



ABSTRACT BOOK

12 – 14 November 2019

Menemen- Izmir, TURKEY

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Distinguished Participants,

The turning benchmark in the existence of humanity is the transition to settled life and agricultural society. Developments in agriculture from primitive ages to the present have shown us that the preserving the components of agriculture; air, soil, water and biodiversity, is vital for a sustainable life cycle in the construction of our future. We should not forget, “We do not inherit the Earth from our ancestors, we borrow it from our children”.

Today, with the awareness of the precautions to be taken on soil and water resources on a global and national scale, the conservation and sustainable use of limited natural resources is one of the primary objects. In line with this objective, it is aimed to establish a platform where researchers, academicians, people and institutions operating in the field of soil and water resources come together and share knowledge and experience. Within this scope, the 6th Congress on Soil and Water Resources with International Participation was held by General Directorate of Agricultural Research and Policies, Ministry of Agriculture and Forestry with the support of the relevant universities in International Agricultural Research and Training Center, Menemen, Izmir, Turkey between 12 – 14 November 2019.

This Abstract Book contains totally 183 abstracts of 144 as oral presentations and 39 as poster presentations from 9 countries. Throughout the congress, it is aimed to share knowledge and experiences with the studies carried out under the main headings of soil, plant nutrition, agricultural irrigation, climate change, agricultural ecology, agricultural mechanization, information technologies and agricultural economy.

We are honored by your presence in the 6th Congress on Soil and Water Resources with International Participation held on 12-14 November 2019 in our Center.

Yours sincerely,

Dilek KAHRAMAN

Director

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The Changing World of Agriculture

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Abstract

Since its invention in the Neolithic age, thousands of years ago, agriculture has been changing, always adapting to the changing environment and conditions of human existence. The speed of change has accelerated dramatically over the past 60-70 years, mostly driven by population growth and dominating economic models. As a consequence, we are now faced with the need to feed an estimated 9 billion people by 2050 on one hand and with the ever increasing contamination of our basic resources (soil, water, air) by industrial intensive agriculture. On the background of this picture, we see a wealth of new technologies becoming available that can be and have been put at the service of making agriculture more sustainable. One of the prime examples is the combination of data from Earth Observation satellites, geographic information systems, and Information and Communication Technologies, which provides the agriculture sector with an unprecedented amount of data. This has opened the path to advanced precision agriculture that enables the farmer to adapt the amounts of inputs (nutrients, irrigation, plant protection, seeds) to the space-time variability of the plant's requirements. We briefly review the most important approaches and their capacity to optimize yields, farmers' profits, and environmental benefits in the short term (over a growing season). In the long term, we need a paradigm shift, e.g. transform to production systems that regenerate the soil, production systems that offer real (economic, social, environmental) benefits to farmers and the rural environment. This means transcending the current narrative ('intensive industrial agriculture is needed to feed the 10 billions'), going from 'sustainable agriculture' to 'regenerative agriculture'. At the present state of deterioration of soils, water, environment, we need to regenerate (i.e., make them healthy again) before we can sustain. We briefly review the most promising approaches in this area.

Keywords: precision farming, sustainable agriculture, variable rate technology, regenerative agriculture

Environmental and Agronomic Properties of Biochar

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Abstract

Biochar, defined as carbonized biomass, is being used more and more in order to especially increase organic carbon capacity of soil, reduce climate change, increase soil fertility and crop production, control soil pollution through water infiltration and retention in soil by controlling atmospheric carbon dioxide and nitrogen oxide emissions. In the last decade, a large number of international studies on biochar have been conducted and a large literature on the subject has emerged. This paper assesses standardized methods recommended for biochar characterization, relations between soil, plant, atmosphere and biochar and some important agronomic and environmental properties of biochar.

Keywords: Biochar, Carbon fixation, Soil fertility, Soil pollution



Soil Productivity of Turkey

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Abstract

Turkey is 13th in size care in the World with 24 million ha of agricultural area and 15.1% of the land has a high potential for agricultural use. As our country is exposed to events of almost all geological periods, it has very different geomorphological structures and physical and chemical soils. Our soils are generally distributed that steep to very steep slope, basic reaction (pH> 7.6), high CaCO₃ content (> 15%), low organic matter (<2%), shallow soil depth for plant growing (<50cm), heavy structure (clay> 45%) and under severe erosion. In addition, land fragmentation and low operational scales are the most important anthropological factors affecting on-farm improvements and yields. However, salinity-alkalinity and drainage conditions of areas where intensive fertilization and irrigation are applied should be continuously monitored. In order to increase the yield in our agricultural lands, organic matter increasing measures should be taken and agricultural activities should be carried out with scientific approaches based on sustainability principle. For this purpose, soil survey and consolidation studies in agricultural lands should be completed as quickly as possible. It is also recommended that we could develop agricultural policies by using product-based land evaluation approaches in agricultural soils of the different ecologies and conduct integrated research into Agriculture 4.0.

Keywords: Agriculture policies, land use, soil productivity, Turkey

Determination of Irrigation Depths using WASH_2D and Weather Forecast

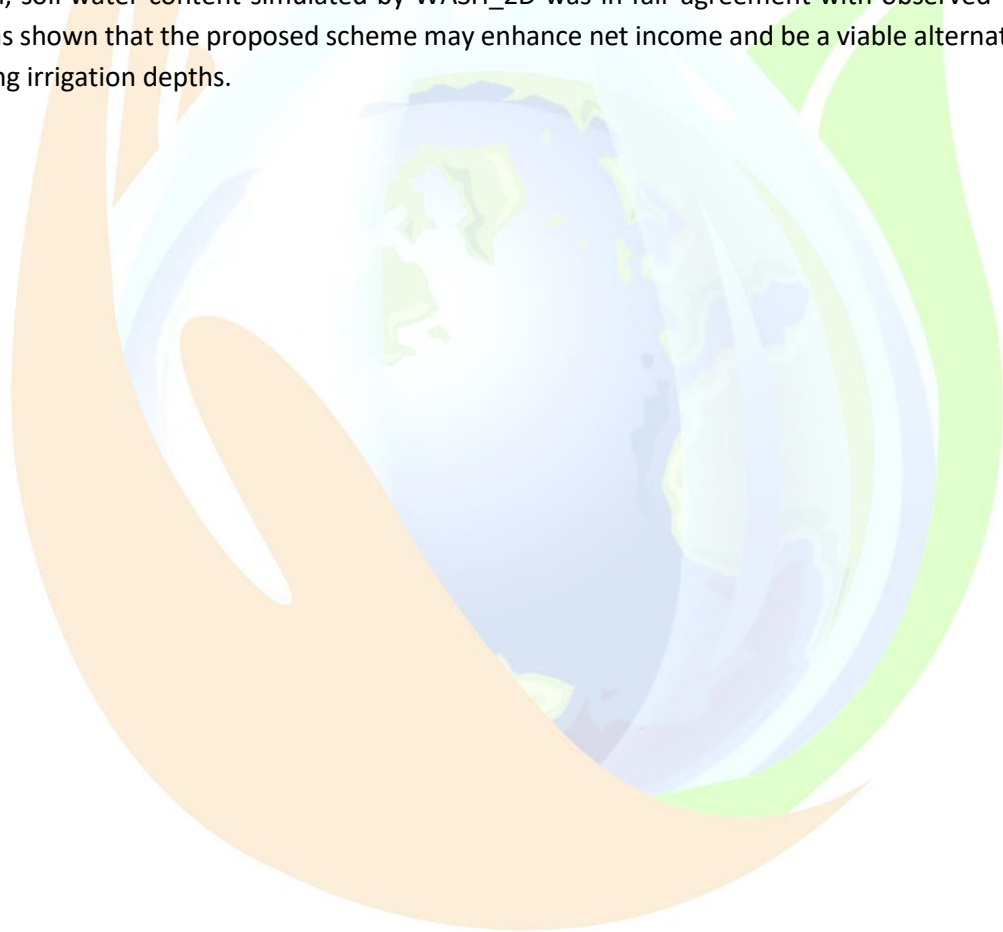
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Abstract

Irrigation management can be improved by utilizing advances in numerical models of water flow in soils that can consider future rainfall by utilizing weather forecasts. We have developed a numerical scheme to optimize irrigation depth on scheduled irrigation days using a concept of virtual net income such that virtual net income attained during each interval be maximized. To evaluate benefits of the proposed scheme, we compared crop yield and net income of this scheme to those of an automated irrigation method using tensiometers. Sweet potato was grown in 2016 in a sandy field of the Arid Land Research Center, Tottori University, Japan under either a non-optimized automated irrigation or the proposed scheme. Under the proposed scheme, 18% less water was applied, yield increased by 19%, and net income was increased by 25% compared with the results of the automated irrigation system. In addition, soil water content simulated by WASH_2D was in fair agreement with observed values. Thus, it was shown that the proposed scheme may enhance net income and be a viable alternative for determining irrigation depths.





Change of Soil Properties in an Ameliorated Pasture in a Long-Term Period

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Abstract

In this study, effects of pasture amelioration studies between 2006-2011 on soil properties after 3 years in natural pasture soil of Minöz Creek Basin were investigated. Pasture amelioration methods were; two controls under uncontrolled and controlled grazing, fertilizing, spread seeding, aeration, spread seeding+fertilizing and polyacrylamide. Pasture amelioration methods have shown positive effects on soil properties depending on years (2006-2011). When comparing 2011 with 2006, decreases in MWD and DB values and increases in EC, pH, OM, AS, PNT and I values were determined. The highest values for OM was 4,17% in 2006 and 5,55% in 2011; AS was 58,16% in 2006 and 61,5% in 2011 and I was 16,41 cm h⁻¹ in 2006 and 256,42 cm h⁻¹. When comparing 2014 with 2011, decreases in EC, pH, OM, AS, PNT and I values and increases in MWD and DB values were determined. In 2014, decreases in soil properties were determined as OM to 1,95%; AS to 51,9% and I to 7,38 cm h⁻¹. The highest DB value 1,57 gr cm⁻³ in 2011 increased to 1,71 gr cm⁻³ in 2014. AS values decreased in 2014 depends on the decreases of OM values and increases on DB values. The mean values for the soil properties in 2011 changed as OM 4,13% decreased to 1,49%; AS 56,80% decreased to 45,35% and DB 1,44 gr cm⁻³ increased to 1,58 gr cm⁻³ in 2014. The results indicated that the importance of pasture amelioration methods for sustain and improve the limited low quality pastures in the region was observed. In application deficiencies; the unfavorable conditions of pasture can be achieved in 3 years. The fastest and the highest degradation in pasture were determined as increases in DB values and decreases in AS values. The longest effect and minimum change were determined in EC and pH values.

Keywords: Pasture land, Soil physic, Aggregate stability, PAM, Amelioration

CANCELLED



Soil Loss due to Sugar Beet Harvesting in Turkey

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Abstract

Erosion of water, wind and soil tillage is a well-known and widely studied topic in terms of agriculture and environment. On the other hand, soil transported from the field after harvesting caused by taproot plants such as sugar beets, carrots and chicory, tuberous root plants such as potatoes, bulbous root crops such as onions, peanuts, and vegetables such as leeks and celery has been the subject of scientific studies as an important source of artificial erosion in recent years. The amount of soil which is taken from approximately 300 000 hectares of sugar beet production area and delivered to the sugar factory constitutes an important item for loss of agriculture, environment and sugar production costs in Turkey. In other words, soil loss due to crop harvesting (SLCH) is another process of soil erosion that should not be neglected in the calculation of soil degradation rates. The high amount of transported soil not only causes land degradation, but also increases sugar prices due to the loss of labour, water and energy required to clean up the soil during the sugar production process. On the other hand, lost soil due to SLCH is rich in both organic matter content and main plant nutrients. According to the results, the average soil loss rate was calculated as 2.31 Mg ha⁻¹. This loss rate means that approximately 150 000 Mg of soil is lost annually from 99 853 ha Türkşeker sugar beet production areas. It means the total soil loss is approximately 440 000 Mg from the 291 000 ha production area in Turkey according to data of 2018. The annual transport cost of this amount of land is approximately US \$ 3 million. When the cost of water treatment is included in the transport cost, the cost of cleaning the soil in the floatation channels of the factory and the cost of sugar losses caused by the soil, the total cost will be much higher than the estimated cost.

Keywords: SLCH, Soil loss, Soil tare, Sugar beet, Soil delivery

Assessing the Soil Quality Index as Affected by Two Land Use Scenarios in Miandoab Region

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Abstract

Soil quality is the capacity of a specific kind of soil to function, within natural or managed ecosystem, to sustain plant productivity, maintain water and air quality, and support human health. It varies from one to another soil with different land uses and consists of physical, chemical and biological properties or soil quality indicators that reflect the soil condition. In this research, physical, chemical and biological properties of 80 samples (0-25 cm) with 19 representative soil profiles quantified to measure the soil quality index (SQI) in Miandoab region, Iran across farmland and orchard. These properties include: aggregate stability, bulk density, soil moisture content, saturation percentage, particle size fractions (clay, silt, sand), pH, EC, available P and K, OC, total N, C/N, CaCO₃, sequestration of organic carbon, CEC, microbial respiration and microbial population. Principal component analysis used as a dimension reduction method to separate farmlands and orchards land uses. The linear and non-linear SQI were calculated and the results showed a clear difference in SQI as affected by the aforementioned land uses. The specific contribution of each minimum data set also showed that soil OC, N, MR, MP, silt, CaCO₃, AS and BD had the highest importance to SQI. Additionally, SOC made the highest average contribution to SQI (13.01%) followed by N (12.63%) and MR and MP (11.91%). The linear-SQI value more significantly affected by the physical properties than the chemical and biological ones. It varies from the maximum value of 35.17% in the farmland to 37.74% in the orchard. On the other hand, the nonlinear-SQI showed the highest contribution of biological SQI in the farmland (73.94%) followed by the orchard (64.15%). Furthermore, both linear and nonlinear equations may be acceptable for assessing SQI using aforementioned soil properties.

An Innovative Approach for Water and Soil Resources Protection in Spatial Planning: Landscape Character Based Agroecological Zonning - “LC-based AEZ”

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Abstract

Agroecological zoning describes the areas that were defined mainly and primarily on the basis of features of soil, topography and climate according to the ecological needs of the agricultural plants. Zoning concept mentioned within the landscape context in this study represents a spatial analysis that integrates natural and cultural landscape features into above mentioned definition with a particular emphasis on water and soil resource protection. We experience more and more climatic variability and change in the forms of frequent, severe and less foreseeable floods and droughts. Countries, institutions and service sectors are in increasing and urgent need of development of adaptation or resilience for those kind of changes in the hydrologic cycle which is a guiding natural process for water and soil resources protection purposes. This paper suggests Landscape Character Based Agroecological Zonning (LC-based AEZ) as an innovative approach both for decisions on the rural land-use pattern and also for adaptation and resilience to the landscape changes. LC-based AEZ has conducted in three main steps in the case area of Malatya province in Turkey. Characteristic agricultural plants of the landscapes as a part of cultural identity has been defined as a first step, and secondly, agroecological zones were mapped for those plants. Sustainable agricultural strategies were spatially developed as third constructive step, by assessing the structure and the function of the landscape character (that had been studied as a part of a TÜBİTAK KAMAG 1007 Project) together with previously defined agroecological zones. This approach provides information that is necessary to include rural lifestyle and cultural characteristics into the spatial planning process while suggesting a rural agricultural development sensitive to dynamic ecological processes.

Keywords: Agroecological zoning, Landscape character analysis, Spatial planning, Rural landscape

A New Risk-Based Model in Watershed Management Processes: Ecological Risk Characterization

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Abstract

Watershed is a system in which soil, vegetation, topography, geology, climatic and socio-cultural characteristics are related to each other at different aspects. Therefore, watershed planning and management strategies require an approach that takes into account ecological characteristics and sociocultural systems. This research has a risk-based approach that may contribute to watershed planning and management strategies. The aim of the study is to create a risk characterization model of ecological and social factors in the landscape scale of Bakırçay Basin. Accordingly, spatial risk conditions of land use / cover, soil erosion, meteorological drought, population change and fire potential were analyzed as risk factors of the study area. Temporal scale is determined as between the years 1985-2013 and spatial scale is determined as 30X30 meters of this research. Hybrid classification technique for analyze land use / cover change risk, Revised Universal Soil Loss Equation (RUSLE) method for calculate soil erosion risk, Standardized Precipitation Index (SPI) for calculate meteorological drought risk, Inverse Distance Weighting (IDW) method for calculate population change risk, and Multi-Criteria Analysis (MCA) method was used to calculate fire risk. The spatial parameters produced by the analysis of risk factors were evaluated by using Geographic Information Systems and Remote Sensing techniques with MCA, Analytical Hierarchy Process and Risk Character Analysis approaches. As a result, a spatial ecological risk model of Bakırçay Basin has been developed that can be re-developed according to stakeholder needs and strategies. Accordingly, especially the areas around Soma and Bergama cities have high risk due to intensive mining and urbanization activities, and these regions are the areas that should be giving priority in watershed planning and management processes.

Keywords: Watershed management, Ecological risk characterization, Geographic information systems, Remote sensing, Bakırçay basin

The Importance and Mapping of Folk Soil Knowledge in Land Planing

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Abstract

Traditional ecological knowledge is a reflection of one's knowledge transmitted by cultural transfer from generation to generation. Nevertheless, Local folk land knowledge is disappearing, not passing on to one generation to the next, and therefore leading to a loss of a community's cultural heritage. However, this knowledge from centuries has value and should be considered in soil planning. It is a known fact that development efforts that ignore experience, indigenous knowledge, local information systems, and the local environment have often not achieved the desired goals. Understanding of knowledge of soil provides insight to design more appropriate participatory agricultural research programs. In fact, it can be said that the management of local knowledge offers an important and valuable input in the management of sustainable development programs. In this context, the aim of this study is to study out the folk knowledge towards soil classification, soil use, soil management and soil fertility; and also to map folk knowledge about soil. With this purpose in mind, semi-structured interviews were conducted with 40 farmers over age 30 from three villages in İslamlar, Kabakum and Müsellim. Spatial information from the interviews was rectified with the help of mental maps and mapped using Geographical Information Systems technologies. Folk had named soils according to soil color and texture but also assign special names for soils and landscapes with unique and distinct characteristics. As a result of obtained maps, it is thought that folk knowledge has added value to scientific methods for soil mapping and land-use planning. Consequently, as a result, the use of local land knowledge needs to be increased to develop rural development projects and manage natural resources.

