

Use Of Soil And Water Assessment Tool For Sediment Modeling

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The soil is the natural, dynamic, heterogeneous, non-renewable resource, which supports plant and animal life. It is the most precious primary resource for the very existence of humankind. Soil and water problems in Varanasi are stressed due to rising population and climate change. The studies showed that the changing climate and intense human activities would complicate the situation endangering the water and soil resources. To support sustainable uses of these resources, an appropriate model is required in this area and to develop such model runoff, evapotranspiration and soil erosion modeling is essential. In this paper, soil and water assessment tool (SWAT) is used to model sediment yield processes of Varanasi watershed in the Ganga basin. Ten years of daily meteorological data, soil data procured from the National Bureau of Soil Survey, digital elevation model of 90 m resolution and Landsat 8 satellite imagery are used as inputs. The watershed was divided into 39 sub-basin for analysis and modeling. The Sufi-2, Parasol and GLUE algorithms were used for validation and calibration. The data was divided into two halves of 5 years each. First half was used for calibration and the second half for validation of the model. The results revealed that more than half of the annual precipitation water is lost in evapotranspiration and runoff. Sediment yield of various soil erosion-prone areas was estimated. The results from modeling would be further used to propose and model multiple water conservation and sediment filtration basin structures in the flood and soil erosion impacted areas. This study also revealed that how the SWAT model is valid to be used in hydrological and soil erosion modeling. These results can be further implemented for improving water and soil quality of the watershed.

Keywords

Runoff, Soil erosion, SWAT, Watershed, Evapotranspiration

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A Study Of Effects Of Organic Compounds And Fe And Zn Nano-Fertilizers On The Yield And Absorption Of Macronutrients In Tomatoes

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To investigate the effect of Zn and Fe nanoparticles, as well as vermicompost and humic acid on the yield and absorption of macronutrients in tomato, a factorial experiment with a randomized complete block design was conducted at Agricultural and Natural Resources Research Center of Torogh. The first factor consisted of organic compounds at three levels of control (non-consumption), application of 5 tonne/ha of vermicompost and application of 5 kg/ha of humic acid. The second factor comprised of Fe nanoparticles at two levels of control (non-consumption) and use of 2.6 kg/ha of nano Fe-oxide and the third factor consisted of Zn nanoparticles at two levels of control (non-consumption) and use of 2.6 kg/ha of nano Zn-oxide. The samples of each plot were obtained from three central lines by removing 1 m from each side. A leaf sample and a fruit sample were derived from each plot and analyzed to determine the concentration of macronutrients. The results showed that the highest nitrogen concentration of fruit was observed in control treatments and combined use of humic acid and Zn nanoparticles. The highest phosphorous and potassium concentrations in leaves and fruit yield were observed at different levels of organic compound treatments (including humic acid and vermicompost) and the application of Zn and Fe nanoparticles. The lowest level was also observed in non-consumption of organic compounds and Zn and Fe nanoparticles. In the interaction of organic compounds and Zn nanoparticles, the combined use of humic acid and Zn nanoparticles showed the highest and the combined use of vermicompost and Zn nanoparticles revealed the lowest phosphorous concentration in the fruits. The comparison of the mean interactions of organic compounds and Fe nanoparticles, as well as Zn and Fe nanoparticles, suggested that except for the treatment of Fe nanoparticles (alone), which was placed at a lower class, other treatments were placed at the same statistical group in terms of phosphorous concentration in the fruit. In general, the use of humic acid and vermicompost as sources of organic compounds could contribute to the absorption of macronutrients by plants, increasing phosphorous and potassium concentrations in leaves as well as nitrogen and phosphorous concentrations in tomato, which enhanced the overall yield of tomatoes.

