Investigating the Effect of Gypsum Content and Hydraulic Gradient on Solubility Gypsum Clay Soils

ALIABBAS AFSHARIAN[1], NADER ABBASI [2*], AMIR KHOSROJERDI[3], HOSEIN SEDGHI[4]

1. Former Graduate Student, Islamic Azad University, Science and Research Branch of Tehran
2. Associate Professor, Technical and Agricultural Engineering Research Institute, Karaj
3. Assistant Professor, Islamic Azad University, Science and Research Branch of Tehran
4. Professor, Islamic Azad University, Science and Research Branch of Tehran

ABSTRACT

Presence of gypsum particles in soil may cause many problems in such different application as agriculture and construction. Solubility causes the gypsum particles in contact with water, to be gradually dissolved and flow out of the environment. The structures built on these soils can be damaged due to solution of gypsum particles existing in the soil and collapse of the bed. In this research the effects of two factors including; gypsum content and hydraulic gradient were studied on solubility of gypsum containing clay soils. Samples of gypsum containing soils were provided artificially by adding various rates of natural gypsum including 0, 5, 10, 20 and 30 percent by weight of clay soil being prepared. Each gypsum soil sample was leached under five hydraulic gradient levels of: 0.5, 1, 2, 5 and 10. The results indicated that the rate of Gypsum present in the soil directly affects the rate of solubility in a way that by increasing the percent of Gypsum the rate of solubility was increased .Also the rate of leaching including the rate of derived Gypsum from soil to primary rate of Gypsum is decreased by increasing the rate of Gypsum. In addition, by increasing hydraulic gradient, the speed and volume of drained water through the soil increased in a specified time and thereby more gypsum particles washed out through the soil.

* Corresponding Author's Email: Nader_iaeri@yahoo.com

Optimal Operation of Water Resources Systems through Use of MOPSO Multi-Objective Algorithm

MILAD ASADI[1], ALIMOHAMAD AKHONDALI[2], ARASH AZARI[3]*

1. MSc. Student, Shahid Chamran University of Ahvaz
2. Professor, Shahid Chamran University of Ahvaz
3. Assistant Professor, Razi University of Kermanshah

ABSTRACT

Throughout the study, a method is proposed by making use of a multi-objective structure and employing new formulations, where instead of increasing reliability based on meeting a demand of 100 percent in some months regardless of the dry months, part of the water of wet months or wet seasons be stored in reservoirs to be used in dry months to compensate for failure intensity. To this end, Multi-Objective Particle Swarm Optimization (MOPSO) algorithm was connected to the WEAP simulation model. The main purpose of this type of structures is to offer a resolution to increase the percentage of demand coverage in dry months in addition to reach an acceptable demand meeting reliability over the entire period depending upon the operation capacity of the reservoir. Ultimately, the results of three scenarios, including a current situation, land development management scenario and an optimization one, were evaluated. According to the results of the current situation scenario, in all the operation period the situation was reported acceptable, except for a few months. In land development scenario, for most consumptions in most of the dry years and in the last six years of planning, the demand coverage was equal to zero in three to eight consecutive dry months, and it was lower than 5% in these months in the rest of the low-water years. On the other hand, the demand coverage increased from 28% to 60% in these months by implementing the optimization model. Also, in the optimal scenario of reliability, supplying downstream environmental demand as well as the Maroon hydroelectric dam need was improved. This study depicts that using the strategies of this research will lead to a better reservoir management and will reduce failure intensity in supplying different consumptions during low-water months.

Keywords: Reliability; Optimal Operation; Failure Intensity; MOPSO

* Corresponding Author's Email: a.azari@razi.ac.ir

Determination of Phosphorus in Some Calcareous Soils by Diffusive Gradients in Thin Films (DGT) method

REZA KHORASANI[1]*, AKRAM HALAJNIA[2], HADISEH RAHMANI[3], HAMID POURAN[4]

1. Associate Professor, Ferdowsi University of Mashhad
2. Assstant Professor, Ferdowsi University of Mashhad
3. Ph. D. Student, Ferdowsi University of Mashhad
4. Fellow of London Middle East Institute, SOAS, University of London

ABSTRACT

Diffusive Gradients in Thin films (DGT) method is used as a method of phosphorus determination in some soils. This method was used to evaluate P in 10 different calcareous soils. Extractable phosphorous through this method was compared with that in 5 other methods and P uptake by wheat plant in a glasshouse pot experiment. The results showed that the range of P concentration extracted through DGT method (CDGT) stood between 23.4 and 494.6 µg L-1 depending upon soil types. Because of these changes, no correlations were observed between P concentration extracted through DGT with other methods and P uptake by wheat plant. However, in a separate investigation in some soils with low CDGT, the correlation was highly improved. Therefore, it can be asserted that use of DGT method is recommendable for evaluation of P in calcareous soils CDGT lower than 250 µg/l, due to close correlations between this method and other methods, especially in the case of phosphorous uptake.

