Investigation the effects of muddy water in decreasing seepage in the transition channels (Case study: Ferdows, South Khorasan province)

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ABSTRACT

Water of Baladeh's qanats travels around 15 Kilometers to arrive the lands in Ferdows by a channel. Farmers in order to reduce seepage in transition channels try to make the water muddy. In this research, with measuring seepage in both muddy water and pure water channels, the effects of making muddy water in seepage are investigated. The Seepage in channel 1 and 2 is measured by inflow-outflow test. Noticed that pondage test is employed for channel 3. The results show that making muddy water in a 16 hours period can reduce seepage around 60-67 percent. Also with continuing in making muddy water and controlling the erosion, seepage can be decreased approximately 95 percent. Loss of water in entrance of the channels is twice of the value in channels bed. Also muddy water can decrease seepage around 95 percent in sealing of pores in intake valves. Nowadays the most significant effect of turbid water in Baladeh qanats is closing the output pores of valves.

Keywords: Flow Measurement, Clogging, channel sealing, gate

Quantitative soil quality assessment in different land uses at some Parts of south eastern of Qazvin

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ABSTRACT

The assessment of soil quality is one of the most useful methods to evaluate soil management conditions and different uses of land. The determination and comparison of quantity indices is one of the best ways to compare the quality of different soils. In this study, soil quality indices and selection methods were compared to evaluate the soil quality effectively for various land uses. In this paper, seventeen properties of soil including the physical, chemical and biological properties were selected as total data sets (TDS) at five different land uses including orchard, rangeland, irrigated farming, dry land farming and unutilized lands in slope classes of 0-2%, 5-7% and 9-11% at some parts of south eastern Qazvin province,Iran. Then, 7 properties were selected as Minimum Data Set (MDS) using Principle Component Analysis (PCA). The soil quality was evaluated by Integrated Quality Index (IQI) and Nemero Quality Index (NQI) in two sets of soil properties including MDS and TDS. The results from the research showed that orchard and rangeland hadthe highest IQI and NQI in both data sets, respectively. However, irrigated farming, dry land farming and unutilized lands have the least IQI and NQI in both data sets respectively, and they have significant difference compared to orchard and rangeland. The correlation coefficients between TDS and MDS were 0.95 and 0.88 for IQI and NQI, respectively. These coefficients indicate the higher reliability of MDS against TDS, and also they show that the IQI offers better results to evaluate the soil quality in this case study.

Keywords: Integrated quality index, Nemero quality index, Total data set, Minimum data set, land uses

The effect of slot on bed topography around the bank attached triangular vane in 90-degree bend

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ABSTRACT

Although the spur dikes have an appropriate performance to protect the rivers' bank, these structures are not immune against the local scour around their tips. Recent researches have shown that the bank attached triangular vanes have less scour depth at their tips toward the spur dikes because of their geometrical shape. One of the methods to improve the flow pattern around the structures is creating slots in the structure to reduce the maximum scour depth around the structure's tips. In order to achieve the purposes of the present study, a rectangular slot (with an opening percentage equal to 10 percent of the effective vane surface and the location of the slot being parallel to the chord) has been created in the bank attached triangular vane. Then the effect of the slot on the bed topography was analyzed at different angles and hydraulic conditions (0.287, 0.304 and 0.322). The research results showed that the average reduction of the maximum scour depth by means of a slot at the angles of 23, 30, 40 and 60 degrees have been 70, 20, 17 and 54 percent, respectively. Also, the created slot in the vane caused the maximum scour depth to be formed away from the outer bank. By increasing the Froude number, the maximum scour depth increased at sample-slotted vanes.