Keywords: Geographical information sytems, Folk knowledge, Soil management, Traditional ecological knowledge, Soil fertility

Impacts of Pomegranate Juice Waste Compost on the Chemical and Biochemical Characteristics of Soil

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Abstract

In this study, the pomegranate pulp and peelings are composted and their impacts on some of the chemical and biochemical characteristics of soil are revealed by a 180-day incubation experiment. In the study, the farmyard manure (FMC), whose impacts were revealed by many studies as a compost, was also composted and it was included into the subject matter of the experiment for comparative purposes. According to the incubation experiment results, the nitrogen contents (N) of the soils, where the pomegranate pulp (PP), pomegranate peelings compost (PC) and farmyard manure compost (FMC) were applied, decreased based on the incubation time, and the N increased based on the increasing amount of compost. In all three compost applications, the amount of organic matters of the soils increased based on the dose and the highest amount of organic matter contents were found in the 2 tons/da PP application. The total Cu, Zn, Mn and Ni amounts of the soils, where the PP, PC and FMC were applied, increased based on the dose, and they displayed significant decreases based on time, and the amount of Pb increased by time ($P<0.05$). The CO₂ respiration, biomass, Cmic/Corg index ratio of the soils, where the PP and PC were applied, displayed an increase when compared to the control group and they decreased over time. The CO₂ respiration values of the soils, where the FMC was applied, decreased on the 180th day when compared to the beginning. The β glucosidase enzyme (BG) in the soils, where the PP and PC were applied, increased over time ($P<0.05$). In the soils, where all three composts were applied, the alkaline phosphatase enzyme activity decreased over time ($P<0.05$), the increase in the activity that took place based on the increasing dose in the PP and FMC application was found as statistically significant.

Keywords: Pomegranate peeling, Pomegranate pulp, Compost, Enzyme, Biomass, Soil

Interpreting Physiographic Components by Using Digital Air Photos and Manufacturing Soil Series Maps, Kırşehir-Mucur Sample

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Abstract

In this study, detailed soil survey of Küçükkevak village, Mucur township of Kırşehir was carried out at series level. Study area is located within 25 km distance from Kırşehir and encompasses a total of 1954 ha lands of Küçükkevak village. Study was performed in accordance with its methodology following preparations, fieldwork, laboratory analysis and second officework. Stereo aerial photographs of 1/5000 scale with 30cm spatial resolution were used for interpretation and delineation in the office, and 1/10 000 scale orthophotos were employed during fieldwork. Study area was interpreted on stereo models and physiographic units were distinguished and possible soil series identified. 12 soil pits were dug for the representation of each landscape, 11 soil series and a soil variant were defined then boundaries of soil series were checked by augering. Soil series were classified according to Soil Taxonomy 2014. According to the results obtained from soil surveys and maps at the serial level formed by interpretation of physiographic units using stereo images; In the old map, the points obtained by 91 polygons according to the storie index rating are in the range of 3–81 and the average index score is 48, while in the new map the score range of 457 polygons is in the range of 3–70 and the average index score is 25 and 44 different index points have been formed. A total of 11 different soil series, 1 variant, 11 phases and 2 ordo depending on these series were determined.

Keywords: Detailed soil survey and mapping at series level, Stereo aerial photograph, Land consolidation, Physiography

Investigation of the Possibilities of Using NIRS Reflection Technique and Mapping Soil Series

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Abstract

Determining and mapping of the soil series with their phases in the detailed soil survey studies is a time consuming and required highly specialization. Therefore, the aim of this study is to determine the usefulness of NIRS reflection technique in the discriminating of soil series in field due to this technique nowadays has been used in the determination of some soil properties. The reflection values of 531 soil samples taken on a horizon basis to present soil series and major phases of the Çukurova Region were obtained. In order to verify the data, belong to the soil series used in the study, four extensive soil series have been sampled, contents of organic matter, calcium carbonate and textural class were determined and the reflection values of these soils were compared. Statistical analysis was performed using the PLSR method CV (Cross Validation) and model estimation method. As a result of cross-validation, R² values between the reflection values and calibration of the soil sample 531 in the whole data set for clay; 0.47 for clay; 0.44 for silt; 0.36 for sand; 0.32 for organic matter; 0.21 for lime was found. In the validation set; clay R² 0.44; silt R² 0.41; sand R² 0.29, organic material R² 0.26; lime R² was found to be 0.18. It is concluded that NIRS technology was found to fail due to low correlation values in the identification and mapping of soil series and lack of healthy relationships between reflection values and soils.

Keywords: Visible-near infrared spectroscopy, Soil survey, Cukurova Region

Effects of Tea Trash Biochar Applied to Different Periods on Soil Enzyme Activities and Development of Safflower Plant

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Abstract

A greenhouse experiment was carried out to determine the effects of the same doses of tea litter biochar in one and two times at different periods on soil enzyme activities, soil organic matter and safflower plant growth. In the experiment, 15.15.15 mixed fertilizer and 0, 100, 50 + 50, 200, 100 + 100, 400, 200 + 200 kg / da biochar were applied. The first doses were administered from the beginning of the experiment and the second doses were given 1 month later. Safflower was harvested after 75 days. Biochar applications played a positive role in both enzyme activities and plant growth compared to control and chemical applications. With the exception of the organic matter content, the subjects treated with biochar for the second time gave better results than subjects treated with the same dose at once. Organic matter content reached the highest value in 400 kg / da biochar application at one time. As a result, instead of giving biochar applications in agricultural soils at one time, giving 400 kg / da in total in 2 times both increased enzyme activity and organic matter content in soils and contributed positively to plant development.

Keywords: Biochar, Soil, β -glucosidase, Alkaline phosphatase, Urease, Organic matter, PLants growth

Effects of Cover Crop Mixtures on Arbuscular Mycorrhizal Colonization of Cotton

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Abstract

Most of the soils in the southeastern US are considered of lower quality because of soil erosion, runoff and leaching of nutrients, and low soil organic matter content. Cover crops can alter soil habitat by affecting nutrient status, amount and quality of residue, aggregation, and microbial habitat, and can enhance microbial diversity and activity. Arbuscular mycorrhizal fungi (AMF) form a symbiotic relationship with the roots of most crops, including row crops such as cotton. When living roots are absent in the soil for long time periods, the number of AMF may decrease. Thus, cover cropping provides better habitat to soil organisms by keeping living roots in the soil and is a better management strategy for enhancing AMF colonization of cash crops. In this study, the effects of cover crop mixtures on AMF colonization of cotton was examined in a three-year cotton (*Gossypium hirsutum* L.) and soybean (*Glycine max*) rotation system under conservational tillage. Winter cover crop treatments included fallow, cereal rye (*Secale cereal* L.), cereal rye + crimson clover (*Trifolium incarnatum* L.), cereal rye + radish (*Raphanus sativus* L.), crimson clover + radish, and a mixture of all three cover crops. Cotton roots were taken in 2016 and 2018 when the cover crop treatments had been in place for one and three years, respectively. AMF infection rates were determined in cotton roots by staining the roots with chlorazol black E. Infection rates ranged between 13 and 61% in the first year and 19.5 and 62.7 % in the third year. Mycorrhizal colonization of cotton in the cereal rye + crimson clover treatment was the highest in both years and was significantly higher than that in the fallow treatment. This suggests that the rye - clover mixture promoted AMF development in the cotton and soybean rotation system.

Soil Quality Indicators and their Impact on Crops Safety

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Abstract

The problem of the food safety of agricultural products has become very complicated. The greatest danger to human health is contaminants of agricultural products coming from the environment. The main ways of contamination of food raw materials is pollution of crops with pesticides used to control pests and plant diseases and violation of hygienic rules for the use of fertilizers. There is also a risk of irrigation with using municipal and other wastewater, sludge from sewage treatment plants, in plant production. Have the influence on plant origin products safety migration of toxic substances into the food products from food equipment, inventory, containers, packaging, due to the use of unauthorized polymeric, rubber and metal materials and non-compliance with sanitary requirements in the technology of production and storage of products, which leads to the formation the toxins of microbiological origin, the entry into production of toxic substances from the environment - atmospheric air, soil, water bodies which accumulate dangerous elements from using the veterinary drugs used for fattening and prevention of diseases of livestock and poultry. The indicated risks identified and determined their values based on experts opinion method in accordance to the requirements of international standards ISO 31000:2018 Risk management — Guidelines and IEC 31010:2019 Risk management — Risk assessment techniques. The studies assessed also the risk to agricultural safety of the contaminated soil on which it was grown and suggested measures to minimize the risks identified.

Keywords: Quality indicators, Safety of agricultural products, Requirements, Agricultural production standards, Risk assessment

Efficiency of Humic Acid Extracted from Different Sources for Reduction of Hexavalent Chromium

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Abstract

Reducing CrVI to CrIII is a common method for removal of CrVI from contaminated environments. In this study, the efficiency of humic acids extracted from various sources to reduce CrVI in contaminated aqueous solutions was compared. First, humic acids were extracted from leonardite, peat mass, peat, cocopeat, coal, common char, biochar, vermicompost as well as sewage sludge. Then, total acidity, quantity of functional groups, spectrophotometric indices of E4/E6, E2/E3 and $\Delta\log K$ and maximum reducing capacity of the investigated humic acids were measured. In addition, identification of the structure of humic acids was performed using FTIR technique. Then, the humic acid reducing capacity was measured and its relationship with these properties was investigated. To measure the reducing capacity of humic acids, a concentration of 0.1 mM CrVI from the source of potassium dichromate in a sodium nitrate solution (0.03M) with a pH of 2 and in the presence of 0.01 g of humic acid per liter was used. This experiment was conducted in three ways (symbolized by E1, E2 and E3). These experiments differ markedly in terms of method of phosphate buffer addition to release adsorbed CrVI ions by humic acid. This buffer was added to a given volume of final extract, to total volume of final suspension and to initial solution containing CrVI in experiments E1, E2 and E3, respectively. According to the results, the CrVI reducing capacity depend not only on the nature of humic acid but on the method of experiment. The minimum reducing capacity was observed for common char using experiment E2 and the maximum value was for biochar and cocopeat in all three experiments. Regarding more repeatability, method E2 was superior to other two methods. The results showed that the two factors of $\Delta\log K$ and maximum reducing capacity had a significant relationship with reducing capacity.

Keywords: Biochar, Phosphate buffer, Reducing capacity

Salt Tolerant Wheat – A Requirement of Arid Regions of the World

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Abstract

Modern wheat has become prone to the environmental stresses due to narrowing of its gene pool through breeding and domestication. Hence, it is required to develop variation in the cultivars by introgression of stress tolerant genes in common landraces and cultivars. More than 20% of the agricultural soil in the world is affected by salinity stress. It poses great challenges to the production quality and quantity of wheat crop. Salt stress disturbs plants by the accumulation of excess of sodium ions in leaves affecting the crucial processes like photosynthesis, transpiration etc. In this scenario, genes responsible for the exclusion of sodium ions from leaves can facilitate the salt tolerance mechanism in plants. Nax1 and Nax2 genes that are originally derived from wheat progenitor, Triticum monococcum are found to be responsible for Na⁺ exclusion from leaves. However, these genes are absent in modern tetraploid and hexaploid wheat. Hence, these genes are required to be introgressed in modern wheat lines that can be grown in different salinity stress affected arid and semi-arid regions of the world. Previously, salt tolerant Australian tetraploid and hexaploid wheat lines with Nax1 and Nax2 genes were developed. In a TUBITAK supported project, salt tolerant genes, Nax1 and Nax2 were introgressed in Turkish hexaploid and tetraploid wheat cultivars and salt tolerant wheat lines have been developed. Marker assisted selection was employed for the selection of pure lines after every direct and back-crossing phase up to BC4 (backcross 4) stage. The efficiency of introgressed genes in providing salt tolerance to Turkish wheat material was determined using different physiological trials under greenhouse and hydroponic growth conditions. After conducting the required quality analysis of the established lines, developed wheat material can be utilized in breeding programs and can be grown in salinity stress affected regions.

Keywords: Backcrossing, Classical breeding, Marker assisted selection, Soil salinity, Wheat

Determination of Potential Ecological Risk Index based on Heavy Metal Elements for Organic Farming in Micro Catchments of Ordu Province

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Abstract

Soil pollution, influenced by both the natural and anthropogenic factors, significantly reduces environmental quality. This research was carried out in some micro catchments located on Ordu province in order to determine potential ecological risk index based on heavy metal elements for organic farming. For this purpose, 166 soil samples (0-20 cm) were taken from the study area and some physical and chemical and some heavy metal concentrations (Cd, Cu, Cr, Ni, Pb and Zn) analysis were done. In this study, it was determined; i-) some physical and chemical properties of catchments' soils, ii-) heavy metal (HM) contents and the correlation relation between physical and chemical properties of soil and HM concentrations and iii-) potential ecological risk index (PERI). Statistically, it was also found significantly negative relationships between pH and Cu of soils whereas it was found significantly negative relationships between EC and Cu. PERI was calculated using the data obtained to evaluate the environmental risks of heavy metals in the region. According to the obtained PERI results, it was detected that while 54% of total soil samples were low while, 42% of them were moderate class. Only 4% of them were classified as significant ecological risk level. Moreover, according to mean potential ecological risk index of these HMs, it can be ordered as Cd>Pb>Cu>Ni> Zn>Cr.

Keywords: Heavy metal, Micro catchment, Potential ecological risk, Ordu

Determination of Heavy Metal Risk and Enrichment Factor in Some Micro Catchments Used for Tea Cultivation

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Abstract

Heavy metal (HM) pollution in agricultural areas has been very important in recent years, especially because of the detrimental effects on food safety and ecosystem. This study was conducted to determine the HM risk for 29 micro catchments used for tea cultivation in Rize Province. For this purpose, 96 surface soil samples (0-20 cm) were taken from these micro catchments and some physical, chemical properties and HM (Cd, Cu, Cr, Ni, Pb and Zn) concentrations of these soils were determined. Using this data; i-) Enrichment Factor (EF) for evaluation of HM accumulation in soils, ii-) Correlations between physical and chemical soil properties and HM concentrations were determined. According to the EF values obtained by dividing the determined HM values of the soils to the average HM values found in the earth's crust; enrichment factors of Cr, Co and Ni were below the minimal enrichment level and there was no risk of contamination in these elements at the sampling points. In terms of Cd, while 26% of the sampling points were in the moderate enrichment group, 52% and 1% were in the significant enrichment and very high enrichment groups, respectively. Therefore, there was a risk of Cd pollution in a significant part of the sampling points. In a very small part of the study area, moderate pollution risk for Cu, Pb, and Zn was determined. According to the correlation analysis, it was found that there were positive relations between sand content with Cu ($p < 0.05$) and Co ($p < 0.05$); clay content with Cd ($p < 0.05$); pH value with Zn ($p < 0.05$); organic matter value with Pb ($p < 0.01$). However, negative correlation was found between organic matter value and Co ($p < 0.01$).

Keywords: Heavy metal, Micro catchment, Enrichment factor, Tea, Rize

Investigation of the Effects on Heavy Metals (Chromium and Manganese) in Soil of Mining Activities: Case of Orhaneli and Büyükorhan (Bursa)

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Abstract

Mining is one of the most important economic activities carried out by human beings. However, as in other anthropogenic activities, mining activities have many negative effects on the environment. Some of the environmental impacts of mining activities are soil, water, air pollution, land degradation, reduction of biodiversity, soil collapse and health problems. In this study, it is aimed to determine the effects on soil pollution (arsenic, copper, zinc, chromium and manganese) of mining activities carried out around Orhaneli and Büyükorhan (Bursa). For this purpose, 19 soil samples were taken from the study area by systematic random grid method. Ordinary and indicator kriging methods were used to determine, mapping and risk assessment of spatial variation of heavy metals in the study area. In addition, distance analysis was used to determine the relationship of each heavy metal with the mines. Pearson Bivariate Correlation analysis was used to reveal how heavy metals in the soil were affected as they approached or moved away from the mines. As a result, the highest levels of arsenic, copper, zinc, chromium and manganese were found in areas south of Orhaneli where chrome and marble quarries are dense. As a result of distance analysis, a meaningful relationship was found between heavy metals and mines. For arsenic, copper, zinc and manganese, values below the limit values were determined and for chromium levels above the limit values were determined.

Keywords: Heavy metals, Büyükorhan, Geographical information systems, Mining activities, Orhaneli, Soil pollution

Determination of the Effects of Rhizobacteria Containing ACC Deaminase on the Growth of Wheat Grown Under Salt Stress Conditions

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Abstract

The aim of this study was to isolate, characterize the rhizobacteria containing ACC Deaminase from wheat roots and to determine the potential of bacteria to increase wheat growth under salinity conditions. In this study, 26 ACC deaminase-containing bacteria were isolated and the growth of wheat under salinity conditions was determined by petri dishes, jars and pot experiments. Petri dishes were established with 26 bacteria and 7 bacteria isolates were found to be effective and jar tests were established. As a result of the jar tests, two bacterial isolates which increased the plant growth at the highest level were used together and pot experiments were established at control (0.95), 3.98, 7.80, 11.05 dS m⁻¹ salt concentrations. Pot experiments were carried out with 3 replications and chlorophyll a, chlorophyll b, carotenoid, malondialdehyde, membrane stability index, proline, yield per pot, leaf sodium and potassium content were determined. It was determined that chlorophyll a, chlorophyll b, carotenoid, membrane stability index, yield per pot, leaf potassium content increased with bacterial application while malondialdehyde, proline and leaf sodium content decreased compared to control.

Keywords: ACC Deaminase, Rhizobacteria, Salinity, Wheat

Comparison of Soil and Plant Analysis Methods Cost

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Abstract

Several methods has been used for soil and plant analysis throughtout the world. Research about the cost of different methods is limited. Thirty four vineyard soil and leaves samples taken from Manisa region were used as material and analysed with severel methods for each parameters. Soil pH and total N; plant P (sample preparation and quantification) analysis were evaluated in respect to results and costs. Results revealed that significant differences were found between analysis methods.

Keywords: Soil, Plant, Analysis methods, Cost



Mycorrhizal Inoculation Affects Grain and Protein Yield of Bread Wheat Genotypes with Different P-uptake Efficiencies

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Abstract

Raw phosphorus material used in the development of phosphorus fertilizers is not readily available in many countries. This places pressure on countries like Turkey to import chemical fertilizers in order to meet agricultural demand. For years, research has concentrated on finding alternatives that both decrease chemical fertilizer dependency whilst maintaining or improving crop production. Much focus has been placed on the use of biofertilizers, especially the use of mycorrhiza in crop production. However, little is known regarding the effect of mixed AM fungal species inoculation on different wheat genotypes with varying rates of phosphorus fertilizer application under field conditions. The aim of the study was to determine the effects of mycorrhizal inoculation on various yield parameters. This study was conducted at the Bahri Dağdaş International Agricultural Research Institute. Two different bread wheat genotypes with different phosphorus (P) uptake efficiencies: Bayraktar 2000 (P-inefficient) and Tosunbey (P-efficient), were inoculated with a mixture of eight beneficial mycorrhiza (*Glomus* spp.) and four different doses of DAP fertilizer under field conditions. In November 2017, one decare was planted in the field and harvested in July 2018. Tosunbey and Bayraktar 2000 showed a significant difference between mycorrhiza inoculated and non-inoculated plots under increasing phosphorus doses application. Grain and protein yield increased for Bayraktar 2000 with mycorrhiza inoculation at higher fertilizer application rates. Tosunbey on the other hand only showed higher grain and protein yield where no fertilizer was applied under mycorrhiza inoculated treatments. However, Tosunbey's grain and protein yield decreased with increasing fertilizer application and mycorrhiza inoculation. Hence, there is a significant difference between the genotypes with respect to their interactions with mycorrhiza under field conditions, and this difference may be attributed to their variation in P-efficiency.