Keywords: Available P; P extraction method; P Fractionation; P Uptake

* Corresponding Author's Email: Khorasani@um.ac.ir

Evaluation of Conveyance Efficiency and Water Seepage Loss in Irrigation Canals with HDPE Geomembrane Lining in Plains of Zaiandeh-Rood, Moghan and Kerman

REZA BAHRAMLOO[1]*, NADER ABBASI[2], ALIREZA MAMNNPOSH[3], KERAMAT AKHAVAN[4], HAMID RIAHI[5]

1. Assistant professor, Agricultural Engineering Research Department, Hamedan Agricultural and Natural Resources Research and Education Center, AREEO, Hamedan
2. Associate Professor, Iranian Agricultural Engineering Research Institute (IAERI) , AREEO, Karaj
3. Assistant professor, Agricultural Engineering Research Department, Esfahan Agricultural and Natural Resources Research and Education Center, AREEO, Esfahan
4. Assistant professor, Agricultural Engineering Research Department, Ardabil Agricultural and Natural Resources Research and Education Center, AREEO, Ardabil
5. Assistant professor, Agricultural Engineering Research Department, Kerman Agricultural and Natural Resources Research and Education Center, AREEO, Kerman

ABSTRACT

The level of water losses in 7 irrigation canals in plains of Zaiandeh-rood, Moghan and Kerman, with the same specifications of HDPE geomembrane lining of the same age, were evaluated. The losses of water in the canals was determined by input-output method in three stages. At the same time, the volume of evaporation using a class A pan installed in the coming next canals, was determined. To calculate seepage losses, the level of evaporation losses were deducted from the total ones. Based on the results, the level of efficiency stood between 95.9 and 99.7 and on the average it was 98.9 percent. The total losses in the canals were determined between 3.3 to 13.8, and on the average 11.5 lit/s per kilometer. From total losses, between 3.3 (Zaiandeh-rood) and 16.2 (Kerman) and on the average some 7.1 percent was due to evaporation and the remainder due to seepage from geomembrane lining. The seepage losses in evaluated canals was between 0.03 (KC in Kerman plain) 0.16 (EC4 in Zaiandeh-rood) and an average of 0.1 m3/m2/day (17 times below the concrete lining). The results of the study showed remarkable impact of geomembrane lining in control of water losses from irrigation canals and the advantages as compared with the conventional concrete lining.

Keywords: Evaluation**,** geomembrane lining**,** irrigation canals**,** seepage water losses

---

* Corresponding Author's Email: r.bahramloo@areeo.ac.ir

Evaluation of Shear Strength of Soil Stabilized by Microbiological Method

SEYED MOHAMMAD ALI ZOMORRODIAN[1*]; HAMIDEH GHAFFARI[2]

1. MSc. Student, University of Shiraz
2. Associate Professor, University of Shiraz

ABSTRACT

Biogrout is a new method in soil improvement based upon microbially induced calcium carbonate precipitation (MICP). In the present study *Sporosarcina pasteurii* bacterium, an aerobic bacterium which exists pervasively in natural soil deposits was utilized to control soil erosion. The undrained shear strength of the soil was recorded employing an in situ miniature van shear apparatus. The evaluations of shear strength were carried out for three types of sandy soil (Siliceous and carbonate), in four OD= 1, 1.5, 2, 2.5 levels, at different curing times of 3, 7, 14, 20, 28 days, and, the re- injection of the bacteria solution and cementation within the interval of 6 days. Also, the influence of environmental conditions on the performance of the bacteria and the level of shear strength were investigated. The results show that the shear strength improved with the time passed. The highest shear strength was obtained in the carbonate sand and fine silica sand equal to 0.64 and 0.39 kg/cm^2 in a period of 28 days, respectively. The optimal balance between nutrients and the number of bacteria was observed at OD=1.5. Also, the results revealed that the re- injection of the bacteria solution and cementation was more effective than only of once rejection in the shear strength, especially in the silica sand equal to 55% in a curing period of 28 days.

