilus eugeniae* in waste management. Earthworms were cultured in cow dung for three months by standard method and then transferred to kitchen waste samples. They were then analyzed for inorganic nutrients like N, P, K , Mg, Mn, and several other micronutrients. There was significant ($p<0.05$) increase of these nutrients in the vermicompost as compared to control i.e the waste not treated with these earthworms. In the second set of experiments, domestic and dairy wastewater was treated with these worms. The vermifiltration had changed the pH, conductivity, TDS and turbidity of water to the normal range. The Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) were lowered 63% and 92.52% respectively (at $P<0.05$) without earthworms i.e by the conventional method using gravel, broken brick, sand and chalk only 25% BOD and 20% COD were reduced. Therefore, vermitechnology can be used as a cost effective yet innovative scientific process for the bioremediation of wastes. Thus, due to their biological, chemical and physical action, earthworms can be directly employed to promote sustainable management of wastes.

Keywords: Vermicomposts, Vermifiltration, ECO Task Force, *Eisenia fetida, Eudrilus eugeniae*

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K - 006

SUSTAINABILITY ISSUES AT HIGHER EDUCATION INSTITUTIONS: A VISION

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As major contributor to the values, health and well-being of society, higher education has a fundamental responsibility to teach, train and do research for sustainability. We believe that success of higher education in the 21st century will be judged by our ability to put forward a bold agenda that make sustainability and the environment a cornerstone of academic practice.

Higher educational institutions are considered microcosms of small city and encompasses within its campus border a myriad of diverse operations and activities that impact the environment. This includes physical, chemical, biological research labs, meetings rooms (conference halls), hostels, canteen, mess, sports facilities, construction and demolition sites, drinking water supply, gardens, solid hazardous biological wastes etc. These sites offer model to adopt appropriate environmental management system for sustainability and conservation of natural resources and also for environmental assessment.

These institutions shall work to guard our environment for sustainable future which is ultimate for resilient ecosystem. We have always worked to explore opportunities to improve environmental performance and sustainability. These activities are used to handle a crises. Although these activities are done but in isolation and improvements were generally not measured/recorded. These practices were generally not standardized and were not documented. It is a high time to develop a system to manage environmental issues.

The Paper presents a design manual with parameters in the form of sustainability indicators which are applied to audit/assess sustainability in the campus.

Keywords: Sustainability, Resilient ecosystem, Higher Education, environment

K - 007

THE STATUS OF ENVIRONMENTAL EDUCATION IN THE SECONDARY SCHOOOLS OF JHARKHAND

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Over the last few decades, rising global concern over climate changes and environmental degradation worldwide has resulted in emergence of Environmental Education (EE) as an effective tool to create awareness and understanding of environment and its associated problems and develop skills and competencies for protection and conservation of it for a sustainable future. India with its determination to overcome climate change and create a greener planet has been promoting Environmental Education (EE) by making it integral part of its Education policies. National Council for Educational Research and Training (NCERT) has been responsible for drawing out the curriculum framework for EE. The present practice involves infusion approach where EE is imparted through the teaching of other school subjects like Chemistry, Biology, Geography and Economics at secondary and higher secondary level. Centre for Environmental Education (CEE) established in 1984 under Ministry of Environment and forest, Government of India has supported EE programme in schools through various measures. The focus of such Government interventions remains definitely to build a task force which would be informed and skilled enough to work for a sustainable future. In the light of India's commitment to this goal, it becomes imperative that EE should get momentum and be strengthened to fulfil the need. The present study has been undertaken to find out the status of Environmental education in secondary schools of Jharkhand with the objectives to draw a comparative account of the curricular practices, transactional methods and evaluation techniques adopted for EE in the three categories of secondary schools (Jharkhand, CBSE and ICSE board) and to ascertain their appropriateness in accordance with Government policies. It is a descriptive type of study conducted through survey method. Data collected using a questionnaire has been interpreted using simple percentage analysis. The population comprises secondary schools of Jharkhand. A sample of 15 schools has been selected through random sampling technique. Teachers from these schools have been given the questionnaire based on the subjects they taught (Geography, Chemistry, Biology, Economics). The findings of the study suggests that only 88.3% Jharkhand board schools have included all the aspects of EE (related to both environmental concerns and conservation) in their curriculum and 63.7% of them are following transactional methods as per policy recommendations. On the other hand ICSE and CBSE board schools have incorporated all the aspects of EE in their curriculum. 96.3% CBSE board schools and 98% ICSE board schools have adopted transactional strategies as per the norms. Both CBSE and ICSE board schools are implementing Continuous Comprehensive Evaluation (CCE) techniques for EE whereas only 74.9% Government schools have adopted CCE. Given the fact that large part of our young population still have access to education through the government schools, the findings of the study recommends immediate measures to strengthen the present EE practices in these schools if the country nurtures the dream to prepare environmentally conscious and righteous future citizens for a better world.