Keywords

Humic acid, Macronutrients, Vermicompost, Nanoparticles

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Assessment Of Air Pollutants At Selected Monitoring Stations Of Moradabad

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Moradabad is one of the brassware city of India and known as the 'Pital Nagari', it is famous for the brassware items which has elevated the risk of atmospheric pollution. The present study was carried out to assess air pollutants at selected monitoring stations using a statistical approach consisting of analysis of variance and air quality index (AQI). It is evaluated by monitoring PM₁₀, SO₂ and NO₂ at three different sites, that is Buddh Bazar (site I), Police Training Centre (site II) and Moradabad Development Authority (site III). Results are based on AQI calculator launched by MoEF, New Delhi. The AQI obtained from different sites is 194, 148 and 130 at sites I, II and III for the summer season and 226, 167 and 150 at sites I, II and III for the winter season, respectively. During monsoon, AQI observed is 183, 139 and 100 at sites I, II and III. The maximum AQI value was recorded at the site I in winter season while minimum at the site III in monsoon season. The exalted concentration of all the pollutants at the site I may be due to anthropogenic activities, that is vehicular density and generators near bus stand and railway station and a number of open brass melting furnaces pose a serious threat to air quality. Police training centre falls in high pollution category where roads, lanes and bylanes are swept every morning by a number of worker and trainees. Control site (Moradabad development authority) showed moderate pollution as it is relatively a clean area. The study concluded that a high number of vehicles and the brassware industries are responsible for the enhanced concentration of air pollution.

Keywords

PM₁₀, SO₂, NO₂, Air quality index, Health effect

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Performance Study Of Fixed Bed Hybrid Bioreactor Treating Synthetic Carbonaceous Wastewater

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A laboratory scale fixed bed hybrid bioreactor of volume 15 L was fabricated with perspex sheet as an attached surface. The biofilm was developed on a frame made by combining nine angular fins with equal angular spacing. Synthetic carbonaceous wastewater was continuously fed with HRT ranging between 4-8 hrs, COD between 150-250 mg/L and biomass concentration in the range of 2000-3500 mg/L. The effluent COD, as well as the biomass concentration, was monitored for each continuous run until quasi-steady state condition reached. In order to judge the performance of the hybrid bioreactor, two important operating parameters, namely volumetric organic loading rate and F/M ratio have been taken into consideration. Fixed media support plays an important role to accommodate more and more attached biomass which enhances the removal of BOD/COD from wastewater. The effluent sample and reactor content were taken for measuring final COD concentration and steady state suspended biomass concentration, respectively.

Keywords

Fixed bed hybrid bioreactor, Biofilm, Volumetric organic loading, F/M ratio, Synthetic carbonaceous wastewater

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To Study use of Rubber Seed Oil Blends Diesel Fuel at Various Injection Pressures

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The physico-chemical properties of the fuel, such as viscosity, volatility, density, flash point and fire point affect the performance and combustion process. If high viscosity and density biofuel are directly supplied into the engine, complete combustion will not take place in the combustion chamber. Hence different methodologies are employed to get the better performance or atomization of the fuel. In this experimental study, the effect of injection pressure (IP) on the performance and emission of compression ignition (CI) engine fuelled with rubber seed oil as biodiesel and its blends with pure diesel was evaluated. The engine tests were conducted on constant speed diesel engine fuelled with diesel and various bio-blends of rubber seed oil (RSO) at the proportion of B20. The test results were compared with that of pure diesel as engine test fuel at various injection pressures of 200, 220 and 240 bar. The results show that the brake thermal efficiency has been improved with B20 (20% RSO and 80% pure diesel) at an IP of 240 bar compared to other biofuels at different injection pressures. It was also observed that the emissions, such as carbon monoxide (CO), unburned hydrocarbons (UHC) were considerably reduced and NOx emissions increased when compared to other biofuels at different injection pressures.