Keywords: Grain Yield, Mycorrhizal fungi, Phosphorus, Protein Yield, Wheat

The Effect of Different Biochar Doses and Mycorrhizae Application on Corn Root Morphological Properties

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Abstract

Maize (*Zea mays*), which is one of the most produced industrial crops and has a widespread cultivation area in the world. It is an important rotation plant as well. Due to the widespread root structure of the maize gripping the soil and effectively uptake the nutrients and water. Since atmospheric CO₂ concentration reached 410 mg.L⁻¹ it is crucially important to mitigate CO₂ in optimum concentration. Recently there were so many studies about effect of biochar on CO₂ mitigation, soil carbon sequestration, nutrition cycle and water efficiency. In addition to biochar also mycorrhiza symbiosis increase soil carbon sequestration and nutrition uptake. Aim of this study to understand effect of increase doses biochar application and mycorrhiza application on root morphologic characteristics. The experiment was established at Cukurova University Research and Application Field as field experiment on Menzilat soil series. Four different biochar doses as %0 (0 ton.ha⁻¹), %1 (10 ton.ha⁻¹), %2 (20 ton.ha⁻¹) and %4 (40 ton.ha⁻¹) applied with mycorrhiza and without mycorrhiza application. Four different mycorrhiza species were mixed as *Glomus mosseae*, *G.intrarades*, *G.clarium* and *G.etunicatium* and inoculated maize seeds. The experiment was established at June 2018 and harvested at November 2018. After than harvest, root samples were taken from 1 m² area at 0-30 cm soil depth. Roots were washed and then sub samples were taken for morphologic (length, diameter, volume and area) analyses by WinRhizo program. On average, in non-mycorrhizal inoculation, increasing doses of biochar decreased root length, volume and root area. On the other hand, increasing doses of biochar with mycorrhiza application increased root length, volume and area until 20 ton.ha⁻¹. Mycorrhiza inoculated plant have higher root length, volume and area than that of non-inoculated ones.

Keywords: Biochar, Mycorrhiza, Maize and Root morphology

Effect of Different Nitrogen Doses and Mycorrhiza Vaccination on Alfalfa Carbon and Nitrogen Fixation

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Abstract

Increasing CO₂ concentration in atmosphere is causing climate change and natural disasters. Still the best way to mitigate the atmospheric CO₂ concentration to soil is the mechanism of photosynthesis through plant. Destruction of forest, meadow and pasture lands and loss of productivity has negatively affected CO₂ sequestration and increase the concentration in the atmosphere. It is crucially important to use plant species to sequester the atmospheric CO₂ through plant species. One of these plants alfalfa (*Medicago sativa*), have high protein content like other animal feeds. In addition, alfalfa is important key plant for soil management with high nitrogen (N) and carbon (C) fixing properties. Also, mycorrhizal inoculation can increase alfalfa carbon and nitrogen sequestration potential. It is assumed that the use of mycorrhizal fungus, a biological fertilizer, to increase the fixation of alfalfa C and N for quality, eco-friendly and sustainably strategic mechanisms. Aim of study is to research the effect of N doses and mycorrhiza inoculation on C-N fixation, plant development. Hypotheses was tested that increasing doses N and mycorrhiza inoculation increase C-N fixation, plant growth. The experiment was established under greenhouse conditions as a pot experiment. Five different doses nitrogen such as 0, 50, 100 and 200 mg N kg⁻¹ were applied as NH₄NO₃ form with mycorrhiza (as *G. mosseae*) and without mycorrhizal inoculation. We used ten alfalfa seeds for each pot. Plant parts (root and shoot) were sampled at harvest time. Plant shoot and root parts were taken and then dry matter before analyzed by Fisher-2000 model CN analyzer. The results revealed that mycorrhiza application significantly increased alfalfa C-N concentration and amount. In addition to there was no remarkable different between N doses application in between mycorrhizal application. Founding results are supporting our hypothesis.

Keywords: Alfalfa, Mycorrhiza, Nitrogen and carbon

Effects of Liquid Earthworm Fertilizer Applications on the Yield of Barley Cultivars

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Abstract

This study was conducted to determine the effects of increasing doses of foliar liquid earthworm fertilizer applications (0, 0.3%, 0.6%, 1%, 1.2% and 1.5%) on the yield of different barley varieties (Akdane, Erciyes and Efes-98). In the experiment which was carried out in randomized blocks according to the factorial experiment design with 3 replications, the solution containing liquid earthworm fertilizer was sprayed from the leaves before the tillering stage and till the stalk until the plant got wet after sunset. When the barley plant reached maturity, the harvesting was carried out considering the side effects and yield was calculated as kg/da. As a result of the research, increases in yields were determined with increasing doses of liquid fertilizer application and the highest yields were determined as 599.7 kg/da, 533.0 kg/da and 514.0 kg/da, in Akdane, Erciyes and Efes-98 barley varieties, respectively. When the average of barley varieties were taken into consideration, it was determined that the yield changed according to liquid earthworm fertilizer applications and increased between 11% and 15% according to control (461.6 kg/ da). In addition, based on the average yield of barley varieties, the most appropriate dose of liquid earthworm fertilizer was found to be 0.6% because of the economic.

Keywords: Barley, Liquid earthworm fertilizer, Yield

The Effects of Organic and Inorganic Fertilizer Applications on Buckwheat Root Development

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Abstract

The buckwheat (*Fagopyrum esculentum*) is very healthy in terms of human nutrition with its rich protein, carbohydrate, mineral and vitamin content. It is also among the functional foods that reduce the risk of disease especially used by celiac patients. The buckwheat plant needs an advanced root system for its healthy growth. It has been found that there is a very few studies in the literature on root morphological characteristics of buckwheat plant. The aim of study is to investigate the effect of organic and inorganic fertilizer applications on two different buckwheat varieties some plant root parameters (length, area, volume and diameter). The experiment was established as randomize design in split plots in 2019 in Cukurova University, Department of Field Crops Research and Application. Aktaş and Güneş buckwheat varieties were used in the experiment. Five different fertilizers (Control, Urea, Worm manure, Chicken manure, Cattle manure) were used in the experiment. Buckwheat cultivar were cultivated in April 2019 and harvested in July 2019. After harvesting, the plant roots were sampled and they washed and then the morphological characteristics were determined by WinRhizo program. Data were statistically analyzed by JMP 8. In terms of root length, statistically a significant difference was found in between the fertilizer treatments. In terms of root length, the best practice was chicken manure (39.7 km.da⁻¹), followed by mineral urea (27.8 km.da⁻¹). Statistically significant differences were determined in between different buckwheat varieties and different fertilizers in terms of root area and root volume parameters. Aktaş buckwheat cultivar increased the root growth better than that of Güneş cultivar. Among the fertilizer applications, chicken manure and mineral urea fertilizer applications increased root growth better than control treatment.

Keywords: Buckwheat, Root morphology, Organic fertilizer

Determining the Adequate Limit Values of Manganese Which Is Useful to Plants in Calcareous Soils Containing Basic Reaction and Low Organic Matter

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Abstract

Considering dry matter rate of dwarf bean plant of increasing doses of manganese applications, this study was carried out in greenhouse experiment to determine the adequate limit values of manganese which is useful to plants in calcareous soils containing basic reaction and low organic matter. The experiment with 4 replications according to randomized parcel experimental design, 15 soils with different physical and chemical properties in increasing doses of Mn (0, 10, 20, 40 and 80 mg Mn kg⁻¹) were applied in the form of MnSO₄.3H₂O (27 %Mn). After the experiment, dry weight of the leaves were determined and the manganese contents were dissolved in CEM-MarsXpress microwave after necessary pretreatment and manganese contents were determined by ICP-AES (Varian, Vista Axiel Simultaneous). As a result of the research, it was determined that the interaction of soils and manganese applications on plant dry matter yield was significant at 1% level. To determine the amount of manganese useful to the plant in the soil, taking into account the maximum dry matter yield obtained by manganese fertilization, manganese amount determined by 0.005 M DTPA + 0.01 M CaCl₂ + 0.1 M TEA (pH: 7.3) extraction solution was classified as very low if it was <3 mg kg⁻¹, low if it was 3.1-5.0 mg kg⁻¹, adequate if it was 5.1-7.5 mg kg⁻¹, high if it was 7.6-10.5 mg kg⁻¹ and very high if it was >10.6 mg kg⁻¹.

Keywords: Bean, Manganese, Calibration equation, Adequate limit value

The Effect of Calcium and Boron Applications from Leaf and Soil on Fruit Set and Shoot Development on Ayvalık Olive Variety

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Abstract

Boron has been reported to positively affect fruit set by increasing cell division and nucleic acid synthesis. It is also known that calcium and boron are involved in the formation of cell walls, division and elongation of the plant. In this study, it was aimed to investigate the effects of different doses of calcium (Ca) and boron (B) applications from foliage and soil on fruit set and on shoot development. The study was carried out between 2008-2011 in a plantation of 20 years old Ayvalık olive varieties in Kemalpaşa, İzmir. 5 different foliage applications (Ca0.5%, B0.3%, B0.5%, Ca0.5xB0.3% and Ca0.5xB0.5%) and 6 different soil applications (Ca100 g/tree, B200 g/tree, B400 gr/tree, Ca100xB200 gr/tree, Ca100xB400 gr/tree, post-harvest Ca200xB400 gr/tree) were achieved. Shoot length and shoot diameter values were found to be significantly higher in the absence years (26.04 and 2.97 cm, respectively) which had limited harvest than the presence years (20.39 and 2.25 cm, respectively). There was no difference in shoot length and shoot diameter between applications in the absence years. In the presence years, the best shoot development was obtained in 200 gr/tree soil application of boron (23.92 and 2.47 cm, respectively), but this value was not found to be significant compared to the control. Bloomed numbers of trees were close to each other in the absence and presence years; but it was observed that fruit set rates are changed between these years and thus the yield was affected. In the presence years, the highest flower (189.8 pieces/tree) was observed with Ca100xB200 gr/tree soil application, fruit set rate was 3.76% and yield was 63.9 kg/tree. However, 114.8 blossoms/tree, 4.03% fruit set rate and 67 kg/tree yield were determined with Ca0.5xB 0.3% leaf application. The most stable and recommended data were obtained with 0.3% leaf application of Ca 0.5xB%.

Effect of Bat Manure on Bulk Density (Volume Weight) and Porosity

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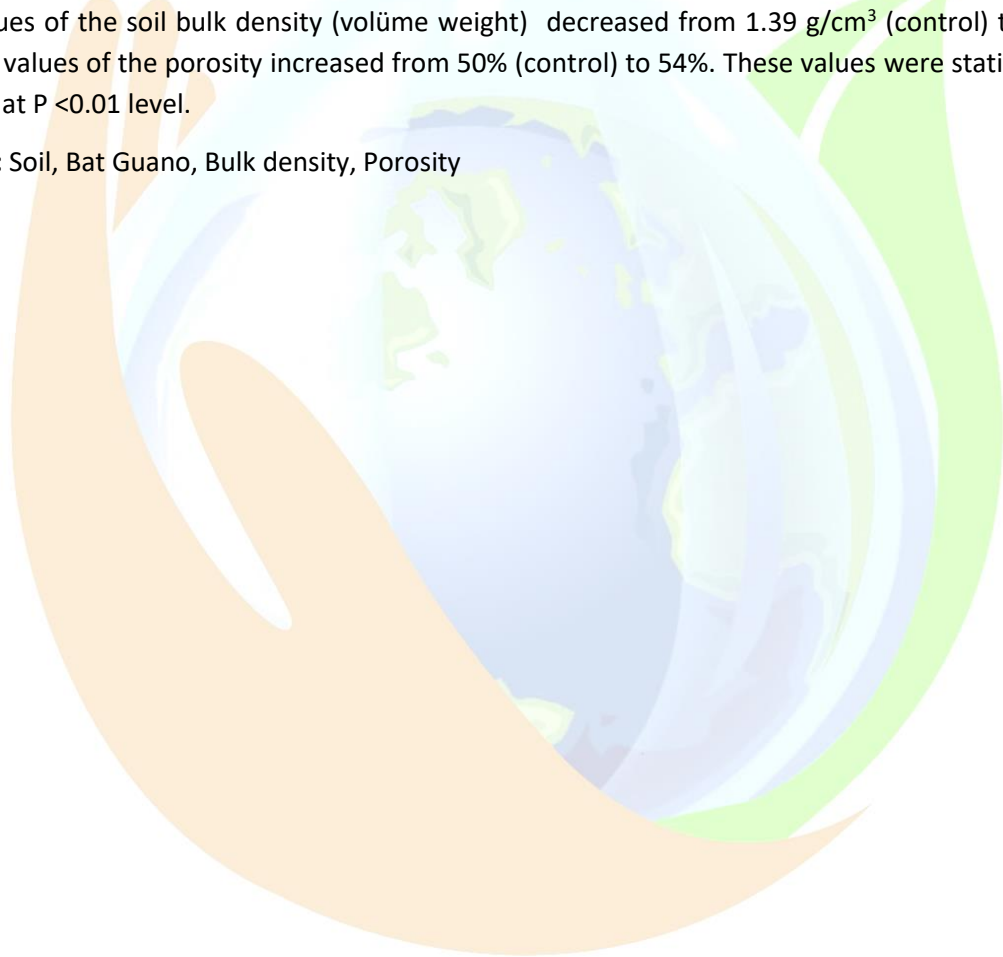
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Abstract

Soil aeration and the movement of water in the soil directly affect quality and yield in agricultural production. These properties vary according to the amount of organic matter in the soil. In this study; The effect of bat guano, an organic material which has never been tried before in this field, on porosity and bulk density of the soil was investigated. Bat guano was compared with livestock manure traditionally used in the region. The study was carried out in the experimental area of Soil Water Campus of East Anatolia Agricultural Research Institute in 2011-13. As the subject of the experiment: Bat guano and livestock manure 0 (control); 500; 1000; 1500; 2000 kg/da doses were applied. According to the results obtained from the study; at the highest application dose of bat guano (2000 kg/da) values of the soil bulk density (volume weight) decreased from 1.39 g/cm³ (control) to 1.21 g/cm³ and values of the porosity increased from 50% (control) to 54%. These values were statistically significant at P <0.01 level.

Keywords: Soil, Bat Guano, Bulk density, Porosity



The Effect of Leaf Applications "Bionutrients Soluble" on Yield and Some Yield Components of Wheat at Different Development Periods

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Abstract

This study was planned to determine the effects of "Bionutrients Soluble" (N%8, P₂O₅%1, %9 K₂O, *Bacillus subtilis*, *Bacillus licheniformis*, *Bacillus amyloliquefaciens* ve *Bacillus pumilus*) leaf applications on yield and quality parameters of bread wheat at different developmental stages. The experiment carried out for this purpose was conducted in the wheat sowing season of 2018-2019 at Doğan kent location of the Eastern Mediterranean Agricultural Research Institute. Trial; In the planting norm of 450 pieces/m², randomized blocks were established with four replications according to the experimental design. The size of the test plots was adjusted to be 1.4 m wide and 5 m long. Ceyhan-99 spring bread wheat variety, which is widely sown in the region, was used as seed material. In this research, "Bionutrients Soluble" leaf applications were applied to the wheat in different stages of development. For this purpose, 4 themes was worked out as; control (0 gr/da), tillering (0.75 gr/da-Bionutrients Soluble), tillering + stem elongation (0.75 g/da-Bionutrients Soluble) and stem elongation (0.75 g/da) Bionutrients Soluble. As a basic fertilizer for all experiment subjects; 15 kg DAP per decar were given during sowing period and 29 kg UREA during the tillering period. As a result of applications the number of wheat spike (number /m²), hectolitre weight (kg) and yield (kg/da) was found on the effect of statistically significant differences in the level of 5%, while the effects on plant height (cm) were found to be statistically insignificant. As a result of the research carried out; using "Bionutrients Soluble" in wheat farming, both in tillering and stem elongation periods, increased the yield 13.16% versus the control subject. There were no statistically significant effects on quality parameters of wheat by using "Bionutrients Soluble" in foliar applications.

Keywords: Wheat, Bionutrients Soluble, Yield, Quality

In the Overall Evaluation of Fertilization Trials by Regression Analysis Method

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Abstract

It is necessary to conduct fertilization trials in different parts of the research target area in order to determine the fertilizer needs of the plants. However, it is expected that different values from the same test subjects will be obtained depending on the climate and soil characteristics of the places where these tests are conducted. Therefore, a fertilization program cannot be established by looking at the yields obtained from the trials. For this, the values obtained from all experiments should be evaluated by using certain statistical methods. The aim of such evaluations is to establish fertilization programs by revealing the relationship between the amount of fertilizer applied and the yield. Two equations are used to determine these relations One of them is a quadratic equation $Y = a + bx + cx^2$; the other is the Modified Mitscherlich equation $\log Y = \log A - b(1 - c)^x$. The quadratic equation is used to collectively evaluate the experiments carried out on poor soils of plant nutrients. The Mitscherlich equation is used to collectively evaluate the experiments carried out in the soils ranging from poor to rich in plant nutrients. Fertilization programs prepared according to the fertilizer product relationships determined by quadratic equation are mostly valid for nutrient-poor soils. Fertilization programs prepared according to the fertilizer product relationships determined with Mitscherlich equation can be safely applied in soils ranging from poor to rich. In this article, the quadratic equation is used in the aggregate evaluation of the fertilization trials, and the points to be considered while performing the regression analysis to determine the parameters a, b and c of the equation will be pointed out.

Keywords: Fertilization experiments, Regression analysis

Evaluation of the Effects of "AVAIL" Usage as Basic Fertilization Fertilizer on Some Yield and Quality Criteria in Bread Wheat

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Abstract

This study was planned to determine the effects of "Avail" (phosphorus fertilizer booster) as base dressing (both the sowing fertilizer) on some yield and quality criteria in wheat versus DAP, which is used as the classic base dressing fertilizer. The experiment was carried out during the 2018-2019 wheat sowing season at Doğan kent location of the Eastern Mediterranean Agricultural Research Institute. In the planting norm of 450 pieces/m², randomized blocks were established with four replications according to the experimental design. The size of the test plots was adjusted to be 1.4 m wide and 5 m long. Ceyhan-99 spring wheat variety was used as plant material in the experiment. For this purpose, control subject (without fertilizer), conventional application- DAP (15 kg/da)+UREA (29 kg/da), AVAIL coated DAP (15 kg/da)+UREA (29 kg/da) and DAP (25 kg/da)+UREA (29 kg/da) were studied in 4 themes. As a result of the observations and analysis of variance; the effects of plant height (cm), number of spike (number/m²) and yield (kg/da) were found statistically significant. In the research; 15 kg DAP/da as base dressing (both the sowing) and 29 kg UREA/da from the top, which is the conventional application in wheat agriculture, provides 30.23% increase in yield compared to control subject (without fertilizer), while 15 kg/da AVAIL as base dressing and 29 kg Urea/da from the top application versus control subject (without fertilizer) yield increased to 73.76%. As a result of the research, the application of AVAIL (15 kg/da) from the bottom and UREA (29 kg/da) from the top yielded 33.43% yield increase compared to the conventional application DAP (15 kg/da)+UREA (29 kg/da). In terms of quality criteria, the effect of the fertilizers subject to the experiment was similar.