Keywords: *Sporosarcina pasteurii*, Shear Strength, Van Shear Apparatus, Soil Erosion

* Corresponding Author's Email: mzomorod@shirazu.ac.ir

A Model to Estimate Soil Water Depletion Coefficient using Plant and Soil Properties

FATMEH MESKINI VISHKAEI[1], MOHAMMAD HOSEIN MOHAMMADI*[2], MOHAMMAD REZA NEISHABOURI[3], FARID SHEKARI[4]

1. Former Graduated Student, Faculty of Agriculture, University of Zanjan
2. Associate Professor, University College of Agriculture and Natural Resources, university of Tehran, Karaj
3. Professor, Faculty of Agriculture, university of Tabriz
4. Associate Professor, Faculty of Agriculture, university of Zanjan

ABSTRACT

Within the present study, a conceptual mathematical model is developed to determine the relationship between plant response to water factor (ky) and soil critical moisture (θc) below which the plant is under stress. The evaluation of model performance carried out using a set of experimental data from a green-house trial. The results showed that for a given Ky, relative plant yield (Yr) is linearly reduced by decreasing the differences of soil moisture from θc ($\theta c-\theta$). The greater sensitivity of plant type or growth stage to water deficit (higher Ky values) caused more slope of the linear relationship between Yr and ($\theta c-\theta$). In other words, more allowable depletion coefficients can be assigned to the plants with low Ky values. Moreover, for a given Yr, plant sensitivity is exponentially increased by the reduction of soil moisture. In addition to confirming the model results, experimental observations indicated that the critical moisture of clay loam soil for either soil was 0.28 cm^3 cm^{-3}, while the θc values for sandy loam soil for wheat and canola were 0.21 and 0.195 cm^3 cm^{-3}, respectively. Soil allowable depletion coefficient for wheat in either soil was obtained about 0.35. This was when, soil allowable depletion coefficient for canola in sandy loam soil (F=0.44) was more than clay loam soil (F=0.38).

* Corresponding Author's Email: r.bahramloo@areeo.ac.ir

Estimation of the Longitudinal Dispersion Coefficient using the Dimensional Analysis in Surface Water Flows

MEHDI MOHAMMADI GHALENI[1]; KUMARS EBRAHIMI[2]*; MOHAMMAD HOSSEIN OMID[3]

1. Former Graduated Student, University College of Agriculture and Natural Resources, University of Tehran, Karaj
2. Professor, University College of Agriculture and Natural Resources, University of Tehran, Karaj
3. Professor, University College of Agriculture and Natural Resources, University of Tehran, Karaj

ABSTRACT

Longitudinal dispersion coefficient is amongst the most important needed parameters for the solution of the advection-dispersion equation. In the present paper a new equation for predicting the longitudinal dispersion coefficient in surface water streams is presented. To archive the aim, a collection of 176 sets of recorded field data from different canals and rivers were employed, involving dimensional analysis. The performance of the new equation was compared with a number of 18 selected ones of the well-known empirical equations, using the above mentioned data. The results indicated that the new equation was twice in precision, in comparison with to the other equations. In other words, the calculated average percentage error between the predicted vs recorded data for the proposed new equation was less than ±100 percent. Also, the mean absolute error and root mean square for the new equation were obtained as equal to 0.34 and 0.03, respectively, which are less than those in the other equations.

Keywords: Empirical equations; Estimation; Pollution advection; River; Surface water streams

* Corresponding Author's Email: ebrahimiK@ut.ac.ir

Effect of Enriched Vermicompost with Iron Slag on Corn Fe Availability in a Cadmium Polluted

SARA BAGHERI[1], AMIRHOSEIN BAGHAEI[2*]; SEYED MAHDI NIEI[3]

1. Former Graduate Student, Islamic Azad University, Arak Branch
2. Assistant Professor, Islamic Azad University, Arak Branch
3. Instructor, Islamic Azad University, Arak Branch

ABSTRACT

This research was performed to investigate the effect of iron slag enriched vermicompost on the changes in Fe availability in a Cd polluted soil. Treatments consisted of applying enriched vermicompost (0, 15 and 30 Mg ha^{-1}) with 0 and 5% pure Fe from iron slag of Mobarakeh Steel Complex in a polluted soil (0, 5, 10 and 15 mg Cd kg^{-1} soil). The plant studied in the experiment was corn (Zea mays L. single grass 704). Increasing the loading rate of vermicompost from 0 to 15 and 30 Mg ha^{-1} in a Cd polluted soil (10 mg Cd Kg^{-1} soil) increased in DTPA extractable-Fe by 13 and 22 times, respectively. In similarity with these results, 60 days past from the experiment, the root and shoot Fe concentrations also increased by 4.17 and 14.4 times, respectively. The results finally show that applying vermicompost enriched with 5% pure Fe can probably affect such soil physical and chemical properties as pH and CEC that cause an increase in soil and plant Fe availability. However, the role of applying vermicompost on decreasing soil and plant Cd availability and thereby, increase in corn Fe availability cannot be ignored.