Keywords: River bend, Bank attached vane, Slot, Maximum scour depth

Introduction and Assessment of a New Effluents Usage Method

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ABSTRACT

The increase in water demand from different aspects of water usage highlights the importance of the treated wastewater as a new water resource. The main aim of the current paper is to present a new method to specify the best applications for effluents involving fuzzy and entropy approaches based on the characteristics of effluents. To achieve this goal, the effluents' characteristics data of Arak city wastewater plant were utilized from 2013 to 2017. Also, six possible consumption options were determined and considered. Then, the appropriate parameters that were involved with the new derived indices were selected and the best options were chosen. The mentioned indices are named the Fuzzy Effluents Quality Index (FEQI) and the Entropy Effluents Quality Index (EEQI). The results of the research indicate that not only the proposed indices are sensitive to the input parameters, but they also classify the effluents correctly. Moreover, the results illustrated that the quality of Arak effluents in the last 5 years have improved. As in the last year, according to the new indices, the effluents can be used in industrial, environmental, fodder production, cooked vegetables, oil seed production, and artificial groundwater recharge systems.

Keywords: Effluents Quality index, Effluents usages, Fuzzy logic, Entropy, Factor analysis

Application of dimensional analysis to investigate the dissolved oxygen increase using classical hydraulic jump

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ABSTRACT

Dissolved oxygen is a key parameter to study the water quality. In this investigation, the classical hydraulic jump as an aeration method is used to increase the dissolved oxygen. A number of experiments were carried out for the different Froude numbers in the range of 2 to 4.5 in order to study the phenomenon. A total of 240 data points were collected for different hydraulic conditions. Although the previous studies indicated that the aeration efficiency of the hydraulic jump should be considered as a function of the jump head loss, the experimental results of this study revealed that it also depends on other hydraulic and qualitative parameters. In this regard, Buckingham analysis was used to find the effective parameters in the phenomenon of dissolved oxygen increase using classical hydraulic jump. The mathematical equation of the functional relationship was obtained using the incomplete self-similarity theory. In order to find the dissolved oxygen right after the hydraulic jump, the results of this study indicated that the mean absolute relative errors associated with the relationships proposed in this study, and the one available in the literature were 9.09% and 24%, respectively. Also, the Root Mean Square Error (RMSE) values calculated using the method proposed in this study, and the one available in the literature were 0.42 and 1 ppm, respectively.

Keywords: Hydraulic jump, Dissolved Oxygen, Dimensional analysis

Evaluation of soil loss tolerance via soil productivity and quality at a watershed scale: Haji-Ghushan watershed, Golestan province

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ABSTRACT

Erosion is known as one of the important factors in the degradation of soil resources and non-point pollutions. A wide range of damaging effects including social, economic and environmental problems occur when soil erosion rate goes beyond the allowable value. There are several methods to determine soil erosion tolerance and each one has specific advantages and limitations. In this paper, two widely used methods were compared to determine the tolerable erosion in a watershed scale. The first approach is based on the assessment of the Productivity Index (PI) and the second approach is based on soil depth and soil quality index. A particular minimum data set of soil properties including infiltration, water capacity, organic carbon, aggregate stability, bulk density, and fertility status (nitrogen, phosphorus, potassium) were used to calculate the criteria. The results showed that the calculated tolerable erosion by the two methods were closely related. The average tolerable soil erosion for the study area was determined 9.2 and 10.2 ton/ha/year based on soil productivity method and soil depth-quality approach, respectively. The PI-based approach is preferred over the soil depth-quality approach for two reasons: First, the PI-based approach is a depth-wise and chemo-physical properties of topsoil are compared with subsoil layers. Second, the soil depth-quality based approach is a general guide that cannot take the differences between soils into account in details. As both models just take the onsite effects of erosion into account, these values can be used for managers and decision-makers of soil conservation regardless off offsite impacts.