Keywords

Diesel engine, Rubber seed oil, Performance, Emission, injection pressure

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Effect Of Plant Growth Promoting Rhizobacteria Isolated From Gangetic Plains Of North Bihar On The Soil Properties Of Organically Cultivated Momordica charantia Lin

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With the environment already bearing the brunt of pollution through assimilation of innumerable toxins and inorganic waste, tilling practices should control the indiscriminate use of chemical fertilizers. Plant nutrients coupled with the optimal use of green fertilizers resides at the heart of sustainable agricultural practices. It also implies that the soil type(s) and its influencing micro-climatic conditions should also consider before implementing fertilizers. As microorganisms play a vital role in biogeochemical cycles impacting on soils, this study aims to assess the effects of plant growth promoting rhizobacteria (PGPR) as an environmentally efficient biofertilizer, to investigate its efficacy in maintaining the salinity and in enhancing the microbial turnover of the soil. The methodology involved pot experiments on Momordica charantia Lin. (Jaunpuri variety) of the Cucurbitaceae family having nutritional value and therapeutic benefits. Two strains of Aneurinibacillus migulanus bacteria, S1(V)23 and S2(V)12 isolated from Gangetic plains of North Bihar and used as PGPR. The results of soil nutrients were compared with defined standards of macro and micro-nutrients of ICAR at the Central Soil Testing Laboratory, Patna. The study revealed that soil inoculated with the broth medium of S1(V)23, S2(V)12 and combined S1(V)23 x S2(V)12 showed increment in the organic carbon (1.241%, 1.093% and 1.210%) as compare to the soil dosed with chemical fertilizers (0.539%) though the N, K was found higher in the soil dosed with chemical fertilizer (554 kg/ha and 579 kg/ha) but P content was low (52 kg/ha) as compared to soil inoculated with PGPR(s) S1(v)23, that is, 78 kg/ha. The micronutrients in the soil were observed more in PGPR inoculated soil as compared to the soil chemically dosed. The CSTL has recommended these identified PGPR biofertilizers, a better option as compared to chemical fertilizer for various crops and cropping sequences of the state.

Keywords

Biofertilizer, North Bihar Gangetic plains, Plant growth promoting rhizobacteria, Macronutrients, Micronutrients, Momordica charantia Linn.

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Studies On Removal Of Ammonium By Steel Slag From Aqueous System

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Steel slag is a waste material from the steel industry. The potential of steel slag as an adsorbent for the removal of ammonium from the aqueous system is studied for treating wastewater having ammonium as one of the pollutants. The influence of various factors, such as initial concentration, adsorbent dosage and temperature on the adsorption capacity has been studied. The adsorption capacity is found to be 0.143 mg/g. The maximum ammonium removal is found to be 74%. The percentage removal of ammonium is observed to increase with an increase in the initial concentration of ammonium. The adsorption of ammonium is found to be spontaneous and endothermic in nature. The Freundlich equation is found to interpret adsorption isothermal data. Pseudo second order equation helps to understand the reaction mechanism. Fourier transform infrared (FTIR) studies confirm the ammonium adsorbed on the surface of the steel slag.

Keywords

Ammonium, Steel slag, Adsorption, Kinetics, Isotherms, Thermodynamics

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Habitat Diversity And Vegetation Communities Of Lake Kondakarla

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Habitat diversity and vegetation communities of Lake Kondakarla, Visakhapatnam district, Andhra Pradesh were studied between December 2014 to January 2017. The lake environments harbour four distinct types of habitat diversity : wet meadows of lake fringes, littoral shallow areas, limnetic open waters and euphotic deep water areas. A total of 24 plant species belongs to 15 families consisting 4-species of emergent forms, 6-species of floating-leaved, 9-species of free-floating and 5-species of the submerged category were enumerated from Kondakarla lake habitats. Relative abundance of plant species indicates that emergent species (84.60%) and free-floating macrophytes (52.12%) were the dominant group rather than floating-leaved (45.43%) and submerged hydrophytes (36.50%) in lake habitats. Maturity index (MI) of plant communities shows that vegetation communities ecological succession was highest at littoral (42.75) and limnetic (27.33) habitats.

