

# **Groundwater Quality Assessment for Drinking and Irrigation Purpose in Minche-Savarde Basin, Kolhapur District**

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Minche-Savarde is small watershed situated in Deccan Trap lava flows, which is part of Krishna Basin. Detailed groundwater quality assessment of 40 samples are carried out to evaluate suitability for both drinking and irrigation purposes. Chemical characteristics of groundwater was dominated by  $Ca+Mg > Na+K-HCO_3+CO_3$  hydrochemical types followed by  $Na+K-HCO_3+CO_3$  and  $Na+K-SO_4+Cl+NO_3$ , indicating dominance of cation and anion exchange process on both spatial as well as temporal scales. The Gibbs diagram reveals that the majority of groundwater samples falls in rock dominant type, which indicates rock water interaction in the study area is active. The United States Salinity Laboratory (USSL) diagram indicates that the all groundwater samples are free from sodium hazards but the salinity hazard varies from low to very high in many parts throughout the study area. This reveals that the groundwater is moderately suitable for agricultural activities. Analytical results of samples shows that the groundwater quality is fairly good in some places as well as at some places it exceeds permissible limit. In the study area major ion values are maximum in pre-monsoon seasons as compare to post-monsoon season.

## **KEYWORDS**

Minche-Savarde, Groundwater quality, Irrigation, Suitability, Parameters.

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## **Biochemical and Electron Microscopic Analysis of Eyestalk of the Mud Crab, *Scylla serrata* Exposed to Silver Nano Particles**

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Silver nano-particles (AgNPs) are widely used as spectrally selective coatings for solar energy absorption, chemical catalysts and especially for antimicrobial sterilization. After their discharge, silver nano-particles will most likely enter the ecosystems and may produce an adverse response in many aquatic animals altering their fitness and ultimately changing their densities or community populations. Hence, the present study was carried out with silver nano-particle (AgNP) induced toxicity and biochemical changes in the eyestalk of the mud crab *Scylla serrata*. After standardization of LD50 (25 ppm/kg) value, a single concentration of 20 ppm was used for the toxicity studies. Disorganization of corneal cuticle, formation of corneal cones, constriction of internal medulla and complete disorganization of basement membrane were observed through histological analysis and scanning electron microscopic (SEM) analysis of eyestalk of crabs exposed to silver nano-particles showed shrinkage and appearance of scars in the eyestalk developed in the basipetal succession and severe cell damage, total collapse of normal architecture leading to complete degeneration were to be observed. Biochemical analysis showed increased level of total protein, carbohydrate and lipid contents and tissue damaging enzymes, such as SOD, CAT and GPx from day 2 to day 10 on exposure to silver nano-particle which indicates severe tissue damage due silver nano-particle treatment. The overall results concluded that the release of silver nano-particle into aquatic ecosystem would have a direct impact on the aquatic animals and affect the biodiversity of aquatic life.

### **KEYWORDS**

Eyestalk, Nano-particle, Mud crab, *Scylla*, Silver.

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# Investigation of the Relationship Between Drought and Soil Physico-chemical Properties in the Barak Plains

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In those last periods, there has been a climate changes in Turkey. These changes affected the southern regions of Turkey with increased frequency and severity of drought. Subsequently affecting different ecological events and dynamics from plant cover to soil formation. In this study, the drought condition of the last 50 years in Barak plain, east of Gaziantep plateau (an average 800 m elevation) was analyzed. At the same time, the effect of arid conditions on the soil physico-chemical properties of the study area was analyzed. Preliminary findings obtained from Gaziantep station during the study period showed extreme drought in 1970, 1973, 1990, 1999 and 2008. During these periods, the Barak plain had precipitation well below normal. For many years, the climate has been very arid and exceptionally dry. Moreover, soil physico-chemical property over the time showed a significant decrease in pH and increase in soil minerals (example Fe, Mn, Zn, K). Those arid periods potentially withdraw and reduce the underground water. In other words, during these arid periods, the flow of streams in Barak plain decreased and at the same time water pollution; salinity of soil and water increased. In addition to this, it is also seen that in the study area, soil erosion and desertification increased due to drought.

## KEYWORDS

Barak plain, Soil, Climate, Drought.

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# **Second Law Analysis of Small Scale Organic Rankine Cycle**

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This paper essentially consists of energy and exergy analysis of a solar powered organic rankine cycle (ORC). R245fa has been used as the working fluid in this low-temperature organic rankine cycle for 1 kW power generation. The exergetic efficiency and exergy destruction rates are calculated for this system using second law analysis. The results show that the energetic efficiency reaches its peak value of 7.53% while exergetic efficiency is found to have a peak efficiency of 32.36% at the same inlet expander temperature. Also, the maximum exergy destruction occurs in the evaporator rather than in the condenser as evident by this analysis. It may be inferred that performance of any organic rankine cycle can be estimated by exergetic efficiency more precisely than energetic efficiency. The goal of this research is to highlight that this kind of system can be used for generating electrical power in buildings.