Keywords: Soil degradation, Non-point pollution, Soil conservation

Investigating the effects of best management practices on the reduction of point and non-point source pollution of water using SWAT model (Case Study: Seimareh River)

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ABSTRACT

Surface water quality has a far-reaching impact on the human health and aquatic ecosystems. The sources of surface water pollutions include Point Source (PSP) and Non-Point Source Pollution (NPSP). The action of Identifying the point source and non-point source pollutions is critical to evaluate surface water quality and major pollutant sources in a watershed. In this study, Soil and Water Assessment Tool (SWAT) was used to investigate the influence of PS and NPS Pollution on the water quality. The model was calibrated for the period 2000-2009, and then it was validated for the period of 2010 to 2011. The values of Nash-Sutcliffe efficiency (ENS) and R^2 for simulations of flow and nutrient loads range from 0.84 to 0.96 for calibration period, while they vary from 0.69 to 0.85 for the validation period used for flow simulation. The statistical results revealed that the SWAT model simulated the monthly flow and nutrient loads satisfactorily in Seimareh watershed. Also, SWAT model was used to identify the critical source areas (CSAs) of sediment, TN and TP at the watershed level. SWAT model identifiedof 9 sub-the watershed (33% of total watershed area) as CSAs for TN and TP. The sub-watersheds 1, 6, 10, 17, 21,22, 25, 26 and 29 were identified as CSAs of TN and TP while most of these sub-watersheds were also identified as sediment CSAs. Then, the model was also used to simulate the impact of Best Management Practices (BMPs) at controlling nutrient losses. Major BMPs implemented were reducing chemical fertilizer application, and building a filter strip along the river bank. The result of WQI demonstrates that water quality at the upstream is generally better than the downstream with higher level of nutrient loads. Also, the seasonal variations WQI clearly indicates the summer and autumn season as the critical time period for nutrient loads within the watershed. The result showed that the BMP scenario reduced the pollutant losses compared to the baseline condition, and the greatest reduction in the nutrient losses was observed in the filter strip located along the river with percentage reductions of 68%, 36% and 39% for sediment, TN and TP, respectively. Overall, this study helps our understanding of the status of water quality and the role of the best management practices (BMP) options to improve water quality.

Keywords: Surface water quality, Point Source (PSP) and Non-point Source Pollution (NPSP), SWAT Model, Best Management Practices (BMPs), Seimareh River Watershed

Evaluation of nutritional status of squash by Compositional nutrient diagnosis (CND) method in Khoy region

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ABSTRACT

Compositional Nutrient Diagnosis (CND) methods are important to interpret the results of chemical analysis and diagnosis of nutritional status of plants. In order to evaluate the nutritional status of squash (*Lagenaria Vulgaris*) through CND and to determine nutrient norms for this crop, 122 leaf samples were collected from squash fields of Khoy region and N, P, K, Ca, Mg, Fe, Mn, Zn, Cu and B elements in the samples were analyzed. The squash fields were divided into two high and low yielding groups, based on mathematical and statistical methods and by additive function of variance ratio and then the CND indices and norms were calculated. Results of the research showed that there were significant differences between high and low yielding fields in terms of nutrients' concentration. Based on CND indices, potassium and zinc nutrients had the most negative indices. CND nutritional balance index of low yielding fields were more than zero indicating nutritional imbalances in these fields.

Keywords: CND indices, Norm, Nutritional status, Squash

Effect of different tillage systems and cover crop on aggregate stability, aggregate tensile strength and penetration resistance of a silt loam soil in Hamedan

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ABSTRACT

Soil management practices have different impacts on the values of soil resistance at different suctions, which have been rarely evaluated. In this study, the combined effects of tillage and cover crop factors on the aggregate stability, tensile strength of aggregates and soil penetration resistance at different suctions were evaluated. The tillage factor in three methods including moldboard plow, chisel plow and no-tillage, and cover crop factor in three types including Vetch, Lathyrus and no cover crop at the factorial design with three replications was applied. The aggregate stability was measured using wet-sieving method. The tensile strength of aggregates and the penetration resistance of the undisturbed samples were determined by Dexter and Kroesbergen indirect method and a micro penetrometer, respectively. Soil management practices had the highest impact on the resistance characteristics at 30 kPa matric suction. No tillage treatment reduced the tensile strength due to the reduced tillage intensity and the intact soil. The conservation tillage with Lathyrus cover crop increased the stability of aggregates by 155 percent in comparison with the no tillage-no cover crop in the spring season. Also, conservation tillage with Lathyrus treatment increased the tensile strength of aggregates by 7-45 percent compared with other treatments in the autumn season. The conservation tillage without cover crop reduced the penetration resistance in comparison with most treatments by 4.5-99 percent at most matric suctions due to the reduced plowing and the decreased agricultural machinery traffic. Therefore, this study recommends using Lathyrus cover crop with conservation tillage in agricultural fields. The results of studying the aggregates' strength with further research, could be used to determine the optimum time of agricultural operations.