Keywords

Kondakarla lake, Habitat diversity, Vegetation community, Hydrophytes, Maturity index

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Assessment Of Spatio-Temporal Variation In Pond Water Quality: A Case Study

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The aim of the present study was to assess the spatial and temporal variations in pond water quality of Amritsar district of Punjab. The water quality data was collected during the winter (January 2016) and summer season (May 2016) from eleven different sampling sites. Eighteen water quality parameters, like alkalinity, hardness, electrical conductivity (EC), biological oxygen demand (BOD), chemical oxygen demand (COD), dissolved oxygen (DO), pH, total dissolved solids (TDS), Ca, Mg, NO₃⁻, NO₂⁻, PO₄³⁻, SO₄²⁻, etc., were evaluated. The water quality data was then analyzed using multivariate statistical tools including factor analysis, cluster analysis and Pearson correlation. The results of cluster analysis divided the sites into three different clusters on the basis of pollution load during the seasons. Overall the study showed that the water was polluted by anthropogenic activities, like the dumping of municipal and domestic waste and various agricultural activities. The study also revealed that multivariate statistical tools are important for understanding complex data sets for the assessment of water quality.

Keywords

Ponds, Physico-chemical parameters, Multivariate statistical techniques, Spatial and temporal variation

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To Determine Concentration Of Pollution And Dissolved Oxygen In River Water Using Fractional Advection-Diffusion Equation Through Sumudu Transform

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In the present research paper, we have used the Sumudu transform to solve the fractional advection-diffusion equation. This type of diffusion equation is most useful to calculate the concentration of pollution and dissolved oxygen in the river water. The Caputo fractional derivative to diffusion equation was used and solved through Sumudu transform. These results prove that the Sumudu transform is really useful and applicable for finding solutions to the problems related to the concentration of pollution and dissolved oxygen in the river water.

Keywords

Sumudu transform, Fractional advection-diffusion equation, Riemann Liouville fractional derivative, Chemical parameters, Water pollution, Mittag-Leffler function

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Rainwater Harvesting Strategy For The Kolkata Metropolitan Area

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There is no doubt that water scarcity is a problem, not only confined to the global scale but also to regional scales. Narrowing the issue to our country India, more so for the state of West Bengal, the issue is quite alarming. As a whole, the condition of the state of West Bengal is quite dismal as far as the availability of groundwater is concerned. One of the solutions to mitigate this issue happens to be rainwater harvesting. The present pilot study relates to the feasibility of rainwater harvesting as a probable solution to the increasing water demand for the metropolis Kolkata, particularly with respect to one of the sectors, such as the residential sector. This paper presents a comprehensive study of integrated management including issues and challenges for maximum possible utilization of rainwater for the mentioned residences to reduce the water requirement from the Kolkata Municipal Corporation (KMC) and groundwater sources.

Keywords

Rainwater harvesting, Precipitation, Water quality parameters, Artificial recharge

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Are We Taking Poison Every Day?

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Effective Utilization of Solid Waste, a Rational Approach Under Clean India

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Solid waste is proving to be one of the greatest risks to the general public. In order to conquer this issue, an itemized review within the specialized grounds is needed. The study was conducted in a technical campus (7 divisions) including office cafeteria flask and entire grounds. It has been discovered that the considerable measure of recyclable, non-recyclable and inorganic squanders are created inside the grounds. Recyclable squanders have been appropriately isolated and reused. Appropriate assimilation chamber, like Bangalore and indoor composting strategies are embraced with vermin fertilizing the soil activity for snappy disintegration. The outcomes gathered from the tests performed were issued for proper waste utilization. The task is to make the specialized ground a strong zero waste hatchery.

Keywords

Solid Wastes (SW), British thermal unit (BTU), High density polyethylene (HTPE), Liquefied petroleum gas (LPG), Total suspended solids (TSS), Volatile suspended solids (VSS), Mixed liquor suspended solids (MLSS), Mixed liquor volatile suspended solids (MLVSS), Food to micro organism ratio (F/M), Volatile fatty acid (VFF)

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