* Corresponding Author's Email: a-baghaie@iau-arak.ac.ir

Effect of Montmorillonite and Organoclay on Urease and L-Asparaginase Activities in Soil

MAHBOOBEH ABOLHASANI ZERAATKAR[1], AMIR LEKZIAN[2*], AMIR FOTOVAT[3], REZA KHORASANI[4]

1. Ph. D. Student, Faculty of Agriculture, Ferdowsi University of Mashhad
2. Professor, Faculty of Agriculture, Ferdowsi University of Mashhad
3. Associate Professor, Faculty of Agriculture, Ferdowsi University of Mashhad
4. Associate Professor, Faculty of Agriculture, Ferdowsi University of Mashhad

ABSTRACT

The enzymes amidohydrolase play a significant role in the maintenance of a sustainable environment and a sustainable agriculture sector. This is mainly because it is central to biochemical reactions (organic decompositions, food cycles, and pollutant decomposition). Therefore, keeping these enzymes active and stable in soil is a crucial task. The effect of adding montmorillonite and organoclays on the activity and stability of these enzymes in soil was investigated. Organic clay was produced by modifying the Na-montmorillonite clay using the hexadecyl trimethylammonium bromide cationic surfactant. To analyze the structural and morphological profiles of the synthesized organoclay montmorillonite, Field Emission Scanning Electron Microscope (FESEM) and the clay's cation exchange capacity were employed. The effects of the organic clay and the incubation period on urease and L-asparaginase activities in soil were investigated. Results from statistical analyses showed that the effects of clay type and incubation period on the activity of either enzyme (urease and L-asparaginase) were significant at a 5% level of confidence. The activity level of both enzymes in soil samples treated with organic clay (71.48 and 9.01 $\mu gNH4+-Ng-12h-1$ in urease and L-asparaginase) was significantly higher than that in the control (29.12 and 4.22 $\mu gNH4+-Ng-12h-1$ in urease and L-asparaginase) and as were montmorillonite clay sample (39.84 and 5.26 $\mu gNH4+-Ng-12h-1$ in urease and L-asparaginase) s. A maximum declining slope in the activity of both enzymes was observed after 7 past days from incubation. The organoclay prepared from the montmorillonite clay successfully maintained the soil enzymes. Therefore, use of this organoclay can positively affect the enzyme's activity and stability.

* Corresponding Author's Email: lakzian@ferdowsi.um.ac.ir

Effect Rock Fragment Content on Some Physical Quality Indices of a Silt Loam Soil

HOSEIN ASGARZADEH[1]*, FARROKH ASADZADEH[2], PARVIN KHALEGHI[3]

1. Assistant Professor, Faculty of Agriculture, University of Urmia
2. Assistant Professor, Faculty of Agriculture, University of Urmia
3. MSc. Student, Faculty of Agriculture, University of Urmia

ABSTRACT

This study was conducted to investigate the role of rock fragment content on water retention and soil penetration resistance curves as well as determining the correlation of soil physical quality indices with the rock fragment content of the soil. A silt loam soil, containing 5% w/w 2 to 5 mm in diameter rock fragments, was employed for the study. The experiment was carried out based on a completely randomized design with six treatments and three replications. The treatments include six levels of 5, 10, 15, 20, 25, and 30% w/w of 2 to 5 mm diameter gravel. Large drainable soil bins (40 cm × 50 cm with 50 cm depth) were used throughout the study. The bins were put outside (under natural conditions) after being sowed with wheat (*Triticum aestivum* L.) and received enough water using irrigation and rainfall. There were significant differences ($p<0.05$) between the soil water content values in important matric suctions. The highest (i.e., 0.322 cm3 cm-3) and the lowest (i.e., 0.269 cm3 cm-3) means of water content at matric suction of 100 hPa were obtained for the treatments of 10 and 30 percentage of the rock fragment content, respectively. Increase in rock fragment share content of the soil significantly reduced the water content where the critical penetration resistance of 2 MPa occurred. There was significant relationship between the water content of 2 MPa and rock fragment content of the soil. Increase in the rock fragment from the normal value (5%) to 30% caused the bulk density and infiltration time increase to more than 11 and 254, respectively.

Keywords: gravel content; water retention curve; soil penetration resistance curve; soil physical quality indices

---

* Corresponding Author's Email: asgarzadeh8688@gmail.com

The Effect of Zero Valent Iron Nanoparticles on Reduction of Heavy Metal Contamination in Calcareous, Acidic and Sandy Soils

SEYED MOSTAFA EMADI[1*], MOHAMMAD ALI BAHMANYAR[2]

1. Assitant Professor, Sari University of Agricultural Sciences and Natural Resources, Sari
2. Professor, Sari University of Agricultural Sciences and Natural Resources, Sari

