Evaluation technical and operation of disc filters of filtration equipment on the micro irrigation systems

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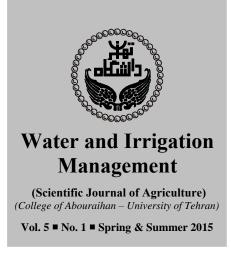4. Professor, Department of Water Engineering, Aburayhan Campus, University of Tehran, Iran

Abstract

One of the main problems in micro irrigation system is inappropriate combination and in some cases inappropriate performance of filters and sand tanks in central control systems which cause reduction in efficiency of system and increasing of operating costs. This study evaluates affect the amount of algae on the performance of disc filters sand tank in research farm deputy of soil and water and agriculture industry of Karaj. Experiments were carried out in four treatments, the first option is typical disk filter and sand tank, the second option involves sand tank automatic disc filter, the third option involves automatic disc filter without sand tank and eventually the fourth option involves typical disc filters without sand tank. These treatments have been compared in the three physical qualities of water. The results of experiments which lasted for three months showed that that typical disc filters and automatic in organic and suspended solids concentration of less than 50 milligrams per liter, had a very good performance. Disc filters in concentration of organic matter and suspended in the range of 50 to 100 milligrams per liter, good performance. Concentrations above 100 milligrams per liter disk performance drastically declined and the sand tank are required.

Keywords: automatic, central control, organic materials, physical qualities, sand tank.

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Effect of irrigation management with saline waters on soil salinity in the crop rotation

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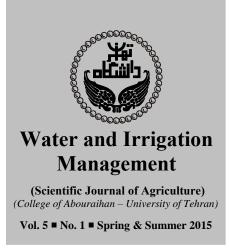**Abstract**

In order to investigate the effects of saline waters on some soil characteristics, this experiment was conducted with three irrigation water salinity treatments contains 1.7-3.4, 8-9 and 11-12.5 dSm^{-1} (low, medium and high salinity) and two irrigation water managements with four replications in a wheat-fallow-sugar beet-safflower rotation. Results show that in (1) Irrigation management with low water salinity in early season followed by medium or high saline water caused a significant decrease in ECe and SAR and meantime yield increased as compared with (2) irrigation management with medium and high saline water treatments during whole season. Wheat grain, extractable sugar in sugar beet and safflower grain yield in irrigation water management (1) followed by medium water salinity increased 26.5, 7.4 and 36.4 percent as compared to irrigation water management (2) with medium salinity respectively. Irrigation water management (1) followed by high water salinity increased wheat yield by 94 percent. Sugar beet with no change and safflower with more than 100 percent yield increase. ECe and SAR changes show that irrigation management (1) followed by medium saline water of about 8 dSm^{-1} could relatively maintain soil solute balance, so that condition for growing semi tolerance and tolerant crops such as wheat, sugar beet and safflower maintained.

Keywords: firsts season irrigation, salt accumulation, sodium adsorption ratio, soil salinity, water quality.

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Probabilistic forecast of climate change effects on Hamadan-Bahar aquifer

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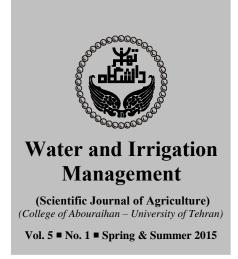
Abstract

This study will evaluates climate change impacts on groundwater resources in Hamadan-Bahar alluvial aquifer in the west of Iran. Different climate models are weighted in the basis of their ability in predicting monthly observed climate data in the base study period (1970-2000). With respect to climate models weights and their predictions, precipitation and temperature changes in 10, 50 and 90 probability percentile are estimated. Daily observation data of Hamadan synoptic station and ΔP, Δt under A2 emission scenario at 90 probability percentile, as a critical condition in groundwater recharge, have been imported to an stochastic weather generator, named LARS-WG, and future precipitation and temperature data are produced for the study period (2015– 2045). Multi layer perceptron artificial neural network and visual MODFLOW are used for simulating daily run off and groundwater table respectively. Simulated groundwater table indicates a significant depletion in groundwater table around 38 meters specially in the south-southwest of aquifer and at the end of modeling period aquifer saturated thickness will be less than 12 meters.

Keywords: climate models, groundwater, MODFLOW model, probability level, runoff.