Keywords: Wheat, Avail, Yield, Quality

Fertility Status and Potential Nutrition Problems of Soil Orchards in Bilecik Province

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Abstract

This research was carried out to determine nutritional problems and soil fertility status of orchards soils in Bilecik Region. For this objective, 41 soil samples were collected from intensive orchards area and used as material. Texture, pH, EC, CaCO₃, organic matter, available P, extractable K, Ca, Mg, Na, B, Fe, Cu, Zn and Mn analysis were done in soil samples and results of them were compared with threshold values. According to the findings; orchard soils generally have clay, clay loam, sandy clay loam and sand loam texture, 39% are very lime and no salinity problem. The amount of organic matter in 73% of the soil is low, in 83% of the extractable P was found to be inadequate and extractable K was determined to be rich in the vast majority. The extractable Ca, Mg and Na contents of the soils vary between 2035-8039, 90-729 and 7-292 mg kg⁻¹ respectively. Orchard soils were sufficient in terms of extractable Cu and Mn, but the amount of extractable Fe and Zn was low. In 61% of the examined soils, extractable B was determined to be insufficient. The orchards should be supported in terms of nitrogen, phosphorus, iron, zinc and boron elements and a fertilization program based on soil analysis should be implemented.

Keywords: Orchard, Soil fertility, Plant nutrient

Effect of Nitrogen Fertilization on Peach Yield in Aegean Region

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Abstract

This research was carried out with Redhaven variety planted at 6 m x 6 m rows in the established area in order to determine nitrogen fertilizer requirement of peach grown in Aegean Region at between 1998-2002. The experiment was conducted in randomized block design with 3 replications which is formed in 0 - 250 - 500 - 750 gr N / tree levels of nitrogen. Preliminary yield values of tree trials were determined in the first year of the study. In the next three years, the yields were obtained by applying different nitrogen levels. According to covariance analysis results based on yields, the values are examined; it was found statistically significant that there was a difference between corrected yields and fertilizer levels. For the soil depth of 0-20 cm in the Aegean region, the required amount of nitrogen for peach under the conditions that the organic matter content in the soil is between %1-2 was determined by using regression analysis method and the following equation $Y = 41.88 + 103.93X - 111.68X^2$ ($R = 0.772$ *) was obtained. According to the results obtained, when the applied fertilizer and product prices were taken into consideration, the economic nitrogen level that needed to be applied to peach was determined as 453 gr N / tree and the amount of economic product as 66.0 kg / tree. Additionally; some microelement contents in the leaves and the effect of applied fertilizer to fruit quality properties were analyzed and found out statistically nonsignificant.

Keywords: Aegean Region, Peach, Fertilizer, Nitrogen, Yield

Evaluation of the Effects of Nutrisphere-N as a Top Fertilizer on Some Yield and Quality Criteria in Bread Wheat

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Abstract

In this study; the effects of "Nutrisphere-N-UREA" fertilizer, a nitrogen stabilizer, on some yield and quality criteria in bread wheat were investigated. The experiment carried out for this purpose was conducted in the wheat sowing season of 2018-2019 at Doğankent location of the Eastern Mediterranean Agricultural Research Institute. Trial; in the planting norm of 450 pieces/m², randomized blocks were established with four replications according to the experimental design. Ceyhan-99 wheat variety was used as plant material in the experiment. In this study, which is planned for the comparison of urea fertilizer used as top (tillering stage) fertilizer in wheat and "Nutrisphere-N-UREA" fertilizer, the followings was carried out; control (without fertilizer), conventional-DAP (15 kg/da)+UREA (29 kg/da), DAP (15 kg/da)+Nutrisphere-N-UREA (15 kg/da) and DAP (15 kg/da)+Nutrisphere-N-UREA (29 kg/da), 4 subjects were studied. As a result of the observations and variance analyzes, the effect of "Nutrisphere-N-UREA" usage on all yield and quality criteria examined, was found to be statistically significant despite classical top fertilizer (Urea) application. In the research; the lowest yield value 178.43 kg/da was obtained from the control subject. In traditional practice was yield per decare 326.88 kg while Nutrisphere-N-URE (15 kg/da) yield was 388.46 kg per decare was obtained. Nutrisphere-N-URE (29 kg/da) was used as top fertilizer and yield of 362.36 kg per decare was obtained. The effects of the trial themes on quality parameters of wheat were found similar except the control subject.

Keywords: Wheat, Nutrisphere-N, Yield, Quality

The Effect of Different Nitrogen Applications by Injection Method on Grain and Biomass Yield and Some Plant Parameters of Wheat

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Abstract

In this study, by injection method (CULTAN), a new method of fertilizing plants in Turkey, as compared with conventional fertilization methods of the ammonium fertilizer on grain and biomass yield and some other effects on plant parameters of wheat. The aim of this study is to determine the effect of different nitrogen applications (N 100%, N 70%) on yield and some other parameters in this method, which is based on the injection of ammonium as liquid fertilizer solution into soil, which can be an alternative to conventional fertilization methods in areas where wheat production is significant. According to the results of the study, grain (8320 kg ha⁻¹) and biomass yields (240 kg N ha⁻¹) were obtained at the highest 100% CULTAN application, followed by Conventional 100% application; In N70% applications, it was found that lower yield values were obtained. The highest number of spike determined in the unit area of CULTAN 100% application; the number of grain per spike and thousand grain weight was found lowest in control application and there was no statistical difference found between the other applications.

Keywords: Injection fertilization, Nitrogen, Wheat, Yield

Effect of Nitrogen Fertilization on Oil Content of Sunflower

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Abstract

Sunflower production is increasing both in dry and irrigated conditions in order to meet the vegetable oil need of our country. Sunflower is the main alternation plant and most widely grown in dry conditions after wheat in Thrace region for a long time. This study was carried out between 2013 and 2016 years in order to determine the effect of nitrogen fertilization on oil ratio of sunflower in Thrace Region. For this purpose, 27 field trials were conducted for four years within the scope of the study. Trials were carried out according to Latin square experiment design; Nitrogen fertilizer levels of 0 (N0), 3 (N1), 6 (N2), 9 (N3) and 12 (N4) kg / ha (N) were applied. The oil content (%) of the sunflower plant was determined by NMR. When the results of the study were evaluated, it was determined that nitrogen fertilization decreased the oil content of sunflower. As a result of statistical analysis made by combining all trials, as the amount of nitrogen applied increased, the ratio of sunflower oil was determined avaragely %; N0 = 42.37, N1 = 42.04, N2 = 41.82, N3 = 41.07 and N4 = 40.71. In our country where the product price determination is made according to % oil ratio in the market, the negative effect of excess nitrogen on oil ratio should be taken into consideration in determining the amount of nitrogen fertilizer to be given to sunflower.

Keyword: Sunflower, Oil content, Nitrogen

The Effect of Nitrogen Fertilization by Fertigation Method on Cotton Yields Components in Harran Plain Conditions

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Abstract

Nitrogenous fertilizers, which are one of the essential inputs of agricultural production, may turn different transformations and move away from the soil as quickly as they are applied to the soil. In order to increase the efficiency of nitrogenous fertilizers, it is possible to divide the applying nitrogen required by the plant as more than one time to minimize fertilizer losses, to prevent contamination of water resources and to provide nitrogen economy in the soil. In this study, nitrogen fertilizer usage amount with efficiency and yield components of cotton plant were investigated by using fertigation method. Experimental randomized blocks design were set as 5 (nitrogen fertilizer dose) x 3 (block) according to the split plots experiment design. Experimental subjects are nitrogen fertilizer doses N0, N6, N12, N18, N24. In nitrogen doses, N0 is 0 kg ha⁻¹ pure nitrogen, N6 is 60 kg ha⁻¹ pure nitrogen, N12 is 120 kg ha⁻¹ pure nitrogen, N18 is 180 kg ha⁻¹ pure nitrogen N24 is 240 kg ha⁻¹ pure nitrogen ammonium sulfate. Stonville 453 plant variety was used in the experiment as cotton planting. According to the results of the soil analysis, the amount of nitrogen from the phosphorus fertilizer given at the base (18-46-0) was removed and the remaining nitrogen fertilizer amount was given by dividing the drip irrigation system in 6 times. The required phosphorus fertilizer for N0 was applied in TSP. At the end of the study, the effect of nitrogen fertilization by fertigation method on cotton as plant height, cocoon number, cocoon weight and cocoon mass pain was determined in Harran Plain conditions.

Keywords: Harran plain, Fertigation, Cotton, Yield Components

Commercial Wheat Fertilization Based on Nitrogen Nutrition Index

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Abstract

The FATIMA project validated the methodology for estimating biomass using remote sensing (RS) for wheat in commercial plots in the province of Albacete. This work describes the practical application on commercial plots of the planning and operational implementation of the variable rate technology (VRT) through nitrogen nutrition index (NNI) maps throughout wheat development. In the framework of the project, it was demonstrated that the relationship between the critical nitrogen concentration (Nc) and the biomass proposed in the literature is valid in the study area to determine the nitrogen absorption throughout the growth cycle of wheat. Therefore, with the time series of images, it is possible to estimate the biomass accumulated and NNI at any stage of crop development and for any pixel within the plot. The material analysed to determine the nitrogen concentration was biomass samples obtained in the field over 3 field campaigns, at previously selected sampling points, based on the management zone maps (MZM), which different rates of fertilizers were applied. The knowledge about the NNI allows fertilizing at critical moments throughout the wheat campaign. The variable rate technology allows the application of fertilizers to be adjusted to the real demand, spatially distributed.

Keywords: Remote sensing, Wheat, Biomass, Nitrogen nutrition index (NNI), Variable rate technology (VRT)

Spatial Nitrogen Management Using Sensor-Based Precision Technologies: The FATIMA Experience and Beyond

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Abstract

Spatial variability of soil properties, year-to-year variations in weather conditions, and other factors make it difficult to predict economic optimum nitrogen rates (EONR) early in the season. Active canopy sensors integrate the factors that have influenced photosynthesis from early season to the time of sensing and have the ability to assess spatially variable crop N requirements. Unlike in-season N fertilizer recommendations that are based on soil- or tissue-test results, canopy sensors can be directly mounted to a fertilizer applicator, making it possible to collect reflectance data and apply variable N fertilizer rates in an on-the-go one-pass operation. One such variable-rate application (VRA) system for granular fertilizer with 1-m linear spatial resolution was developed under the auspices of the Fatima project (Horizon 2020). With an automated sensor calibration procedure to normalize reflectance data and with the Holland-Schepers algorithm at the core of the system, the efficiency of VRA was tested in three major crops of central Greece under field-scale conditions. Compared to farmer-perceived uniform N rates, the VRA reduced total N inputs by 20-38% and increased agronomic NUE by 11-46% by delivering an EONR in durum wheat, maize and cotton. The VRA also increased return over N cost by €67-91/ha and net returns over N by €119-248/ha when marginal yield increases were observed in wheat and cotton. These environmental and economic benefits were obtained in crop-years of yield response to N fertilization. In-season canopy sensing amounts to a point-in-time assessment of crop vigor that is indicative of yield potential provided growing conditions remain favorable. Lack of yield response to in-season fertilization naturally leads to an over-supply of N above the EONR. Broader-scale trials are needed to verify these performance characteristics. The current VRA configuration is suited mainly for small-to-medium operations in the EU where granular fertilizers are commonly available. The development and evaluation of a complementary liquid VRA option is a research priority because it adds versatility, improves precision and reduces the cost of spatial fertilizer applications. With the ability to spray the liquid on to vegetation or dribble the liquid on the soil surface, liquid VRA can be used in a multitude of annual and perennial crops or at different growth stages. Blending with micro-nutrients and growth regulators is another foliar VRA option while the same configuration can be used for spraying herbicides and fungicides. The pump flow control responds to pressure changes from 0 to full rate in 0.5 sec and the flow rate monitors for each nozzle ensure uniformity of delivery across rows. These properties make the system able to precisely deliver liquid fertilizer at a sub-meter spatial resolution in the direction of travel at operating speeds of 12-15 kmph that are appropriate for medium-to-large scale operations.

Keywords: Nitrogen management, Variable-rate application (VRA), Sensor-based precision

Estimation and Mapping of Clay and Organic Matter in Soil Based on Field Radiometry and Sentinel-2

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Abstract

Understanding the spatial distribution and space-time variability of soil properties is essential for respectful land use planning on agriculture. High-resolution soil properties maps like texture, water-storage capacity, cation exchange capacity, drainage, and adsorption capacity are essential inputs for modelling hydrological, erosion, and ecological soil processes and, so that, for agrosystems management and environmental protection. The main disadvantage is the wide quantity of information required with a high cost on time and resources. The use of multispectral VIS-SWIR techniques coupled with multivariate models has been applied to estimate soil properties quickly, economically and non-destructive. The application of geostatistics has made it mapped. In this work, we have compared laboratory continuum multispectral measurements (400 – 2500 nm) coupled with geostatistics and discrete remote measurements (Sentinel bands) to estimate and map clay and organic matter on agriculture soils. The experimental data were collected in commercial fields located in the Central Plateau of the Iberian Peninsula, Spain, during FATIMA project.

Keywords: Remote sensing, Sentinel2, Spectral signature, Reflectance spectroscopy, Soil clay content, Soil organic matter content, PLS model, Kriging

Effect of Nitrogen Applied by Fertigation Method on Vitamin C Level of Paste Pepper
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Abstract

This research has been conducted to determine the amount of fertilizer demand of paste pepper in Izmir grown with fertigation method. The research was carried out in the experimental field of International Agricultural Research and Training Center in 2013, 2014, 2015. “Yalova Yaglik 28” pepper cultivars were used in the research. The parcels were set according to randomized block design with 5 treatments and 4 repeats and the plants were planted with 80 cm between-row and 35 cm within-row spacing. The Nitrogen treatments were N₀= 0 kg N da⁻¹ (0 mg kg⁻¹), N₁= 9 kg N da⁻¹ (20 mg kg⁻¹), N₂= 18 kg N da⁻¹ (40 mg kg⁻¹), N₃= 27 kg N da⁻¹ (60 mg kg⁻¹), N₄= 36 kg N da⁻¹ (80 mg kg⁻¹) and applied within 450 mm irrigation water. With a lateral allocated to each row, the irrigation intervals were 3 and 4 days and the fertilization was applied in the 4 day treatments. Ammonium nitrate (33%) was used as nitrogen fertilizer and phosphoric acid (85%) was applied to each plot equally in the rate of 15 kg P₂O₅ da⁻¹ (33 mg kg⁻¹) as phosphorous fertilizer. The average vitamin C values changed between 66.15 and 136.53 mg/100g⁻¹. The effect of nitrogen treatments on vitamin C was found to be significant at 99% confidence level in all three years and N₀ treatment without nitrogen had the highest correlation level. As a result of the study, it was determined that nitrogen applications had negative effects on vitamin C level.

Keywords: Pepper, *Capsicum annuum* L., Fertigation, Nitrogen fertilizer, Vitamin C, Drip irrigation

Determination of the Relationship between Nitrogen Uptake, Yield and Quality Characteristics of Different Nitrogen Forms in Soil of Wheat Grown in Dry Conditions

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Abstract

This study, was conducted in 4 different locations in the Konya Plain in a field trial established in dry conditions to determine the relationship between wheat's nitrogen uptake, yield and quality characteristics of nitrogen in different forms (Organic-N, NH₄-N, NO₃-N, NH₄ + NO₃-N, total-N) in the soil. The experiment was established with 4 replications according to the randomized block design and 5 different doses of nitrogen (0, 3, 6, 12 kg da⁻¹) were applied. As a result of the research, wheat yields vary depending on nitrogen applications, 320, 413, 446, 441, 429 kg da⁻¹ respectively. Positive correlation was found between nitrogen content and yield ($r = 0.649^{**}$) and harvest index ($r = 0.544^{*}$), yield and number of grains per spike ($r = 0.599^{**}$) and hectoliter weight ($r = 0.493^{*}$). In addition, the highest nitrogen uptake, yield and quality characteristics of wheat were obtained with 12 kg da⁻¹ N application.

Keywords: Nitrogen forms, Bread wheat, Yield

Determination of the Relationship between Nitrogen Uptake and Different Nitrogen Forms of Bread Wheat Grown Under Irrigated Conditions in Konya Region

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Abstract

These field trials were carried out in 10 different regions of Konya plain to determine the effect of different forms of nitrogen present in the soil on the nitrogen uptake of the wheat plants. In the study, 7 different nitrogen doses (Control, 4 kg da⁻¹, 8 kg da⁻¹, 12 kg da⁻¹, 16 kg da⁻¹, 20 kg da⁻¹, 24 kg da⁻¹) were given in randomized block design experiments with 4 replications. Mineralized organic-N; NH₄-N, NO₃-N and NH₄ + NO₃-N extractable with KCl; NO₃-N obtained from phenoldisulfonic acid method and total N amounts were determined in soil samples. As a result of the study, the relationship between nitrogen content of the wheat flag leaves and NO₃-N amount determined by phenoldisulfonic acid method ($r = 0,2948^{**}$) was found to be statistically significant ($p < 0.01$). Considering the nitrogen content found in the flag leaves of the wheat plants, the amount of NO₃-N determined by phenoldisulfonic acid method was found to be crucial for nitrogen nutrition of wheat plants. In the study, significant differences were observed in different nitrogen doses. The highest flag leaf nitrogen content was obtained at the dose of 24 kg da⁻¹.

Keywords: Nitrogen forms, Phenoldisulfonic acid, Wheat

Utility of SPAD-502 Chlorophyll Meter for Determination of Iron and Chlorophyll Content of Vine Leaf

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Abstract

The aim of the study was to determine the iron and chlorophyll contents of vine leaves by using SPAD-502 Chlorophyllmeter. For this purpose, leaf and soil samples were taken from 12 vineyards in Manisa Alaşehir Region. Chlorophyll a and Chlorophyll B contents of the leaf samples were determined in laboratory after SPAD-502 chlorophyll meter was measured. Iron and active iron contents of leaf samples were also determined. After soil samples were sieved through 2 mm sieve, pH, salt, organic matter, CaCO₃, active CaCO₃ and available Fe contents were determined. As a result of correlation analysis, $r = 0,601$ * positive correlation was found between leaf Fe content and SPAD-502 measurement values. In addition, a positive correlation was found between SPAD-502 and Chlorophyll a value $r = 0,606$ *. There was a negative correlation between soil lime and active lime content and SPAD-502 values $r = -0.849$ ** and $r = -0.724$ **, respectively.

Keywords: Chlorophyll, Vine, Chlorophyllmeter



Determining and Mapping the Fertility and Microelement Scopes of the Agricultural Soils of İzmir Province via Inverted Distance Weighted Method

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Abstract

This research was carried out to determine the fertility and microelement scopes of the agricultural soils of İzmir province and to create a database and distribution maps (pin maps) by using geographic information systems technique between 2014-2017. Within the scope of the research, a total of 502 soil samples, representing agricultural areas, were taken from 0-20 cm soil depth with 2.5 km x 2.5 km grid intervals. In soil samples taken; texture, pH, EC, lime, organic matter and extractable phosphorus, potassium, iron, copper, zinc and manganese analyzes were performed. Soil analysis results were classified according to certain criteria and deficiency, adequacy or excess levels of nutrients were determined. After the classification of soil parameters, a database was created within the scope of GIS and soil distribution maps were produced via Inverse Distance Weighted method. According to the results it was found out that, 55.18% agricultural soils of İzmir was sandy-loamy, 49.60% was mildly alkaline, 42.03% was slightly saline, 57.17% was non calcareous-slightly calcareous, 55.98% had minimal organic matter. In terms of extractable elements, 28.09% did not have enough phosphorus, 47.21% had high potassium, 90.84% had high levels of iron, 96.61% had high levels of manganese, 44.42% had zinc and 69.91% had medium levels of cooper.