ABSTRACT

Nowadays contamination of soils containing heavy metals is among the great environmental concerns of the human beings. The application of zero valent iron nanoparticles (ZVINs) as an amendment for environmental pollutions has been highly considered by many researchers in last few decades. This study was conducted to synthesize and characterize the ZVINs stabilized with carboxyl methyl cellulose (CMC-ZVINs) in aerobic conditions and to assess their ability for reduction of DTPA extractable lead (Pb), cadmium (Cd), nickel (Ni) and copper (Cu) from some three polluted soils including sandy-calcareous, acidic as well as clay-calcareous soils. An experiment of completely randomized design of a factorial arrangement of treatments consisting of nano zero valent iron doses (0, 0.5, 1 and 2 w/w %), soils (sandy-calcareous, acidic and clay-calcareous soils) within two time periods (10 and 20 days) with three replications was carried out. The results of SEM and XRD analyses indicated that the CMC-ZVINs with the mean size of less than 50 nm and a maximum of 2θ peaks at 44.8° confirmed the nano sized and zero valent status of particles, respectively. Results also indicated that the DTPA extractable Pb, Cd, Ni and Cu within the three polluted soils decreased with increase in zero valent iron nanoparticle dosages. The percentage of available Pb reduction was higher in comparison with other heavy metals. The aging of nanoparticles from 10 to 20 days led to more significant reduction of DTPA extractable heavy metals. Overall, the synthesized CMC-ZVINs can potentially be introduced as an effective remediation approach for Pb, Cd, Ni and Cu contaminated soils.

[*] Corresponding Author's Email: mostafaemadi@gmail.com

Improving Irrigation Performance by Managing the Irrigation Cut-off Time in SIRMOD (Case Study: Moghan Agro-Industry and Husbandry)

YASER HAMDI AHMADABAD[1], ABDOLMAJID LIAGHAT[2*], TEIMOOR SOHRABI1[3], ALI RASOOLZADEH[4], BIJAN NAZARI[5]

1. Ph. D. Student, University College of Agriculture and Natural Resources, University of Tehran, Karaj
2. Professor, University College of Agriculture and Natural Resources, University of Tehran, Karaj
3. Professor, University College of Agriculture and Natural Resources, University of Tehran, Karaj
4. Associate Professor, University of Mohaghegh Ardebili, Ardebil
5. Assistant Professor, University of Qazvin

ABSTRACT

There are several mathematical models of different solutions for evaluating surface irrigation, one of which is SIRMOD. Throughout the present study, some evaluation indices were analyzed using SIRMOD. In each field trial following the pertaining field experiments, such factors as inlet discharge, cutoff time, advance and rollback time, infiltration characteristics, geometry of furrow, field length, land slope, and soil moisture were assessed and taken as model inputs. Water application efficiency was also determined for the current status. Two different solutions were applied for improving the water application efficiency in the study fields; first, cutting off the flow as soon as water reaches the end of the furrow (first scenario), and the second, cutting off the flow before water reaches the end of the furrow (second scenario) and then the simulation was executed for a second round. According to the SIRMOD simulation, the average water application efficiency was increased from 35% to 61% for the first scenario and 75% for the second scenario. Results of both scenarios in SIRMOD showed that these two approaches could improve the irrigation performance of surface irrigation and offer a cut-off time for more efficient management of irrigation by farmers.

Keywords: Furrow**;** cutting off the flow**;** evaluation indices**;** SIRMOD

---

* Corresponding Author's Email: aliaghat@ut.ac.ir

Calibration and Validation of model WEAP21 for Zarrineh Rud and Simineh Rud Basins

JAMAL AHMADAALI[1*], GHOLAM-ABBAS BARANI[2], KOUROSH QADERI[3], BEHZAD HESSARI[4]

1. PhD Student, Department of Water Engineering, Shahid Bahonar University of Kerman
2. Professor, Department of Water Engineering, Shahid Bahonar University of Kerman
3. Assistant Professor, Department of Water Engineering, Shahid Bahonar University of Kerman
4. Assistant Professor, Department of Water Engineering, Urmia University

ABSTRACT

Planning, design and management of water resources systems nowadays unavoidably include impact predictions. Impact prediction demands modelling. In the present study the hydrological model WEAP21 was calibrated and then validated on Zarrineh Rud and Simineh Rud Basins. Zarrineh Rud and Simineh Rud rivers with a discharge potential of 3 billion m^3 per year contribute a 50% portion to the Urmia Lake Basin. In the present study soil moisture method was employed for the hydrological simulation of model WEAP21. An 11-year statistical period (from 1994-95 to 2004-05) was planned for calibrating the model. The analysis of results of the model simulation using the statistical indices showed that the coefficient of determination, Nash-Sutcliffe coefficient and index of agreement for different stations were respectively as follows: Inflow to Boukan dam hydrometry station: 0.9, 0.83, and 0.95; Nezam Abad hydrometry station: 0.75, 0.74, and 0.92; Dashband hydrometry station: 0.82, 0.81, and 0.95 and Miyandoab bridge hydrometry station: 0.75, 0.75, and 0.92. A nine-year time period (from 2005-06 to 2013-14) was planned for validating the model. The analysis of results showed that coefficient of determination, Nash-Sutcliffe coefficient and index of agreement for different stations were respectively as follows: Inflow to Boukan dam hydrometry station: 0.88, 0.85, and 0.96; Nezam Abad hydrometry station: 0.72, 0.7, and 0.91; Dashband hydrometry station: 0.86, 0.85, and 0.96; Miyandoab Bridge hydrometry station: 0.8, 0.78, and 0.93. In total, the results of simulation revealed that the model presented an appropriate performance.