Keywords: Compression, Conventional tillage, Conservation tillage, Vetch, Lathyrus

WEPP model efficiency in estimation of runoff and soil loss in stony rangelands of Khamesan watershed, Kurdistan

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ABSTRACT

The aim of this study is to evaluate the efficiency of WEPP model to estimate the runoff and soil erosion under natural events at plot scale in rangelands of Khamesan watershed, Kurdistan. The runoff and sediment induced by events leading to runoff were measured over a three year period (2011 - 2013) in eighteen plots of 24 m long and 1.8 m wide (6 hillslopes with three plots in each). Concurrently, the input data including soil characteristics, vegetation and ground cover were evaluated and recorded during the period.An overall of 24 events were investigated. After calibrating the model using the eight events' data based on the single event section of the model, the validation of WEPP model was carried out using the 16 remaining events. The model estimated the runoff and soil erosion with an acceptable accuracy under natural events in rangeland hillslopes containing significant amounts of rock fragments. The soil erosion estimations were somewhat better than the total runoff. In general, the model efficiency was lower in the hillslopes with higher rock fragments (especially rock cover) and higher percentage of lime compared with the other hillslopes. It seems that rainfall intensity pattern during each event also had a significant effect on the model estimations. In WEPP model for single event estimations, only a number of storm characteristics are used as input data, and intra-storm variations are not considered which may have a significant impact on the amounts of runoff and sediment.

Keywords: Model validation, Plot, Rock fragment, Single event, Soil loss

Assessment of sprinkler irrigation systems with emphasis on performance criteria and operation problems

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ABSTRACT

In this research, the pressurized irrigation systems including 7 center pivots, 3 linears and 8 solid-sets with portable sprinkler systems in the provinces of Tehran, Qazvin, Alborz, and Qom were assessed using the uniformity coefficient, the distribution uniformity, Potential Application Efficiency of Low Quarter, Application Efficiency of Low Quarter, and Irrigation Adequacy indices. In order to compare the assessed systems, the weighted averages of all used indices were calculated. The research results showed that the weighted average of the mentioned indices were 78, 63, 69, 69 and 49 percent for the center pivot system; 75, 68, 64, 55 and 62 percent for the linear system; and 77, 66, 60, 60 and 61 percent for the solid-set system with portable sprinkler ,respectively. By analyzing the indices and comparing them with the field and pumping stations' observations, it was found that the incorrect design, mismatch between the designs, performance and management, and incorrect operation are the main causes of inefficient performance.

Keywords: Assessment, Center pivot, Linear, Solid-set with portable sprinkler, operation

Evaluation of the effects of atmospheric pollutants on the performance of Angestrom- Prescott equation in estimating solar radiation (Case Study: Karaj)

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ABSTRACT

According to the fact that the solarimeteric stations are sparse, and the importance of awareness about solar radiation values, it is necessary to develop solar radiation models based on other meteorological variables. The empirical Angstrom-Prescott equation - which is based on sunshine hours - is widely used for the estimation of solar radiation. Although many studies have been conducted in order to validate the coefficients of this equation for each region in Iran based on the specific meteorological conditions of sites, the role of air pollution as an important parameter to reduce the radiation received from the sun has not been addressed yet. In this article, the validation of A-P equation was carried out based on the 3-year data of Karaj station in a daily time scale, considering the air pollution index through the logarithmic, linear and exponential equations. The research results showed that the corrected models with logarithmic structure with the determination coefficient of 0.5911 were performing better than the original Angstrom-Prescott models.