Keywords: İzmir, Soil fertility, Micro plant nutrient element, Database, IDW

Effect of Different Potassium Fertilizer on Leaf Plant Nutrients of Cabernet Sauvignon Wine Grape

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Abstract

The study was conducted in order to examine the effect of different potassium fertilizers on the plant nutrients of Cabernet Sauvignon wine grape leaves. The experiment was carried on between the years 2014 and 2017 in a trellis system vine of Manisa- Grape Vine Research Institute. Each year, fertilization was done according to target yield after analysing the soil samples taken from 2 depths after defoliation and pruning. Nitrogen (Ammonium Nitrate) and P (Mono Ammonium Phosphate) were incorporated in constant amounts. Potassium was also given in constant amounts but in four different forms (Potassium Sulphate; Potassium Nitrate; Potassium Sulphate + Potassium Nitrate and Control). The trial was statistically designed according to randomized blocks with three replications. The effects of treatments on leaf plant nutrients (N, P, K, Ca, Mg, Fe, Cu, Mn, Zn) was studied via leaf tissues sampled both at bloom and veraison. Results showed that treatments significantly affected the leaf macro and micro nutrients in vines.

Keywords: Cabernet Sauvignon grape, Vineyard, Potassium, Macro elements, Micro elements

Under Long Term Field Condition to Evaluate the Effects of Different Phosphorus Doses on Agronomic Efficiency of Maize Plant

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Abstract

Maize (*Zea Mays.*) plant is one of the most produced cereals around the world. Phosphorus (P), which is one of the most used fertilizers in maize production. P is not a renewable resource and in next 50-150 years it may be finish. And less P fertilization may limit crop yield and production capacity. The purpose of study is to investigate the effects of different P doses on P uptake and its usage efficiency upon Maize under long term filed experiment. A long term field experiment was established in 1998 and since then regularly each year control (without fertilization), 50, 100 and 200 kg P₂O₅ ha⁻¹ P (as triple superphosphate) doses were applied as a basic fertilizers. Dekalb C955 maize genotype was used as plant material. Maize seeds were sown in June 2017 and were harvested in October 2017. After harvest, yield, shoot and root dry weight were determined. P concentrations of each parts were determined by ICP-OES. P content of plots was determined by Olsen method. Agronomic Efficiency (AE), Physiological Efficiency (PE), Agrophysiological Efficiency (APE), Apparent Recovery Efficiency (ARE) and Utilization Efficiency (EU) were calculated. The obtained results reveled that, with increasing doses of P fertilization, P concentration and efficiency of P utilization. Results are statistical significant. 100 kg P₂O₅ ha⁻¹ P doses application have higher AE, FE, GKE and KE efficacy than that of P50 and P200 kg P₂O₅ ha⁻¹ P doses applications. In addition, there was no statistically significant difference between the P applications in the calculation of AFE, but on average P100 application efficiency is higher than the P50 and P200 doses application. The study concluded that the increased doses of P application increased P use efficiency. It was determined that under field condition application of P100 kg.ha⁻¹ P₂O₅ dose was the optimum dose for corn production.

Keywords: Phosphorus utilization efficiency, Maize and Agronomic efficiency

Long-term Evaluation of Cropping Systems Sustainability under Climate Change Scenarios: the EU FATIMA Project Italian Case-Study

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Abstract

The Mediterranean basin is a recognized hot spot for climate change for the next decades, with modifications of rainfall amount and pattern and temperature increase, and where extreme events are expected to severely affect agricultural sector and food security. One of the most important issue caused by intensive agricultural farming systems is the reduction of soil organic carbon (SOC), with a possible worsening in the perspective of climate change, with major side effects on soil functioning. Sustainable agricultural practices can reduce the external inputs (e.g., pesticides, fertilizers and herbicides), increasing crop yield stability and biodiversity in the rhizosphere over time. To date, deterministic crop growth modelling is a major tool for analysing the impacts of climate change on agricultural production. The present study aimed at evaluating the long-term agro-environmental sustainability (30-years) of a typical Mediterranean cropping system using a modelling approach under future climate change scenarios. Within the FATIMA project, measured data from the Italian field trial and EPIC model were used to assess the long-term agro-environmental impacts and sustainability of different nitrogen fertilization treatments on crop yields, water use efficiency, nitrogen use efficiency, soil organic carbon stock change, soil bulk density change, and soil N cycle (nitrate leaching and N₂O emissions), under future climate change scenarios. The tested treatments, applied in a durum wheat – processing tomato rotation, were: Conservative and Synthetic N fertilization method Prediction of sustainable management under climate change scenarios was performed by running the The Environmental Policy Integrated Climate (EPIC) agroecosystem model. The overall evaluation of the alternative fertilization strategy proposed, was considered as good and “sustainable” option for the farmer in order to overcome the management problems due to expected climate changes.

Keywords: Climate change, Long-term sustainability, Agro-environmental impacts, Epic model

Evaluation of Environmental and Economic Sustainability of Different Nutrient Management Strategies

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Abstract

Significant intensification of European agriculture has often had undesirable impacts in soil fertility as well as the increase in soil erosion, the deterioration in water quality, the loss of biodiversity in agricultural ecosystems and the rise in Green House Gas (GHG) emissions, promoting a new vision of the CAP oriented to the development of sustainable farming concept. Within the Fatima project we developed an analytical framework to assess the environmental and economic sustainability of nutrient management in three Case Studies, implemented with different fertilization strategies in the winter wheat production, compared with the conventional one. The framework is based on the concept of "Water-Energy-Food" nexus, considering indicators related to water use and quality, energy input/output, crop productivity, and economic performance. The work focused the attention at farm level taking into account different fertilization strategy: Organic-ORG, Slow Nitrogen Release-SRN, and Synthetic traditional-SNF for Italian Pilot Area; Homogeneous vs Variable Rate Application (VRA) in Greek Pilot Area, and Homogeneous vs Variable Rate Application (VRA), in Czech Pilot. Considering the environmental sustainability, our results provide evidences of the significance of the reduction of energy use (both direct and indirect), the highest value of renewable energies and the reduction of not renewable ones, as well as the reduced impact of groundwater quality (Nitrate loss by leaching) as compared with the conventional fertilization strategy. As regarding the economic sustainability in the VRA (both in Greece and Czech) there are a reduction of production cost, and increase on gross margin, while in ORG and SRN (Italy) those indicator are less sustainable than the conventional one, mainly due to reduction the of marketable yields. This last aspect represent a 'tension' between economy and environment, wich can represent one of the main challenges to be solved through adequate policy instruments considering the different dimension of sustainable crop production.

Keywords: Nitrogen fertilization, Water-energy-food nexus, Environmental quality, Economic sustainability

Effect of Active Carbonate on Available Micro Nutrients in Soils

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Abstract

The aim of this study is to investigate the effect of soil active carbonate content on intake micro nutrients. A total of 20 soil samples were selected for this purpose. The total carbonate content of the first ten samples ranged from 10.02 % to 10.99 % (CV = 3.23). The active carbonate content of these samples varied between 2.90 % and 6.95 % (CV = 34.18). No correlation was found between the active carbonate and the intake micro nutrients in these ten samples. The total carbonate content of the second ten samples ranged from 30.01 % to 34.43 % (CV = 4.31). The active carbonate content of these samples varied between 6,05 % and 14,39 % (CV = 30.01). In the second ten samples, no correlation was found between active carbonate except for Cu and the available micro nutrients. A negative relationship between active lime and available Cu ($r = -0,667 *$) was determined.

Keywords: Active carbonate, Micro nutrients, Soil



Changes of Cr and Co Contents of Some Plants in Manisa Turgutlu Çaldağ Region According to Seasons

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Abstract

The study area is of Manisa Turgutlu Çaldağ in Turkey. The higher parts of the region are composed of serpentinized ultrabasic (serpentinite) and spilitic volcanic (basalt) rocks. Alluvial land is located at the end of the slope. The aim of this study is to investigate the changes of Cr and Co contents of the olive, vine and pine plants in the region according to the seasons (January, April, July, November). For this purpose, 26 points were determined in the study area and 3 replicated plants (leaf-pine needle) and soil sampling were taken. Cr content in soil samples ranged from 22.3 to 551.3 mg / kg and Co in the range of 10.9 to 141.2 mg / kg. Cr was determined between 0.36-2.83 mg / kg and Co was 0.21-1.72 mg / kg in plant samples. According to these results, it is seen that Co amount is high in plant samples but there is no problem in terms of Cr.

Keywords: Soil, Plant, Heavy metal



Effects of Different Iron Sources on Apple Yield

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Abstract

The aim of this study was to determine the effect of soil applications of different iron sources on the yield of 16 year old Starking Delicious apple cultivars in the Ayrancı district of the Karaman province. In the study, plots had two trees, with the exception of the control each tree received 10 ppm Fe in the form of Fe-EDTA (%6 Fe), Fe-DTPA (%11 Fe), Fe-HBED (%13 Fe), Fe-EDDHA (o-o: 2.2) containing 6 Fe, Fe-EDDHA (o-o: 3.5), Fe-EDDHA (o-o: 4.8), Fe-EDDHA (o-o: 5.25) or FeSO₄.7H₂O; in total, 9 treatments were applied in randomized blocks with 4 replications according to the factorial experiment design. As a result, the effect of different iron sources on yield was found to be statistically significant at a 1% level. Although fruit yield varies depending on iron application sources, the highest yields were obtained with Fe-EDDHA (o-o: 4.8) and Fe-EDDHA (o-o: 5.25) applications at 2468 kg ha⁻¹ and 2406 kg ha⁻¹, respectively. In addition, regression analysis between fruit yield, and iron content of leaves and fruits yielded 5% level statistically significant regression equations of $y = 576.45 + 10.07x$ (x = leaf iron content) and $y = 358.64 + 60.008x$ (x = fruit iron content), respectively. A 1 ppm increase in iron content of leaves and fruits can obtain a 1.6% and 11% increase in yield, respectively.

Keywords: Iron, Apple, Starking delicious, Regression, Yield

Determination of Nutritional Status of Olives (*Olea europaea* L.) Grown in Muğla Province in Terms of Boron and Other Elements, Leaf and Soil Relations

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Abstract

This study was conducted to determine the nutritional status of olive cultivated land and olive plant in Muğla province in terms of boron and other elements. For this purpose, soil and leaf samples were collected from 125 gardens in Datca, Koycegiz, Milas, Ula, Seydikemer. In soil sample were made texture, soil reaction, electrical conductivity, lime, organic matter, extractable boron, phosphorus, potassium, calcium, magnesium, sodium analyzez. In plants samples were determined total boron, phosphorus, potassium, calcium, magnesium. The vast majority of the research area has sandy-tin and clayey-tin structure and low organic matter content. Lightly alkaline, neutral and medium acidic soils are in the salt-free class and contain about high lime. According to soil and leaf analysis results; although all of the soil contains sufficient boron, the lack of boron in 93% of the leaves indicates that the plant does not benefit from the existing boron. It was determined that there was serious nutritional problems in terms of B, P, K. At the least, there was nutriotional problems in terms of Ca and Mg. Also, secure correlative relationships between the amounts of nutrient in the soil and the amounts of nutrient in the leaf were obtained. Considering the results of this study conducted in Muğla province, it is understood that effective fertilization program, method and time are extremely important. High quality and high yield production in olive agriculture; balanced fertilization, addition of organic fertilizers and other technical applications.

Keywords: Olive, boron, soil fertility, plant nutrition, macro element

CANCELLED



The Effect of Different Boron Application Methods on Yield Quality and Plant Nutrient Status of Tomato

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Abstract

Boron is a micronutrient that is essential to plant growth. The line between deficiency and toxicity for soil B is very narrow, so care is needed in fertilizer formulation and placement to avoid B toxicity. The aim of the present experiment was to determine the effect of different boron fertilizer application methods on yield, quality and plant nutrient status of tomato grown in greenhouse. The experiment was laid out randomised complete block factorial design and replicated five times. Three different methods as foliar spray (% 0.025B), soil application (4 kgB/ha) and foliar (% 0.025B)+soil application (4 kgB/ha) with a control were applied and Etidot-67 (% 20.8 B) was used sources of boron fertilizer. Regardless of fertilization methods, boron application had no significant effect on the yield and quality of tomato. The B fertilization increased the concentration of this element, but no significant effect on N,P, K, Ca, Mg, Fe,Mn,Zn in tomato leaf.

Keywords: Boron, Tomato, Yield, Quality



Variation and Comparison of Boron Contents for Soils of Çarşamba Delta Plain and Upland in Samsun Province

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Abstract

Boron (B) is one of the essential nutrients for plant growth and also its deficiency and toxicity limit is very close to each other. The effectiveness of B in soils to the plants varies according to many soil and climatic factors. Unlike the most micro elements, B is highly mobile in soils and leached depending on environmental conditions such as rainfall amount or irrigation intensity, etc. Therefore, B deficiency or toxicity in agricultural areas is an important limiting factor in cultivation. Having soils of our country high pH and lime content, heavy texture and low organic matter level constitute significant limitations in plant nutrition especially for B and make it necessary to be investigated. In this respect, purpose of this study was (i): to determine B concentration levels in arable lands of micro catchments located on two different physiographic positions that are Çarşamba Delta Plain and Upland in Samsun Province and also (ii): to reveal relationships between B contents and some physicochemical soil properties. Therefore total of 126 samples were collected from surface depth (0-20 cm) of study area. Analysis of some basic physicochemical parameters such as texture, pH, EC, lime content, organic matter, total N, available P and B, exchangeable cations (Ca, Mg, Na, K) and extractable micro nutrient elements (Fe, Cu, Zn, Mn) were done in the soil samples. According to the results, pH values varied between 4.68 and 7.67 and there was no salinity problem. Lime and organic matter contents of samples were detected as 0.0-14.1% and 1.05-6.91%, respectively. As for B content; in Delta plain concentrations ranged between 0.93-4.40 mg kg⁻¹ as classified mostly in sufficient level while, in Upland positions values were found between 0.22-8.39 mg kg⁻¹. Hereby, results were showed significantly high variability. In addition to these outcomes, it was detected that significant correlations were found between B contents and some physicochemical soil properties.

Keywords: Boron, Physicochemical soil properties, Samsun



ORAL SESSIONS
AGRICULTURAL IRRIGATION

Association the Agricultural Irrigation Policies with Development Plans

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Abstract

Development Plans constitute the main policy documents by identifying the structural transformation areas of critical importance and their related targets and strategies which will be focused on by our country. Besides economic growth, long-term development policies of our country highlight the institutional and structural regulations that focus on efficiency and productivity and, provide effective monitoring and evaluation by aiming to realize the objectives and priorities with concrete programs and actions and to strengthen the plan-program-budget linkage. In order to effectively realize the policies taking place in development plans, institutional level of strategic plans of the public institutions, their medium - long term basic principles, objectives and priorities, and the methods to be followed to reach them and their source allocations should be compatible with the development plan. In our country, the policies for water and irrigation management are defined in development plans. In the projections of five-year development plans, increasing the productivity and quality in agricultural production, ensuring the profitability by lowering the production costs, profitable use of water resources, raising awareness of water users in brief, a sustainable water use policy in agriculture, actions and activities always remain on the agenda. In this paper; In the five-year development plans made in our country until today, in the management of soil and water resources especially the place, importance and reflection to the implementation of agricultural water policies together with the action plans will be examined. Also differently from the past development plans, for the first time in the 10th Development Plan will be touched upon the ' Activating Water Use in Agriculture' Priority Conversion Programme of which policy and activities could be monitored.

Keywords: R&D, Development plans, ÖDÖP, Agricultural irrigation policies

Preparation of Water Distribution Programs and Application Examples in Irrigation Management

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Abstract

The General Directorate of State Hydraulic Works (DSİ in Turkish acronym) was established by Law 6200 in 18 December 1953 and gave an organizational structure in 1954 in order to prevent from the damage of surface water and ground water and/or utilize them with various aspects and do other duties and use empowers stated in legislation. Water economy for the purpose of irrigation is compulsory because of limited water resources, using for various purposes except irrigation, and increasing water demands. It is easy to understand that plant demand can not be reduced so that water economy in irrigation must be done during its conveyance, its distribution and its application to the land. The listed preventions can be accomplished when proper irrigation management methods are applied. The main purpose of the irrigation management is to utilize the irrigation water in planned way in order to provide the most appropriate agricultural production and use existing resources economically. Preparation of water distribution programs plays an important role in irrigation management. These works are conducted in the irrigation facilities operated by DSİ. It is necessary that the same works must be performed in the assigned irrigation facilities to plan the part of water resource used during the year, to determine the amount of water of assigned establishments/organizations and to provide this amount of water, to take precautions by knowing the probable inadequacy beforehand, to have information on removing the conflicts among assigned establishments/organizations, and to monitor and make necessary arrangements.

The Developments of Irrigation Water Distribution Systems and Comparative Assessment of Water Distribution Performance in Turkey

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Abstract

Worldwide, 71% of total water abstraction is used for agriculture, 18% for industry, 11% for domestic purposes. However, 74% of total water supply of Turkey is used for irrigation, 13% for industry and 13% for domestic. Considering the rapid increase in population despite the decrease in quantity and quality of water resources due to the negative effects of global climate change on water resources, the construction of water saving irrigation systems and effective use of water become critical in irrigation. The General Directorate of State Hydraulic Works (DSI in Turkish acronym), is the primary agency of Turkey for overall water resources planning, execution and operation, has shifted its policy in 2003 from classical open channel distribution network to more water saving systems. Pipeline distribution network has been utilized extensively. The proportion of pipeline distribution has soared to 27% in 2018 while it is 6% before 2003. The change in the irrigation method applied due to the change in the type of irrigation network provides a significant increase in the efficiency of water use. Approximately, 62% of total area is irrigated by surface irrigation methods. The remaining part is irrigated with pressurized irrigation methods (sprinkler 21% and drip 17%). Instead of traditional methods, if sprinkler and drip irrigation methods are utilized, sprinkler irrigation increases water efficiency from 60% to 80% and drip irrigation raises water efficiency up to 95%. The aim of this study is to make a comparative assessment of the indicators such as irrigation rate, irrigation efficiency and the rate of water supply depending on the development of water distribution systems in irrigation facilities by the long years in our country. As a result, with the modernization of water distribution systems, significant improvements have been observed in water distribution performance indicators.