---

[*] Corresponding Author's Email: jamalahmadaali@gmail.com

Effect of Conventional vs. Conservational Tillage with Residue Management on Some of Soil Physicochemical Properties as Regards Wheat Crop Cultivation

ABOLFAZL FALAH HERAVI[1], HAMID ABASDOKHT[2*], AHMAD ZARE FEIZABADI[3], AHAMAD GHOLAMI[4]

1. PH. D. Student, Faculty of Agriculture, University of Shahrood
2. Associate Professor, Faculty of Agriculture, University of Shahrood
3. Professor, Agricultural and Natural Resources Research Institute of Mashhad
4. Associate Professor, Faculty of Agriculture, University of Shahrood

ABSTRACT

To study the effect of conventional vs conservational tillage practices though management of plant residue on wheat physiological properties, a field experiment was conducted in 2013-2014 at Mashhad Agriculture and Natural Resources Research center of Razavi Khorasan province. The study was arranged in a split plot design based upon randomized complete block arrangements of three replications. The main plots were composed of tillage systems of: 1) conventional tillage, 2) reduced tillage and 3) no tillage; subplots consisted of management of remaining residue of: 1) 0%, 2) 30% and 3) 60% residue. The results indicated that tillage systems significantly affected Mycorrhizal colonization (spore), soil temperature, water-holding capacity of the soil, porosity. The highest Mycorrhizal colonization (spore)(72.88), Water-holding capacity of the soil (21.59%), porosity (62.09%), were obtained from no-till method. Residue management significantly and differently affected on Mycorrhizal colonization (spore), soil temperature, water-holding capacity of the soil, resistance to penetration, as well as porosity. The highest grain yields were obtained from no-till (6912.2 kg/ha) and 60% residue treatment (6980.8 kg/ha). It is concluded that conservation tillage with more residue left above ground could improve wheat yield along with some of the related soil physicochemical properties.

A Comparison between AquaCrop and Radiation-Thermal Production Potential Models for Potential Yield Estimation in Part of Moghan Plain, Ardabil Province, Iran

AMIR IZADFARD[1], FEREYDOON SARMADIAN[2*], MOHAMAD REZA JAHANSOOZ[3], GHOLAMREZA PEIKANI[4], MOHAMMADREZA CHAICHI[5]

1. Graduate Student, University College of Agriculture and Natural Resources, University of Tehran, Karaj
2. Professor, University College of Agriculture and Natural Resources, University of Tehran, Karaj
3. Professor, University College of Agriculture and Natural Resources, University of Tehran, Karaj
4. Associate Professor, University College of Agriculture and Natural Resources, University of Tehran, Karaj
5. Professor, University College of Agriculture and Natural Resources, University of Tehran, Karaj

ABSTRACT

Potential yields for six cultivated crops, namely wheat, barley, sugar beet, cotton, maize and soybean were estimated, applying either the AquaCrop and radiation thermal production potential method or FAO model in Khodaafarin region, Ardabil province, Iran. Determination coefficient, normalized root mean squared and index of agreement for potential yield in AquaCrop was 0/99, 21/72 and 0/99 while for FAO model amounting to 0/97, 54/25 and 0/96 respectively. Also for a comparison between the potential biomass for AquaCrop and FAO model the Determination coefficient of 0/98, 0/93, normalized root mean squared of 23/55, 58/10 as well as index of agreement 0/98, 0/93 were recorded, respectively. Based upon the results, the AquaCrop model better benefits from a more acceptable performance in comparison with the FAO model. The AquaCrop, demands less data calculation to provide more outputs and applications as compared with FAO model but benefits from a more accuracy. The crops were ranked based upon the calculated yield gap fractions. The lowest yield gap fraction belonged to barley, soybean, sugar beet, wheat, cotton and maize respectively. This ranking could well be used as an ecological coefficient for the region cropping pattern.