Keywords: Solar radiation models, Air pollution index, Daily timescale, Karaj, Iran

Calibration of AquaCrop's normalized water productivity for corn production in Pakdasht region

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ABSTRACT

The normalized Water Productivity (WP^*) parameter is one of the inputs for the AquaCrop model upon which the daily basis biomass production is simulated. The default value determined for WP^* is 33.7 grams per square meter for the corn crop. The problem that this research intends to solve is the amount of normalized water productivity for the Single Crosses 704 cultivar of corn, which has not been determined yet. This study was conducted for two years (2015-2016) at an experimental farm of Aburaihan college belonging to the University of Tehran in Pakdashtregion. An overall of three plots were used for the experiment with an area size of 25 m^2 for each one. The biomass yield of corn was measured six and seven times during the growing season in 2015 and 2016, respectively. The data measured in the first year (2015) and second year (2016) were used for calibration and verification of the model, respectively. The calibration was carried out using two methods of trial and error and the method presented by Steduto et al. (2009). The WP^* was calibrated with a little more accuracy by the latter method, and its value was estimated as 32.3 grams per square meter. The root mean square error and the mean bias error for the comparison between the measured and estimated biomass production are 0.73 and 0.25 ton per hectare for the tested data.

Keywords: AquaCrop model, Yield Production, Full irrigation, Simulation

Analysis of Monthly Flow Discharge Occurrence Pattern using Power Laws Analysis in Some Hydrometric Stations of Mazandaran Province

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ABSTRACT

The assessment of hydrologic wet and dry periods is the primary and necessary basis of water resources management and planning, which needs to be studied and understood in the case of drought occurrence. The aim of this study is the use of Power Law Analysis and analyzing wet and dry periods' patterns of river flow in a number of gauge stations of Mazandaran province. With this purpose, the wet and dry periods of monthly discharge time series in 26 hydrometric stations have been analyzed through a 36-year study period. Therefore, the average monthly discharge, the threshold limit and the starting and ending of the wet and dry spells were calculated and then the number of wet and dry spells' occurrence sequences from 1 to 41 months were determined. The research results showed that there were a straight relationship between the severity and the duration of dry and wet spells. The minimum severity of dry and wet spells were observed in Polur and Hanisk stations with the linear slope of -0.87 and -1.29 in southwest and western parts of the Mazandaran province. The maximum flow duration for dry and wet periods (122.09 and 145.89) were identified in Qoran Talar station at the center of the study area. In other words, the stations in the main branches of the southeast and center of Mazandaran province had dry and wet flow durations more than the other studied stations. The proximity of scatter plots to the straight line or parallel lines without intersection in the study area represented a homogeneous regime of dry and wet periods and significant changes with time were not observed. In this regard, it can be noted that the periodic pattern of monthly discharge and its duration can be determined using the Power Law Analysis method. The results of this study can be used to determine the susceptible areas with long durations of hydrological droughts, and also to determine the intensity of occurred droughts for better planning the surface water resources.

Keywords: Power laws analysis, Flow duration, Threshold level, Flow wet and dry spells, Drought intensity

Estimation of saturated hydraulic conductivity by using gene expression programming and ridge regression (A case study in East Azerbaijan province)