Keywords: Irrigation water distribution systems, Comparative assessment, Water distribution performance, Turkey

Importance of Sustainability and Water Productivity on Agricultural Irrigation Management

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Abstract

Sustainability is to meet the needs of the present without compromising the ability of future generations to meet their own needs. Sustainable irrigation water management should achieve (i) sustaining irrigated agriculture for food security and (ii) preserving the associated natural environment. Thus, three different objectives can be achieved for irrigated agriculture: i) maximizing the crop yield, ii) maximizing the crop water use efficiency (WUE) (water productivity, WP), and iii) maximizing the farmer's economic returns. WP, enhancing total product (kg m^{-3}) and revenue ($\text{\$ m}^{-3}$) based on amount of irrigation water used and/or agricultural economic water productivity. Sustainable water use strategies and increasing WP could be provided by scheduling irrigation events, modifying agricultural practices, improving irrigation systems, and deficit irrigation. The WP could be increased at plant, field and basin level. Increasing WP at the plant level could cover enhancing photosynthetic efficiency, improving seedling vigour, increasing harvest index and increasing root depth. The most important improvements of yield depend on breedings programmes. WP at field level could dependent on soil and water management, change crop, drip irrigation, crop variety, minimum tillage, planting methods, deficit irrigation, irrigation scheduling according to sensitive growing periods, nutrient management and improve drainage. WP at the basin could be increased by improving irrigation scheduling, land use planning and better use of forecast. In this article, water productivity (WP), economic water productivity (EWP) and land economic productivity (LEP) using different amount of irrigation water and different irrigation systems in Southeastern Anatolia Region of Turkey were evaluated using some experimental results. Thus, WP, EWP and LEP should be considered jointly for an optimization of water productivity and water saving in terms of farmers and irrigation schemes.

Keywords: Irrigation, Water productivity, Sustainability, Water economic productivity, Land economic productivity

Climate Change and an Update of the Irrigation Water Consumption Standards in Bulgaria

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Abstract

Recently, water needs for irrigation in Bulgaria have increased which is due to climate warming and drought. The irrigation depths, which have been established as irrigation standards in the 80s of the last century, nowadays seem inadequate. Irrigation network design and irrigation water pricing need a new updated formative base. This research work was commissioned by the Ministry of Environment and Water through the Ministry of Agriculture, Food and Forestry of Bulgaria with the aim of creating new standard basis for irrigation that meets the changed climate conditions of the country. The presentation includes author's investigation results on climate change in the country and updated irrigation depths for a great number of crops. 1971-2010 tendencies of the meteorological elements: air temperature, vapor pressure deficit and reference evapotranspiration at 40 agro-meteorological stations and their statistical proof are presented. Regression analysis and Mann-Kendal's test were used for statistical processing. Rainfall impact analysis was preceded by using De Martonne Aridity Index. The 1981-2010 increase of reference evapotranspiration was estimated by multi-regression analysis. Maps of the climatic values of reference evapotranspiration over the country were elaborated in GIS environment. Irrigation depths of nearly 40 crops were updated for six types of microclimatic conditions within the agricultural territory for moderately dry and very dry year. The methodology includes an update of the list of agrometeorological stations under six microclimatic conditions on the basis of the temperature factor; calculation of coefficients that reflect the increase of the reference evapotranspiration during the period 1981-2010; applying of these coefficients to the currently established irrigation standards; calculation of gross irrigation depths at different irrigation technologies by taking into consideration the efficiency of the irrigation systems. The proposed irrigation depths became a part of an Ordinance of the Council of Ministers in December 2016 as irrigation water consumption standards.

Keywords: Climate change, Reference evapotranspiration, Irrigation depths, Water consumption standards

Fairly Distribution of Agricultural Water under Water Shortages Scenarios

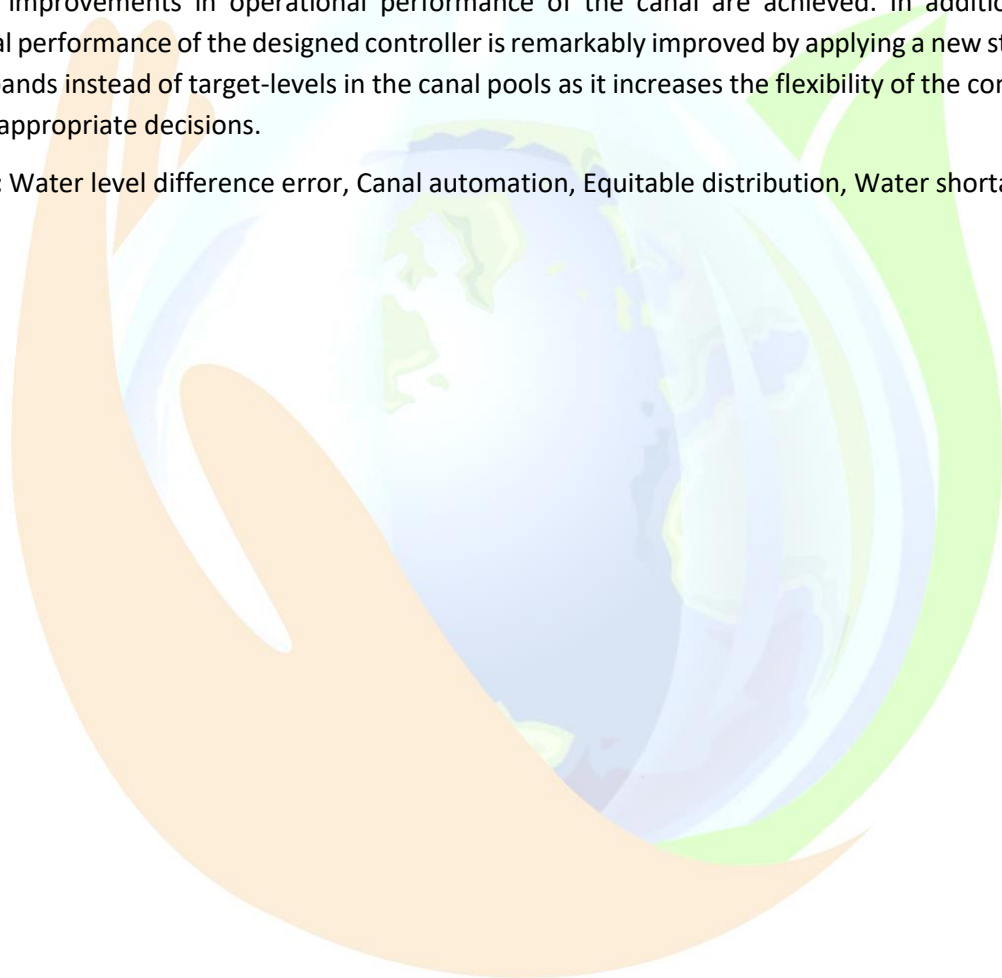
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Abstract

Equitable water delivery becomes one of the main concerns for water authorities in arid regions. Due to water scarcity, providing a reliable amount of water is not possible for most of the irrigation districts in the arid areas. In this study, a novel configuration of the Water Level Difference Error method is introduced to speed up the error sharing in the context of Model Predictive Control (MPC). The potential application of the controller is examined. The main objective of this controller is the fair distribution of water between upstream and downstream users in the main canals suffering from water shortages. The results show fast reactions in equitable sharing of water level deviations from target throughout the canal. Since all the pools are involved in optimally managing the water shortage, significant improvements in operational performance of the canal are achieved. In addition, the operational performance of the designed controller is remarkably improved by applying a new strategy of target-bands instead of target-levels in the canal pools as it increases the flexibility of the controller in making appropriate decisions.

Keywords: Water level difference error, Canal automation, Equitable distribution, Water shortage



Complexity Management of Large Irrigation Canal Management under the Drought Condition by Using Economic Strategies

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Abstract

In this paper, a new configuration of the economic-operational model is proposed in agricultural water distribution procedure. The goal is providing a realistic water delivery framework for water scarcity periods based on the real potential of different irrigated districts located along the main canal where the maximization of the net revenue is pursued. To this end, an economic Positive Mathematics Programming (PMP) model is employed to determine the economic value of the water. Mathematical Operational model of a realistic large irrigated district in the center of Iran is provided using a Model Predictive Controller (MPC). The water users are prioritized based on their potential to offer more economic profits employing penalties on the water level errors that are set according to the economic prioritization. Results show the satisfactory operation of the canal reaches so that the water level in the reaches with high economic water value is kept closer to the operational target levels.

Keywords: Agricultural water distribution, Economic model, Positive mathematical programming, Water scarcity



Virtual Water Exchange and Cropping Pattern Optimization Model for Agricultural Water Management

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Abstract

Lake Urmia basin as Iran's largest inland lake has faced numerous problems in recent years due to ineffective water management practices. In this study, using the optimization approach in virtual water exchange, the most favorable conditions of virtual water trade in this basin were identified, where the maximum income for farmers and the least water withdrawal of the basin are possible. In this regard, two fuzzy and non-fuzzy (classical) optimization models were developed. According to the Lake Urmia restoration program recommendation, 40% reduction in water withdrawal from the basin was considered as the main scenario for comparison of models. The results showed that under the same conditions from basin water consumption prospective, the cropping pattern presented by fuzzy optimization model using (Jayalakshmi solving method) would provide 1.39% more economic benefits to farmers. Furthermore, unlike the non-fuzzy model, the developed fuzzy model showed that in the case of water scarcity (compared to current conditions), the share of crops that are high in the economic value of each unit of their virtual water (such as nuts and apricots) have a priority for production in the basin. Consequently, the presented fuzzy model (with Jayalakshmi solving method), offers more acceptable results than the non-fuzzy model. Therefore, by applying the results of this study on net imports of the basin's crops, in addition to increasing farmers' income, water stress can be reduced in the basin.

Keywords: Optimization, Fuzzy Model, Jayalakshmi, Lake Urmia

Irrigation Results and Basic Performance Indicators in Irrigation Cooperatives in Konya and Afyon

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Abstract

Irrigation cooperatives are generally the type of business organizations in which administrative irrigation is transferred from the irrigation facilities in the areas within the borders of a single settlement unit to the seasonal irrigation water needs and small irrigation facilities. While the administrative and financial audits of the Irrigation Cooperatives have been successfully carried out by the Ministry of Agriculture and Forestry to date, it is possible to achieve the expected benefit from irrigated agriculture, to operate the irrigation facilities within the determined strategies and plans, to monitor the implementation results of the irrigation and to evaluate the results obtained within the framework of certain technical audits and continuity cannot be fulfilled. "Implementation of Measures to Improve Water Use Efficiency in Irrigation Cooperatives" project which prepared by TRGM was established in 2017. In this project, it is aimed to establish the infrastructure for seasonal technical inspections of irrigation cooperatives in the provinces where the cooperatives operate and to publish an "Evaluation Report" for each year. In this study, irrigation results and seasonal performance "irrigation rate" and "irrigation efficiency" were evaluated in irrigation cooperatives operating in Konya and Afyonkarahisar provinces. Irrigation rate was 80% and 60% in Konya and Afyonkarahisar provinces and irrigation efficiency was 80% in Konya and Afyonkarahisar provinces respectively. These values are above the long-term average values for Irrigation Associations and represent the success of irrigation cooperatives as a type of enterprise organization.

Keywords: Irrigation cooperative, Irrigation ratio, Irrigation efficiency, Irrigation method

Systems related to monitoring of Soil Plant Atmosphere Water Relationships

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Abstract

In this review study, systems developed for monitoring of soil, plant, atmosphere and water relationships were evaluated and their scientific base lines, use principles, data oportunities and indicators depends on these data were given. For this purpose systems related to soil water content, leaf area, leaf water potential, canopy-surface temperature and hyper-spectral measurement were review. In addition to these, un-manned aerial systems, multi-spectral camera and thermal camera systems developed for agricultural monitoring were also given.



Calibrating the Crop Coefficient Equation for A Plot in Aegean Region of Turkey

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Abstract

Over the past century there has been a dramatic increase in water scarcity and drought in arid and semi-arid territories even in the Northern Hemisphere, that nowadays have become a topic of increasing research attention also in European Union. Despite Europe's being considered as having adequate water resources, water scarcities and droughts become an increasingly frequent and widespread phenomenon in the scale of the European Union. The imbalance caused by water demand much over the available water resources is a major drawback. During recent years, Earth Observation (E.O.) from space has become the most important source of data for monitoring much of the land surface-atmosphere processes and in particular the hydrology of agricultural and forestry areas. Individually, FATIMA (FARming Tools for external nutrient Inputs and water MANagement) funded by the European Commission under the Horizon 2020 is one of the multi-national joint research efforts which used the E.O. data. In the project, satellite data from Landsat-8 and Sentinel-2 sources were used to monitor 7 pilot plots where various crops have been traditionally cultivated. In the process of 3 years in the project, each harvest provided new outputs about forecasting crop water requirements (CWR). As one of the pilot areas, Menemen plain in Aegean Region of Turkey was also investigated through satellite imagery and in situ data collected. In the light of acquired data, crop coefficient (Kc) equation which was developed by Cuesta et al., (2004) for the Spanish region of the Mediterranean has been calibrated for the Turkish case study. Two cycles of maize and cotton of the Turkish pilot area has been investigated; crop water requirements calculated by remote sensing and actual irrigation applied to the field with respect to in-situ soil moisture measurements are compared in order to obtain a regionalized Kc equation.

Keywords: Earth observation, Remote sensing, Irrigation water requirement, Evapotranspiration, Forecast

Determination of Technical Performance of Drip Irrigation Systems Used in Şanlıurfa

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Abstract

In Şanlıurfa, suggestions have been made for the determination and evaluation of the performance measures of drip irrigation systems, which are supported by TEDGEM and some are established by the farmers themselves, in 20 operating enterprises. Generally, while the values of the Dripper Flow Rate Coefficient and Water Output (Distribution) Equivalence are not within acceptable limits, the Christeansen Equipartition Coefficient, Distribution Homogeneity, Statistical Equipartition, System Propagation (Water Out) Homogeneity and Dripper Performance Change are considered good. The measured wetting percentages (P) of the tested parcels varied between 28-100%. The wetting area is 95-100% and the test places are irrigated every 7 days such as furrow irrigation. T12, T14 and T17 did not receive enough water from the irrigation test points, while the other test points were sufficiently and sufficiently watered. Maximum water depth ranged from 4 to 14 mm. Field application yield (Ea) ranged from 15% to 184% and Ea over 100% indicates less watering. While T1, T3, T7, T8, T9, T11, T18, T19 and T20 irrigation times were higher than the test points, there was not enough watering due to the low watering time at T12, T14 and T17 points. T2, T4, T5, T6, T10, T13, T15 and T16 were sufficiently watered. The yield performance of the lower quarters ranged from 26.10 to 72.90%. PELQ values are below 80%. Low PELQ is a sign of design problems in the system.

Evaluation of Thornthwaite Equation for Estimating Evapotranspiration in Samsun province in Northern Turkey

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Abstract

Evapotranspiration (ET_o) is one of the important items of irrigation management and hydrological cycle. The Penman Monteith (PM) is using the most common equation for estimating reference crop evaporation. This equation needs different meteorological data, but some meteorological data aren't exist in meteorological stations. Therefore the using PM method is limited in some country. For this reason, Thornthwaite equation is used to estimate ET_o . This study is intended to estimate ET_o using different Thornthwaite approaches. In this study, six Thornthwaite approaches were compared the PM equation to estimate ET_o using meteorological data from Samsun province and six districts (Bafra, Çarşamba, Ladik, Beşpınar, Havza and Çakıralan). Different statistic parameters such as coefficient of determination (R^2), root mean square error (RMSE), mean absolute error (MAE) are used to evaluate performance of the methods. The coefficients of determination of model results for Samsun province and six districts were estimated between 0.99 and 0.93. The lowest root mean square error (RMSE) values for testing the model accuracy were between 2.5 and 0.20. The MAE ranged from 0.154 to 1.845 $mm\ day^{-1}$. These results suggested that this regional k value can be successfully used for ET_o estimating with from 0.67 to 0.71 at all stations. According to the results obtained that ET_o could be estimated from new Th-70 approach (effective temperature, k value 0.70). The approach presented in this study could be applied in other regions for obtaining suitable regional calibrations of the Thornthwaite equation.

Keywords: Reference ET, Thornthwaite approach, ASCE-Penman-Monteith, Samsun

The Relationships of Water-Yield on Silage Corn Irrigated with Center Pivot Irrigation System

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Abstract

Yield and quality responses of silage corn to 4 different water levels irrigated with Center pivot system were investigated in Ankara condition. During the plant growth period, full irrigation S_{100} (100%), deficit irrigation S_{75} and S_{50} (75% and 50%) and over-irrigation S_{125} (125%) applications were applied as four treatments. Irrigation water was applied to the S_{100} plots to bring the existing moisture to the field capacity when 50% of the available soil moisture is consumed. 75% of the water given to the S_{100} is applied to the S_{75} , 50% to the S_{50} and 125% to the S_{125} plots. Each treatment was replicated 3 times and harvest pixels were generated randomly within each replication (1.4-row spacing x 1 m length =1.4 m²). Accordingly, 12-14 plants were harvested at each pixel. Plants harvested from each treatment were compared in terms of yield and quality parameters. As a result of the research, mean crop ET of silage corn was found around 940 mm. The highest yield obtained from S_{100} and S_{125} were 11.1 and 10.6 t/da in 2014 and 8.6 and 7.9 in 2015. Although more irrigation water was given to S_{125} , the highest yield was obtained from S_{100} .

Keywords: Center pivot irrigation system, Maize, Moisture sensors

The Effects of Water and Nitrogen Doses on Sugar Properties and Refined Sugar Yield in Sugar Beet Irrigated with Linear Move Sprinkler Irrigation Systems

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Abstract

Optimum use of water in Central Anatolian conditions, use of new techniques in irrigation and fertilization, introduction of new techniques to the local farmers, yield and quality parameters in sugar beet plant, as well as the determination of water-nitrogen-yield relationships in the project in Ankara-Etimesgut Sugar Institute in the trial area three year. In the study, 3 irrigation water subjects (100%, 65% and 30%) and 3 nitrogen doses (0, 8 and 16 kg / da N) were applied. The combined effects of irrigation and nitrogen are of particular importance in sugar beet production. In general, when sufficient soil moisture is provided to limit growth, the uptake of nitrogen in the soil that is beneficial to the plant will not be restricted. Nitrogen-poor soils cannot get good yield from irrigations made with nitrogen fertilizer application. When the 3-year data obtained from the research are evaluated; there is inverse interaction between yield increase and digestion. As the yield increases, the digestion decreases. The presence of sugar between 0 nitrogen doses - full water and full nitrogen dose - full water resulted in favor of a nitrogen dose of approximately 1.35 ° S, 0. Irrigation increases the yield of beets and consequently the purified sugar yield (sugar entering the sack) increases. Nitrogen fertilizer application increased purified sugar yield by 23% and full water application increased by 91%. Irrigation reduces the amount of harmful nitrogen in beet by 174% in all nitrogen dose applications. As irrigation is done, harmful nitrogen decreases. While the yield and quality values of different irrigation water and nitrogen amounts were determined, physiological properties were determined by infrared thermometer and leaf spectrometer and the efficiency of using nitrogen was determined by NDVI measurements made with active nitrogen sensor.