## **KEYWORDS**

Waste heat, Organic rankine cycle (ORC), Exergy analysis, Exergy efficiency.

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# **Study of Ganga River Health Condition Based on Water Quality Indicators with Environmental Aspects and Adaptation Strategies Thereof**

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The challenge on environmental sustainability before India is taking a frightful shape when it comes to the pollution of water. The long stretch of Ganga which is regarded as the holy flow is being messed up by the different anthropogenic activities. Ganga has now become contaminated in its many arms giving rise to a question to our water availability. There has been a long tradition of idol immersion and is too popular in the Ghats of Kolkata whose harmful effects are creating alteration on various components of a river of which water and soil are the most prominent. In this study in order to curb such situation and to establish a rapid assessment the physico-chemical parameters of water samples were collected from different hotspot areas at before and after idol immersion activity and were analyzed as prescribed by APHA guideline. Soil samples were also collected from the same position and tested accordingly in the laboratory of School of Water Resources Engineering, Jadavpur University. Water quality index (WQI) was calculated using the result indicated an increase in pollution load after immersion and quality deterioration characteristics change as well. The water quality index values reflected that an overall water quality is getting deteriorated at a greater extent immediately when the idol immersion process is going on. The results also highlighted that higher amount of lead was used as a raw material received in the river Ganga which may come from idol immersion. Thus it can be concluded that the overall health condition of river Ganga is getting hampered which may reduce the saturation value of dissolved oxygen and disturb the ecological flow at higher rate near by the bank.

## **KEYWORDS**

Water quality index (WQI), Ganga river, Idol immersion, Rapid assessment.

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## **Experimental Study on Water for Flow Uniformity**

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Many radioactive problems due to the non uniform cooling of reactor components in sodium cooled fast breeder reactors signified the importance of spillway weir system. The spillway weir profiles play a predominant role in the cooling of sodium cooled fast breeder reactor components and many chemical processing units. The profiling of weir had been a critical issue need to be considered regarding flow separation point of view. The separation of sodium flow causes entrainment of argon cover gas and hence reactivity problems. This paper describes the effect of spillway profile on flow separation studies, measurement of velocity of water for achieving uniform flow conditions, measurement of film thickness and drag coefficient of water for various flow rates. In this experiment, sodium had been simulated as water and argon as air considering the Froude number and Weber number and results are highlighted. This paper aims to bring out the suitable hydraulic design and production of profile which suits to minimize the flow separation of water over the crest of the weir. The thickness of water over the weir profile directly influences the flow separation. A water flow velocity meter had been used to measure the velocity of water in the upstream side and an ultrasonic sensor with Arduino and LCD setup had been used for measuring the film thickness of water in cylindrical coordinates. Based on the measurements taken, mean drag coefficient had been arrived.

### **KEYWORDS**

Flow separation, Velocity, Film thickness, Drag coefficient, Spillway weir.

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# Combination of Hydrothermal and Chemical Activation Process to Prepare High Surface Area Activated Carbon From *Sterculia foetida* Seed Shells and its Removal of Mercury

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In this present work, activated carbon (AC) prepared from *Sterculia foetida* seed shells plant by the combination of hydrothermal and chemical activation method. To remove the heavy metal prepared activated carbon is used as an adsorbent. Here, it is demonstrated the use of hydrothermal carbonization-derived activated carbon for such an application. The morphology of carbon and activated carbon was characterized by scanning electron microscopy (SEM). Fourier-transform infrared spectrometer (FTIR) was used to confirm activation. Surface area and pore size analysis results allow for comparison of the degree of activation. The experiments were conducted to study the adsorption phenomenon by varying parameters, like contact time, metal concentration and adsorbent dosage. The data obtained from this study were assessed by Langmuir and Freundlich isotherm. Among the equilibrium data, Freundlich isotherm is well adapted and implies that the metal adsorption on activated carbon is heterogeneous. The kinetic data were established to follow closely the pseudo-second order model. The surface morphology of the activated carbon was observed by XRD and BET. The maximum adsorption efficiency of the activated carbon for the removal of mercury ion was determined 89%.

## KEYWORDS

Activated carbon (AC), Heavy metal, *Sterculia foetida*, Biomass, Adsorption.