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ABSTRACT

The hydraulic conductivity of soil is an important physical characteristic, which is used for water modeling and the modeling of solutes and pollutants transport. The direct measurement of soil hydraulic conductivity is a time-consuming and costly process, and due to experimental errors and soil heterogeneity, the results are sometimes unrealistic. Besides, it could be estimated by easily measurable soil properties. The purpose of this study is to develop genetic programming and linear regression models to estimate the saturated hydraulic conductivity of soil using readily available soil properties. With this purpose, 160 soil samples with different properties were gathered from various areas of East Azerbaijan province of Iran. Then some physical and chemical characteristics of soil such as the proportions of sand, silt and clay in the soil, and organic matter, bulk density, pH and EC values were measured. Then the data was divided into two different data sets, namely training (75% of data) and testing (25% of data) datasets. GeneXproTools 4.0 and Statistica softwares were used to calibrate Genetic programming and regression models, respectively. Six pedotranfer functions (PTFs) with a combination of different mathematical operators were designed by the genetic programming. Finally, one of the PTFs which was more accurate than the others was selected. Also, the ridge regression was utilized to develop regression PTFs. The accuracy and reliability of PTFs were determined by R^2, RMSE, and MAE criteria. The research results showed that the genetic programming PTF (GP-PTF) is more accurate and reliable in comparison with the regression-PTF. In a way that the R^2, RMSE (Cm h^{-1}) and MAE (Cm h^{-1}) of GP-PTF were 0.91, 1.82 and 1.23 for the training dataset, respectively, and for the test dataset, the values were 0.92, 2.27 and 1.59, respectively; whereas the values of the above mentioned criteria of regression-PTF for the training dataset were 0.70, 3.48 and 2.07, respectively, and for the test dataset were 0.76, 3.11 and 1.88, respectively.

Keywords: Genetic programming, Modeling, Pedotransfer functions

Effect of Activated Carbon Produced from Pine Cones in Reducing of Irrigation Water Salinity Parameters

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ABSTRACT

The irrigation water salinity is one of the important factors in soil salinization, the decrease in soil permeability and reduction of yields. Hence, finding modern and low cost methods to reduce irrigation water salinity is inevitable. The aim of this study is to produce activated carbon from pine cones and the evaluation of its application to adsorb the ions that cause salinity in the irrigation water. Adsorption experiments were conducted in a batch system and the parameters affecting the adsorption including contact time, initial concentration of salinity ions, adsorption isotherm and kinetics, and the effect of adsorption on irrigation water quality parameters including EC, TDS, TH and SAR, were studied. The research results showed that the maximum reduction of salinity in the electrical conductivity of 5.48, 10.41 and 20.4 (dS/m) were 7, 14.3 and 21.5 %, respectively. Adsorption Kinetic and isotherm of salinity ions followed the pseudo-second order reaction and Freundlich isotherm, respectively. The maximum reduction in TH and SAR values in irrigation water was observed in the salimity of 20.4 dS/m, that were reduced by 14.4 and 14.8 percents, respectively.

Keywords: Adsorption, Salinity, Activated carbon, Kinetic, Isotherm

An uncertainty analysis of general circulation models for estimation of soil moisture affected by climate change

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ABSTRACT

Soil moisture is an important factor in hydrological processes. In this study, the uncertainty of AOGCM models to estimate soil moisture were investigated by SWAP model for the future period of 2099-2080. The climatology data were produced by ten AOGCM models and two emission scenarios of A2 and B1. Subsequently, the data were downscaled by LARS_WG model and then the resulting data were used in SWAP model. The research results showed that during the post-growth weeks, the INMCM3 and NCARPCM models had the highest and lowest amounts of soil moisture, respectively. The uncertainty of annual soil moisture indicated that the INMCM3 model had the highest uncertainty band for A2 and B1 scenarios, and the GISS-ER and CGCM3T47 models had the lowest uncertainty band for A2 and B1 scenarios, respectively. Also, by comparing the moisture in soil depths of 60 cm and 30 cm, it was determined that the moisture in the depth of 60 cm would be higher compared to the depth of 30 cm.

Keywords: Climate change, AOGCM Models, SWAP model, Soil moisture

Experimental study of combined effect of roughness and sedimentation on hydraulic performance of cylindrical weirs under free flow conditions