Keywords: Irrigation, Linear sprinkler irrigation system, Sugar beet, Water-nitrogen-sugar presence, Treated sugar yield relationship

Determination of Yield and Quality Characteristics of Silage Maize (*Zea mays* L.) Irrigated by Drip Irrigation in Eskisehir Conditions

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Abstract

The importance of water use is increasing along with climate change and drought. For efficient water use, the effects yields and ouality of irrigation programs of crops (wheat, maize, sunflower, etc.), which are widely grown in the region irrigated by pressure irrigation, should be determined. Maize is one of the most important roughage in animal feed, both in green and in silage. The increase in the need for roughage in the livestock sector in recent years has naturally increased the interest in silage maize varieties. This research was conducted in Eskişehir Transitional Zone Agricultural Research Institute Soil and Water Resources campus in 2009-2010. this research was used TTM813 silage maize in and it was aimed to determine the effects of different irrigation levels on silage maize yield and quality by using drip irrigation method. In this research, a total of 5 irrigation subjects, including four levels of water, are collected, which cover 50%, 75%, 100%, 125%, % and the effective moisture level of the plant root zone at the root level. The research was conducted in randomized blocks with 3 replications. The values obtained in different irrigation levels in 2009-2010 are as follows; Irrigation waters between 288-644 mm and 294-621 mm, plant water consumption between 363-698 mm and 350-710 mm, green forage yield between 4635-7864 kg / ha and 4578- 7689 kg / ha, crude oil between 2.24-2,60% and 2,12-2,50%, crude protein between 944-11,72% and 9.94-11.98% , crude cellulose between 14,23-14,73% and 12,47%-13.85% It was determined that the values ranged between. According to the obtained results, TTM813 silage maize gave good results both in terms of yield and quality characteristics.

Keywords: Silage Maize, Drip irrigation, Yield, Protein, Cellulose, Oil

The Effect of Different Irrigation Levels and Different Tillage and Sowing Method on Water-Yield Relationships in Second Crop Soybean

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Astract

This study was carried out to determine the effects of different irrigation levels and different tillage and sowing methods on the amount of irrigation water, crop water consumption, water use efficiency and yield in the second crop soybean in Çukurova Region. Study Alata Horticultural Research Institute Tarsus Soil and Water Resources Location 3 different irrigation levels were applied (I100: Completion to the field capacity of the available water of 60 cm soil depth weekly. I70: 70% of the water applied to I100, I50: 50% of the water applied to I100), 5 different tillage and sowing method (T1: traditional soil tillage (Plow-discard-harrow-planting), T2:reduced soil tillage (combined chisel rototiller + roller gear harrow + sowing), T3: reduced soil tillage (Cholly-Goble discard-seeding-planting), T4:(plow + disc harrow + lister taps + sowing), T5: direct sowing). The research was carried out in randomized block split plot design with 3 replications. The result of, the highest yield was obtained in I100xT1 with 427.38 kg/da, while the lowest yield was obtained in I50xT5 with 344.64 kg/da in irrigation x tillage interactions. When the crop water consumption amaount of plants were examined, the highest was obtained with 632 mm I100 and the lowest with 399 mm I50. When the water consumption values of plants were examined, the highest was obtained with 632 mm I100 and the lowest with 399 mm I50. When water use efficiency values were examined, the highest was obtained with 8.7 in I50 and the lowest in 6.6 and I100.

Keywords: Water Use Efficiency, Sowing Method, Soybean Crop, Deficit Irrigation

Importance of Irrigation Methods on Cotton Irrigation in Southeastern Anatolia Region of Turkey

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Abstract

More than 50% of cotton production in Turkey has been realized in Southeastern Anatolia Region. Cotton crop is one of which used much more amount of irrigation water. For this, it will be very important to know effects of different irrigation systems/methods on cotton in terms of water saving and water productivity. Surface irrigation (furrow and border) and pressurized irrigation (sprinkler, surface drip and subsurface drip) methods have been used for cotton irrigation. According to the results of some experiments using surface irrigation methods carried out in the past, the irrigation water requirement and water consumptive use were 1125 mm and 1325 mm, respectively. This has showed that cotton needs much more water in case surface irrigation methods were used. In the another study, surface drip irrigation has provided the maximum yield (5330 kg/ha). However, a yield of 3760 kg/ha and 3390 kg/ha were obtained using furrow and sprinkler irrigation, respectively. According to the experimental results carried out in near time, use of subsurface drip irrigation with a lateral depth of 40 cm were more appropriate in terms of irrigation scheduling, water requirement, water consumptive use, yield and lint quality. Thus it is possible to get about a yield of 5000-6000 kg/ha. As a result, drip irrigation has saved about 30-40% of irrigation water compared to the conventional (surface irrigation) irrigation methods. In addition, drip irrigation provided more water productivity. For that, the farmers prefer to use of modern irrigation methods (drip irrigation) in the last decade. In this paper, the effects of different irrigation methods/systems on cotton growth are discussed in terms of cotton yield, water saving and water productivity.

Keywords: Cotton, Irrigation, Water saving, Water productivity, Modern irrigation, Southeastern Anatolia Region

Water Consumption Modeling of the Cherry Crops for Turkey

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Abstract

Today, the sustainable use of clean water resources in the world in terms of yield and quality in both economic and agricultural production has become increasingly important. Cherry is one of our important agricultural products as domestic consumption and export product. This study was conducted to assist in the efficient and economic use of available fresh water resources in Turkey. In the study; For the reference cherry variety of 0900 Ziraat, 59 phenology records from 20 locations for long years were used. There are different data sources for cherry vegetation periods and different phenological phase standards for years. Different periods are standardized. In the calculation of reference evapotranspiration and plant water consumption, daily temperature, sunshine intensity-time, humidity, rainfall and wind speed values at 2m were used as data set. Plant water consumption was calculated by canopy during phenological periods. "Estimated Suitability Ecological Model For Crop Cultivation" (ESEM) was used for the phenological estimated development dates of the varieties at the stations and "Database Of The Estimated Water Consumption" working infrastructure was used for the calculations of plant water consumption. Dates of 4 development periods in 25 climate zones; It was re-calculated by using the model based on the altitude of the station in the same climate zone. In the vegetation period, 4 different surface leaf coating ratio periods were calculated; beginning, development, middle and final stages of development. According to Penman-Monteith method, potential water consumption of 0900 Ziraat Cherry during the whole vegetation period was calculated and mapped. With the help of the model, by calculating the amount of water to be given during the vegetation in the region where the reference cherry variety is grown, economic and effective use of our limited clean water resources can be guided. Thus, the study will contribute to the sustainability of agricultural production of our water resources.

Keywords: Cherry, Phenology, Water requirement, Water consumption

Water Consumption Modeling of the Bean Crops for Turkey

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Abstract

Today, the sustainable use of clean water resources in the world in terms of yield and quality in both economic and agricultural production has become increasingly important. Beans are widely consumed among legumes. This study was conducted to assist in the efficient and economic use of available fresh water resources in Turkey. In the study; For the reference bean variety of Ayşekadin, 221 phenology records from 37 locations for long years were used. In the vegetation period, 4 different surface leaf coating ratio periods were calculated; beginning, development, middle and final stages of development. In the calculation of reference evapotranspiration and plant water consumption, daily temperature, sunshine intensity-time, humidity, rainfall and wind speed values at 2m were used as data set. Plant water consumption was calculated by canopy during phenological periods. Missing data of 4 development periods (on stations without data) in 25 climatic zones of the plant; the average values in the same climate zone and the altitude of the station are calculated with the help of the model. "Database Of The Estimated Water Consumption" study infrastructure was used for the calculations of plant water consumption. According to Penman-Monteith method, potential water consumption of Ayşekadin variety during the whole vegetation period was calculated and mapped. With the help of the model, by calculating the amount of water to be given during vegetation in the region where the reference bean variety grows, economic and effective use of our limited clean water resources can be guided. Thus, the study will contribute to the sustainability of agricultural production of our water resources.

Keywords: Bean, Phenology, Water requirement, Water consumption

The Effects of Different Irrigation Treatments on Chlorophyll Content and Leaf Area Index of Second Crop Maize

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Abstract

The study aimed to survey the effects of different irrigation treatments on second crop maize chlorophyll content and leaf area index under Menemen plain conditions. The experiment was carried out with two different irrigation intervals (S_1 :3 days, S_2 :6 days) and 5 different irrigation levels as subplots (pan evaporation coefficient; D_1 : rainfed, D_2 :0.3, D_3 :0.6, D_4 :0.9, D_5 :1.2) with drip irrigation system between years of 2013-2015 according to split plots in randomized blocks design. The grain yields varied between 364-1353 kg/da according to different experiment treatments. The highest yield was obtained from S_1D_5 whereas the lowest was D_1 . Chlorophyll and LAI measurements were taken before irrigation during the growing stage. According to different irrigation treatments, chlorophyll content varied between 42.0 and 57.8 and LAI varied between 1.61 and 4.16. It was understood that chlorophyll content and LAI increased with the amount of irrigation water. It was determined that the linear regression between chlorophyll and LAI and yield as; ($R^2_{chl}=0.92$, $R^2_{LAI}=0.80$). Linear regression was determined in water deficient treatments, chlorophyll content indicated stress status more clearly between flowering and grain fill. The differences between LAI values became clearer from flowering stage according to irrigation treatments. It was seen that the highest LAI value occurred in stage between grain formation to ripening stages.

Keywords: Maize, Chlorophyll, LAI, Deficit irrigation

A Research on the Determination of Water-Yield Relationship in Processing Tomato Plants

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Abstract

The fresh water resources in the world including Turkey are decreasing day by day. In order to solve this problem, especially in agricultural production, various studies are being carried out to use the water more effectively. This study is conducted on processing tomato which has a significant production area in our country. It was carried out during the summer season in 2017 under the region conditions of İzmir-Bornova. The aim of the study is to determinate the water-yield relations, some fruit quality characteristics, water use efficiency and irrigation water use efficiency. Kendras F1 industrial tomato type was grown and as an experiment design random blocks was applied in this research. Pan evaporation method was used to determine the amount of irrigation water. Irrigation treatments were applied as I₁₂₅, I₁₀₀, I₇₅ and I₅₀ (125%, 100%, 75% and 50%, respectively). Yields were determined as 1939.94 kg/da, 1650.16 kg/da, 1528.80 kg/da and 1409.10 kg/da for 125%, 100%, 75% and 50% irrigation treatments, respectively. On the other hand, the highest values in quality were determined in 50% irrigation treatment. These quality values are titratable acidity, water soluble dry matter content, fruit dry weight and fruit hardness values as 3.52 mval/100, 6.20%, 8.07 g, 4.15 N, respectively. According to these results, it is thought that I₇₅ irrigation treatment (total amount of irrigation: 343.15 mm and seasonal evapotranspiration: 358.19 mm) has more advantageous, because this treatment with the high yield x quality (briks) value will have more income in tomato production for the farmers.

Keywords: Water deficit, Class-A pan, Processing tomato, Yield, Quality

The Effects of Different Irrigation Water Levels on Yield and Quality of Ginger (*Zingiber officinale*)

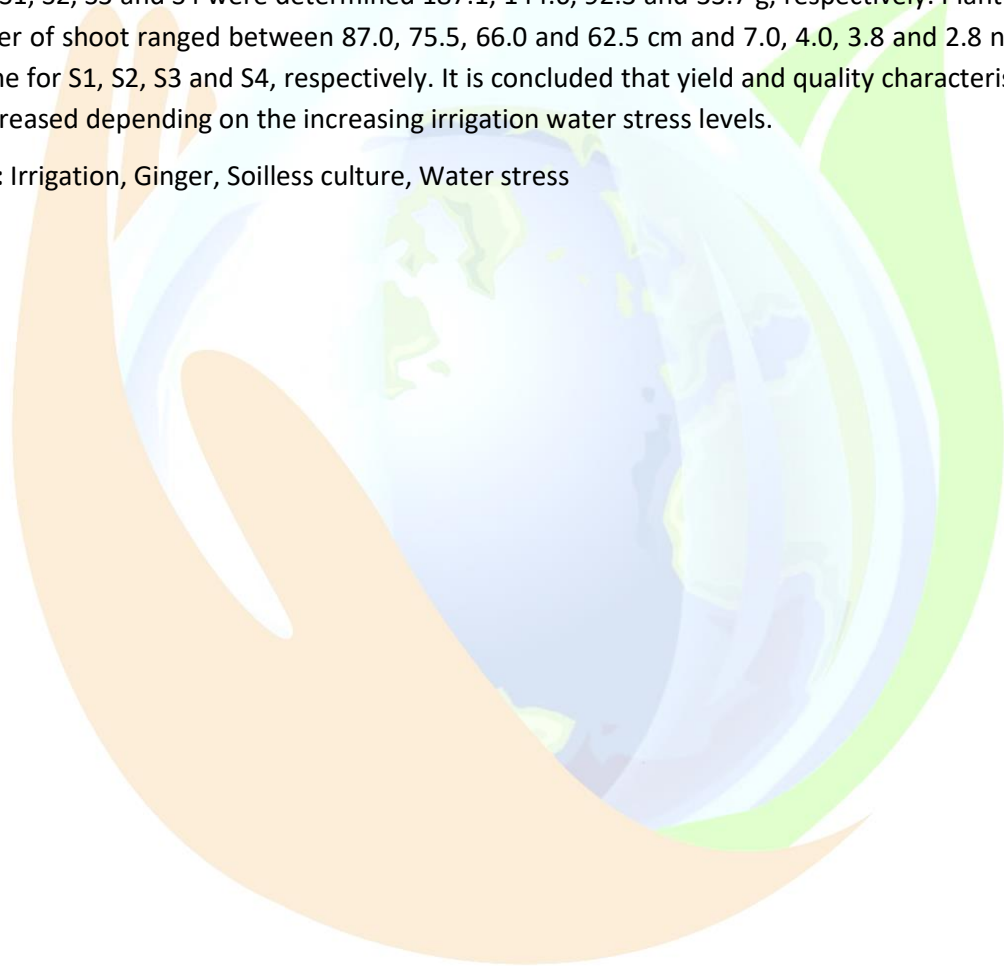
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Abstract

This research was carried out in soilless culture to determine the effects of different irrigation levels on yield and quality of ginger (*Zingiber officinale*) plant grown in glass greenhouse conditions located in Batı Akdeniz Agricultural Research Institute between March 15 and September 15, 2019. The experiment was designed according to randomized block design with three replications. Peat and zeolite (75:25) was used as soilless culture material. Four irrigation levels, S1:100% S2: 75%, S3: 50%, and S4:25% were applied experimental plots according to the daily solar radiation values reaching the greenhouse. Evapotranspiration values ranged between 60.3-241.3 L plant⁻¹. Rhizome fresh weight values for S1, S2, S3 and S4 were determined 187.1, 144.6, 92.3 and 33.7 g, respectively. Plant height and number of shoot ranged between 87.0, 75.5, 66.0 and 62.5 cm and 7.0, 4.0, 3.8 and 2.8 number per rhizome for S1, S2, S3 and S4, respectively. It is concluded that yield and quality characteristics of ginger decreased depending on the increasing irrigation water stress levels.

Keywords: Irrigation, Ginger, Soilless culture, Water stress



The Effect of Different Irrigation Levels on Yield, Number of Capsules and Thousand Grain Weight in Sesame Cultivation

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Abstract

This research aimed to determinate of proper sesame irrigation programme by surface drip irrigation method in Antalya conditions. The research was conducted in Aksu location of Bati Akdeniz Agricultural Research Institute between 2016-2017. Randomized split plots with three replications were used in the study. Four different Irrigation treatment level was applied in the experiment (100 % = I100, 80 % = I80, 60 % = I60, and 0 % = I0). Soil water content was monitored with gravimetric method. In the irrigation programme in the first year of the experiment (2016), 383 mm irrigation water was applied in the control treatment (I100). In the second year of the experiment (2017), 423 mm irrigation water was applied in the control treatment (I100). While the average number of capsules per plant varied between 65 – 113 in the first year (2016) of the experiment, it changed between 149.0 – 195.3 in the second year (2017). The highest treatments were I100 and I80 in terms of the number of capsules. Grain thousands weight changed between 3.33-3.83 g, moreover, seed yield values changed between 100.3-151.6 kg da-1. Irrigation levels were not found statistically significant in terms of grain thousand weight. When the yields were compared in terms of irrigation levels, the highest average yield values were obtained from I100 and I80 irrigation levels. Irrigation levels caused differences on yield and the number of capsule per plant. However, there is no statistical difference on grain thousand weight.

Keywords: Drip irrigation, Deficit irrigation, Sesame

Determination of Recharge in in Karst Formations Using APLIS Model and TOPSIS

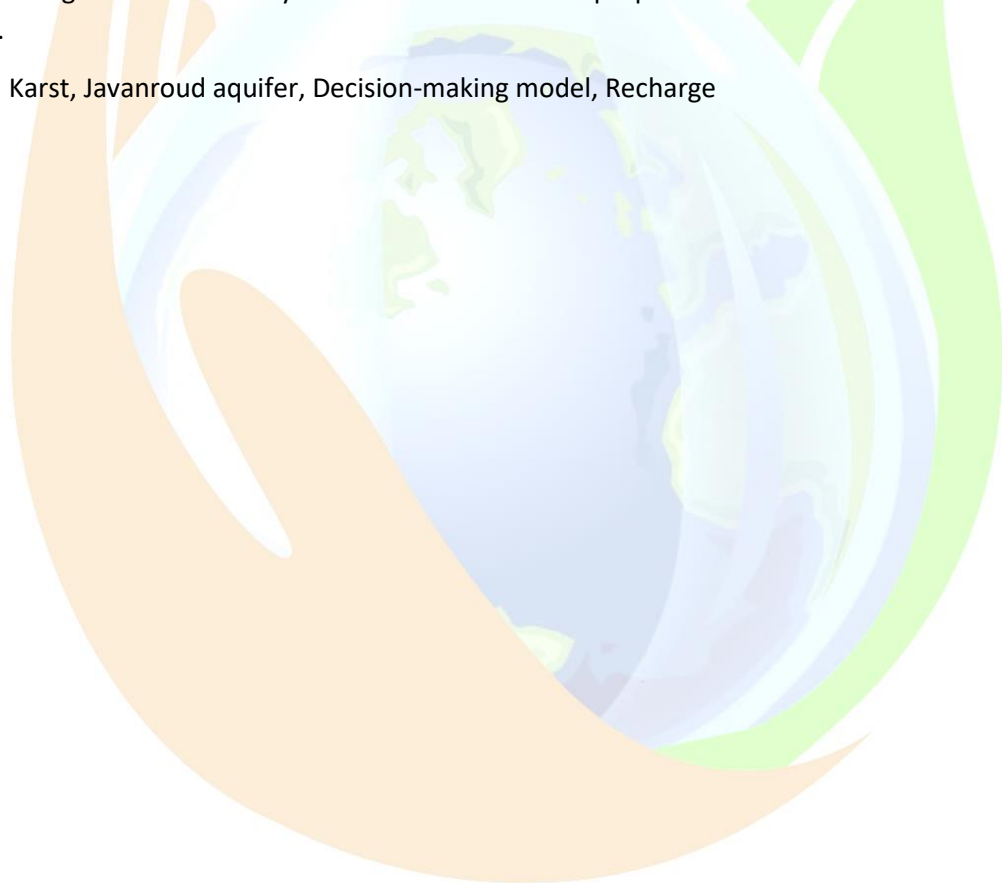
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Abstract

The exploitation of karst water resources is generally high quality than water transfer and surface water in arid and semiarid region. For this reason, investigation of the potential of karst resources for water management is important in water shortage conditions. Therefore, in this paper the potential calculation of water resources in karst formations using usual methods is studied. In the first step, APLIS weighting model was applied in Javanroud, Kermanshah region in west of Iran as the main method, which will be produced and estimated due applying important factors such as elevation of sea level, percent of slope, Lithology, infiltration, and soil texture. In the next step, for modifying of APLIS, TOPSIS techniques were applied to change the weight of the APLIS model. TOPSIS method is categorized as objectivity technique which the modifying rate weight is not considered by someone. At the end the comparison of two maps show that the map of producing by TOPSIS-APLIS technique is better than original APLIS. Finally the TOPSIS method is proposed for some other methods like KARSTLOP.