* Corresponding Author's Email: fsarmad@ut.ac.ir

Water Relations of Citrus Trees under Partial Root Zone Drying along with Application of Shading

HORMOZ EBADI[1], MAHMOOD RAEINI[2*], MOHAMMAD ALI GHOLAMI-SEFIDKOOHI[3]

1. PH. D. Student, Agriculture and Natural Resources, University of Sari
2. Professor, Agriculture and Natural Resources, University of Sari
3. Associate Professor, Agriculture and Natural Resources, University of Sari

ABSTRACT

Climate change and ever-increasing water consumption, along with water scarcity, reduces crop production. Thus, such efficient water management, as deficit irrigation as well as shading could be the answer to some of these shortcomings. In deficit irrigation practice with Partial Root zone Drying (PRD), half of the root zone is irrigated and the other half is left dry. This experiment was conducted involving five treatments of (1) full irrigation, in which trees received 100 percent water content of soil field capacity (FC), 2) two PRD treatments, namely receiving 50 (PRD50) and 75% (PRD75) of FI, and 3) two PRD treatments, as above treated by shading nets (SHPRD50 and SHPRD75). Tukey's test was employed to compare the treatment's means of stomatal conductance (gs), leaf relative water content (rwc), stem water potential (Ψst), and leaf temperature (Tl). Moreover, Regression analysis was carried out among the above factors and leaf vs air vapor pressure difference. The results show that gs and rwc were higher in FI, PRD75 and SHPRD75 relative to the stressed treatments of PRD50 and SHPRD50. The same trend was registered for Ψst, the lowest values being achieved by treatments receiving 50% FI. Leaf temperatures in some measurement intervals were significantly higher in stressed treatments of PRD50 and SHPRD50. Water deficiency significantly reduced yield in stressed treatments of PRD50, while in reverse, it increased fruit soluble solids in PRD50 and PRD75. Shading on PRD treatments increased fruit size and yield, although this improvement was significant only for fruit diameter in SHPRD75 in comparison with PRD50.

Keywords: PRD; Shading; Deficit Irrigation

* Corresponding Author's Email: raeini@yahoo.com

Separated and Combined Effects of Collar and Sacrificial Pile on Scour Reduction of Bridge Piers Group

SEYED MOHAMAD ALI ZOMORODIAN[1*], HAMIDEH GHAFFARI[2], ZAHRA GHASEMI[3]

1. Associate Professor, University of shiraz
2. MSc. Student, University of Shiraz
3. MSc. Student, University of Shiraz

ABSTRACT

Recognition and proposal of some suitable controlling methods to reduce destructive scour phenomenon is indispensible. In this study, the sacrificial piles, square collar and combinations of sacrificial piles and square collars were employed to control the scouring depth around the piers' group. Two and three piers group along a line with a distance of 2.5D between the piers in longitudinal and transversal direction flow were investigated under clear water conditions. The results revealed that the effect of sacrificial piles in reducing the scour depth of the rear pier of pier groups in the flow direction is greater than a single pier. The square collar was more effective in decreasing scour depth of front pier that equaled 72.22% and 69.23% in two and three piers' group, respectively. A combination of sacrificial piles and square collars could further reduce the scouring depth. Also, in the two and three piers group in transverse direction of flow, the combination of sacrificial piles and square collar have demonstrated to be more effective than the square collar and sacrificial piles in decreasing the scour depth. The reduction of scour depth equal to 57.14% and 67.5%, for the two and three pier groups respectively.

---

[*] Corresponding Author's Email: mzomorod@shirazu.ac.ir

Distribution of nitrate and ammonium below furrows and ridges' and nitrogen uptake by maize in Different Rates of Urea Fertilizer application

ARASH RANJBAR[1], ALI RAHIMI KHOOB[2*], MARYAM VARAVIPOUR[3], HAMED EBRAHIMIAN-TALESHI[4]

1. Ph. D. Student, University College of Abureyhan, University of Tehran
2. Professor, University College of Abureyhan, University of Tehran
3. Associate Professor, University College of Abureyhan, University of Tehran
4. Assistant Professor, University College of Agriculture and Natural Resources, University of Tehran

ABSTRACT

Nitrate leaching under furrow irrigation is one of the main reasons of underground water contamination. In order to use fertilizer efficiently and reduce loss of nitrogen, more detailed studies should be done about distribution of different forms of nitrogen along ridges and furrows because the solute movement is not the same in those paths. The main objective followed in this study was to scrutinize the effects of different rates of urea on nitrogen uptake and accumulation of nitrate and ammonium below ridges and furrows during growing season. Maze was planted in the treatments with nitrogen rates of 0, 150 and 250 kg ha^{-1} following a Randomized Complete Block design of three replications. The level of dry aboveground biomass and nitrogen uptake during growing season plus concentration of nitrate and ammonium in soil before and after fertilizing as well after harvesting were assessed over different depths below ridges and furrows. Results showed that depth and rate of nitrogen were two effective factors on accumulation of nitrate and ammonium beneath ridges and furrows. More nitrate concentration was observed under ridges in comparison with that beneath furrows. Following fertilization, nitrate concentration in soil under ridges and furrows decreased and increased respectively along with increase in depth. Also, it was demonstrated that nitrogen uptake increased while agronomic nitrogen efficiency decreased by more nitrogen application. Furthermore, most nitrate accumulation was observed below roots areas, especially under ridges, and after harvest, indicating that the probability of nitrate leaching was very high.