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Evaluation and comparison of multilevel optimization method and IPARM model to estimate infiltration parameters in furrow

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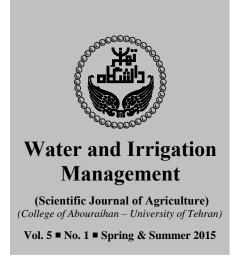### Abstract

The parameters of infiltration equations have a key role to evaluate and design irrigation systems and it is essential to estimate them with high accuracy for increasing irrigation efficiency. In the present study, two approaches consisting multilevel optimization method using advance, recession and runoff data and the IPARM model using advance and runoff data were compared for estimating infiltration parameters of furrow irrigation. The field study in order to collect required data was conducted in Karaj in 2014. Fourteen irrigation events with two inflow discharges (0.29 and 0.44 L/s) during maize growing season were carried out. Based on estimated infiltration parameters of the Lewis- Kostiakov equation, the mean relative error of the IPARM and multilevel optimization methods were obtained 8.1 and 8.5 percents, respectively, to estimate total infiltrated volume. The results indicated that both methods underestimated the total infiltrated volumes for all datasets. The IPARM method had less error than the multi-level optimization method. However, both methods had satisfactory performance to estimate infiltration parameters in furrow irrigation.

Keywords: infiltration parameters, Lewis- Kostiakov equation, relative error, surface irrigation, volume

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Investigation of different irrigation systems and water management on yield and water use efficiency of Black cumin

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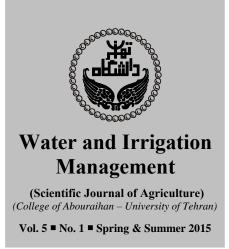
Abstract

Dfferent drip (surface and subsurface) and furrow irrigation methods effects on grain, oil and water use efficiency based on grain black cumin (*Nigella sativa* L.) as medicinal plants was investigated. For this purpose, experiment over the past two years (2009 and 2010) in a randomized complete block was designed in three replications. Treatments in this research were consisting of 50, 75 and 100% of black cumin annual water requirement with different drip irrigation methods consist of (surface and subsurface) and also the furrow irrigation treatments. The results of this research showed significant effects of different levels of water stress on different plant parameters such as: grain, oil and water use efficiency in both years of study. The highest and lowest oil percentage was belonging to different treatments 100% of subsurface drip tape irrigation and 50% of surface drip tape irrigation systems with 30.6 and 29.2% respectively. The highest and lowest average water use efficiency based on seed yield were obtained as 1.67 and 0.96 kg/ha/mm for 50% of subsurface and furrow irrigation treatments, respectively. The results of this investigation also showed that by using of subsurface drip irrigation method and by applying of 50% of black cumin annual water requirement, the highest grain water use efficiency could be obtained.

Keywords: seed yield, subsurface irrigation, surface, water deficit, water use efficiency.

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Estimation of reaeration rate coefficient on Dinachal river using empirical equations and numerical methods, in water quality management

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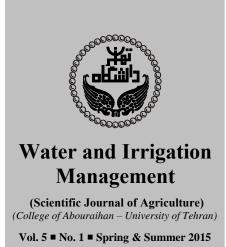3. Professor, Department of Irrigation & Reclamation Engineering, University of Tehran, Tehran, Iran

Abstract

The accurate estimation of reaeration rate coefficient, because of its effects on dissolved oxygen in rivers, is one of the most important initial steps of water quality management. The main goal of this paper is to evaluate the effects of reaeration rate coefficient on the river water dissolved oxygen, case study Dinachal River, Iran. To achieve these aims, water quality samples were collected along a reach of 2 kilometers of the river in September 2013. Electrical Conductivity, pH, Dissolve Oxygen, Biochemical Oxygen Demand, Nitrate and Phosphorus are the main quality parameters which were measured in laboratory, using the above mentioned collected water samples. Streeter-Pheps model has been used to simulate dissolved oxygen in the river analytically and to improve the output of the model advection, dispersion and decay rate terms were included to the basic form of the Streeter-Phepls equation. In addition, dissolved oxygen concentration in the river has been simulated involving FTCS, QUICKEST, Upstream and Lax-Wendroff numerical methods. The reaeration coefficient has been estimated using four eempirical equations including; Oconnor-Dobbins, Langbein-Durum, Boulton and Ling et al.. The results show that Up-stream numerical method containing Boulton rreaeration Coefficient equation has the most accurate results, with the amounts of Pearson correlation coefficient and Mean Absulate Errors equal to 0.995 and 0.033, respectively.

Keywords: biochemical oxygen demand, numerical methods, pearson correlation coefficient, Streeter-Phepls model, water quality.