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ABSTRACT

Cylindrical weirs are one of the most common structures for measuring flow discharge and controlling water level in canals and rivers. Numerous geometric and hydraulic parameters could affect the characteristics of flow passing over these weirs. In the present study, the effects of surface roughness and upstream sedimentation on discharge coefficient, pressure distribution and energy loss is investigated experimentally under the free overflow condition. The tests were carried out for a non-sedimenting channel bed, and sedimentation levels of 2/3 of the weir height. Three different weir diameters and four different surface roughnesses of the weirs were considered for a wide range of flow discharges. The comparison between results of the discharge coefficient of weirs for different upstream channel bed levels and the diameters of weirs indicated that as surface roughness increases from PVC to 4.5 mm, the discharge coefficient of the weir reduces of up to 8%. Also, by increasing the sedimentation level from zero to 2/3 of the weir height, the weir discharge coefficient increases up to 3%. In addition, the increase of roughness to 4.5 mm for sedimentation level of 2/3 weir height, leads to decrease in the discharge coefficient between 3 to 7 percent. By increasing weir diameter from 150 to 250 mm, the discharge coefficient increases up to 5%, and the energy loss decreases up to 15%. Moreover, it was found that in all of the tested weirs, as surface roughness increases, energy loss also increases up to 14% and by increasing the sedimentation level to 2/3 of the weir height, it reduces by 22%. The comparison between the results showed that pressure variation along the weir at a sedimentation level of 2/3 of the weir height followed a similar trend to the one that was obtained under non-sedimentation level. However, the magnitude of pressure decreased by increasing the sedimentation level. Besides, the effect of roughness on the pressure distribution on the weirs was greater at the downstream face compared with the upstream face.

Keywords: Cylindrical weirs, Discharge coefficient of weir, Pressure distribution, Energy loss

Effect of plot scale on runoff under natural rainfall (Case study; Saravan region, Rasht)

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ABSTRACT

One of the challenges to progress in hydrology and soil science researches is that the theories are only applied to certain time-space scales. This study was carried out to find out the effect of plot size on runoff generation and to quantify it's scale effects on runoff generation. For this purpose, 6 experimental plots with the length of 3 to 60 m and the width of 1 to 6 m were established on a hillside in the Saravan region of Rasht, Guilan province, Iran. The outflow runoff data was collected from October to May 2015, and then the data were analyzed. Also, the height of rainfall was measured for each plot using rain gauges. Results of the study showed that as the length of plots increase, the amount of runoff per unit area decrease with a non-linear pattern. The Comparison between the mean values of the plots confirmed that there are no significant differences among plots with lengths longer than 10 m in terms of runoff yield. However, there were significant differences among plots with a shorter or a longer size (P > 0/05). The research results verified the optimal length of 10 m for scaling proposes. A two-parameter model was used for scaling hillslope runoff ratio. Model parameters were determined by model calibration using 9 rain events. The evaluation of the model showed its appropriate efficiency for plots shorter than 30 m long.

Keywords: Erosion plots, Infiltration, Runoff coefficient, Scaling

Study of Spectral, Structural and Chemical characteristics of Humic Acids Isolated from Coalfield of Iran

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ABSTRACT

Due to the significant impact of humic substances on a variety of environmental processes, knowing the chemical, spectroscopic and structural features of these substances should always be considered in studies related to the management and remediation of the impacted ecosystems. In this study, after the extraction and purification of Humic Acid (HA) from low grade coals of mines of IRAN, the gravimetric technic was used in order to determine the degree of purity of HA from non-destructive spectroscopies such as ICP-OES, UV-VIS, FT-IR and CHNOS for measuring the quality and quantity of HA. Also, microstructures of SEM were used in order to study the structure of HA; then the obtained results were compared with standard Aldrich HA. The results of the gravimetric analysis showed that the produced HA had a 98% degree of purification. Also, from the view of quantity, the results of elemental analysis of ICP-OES indicated that after the purification of HA, the concentration of various heavy metals in HA are lower than the recommended safety limit and there is a range of both macronutrients and micronutrients in the structure of HA. Moreover, the quality results of FT-IR, UV-VIS and SEM analysis have shown the presence of an aromatic predominant structure, rich in carboxylic and phenolic functional groups with high humification and condensation degrees, and type A with a loose spongy and heterogeneous porous surfaces for HA. The CHNOS analysis also confirmed the suitability of the coal used to extract HA, and showed that the final product matches the standard HA results.

Keywords: Characterization, Coal, Humic Acid, Spectroscopy, Structure