Keywords: Nitrogen uptake; Nitrate; Ammonium; Furrow irrigation; Maize

---

* Corresponding Author's Email: akhob@ut.ac.ir

Role of Superficial Biochar Mulch Produced from Dairy Factory Wastes on Infiltration and Runoff in Small Experimental Plots

MOHAMMAD HOSSEIN GHAVIMI PANAH[1]; SEYED HAMIDREZA SADEGHI[2*]; HABIBOLLAH YOUNESI[3]

1. Graduate Student, Faculty of Natural Resources, Tarbiat Modarres University, Mazandaran, Noor
2. Professor. Faculty of Natural Resources, Tarbiat Modarres University, Mazandaran, Noor
3. Professor. Faculty of Natural Resources, Tarbiat Modarres University, Mazandaran, Noor

ABSTRACT

The effective utilization of wastes in different forms is an inevitable strategy for such miscellaneous goals as runoff management which also leads to sustainable development. To this end, superficial application of biochar produced from industrial wastes as mulch may act as a bio-economic approach to improve soil conditions and some consequent increment in infiltration. Towards this attempt, the present study was formulated to produce biochar from Kaleh Factory wastes and to apply it as mulch. Biochar was applied in three levels of 400, 800 and 1200 g m-2 on small experimental plots filled with a rangeland soil prone to erosion of Marzanabad Region, northern Iran, to improve soil permeability and runoff components. The rainfall was simulated with intensities of 50 and 90 mm h^{-1} after a span time of 35 days on biochar application in the Rainfall and Erosion Control Laboratory of Tarbiat Modares University. The infiltration and runoff rates were continuously monitored using volume balance method. According to the results, water infiltration to the soil and runoff rates from treated plots with 400, 800 and 1200 g m^{-2} of biochar were 23, 31 and 32% for rain intensity of 50 mm h^{-1}, and 21, 23 and 24% for rain intensity of 90 mm h^{-1}, respectively more (p<0.01) than those reported for control plots. The volume of runoff for the same treatments were also 56, 62 and 67 %, and 59, 64 and 65 % for rain intensities of 50 and 90 mm h^{-1}, respectively, less (p<0.01) than those reported for control plots. However, the time the runoff to be initiated was reduced in all the treated plots. The results further verified that the biochar produced from food industry factories could improve the hydrological components of the degradable soils.

Keywords: Soil and Water Conservation; Soil Bioremediation; Soil Infiltration; Waste Management

* Corresponding Author's Email: sadeghi@modares.ac.ir

A Study of Non-hydrostatic Pressure Distribution of Free Surface Flow in a Rockfill Porous Media

AMIR GORD-NOSHAHRI[1], EBRAHIM AMIRI TOKALDANY[2*], MOHAMMAD SEDGHI-ASL[3]

1. PhD, Faculty of Agriculture and Engineering Technology, University College of Agriculture and Natural Resources, University of Tehran, Karaj
2. Professor, Faculty of Agriculture and Engineering Technology, University College of Agriculture and Natural Resources, University of Tehran, Karaj
3. Assistant Professor, College of Agriculture, Yasouj University, Yasouj

ABSTRACT

Increasing the slopes of water surface and bed or making a considerable curvature of streamlines, resulted in the vertical pressure distribution to deviate from hydrostatic distribution. Because of severe energy loss and big difference between upstream vs downstream water surface elevations in rockfill porous media, it is expected that pressure distribution be non-hydrostatic. In this paper, with the aid of Buckingham π theorem and regression analysis, a relationship is proposed for water surface profile in rockfill porous media. Moreover, a non-hydrostatic pressure distribution for rockfill porous media is derived by applying Euler equation including the effects of streamlines curvature as well as large slopes. A series of laboratory experiments have been conducted on rockfill materials with diameter of 1.68 cm and two media length of 0.5 and 1.0 m. It is found that the introduced model gives satisfactory results as compared with the experimental results so that mean absolute relative error of water surface and longitudinal pressure profile between the two series of the data are 1.31 and 1.71 percent, respectively.

---

[*] Corresponding Author's Email: amiri@ut.ac.ir