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Flood control and management by CAPABLE simulator of unsteady flow in river

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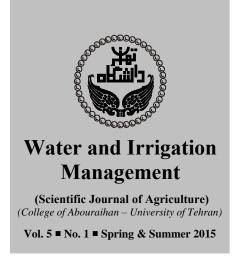
Abstract

Flood flow importance enforces we to simulate its components exactly. In this study, saint-venant equations in conservative form are usedto simulate one-dimensional rapidly varied flow in the river. Upstream methods of Godunov family in finite volume frame work are used to numerical solution. According to Flow conditions in the river, the equations used are included in the source term of the bed slope, friction slope, change within width, and lateral flows. These factors grant high performance to the model. The method is based on solving a series of Riemann problems. HLL and Roe Riemann solver is used to approximate the flux. To improve the accuracy of the order of one to two MUSCL algorithms is used. To evaluate the performance of the proposed numerical algorithms, model results are compared with Analytical Solution and experimental data. At the end, sensitivity of effective parameters in numerical results have been measured. According to the results, both algorithms provide solutions with high precision and optimum results and they have a great ability to simulate one-dimensional flow in different hydraulic conditions in the river.

Keywords: approximate riemann solver, dam break, finite volume method, lateral flow, saint-venant equations.

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Ranking of scenarios for water allocation of Zayandeh Rud dam to different users using the expert multi attribute decision making models

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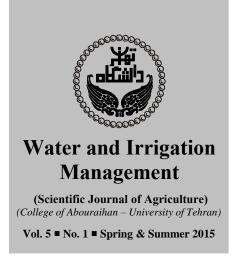4. Ph.D Student, Department of Water Engineering, Tabriz University, Tabriz, Iran

Abstract

Population growth as well as development of industry and agriculture has increased the demand and competition over water resources in large watersheds especially in Zayandeh Rud basin and severely affected on agriculture and environment sectors. Hence, providing a best scenario for the allocation of water in this basin is essential. In this study, due to alternating periods of wet, drought and normal conditions, five water allocation scenarios for each of these conditions were defined. Also the five criteria include measures of social, economic and environmental were selected for quantitative evaluation of scenarios. For ranking the water allocation scenarios, four multi-attribute decision making (MCDM) techniques of ELECTRE-III, AHP, TOPSIS and CP have been applied. Then, the Borda method as a group decision making method has been used for final ranking of scenarios.

Keywords: agriculture, Borda method, environment, ranking, Zayandeh Rud basin.

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Effect of irrigation efficiency increasing on groundwater level fluctuations (Cast study: Ajab-Shir Plain, East Azarbaijan)

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Abstract

Excessive withdrawal of groundwater and reduced rainfall in recent years have caused the drawdown of groundwater table. Therefore, it is necessary to manage it for preventing its damage. The present study was carried out to investigate the effect of increasing the irrigation efficiency on groundwater fluctuation on Ajab-Shir plain aquifer. The aquifer was simulated by using Visual MODFLOW 3.1 software. The steady state calibration of the model was carried out by using data from October 2004. Then the model was calibrated for unsteady state condition by using data from October 1999 to September 2005. Finally, the groundwater level and water balance of the aquifer were forecasted in two states: continuing the present irrigation method (surface irrigation) and changing it to pressurized irrigation system for fall 2005 to summer 2021 period. Based on the results, with the current irrigation conditions, the aquifer water balance will be equal to -2.43 m^3/year for the end of the prediction period. By increasing irrigation efficiency, the balance value was forecasted to be 3.99 m^3/year (3.23 m^3/day increase). Also, the results showed that changing irrigation systems will lead to an average increase of 4.63 m in the groundwater level of Ajab-Shir plain at the end of the prediction period.

Keywords: aquifer mathematical model, aquifer water balance, pressurized irrigation, sensitivity analysis, surface irrigation.

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Evaluating implemented linear sprinkler irrigation systems (Linear) in Qazvin Plain

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Abstract

Evaluating the performance of irrigation systems by providing the possibility of increasing irrigation efficiency in those systems is an important factor in the field of water resources management. In this study, the performance of three systems were evaluated, including linear move sprinkler irrigation systems in maize, sugar beet and alfalfa fields of Magsal Agro-industrial Company which is located in Qazvin plain, in 2013. In order to assess the performance of the cited irrigation systems, the coefficients of uniformity were determined by creating a water collection network of cans to gather the irrigation water in different points of the net. The results indicate that the average values of the coefficient of uniformity and the coefficient of distribution uniformity are 73.3 and 61.9, respectively which express low amounts of the coefficients in the systems of interest. On the other hand, the potential efficiency of water use (PELQ) and actual efficiency (AELQ) in the lower quarter were calculated as 68.21 and 50.6, respectively. These results depict bad management and exploitation. Likewise three-dimensional model of the spatial distribution of the output water of the sprinklers at the field level was drawn by GS + software. Overall, results reveal that the evaluated linear move sprinkler irrigation systems in this experiment were not good in performance which the main reasons can be suggested as weaknesses in management of them.

Keywords: GS+ software, irrigation efficiency, irrigation management, performance evaluation, uniformity index.

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