Keywords: Education Policies, Infusion approach, Curricular practices, Transactional methods, Evaluation Techniques

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K - 008

EMERGING ROLES OF ENVIRONMENTAL NGOS IN PROTECTING ENVIRONMENT

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Non-governmental organizations (NGOs) play important roles in growing awareness in the society mainly by campaigns and educational programs. Environmental NGOs (ENGOs) are involved in environmental management, lobbying, advocacy, and/or conservation efforts. They are generally characterized by creativity, flexibility and innovativeness. The issues like future of environmental protection, sustainable development and zero population growth are some of the major concerns of the environmental NGOs. Many countries including India are facing the profound environmental, social, and economic impacts of rapid population growth, development, and natural resource constraints. ENGOs can play a crucial role in helping to fill gaps by conducting research to facilitate policy development, building institutional capacity, and facilitating independent dialogue with civil society to help people live more sustainable lifestyles. In our present sojourn, we surveyed some prominent areas of Ranchi looking at the pitiable state of environment in the urban areas. We found gross lacunae in the behavior and overall attitude of the people. It was clear that educating the mass for a discernible change was impossible for any single person. It was also a tall order even for the government to do anything directly. Ideally for situations like this mass and regular training program can be outsourced to concerned NGOs. We will discuss about the emerging roles of ENGOs in protecting environment, policy making for urban development, policy implementation, assessment and monitoring etc. We will also discuss about the challenges faced by ENGOs.

Keywords: ENGO, Environmental Conservation, Natural Resources, Sustainable Development

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K - 009

ROLE OF NGOs TO PROTECT THE ENVIRONMENT OF NEW NAGRATOLI AREA OF RANCHI

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Environmental Management is a Collective responsibility that requires the input of various agencies, including governmental and non-governmental like NGOs, play a major role in addressing issue all over the world like framing the environmental conservation and protecting the endangered species of forests and animals. While most people assume environmental protection only focuses on pollution, this further encompasses Sustainable development and management of natural resources and the Flaura and Fauna. NGOs are important especially in areas where the Government cannot serve adequately in addressing the issues of environmental management. Here, NGOs create awareness by allowing the public to debate environmental issues with professional guidance.

NGOs also play a crucial role in advising policy makers like Government officers on the needs and priorities of the local people l. In most cases, they intimate to policy makers what is necessary for the poor people and the environment.

This abstract provides the Role of NGOs to protect the environment. It shows how NGOs create awareness and protect the environment.

Keywords: Awareness, Sustainable Development, Protection, Goal

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K - 010

NGO-COMMUNITY SYNERGY FOR HEALTH AND BIODIVERSITY CONSERVATION

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Forest Biodiversity and its conservation is a crucial ecological issue. The Bhil Vasava adivasis living in the Shoolpaneshwar Sanctuary in the Narmada district in south Gujarat possess immense knowledge about their medicinal plants. However, despite living in areas rich in biodiversity, these tribals live below the poverty line. Aadi Aushadi [AA] is a collaborative venture conceived, created and supported by a team of NGOs (Jeevantirth, Manthan, Srushti Organics and St Xavier's College). It has worked to help adivasi farmers creatively deal with issues of inadequate water, poor lands, chemical-dependent farming and malnutrition-- key issues for communities living below the poverty line. This unique social enterprise, evolved through a sustained process of empowerment, education and entrepreneurship, has empowered tribals with skills in five key areas: Social (group formation), Financial (thrift and credit), Resource management (soil -water conservation-organic farming), Market engagement (networking and sale) and Innovation (diversifying products). It has sought to bring in a holistic approach linking both environment and socio-economic development.Historically AA has evolved from detailed research studies which led to the documentation of over 250 ethnomedicinally significant species. However, to ensure that research goes from 'lab to land', the Xavier Foundation collaborated with the Gujarat Ecology Commission through a project titled "People-forest- Laboratory linkages for the Conservation of Ethnmoedicinal Biodiversity". This resulted in the bringing together of a group of 35 tribal healers—the genesis of the AA enterprise. With a view to motivating traditional Adivasi farmers to 'become entrepreuners', an 'ethnomedicinal network' called Aadi Aushadhi was set up comprising of three Self-Help Groups [SHGs]. The group initially opted for cultivation of ten selected medicinal in four demonstration plots which convinced the SHG members to adopt these plants for cultivation in their own lands. The partner NGOs ensured the capacity building of the AA members in key areas like soil and water conservation, Good Agricultural Practices [GAPs] and transition to organics. Trainings is product processing, medicine preparation, packaging and marketing were also undertaken. Currently AA, an informal group of 115 members is organized into four SHGs which are actively engaged in the production, packaging and marketing of 25 ethnomedicinal formulations in both- rural and urban centres. AA also diversified into production of 'value added foods' and cosmetic products. Providing assistance for marketing the 'Traditional Food Festival' [IIM, Ahmedabad], Agri Asia, Vibrant Gujarat and the Indian Forest Congress has resulted in the creation of a brand name for the novel enterprise with its innovative product, "Mahuda Ice Cream" now awaiting a patent. Currently, AA with support from the Core group of experts from the academic, agricultural and NGO sectors has formed the fulcrum around which 46 Biodiversity Management Committees (BMCs) and 46 People's Biodiversity Registers (PBRs) were prepared for the entire 163 villages of Dediapada taluka. Two FPOs with more than 500 members are in the process of being set up. The aim is to build up a strong AA-BMC network to expand the traditional medicine base, so as to ensure economic gains and to conserve biodiversity.

Keywords: Ethnomedicinal network, social enterprise, resource management

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