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# **A Case Study on the Comparison of $PM_{2.5}$ Mass Concentration Measured by Beta Attenuation Monitor and Gravimetric Method**

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Particulate air pollution, specifically  $PM_{2.5}$  is known to cause cardiovascular diseases in human being (Wang *et al.*, 2015). Because of its health effect, it is a major parameter of the National Ambient Air Quality Standards (NAAQS). In the National Ambient Air Quality Standards, three methods of the measurement of  $PM_{2.5}$  are recommended. In this study, two such measurement methods were used simultaneously and compared at various locations at Raipur city in Chhattisgarh State. Gravimetric method has been one of the conventional methods for the measurement of  $PM_{2.5}$  and has been approved by US EPA as reference method, also by many governing bodies. With the recent advancement in the field of technology there are several methods, which are almost equivalent to the gravimetric method. Among these, beta attenuation monitor (BAM) is the most widely acclaimed technology used all over the world for several years. In this work,  $PM_{2.5}$  was sampled using a filter-based gravimetric sampling method and direct reading instruments (that is beta attenuation monitor) at a location in Raipur city, namely Naya Raipur monitoring station during Diwali festival week and mass concentration results were compared. In general we observed that the deviation in the results obtained by both the methods is larger when ambient relative humidity is high (> 50%).

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## Bioconversion of Banana Pseudostem to Bioethanol

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Banana pseudostem acts as a potential feedstock for biofuel production but, their conversion into fermentable sugars is a major complication. The present investigated reveals the production of ethanol from the banana pseudostem with the help of biological treatment using white rot-fungi, like *Phanerochaete chrysosporium* carried out by SMC (submerge) and solid state (SSC) cultivation. The hydrolysis was done by *Aspergillus niger*, *Aspergillus fumigates*, *Trichoderma reesei* and mixed culture of all fungus. Finally, the fermentation was done by *Saccharomyces cerevisiae*, *Pichia stipitis* and *Candida shehatae*. At solid state cultivation condition *Phanerochaete chrysosporium* using *Trichoderma reesei* fermented by *Pichia stipitis* gives better result in case of pseudostem.

### KEYWORDS

Agriculture, Biomass, Fermentation, Hydrolysis, Pretreatment.

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## **Artificial Recharge by Surface Runoff Harvesting From Perennial Rivers**

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A majority of cities and town in the whole country are dependent on groundwater for their drinking water supply. This resource is being exploited unrestrictedly due to shortage of surface water supply. The groundwater withdrawal has increased tremendously over the last few decades. The groundwater quality has been adversely affected due to various human activities. The need of the hour is urgent remedial management measures to overcome these problems and also to provide a sustainable resource for the future generations. Rainwater harvesting has been used in the past but this is beneficial only during the monsoon seasons. Therefore, it is essential to switch over to remedial measures, such as runoff water harvesting to recharge the groundwater and arrest the declining trend of groundwater level and quality deterioration. In our country majority of the rainfall reaches the sea and thus remains inaccessible for human consumption. In this paper, a novel technique for recharging the groundwater aquifer using surface water from the perennial rivers is being proposed so as to provide a constant subsurface recharge throughout the year. Moreover, this recharge can be used to fill the surrounding percolation tanks, ponds, etc. which would immensely benefit the neighbourhood in terms of crop irrigation and drinking water supply. In addition, this technique can reduce the soil erosion in the perennial rivers and enhance the fertility of the dry lands in the vicinity of the recharge area.

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## **An Overview of Various Methods Available for the Removal of Poly Aromatic Hydrocarbons - A Review**

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Poly-aromatic hydrocarbons, the structurally related chemicals consist of aromatic rings with no substitution. They are a very potent class of environmental pollutants causing harmful effects to the environment. The paper describes the removal of poly-aromatic hydrocarbons (PAH) from wastewater and soil contaminants by using various techniques, such as physico-chemical methods, biological treatment, UV treatment, ozone treatment and photo catalytic degradation. The study involves the evaluation of best technique employed for the removal of poly-aromatic hydrocarbons from the environment.

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## **Carbon Sequestration in *Hevea brasiliensis* Plantations : A Case Study From India**

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The effects of atmospheric carbon dioxide (CO<sub>2</sub>) concentrations and mitigation of CO<sub>2</sub> attracted attention and found a place in the budget of different States all over the world. CO<sub>2</sub> mitigation gained prominence from the second half of the 20th century with initiatives taken by the institutions of international importance. Biotic and abiotic sequestration techniques are validated with additionality, permanence and leakage and biotic carbon sequestration through terrestrial ecosystems was identified as a viable option due to its low cost. In this context, the present paper attempted to estimate the carbon sequestration potential of *Hevea brasiliensis* plantations in Kanyakumari, the southern-most district of India. The development of market mechanism for sequestered carbon widened the investment opportunities and provides economics incentives to the planters in countries enormous forest resources. The carbon flux of plantations will provide a time span for policy makers to arrive at a convincing solution for sustainable development. The present study estimated that the *Hevea brasiliensis* plantations of Kanyakumari district is sequestering 647069 tCO<sub>2</sub> and thereby eligible to earn \$19.41 million through carbon trading.

### **KEYWORDS**

Plantations, Carbon sequestration, *Hevea brasiliensis*, Kanyakumari, CO<sub>2</sub> mitigation.

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