Keywords: Karst, Javanroud aquifer, Decision-making model, Recharge



The Impact of Deficit Irrigation on Wheat and Maize Performance in Bilasuvar plain, NW of Iran

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Abstract

Models are the best methods for selecting the most efficient irrigation method for enhancing performance and yield response. In this research study, using Budget soil and water balance model, we investigated and simulated the impact of deficit irrigation on Wheat and Maize crops of Bilasuvar plain in the north-west of Iran. Multiplicative, Minimum and Seasonal methods with different time steps and, also, evapotranspiration or transpiration were selected for estimating the amount of crop yield and the Budget model was calibrated for the observation years of 2017 and 2018. The results of the statistical analysis for the 10-year study period revealed that choosing the Multiplicative method with 10-day time period provides the best simulation by using potential evapotranspiration. The related values are 0.98 of R², 7.8% of RMSE and 0.83 of EF for wheat observed and simulated data. Regarding maize, the values were R²=0.87, RMSE=7.4% and EF=0.83. The results of later water consumption graphs indicated that influential amounts of rain, soil water reserve, water consumption management and water stress sensitivity have effects on the final output. Furthermore, results demonstrated that water stress sensitivity is higher in the middle growth stage in the initial and final stages. These findings should be considered for planning water deficit irrigation schedule.

Keywords: Budget model, Irrigation planning, Potential evapotranspiration, Bilasuvar Plain

Evaluation of Maize Grain Yield Affected By G×E×M Interactions (Case Study: Pakdasht Area in Iran)

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Abstract

Among the Genetic (G), Environment (E) and Management (M) factors, the quantitative and qualitative yield variations of maize grain are most affected by hybrids, water and nitrogen management and temperature. Therefore, in the present study, the effect of planting date, irrigation and nitrogen fertilizer on the qualitative and quantitative yield of early and late maturity maize hybrids was investigated in Pakdasht region. For this purpose present experiment was performed in split-split-factorial with a randomized complete block design (RCBD) with three replications where was considered irrigation as main factor (at two levels with 6 and 12 days intervals), sowing date as sub factor (at two levels of conventional sowing date and 30 days after conventional sowing date), maize hybrids (at two levels included KSC704 as a late maturity maize hybrid and KSC260 as an early maturity maize hybrid) and nitrogen fertilizer (at two levels included potential and non-fertilization) as a factorial treatments. The results showed that despite the superiority of KSC704 in biological yield, not only no significant differences were observed in grain yield between two hybrids but also in non-stress treatments of late planting date KSC260 had higher grain yield (10902 kg ha⁻¹ 704 and 11395 kg ha⁻¹ 260) ($P \leq 0.05$). In both maize hybrids, the highest grain yield was observed in conditions with no water and nitrogen stresses at conventional planting date. In contrast, the lowest grain yield of both hybrids was observed under water and nitrogen fertilizer stresses in late planting date (704= 8604 kg ha⁻¹ and 260 = 8762 kg ha⁻¹). In the field of qualitative traits, KSC260 was superior in terms of grain dry matter, crude protein and crud fat in in non-stress treatments. According to the results of this study, it can be concluded that not only is there no statistically significant difference between grain yield of KSC260 and KSC704 under water and nitrogen stresses treatments but also its grain yield is higher than KSC704 at late planting dates under non-stress conditions. Furthermore the superiority of grain quality of KSC260 in terms of dry matter, protein and fat content confirms the necessity of using new bred early hybrids with low yield loss in delayed planting dates faced with water crisis.

Keywords: Maize, Irrigation, Nitrogen, Temperature, Grain yield

Comparison of Plant Transpiration and Soil Evaporation Rate Separated by Isotopic Methods and FAO-AquaCrop Model

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Abstract

In this study; it is aimed to separate soil evaporation (E) and plant transpiration (T) from evapotranspiration (ET) of the winter wheat by using stable isotopic methods. Also E and T had been simulated with AquaCrop model. E and T results simulated by model had been compared with results estimated by isotopic method. The field experiment was conducted with three different irrigation water strategies with 4 replication in Murted Basin of Turkey. Treatments were full irrigation (FI), deficit irrigation (DI) and rainfed; no irrigation (RF). Soil-water-plant samples were taken during the anthesis stage for isotopic (¹⁸O/¹⁶O) analyses. The Keeling plot method was used to determine fraction of plant transpiration (F_T%) and soil evaporation (F_E%) respectively into the evapotranspiration from atmospheric vapor (δ_{ET}), soil (δ_E) and plant stem (δ_T) isotopic $\delta^{18}O$ content. According to research results; average transpiration rate were obtained 0.87, 0.84 and 0.75 for FI, DI and RF treatments respectively. A significant positive relationship was found between applied irrigation water and average transpiration rate with a correlation coefficient of 0.91 (R²). The evaporation rates of treatments were 0.13, 0.18 and 0.25 for full, deficit and no irrigation treatments. Field data were used to simulate E and T values with AquaCrop crop water productivity model. According to model results T/ET ratio was found 0.80, 0.79, and 0.68 at the same sampling date. The estimated E/ET ratio was 0.20, 0.21 and 0.18 for FI, DI and RF treatments respectively. Model was estimated transpiration and evaporation rate lower than isotopic method. However it can be said that there is a good agreement between estimated values of the model and isotopic methods. Considering irrigation water amount and plant transpiration, limited irrigation is more suitable for the irrigation of winter wheat in semiarid areas such as Central Anatolia.

Keywords: Evapotranspiration partitioning, Stable oxygen isotope, AquaCrop, Wheat

Determination and Prioritization of Sustainable Water Management Strategies in Arid regions

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Abstract

There are many regions around the world with arid and semi-arid climate and Iran is one of these regions having 65 percent arid and semi-arid areas. Water shortage is a formidable challenge due to low precipitation in these regions which needs to be addressed. An intensive water withdrawal from aquifers and completely inappropriate water use led to negative balance in some aquifers in arid regions. Thus, social and economic crises are concerned for the future by water resources authorities. In this research, the water resources management strategies in Central Desert Basin of Iran were determined by brain storming method and using Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis. Then, these strategies were ranked using Analytic Hierarchy Process (AHP) based on sustainable development criteria. As a result, 9 strategies regarding four categories including economic, social, environmental and technical sections were determined. Moreover, the strategy of "constructing wastewater collection and treatment network and reusing wastewater in industry and agriculture" were ranked in the first place and the strategy of "transferring water from adjacent basins" was placed in the last rank. The results of sensitivity analysis showed the model is sensitive to all of sustainable development criteria except to criterion "feasibility". Additionally, the model is more sensitive to the criterion "socio-cultural acceptance and participation of stakeholders" rather than the other criteria. Generally, high-ranked strategies grouped as continuous and improvement strategies whereas invasive strategies are ranked last. These results indicate the willingness of professionals to meet the challenges of water scarcity in the long term and relying on the strengths of the region rather than solving the problem at once which causes damages to the environment and natural resources.

Keywords: AHP, Strategic management of water resources, Central Desert of Iran, Sustainable development, SWOT

Contribution of High Water Table to Cotton Water Consumption in the Inner Parts of Menemen Plain

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Abstract

In terms of sustainability, it is necessary to know the physical, chemical and fertility characteristics of the agricultural soils as well as their irrigability and groundwater properties. This study was conducted in cotton cultivation lands in the inner parts of Menemen Left Bank irrigation system in Aegean Region. The aim of this study was to determine the contribution of high water table to plant water consumption, the amount of possible salt penetration in the root zone and the water savings in irrigation water. For this purpose, level and quality of water table in agricultural lands south of Gediz River within, Menemen Left Bank irrigation system were studied with Upflow software. 65 groundwater observation wells were drilled at a depth of 3 m in an area located between Menemen, Kesik Quarter, Çavuş Quarter and Gediz River in the inner parts of Menemen plain. During the cotton growing season, the average water table depth in the observation wells was 152 cm and the electrical conductivity (EC) of the water table was 2.0 dS m⁻¹. With Upflow software, the contribution of groundwater to plant water consumption was determined by using groundwater depth and quality values measured at different development periods of cotton in the observation wells. According to the results, it was calculated that 366 mm of plant water consumption, which is 933 mm for cotton, was met from water table. It was calculated that there would also be 266 kg da⁻¹ salt accumulation in the 3 m deep soil layer due to water table contribution and water quality. Approximately 50% of this 25000 da land is allocated for cotton farming. This data indicates that 4575000 m³ of water can be saved annually in net irrigation water requirement.

Keywords: Menemen Plain, Water consumption, Water table, Salt accumulation

Biological Risks of Waste Water in Terms of Irrigation Water

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Abstract

Today, the rapidly growing population has led to an increase in agricultural and industrial activities. These activities further increased the demand for already limited freshwater resources. It has become imperative to manage resources more carefully and to take measures to reduce water consumption. As a result of the decrease in the quality and quantity of water, which is accepted as an infinite source, problems are encountered in supply of resources. As a result, the search for alternative water sources is inevitable. An alternative source in this context is treated wastewater. The use of wastewater is becoming widespread internationally and nationally. Wastewater is widely used as water source in irrigation of landscaping areas, especially in agriculture, industry, cooling, washing, boiler feeding and fire extinguishing processes. These applications can be used directly after wastewater pre-treatment, forming wetlands. Physical treatment is usually performed in the pretreatment. Recently, heavy metals and endocrine degrading substances, which can be observed even in domestic wastewater, pose serious risks. In this study, microorganisms contained in wastewater in agricultural use, endocrine disruptors and biological risks that may pose in agricultural areas will be examined.

Keywords: Waste water, Treatment, Toxic effect, Irrigation

Evaluating Discharge Water of Menemen Biological Wastewater Treatment Plant in Terms of Quality Criteria

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Abstract

Of the $1384 * 10^9 \text{ km}^3$ water in the world, 97.39% is in the sea and oceans as salt water. The remaining 2.01% glaciers and 0.60% is freshwater resources such as lakes, streams and especially groundwater. Such is the case, it is clear that the fresh water resource that can be reached within the world's water resources is quite low or even insufficient. Today, water resources are gradually decreasing and deficit water use is required, thus treated wastewater sources should be used as irrigation water instead of drinking quality water. This study was carried out to show the status and changes of Menemen Biological Wastewater Treatment Plant discharge water in terms of irrigation quality criteria over a period of 6 years. The quality parameters of these water resources, which is an important alternative especially during the irrigation season, were evaluated according to the principles specified in the Technical Procedures and Regulations of Wastewater Treatment Plants. Some chemical and microbiological analyzes were carried out in the samples taken from the discharge water for a period of 6 years. These analyzes are; pH, SS (suspended solids), BOD (biological oxygen demand), fecal coliform, EC (electrical conductivity), B (boron) and Na (sodium). According to the analyses; discharge water of Menemen Biological Wastewater Treatment Plant was determined suitable for irrigation in some ways, however in terms of especially fecal pathogenic organisms, it is not suitable for irrigation. It was also understood that chemical and biological quality parameters of the treated wastewater in Menemen Biological Wastewater Treatment Plant varied considerably over time. This problem can be solved with routine checks in the plant and also by eliminating the setbacks in disinfection units. Thusly, water shortage can be prevented in Menemen Plain where agricultural production is performed intensively.

Keywords: Domestic waste water, Irrigation, Water reuse criteria

Accumulation Heavy Metals with Makro and Micro Elements in Maize Plant Irrigated by Wastewater

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Rıza Kanber²

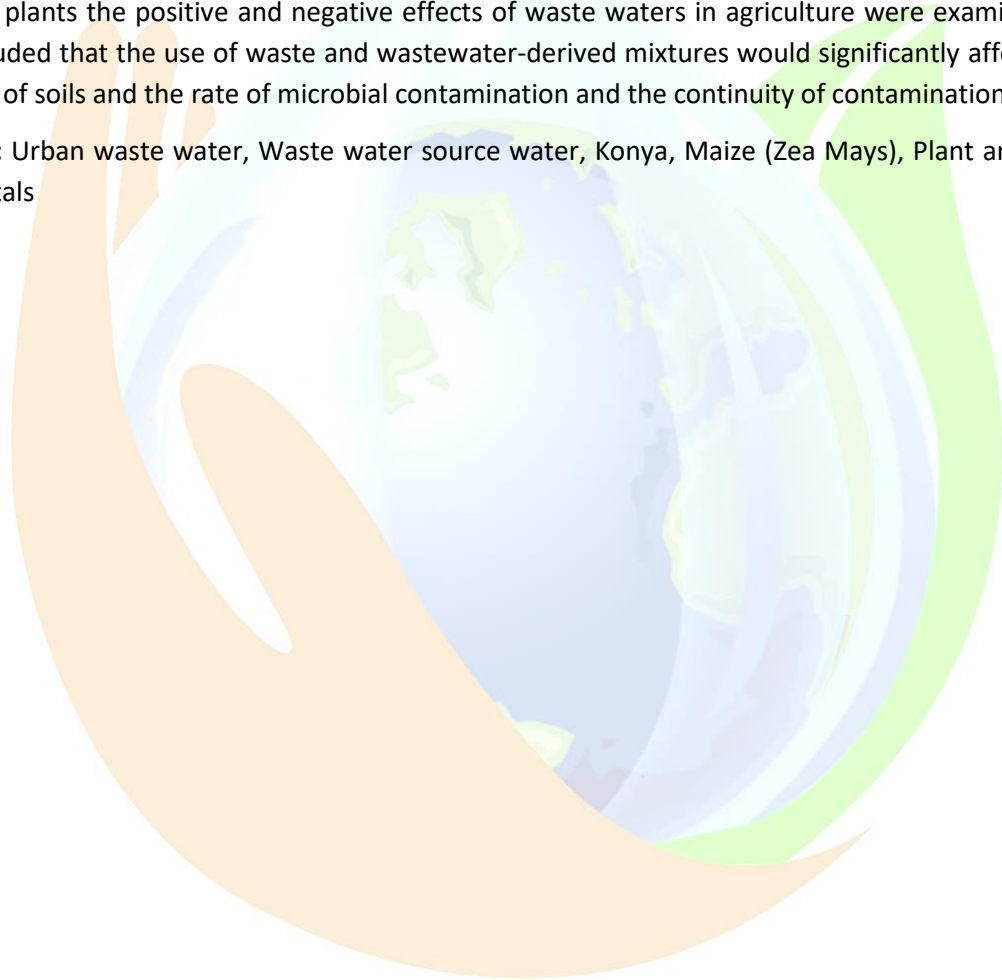
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Abstract

In this study, wastewater based on today's increasing urbanization, the increasing discharge of it, by treatment and mixing equal amounts for reuse in agricultural production have been assessed. The conclusion has been reached that maize can be grown using waste water in agriculture but significantly would affect without controlling of the heavy metal treatment. Macro elements such as N, P, K, Ca, Mg, trace elements such as Fe, Cu, Zn, Mn, and heavy metals such as Pb, Ni, Cd and B were analyzed on different organs of the corn plant grown with the water used in the trial. Upon entering service of treatment plants the positive and negative effects of waste waters in agriculture were examined. It was concluded that the use of waste and wastewater-derived mixtures would significantly affect the wasteland of soils and the rate of microbial contamination and the continuity of contamination

Keywords: Urban waste water, Waste water source water, Konya, Maize (Zea Mays), Plant analysis, Heavy metals



Effects of Olive Mill Waste Water (OMWW) Application on Plant and Soil: A Review

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Abstract

Nearly 95% of world olive production takes place in the Mediterranean countries. Turkey takes place in the major olive producing countries and comes in line fourth in olive oil production after Spain, Italy and Greece. With the future targets of the Turkey' s agricultural policies and the supports given, olive and olive oil production is increasing day by day. However, it is known that some environmental problems caused by olive oil production will continue to increase. Especially the effects of waste water, which is the result of olive oil production and is called “ black water” have been discussed for many years and a solution is being sought for for a long time. OMWW is a serious contaminant because of its high organic material and suspended solids content, its acidic quality and high salinity. Especially in the countries where olive oil production is widespread, a good deal of scientific research has been done for the solution of this problem and some legal measures have been taken in order to prevent OMWW from being dumped directly into the nature. The problems related to the economic viability of the studies on the solutions of OMWW problem have led to an increase in the pursuit of developing new approaches to solve this problem. Recent studies show that thanks to the valuable compounds it contains, OMWW can be seen as a useful by-product, rather than a waste material. In the light of this approach, the studies aimed at the refinement of OMWW have shifted towards recycling it. The purpose of this review is to cast light on the discussions related to different uses of OMWW in view of the results of the studies examining the effects of OMWW especially on plants and soil.

Keywords: Olive oil, Olive mill wastewater, Olive oil waste, Soil

Examining the Use of Scrap Tires as an Envelope Material in Subsurface Drainage Systems

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Abstract

Drainage is defined as the removal of excess water from soil surface or root zone by various engineering methods in order to create a well-aerated plant root zone. In subsurface drainage, organic and non-organic envelope materials are used to make the flow of water to the drains easy and to prevent siltation in the drains. Vehicle tires that have fulfilled their life are an important source of rubber material that must be evaluated. Scrap tires which are reduced to different sizes by various methods are used in different disciplines. However, no finding has been found about the use of this material as an envelope material in drainage. In this study, 10 and 20 cm thick granule materials of different sizes obtained from scrap tires were tested in laboratory conditions, under different water heads, using a constant head permeameter and the results are compared with a 10 cm thick sand-gravel envelope material whether they could be used as an envelope material in subsurface drainage. As a result of the study, it has been determined that the 20 cm thick granule material obtained from the scrap tires can be used instead of the sand-gravel envelope material with a thickness of 10 cm in terms of flow rate and sediment accumulation. Thus, approximately 30 million scrap tires that are released every year in our country will be used as envelope materials to prevent silt accumulation in the drains, avoiding environmental damages in the places where they are stored or piled up, and will be destroyed without causing environmental problems.

Keywords: Permeameter, Sediment, Recycle, ELT, Nature friendly

Determination of Soil Hydraulic Conductivity Rating (Doğankent Case)

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Abstract

This study was conducted in 2017 to prepare the sub-data required for the closed drainage system planned to be designed in the trial fields of Eastern Mediterranean Agricultural Research Institute in Doğankent Location in Adana, Turkey. The hydraulic conductivity values of the soil which will be used in the calculation of the drain interval for the trial area were determined. For this purpose, the orthophoto images of the trial areas were digitized, divided into grids and 12 groundwater observation wells each for an average of 5 ha were determined. The groundwater observation wells whose locations and coordinates were determined on the map were opened at a depth of 4 m and a radius of 8 cm to measure the hydraulic conductivity values of the soil in these wells. As a result of the measurements, it was determined that the hydraulic conductivity values varied between 0.69-5.26 m / day with the mean value of 2.7 m / day. According to the average hydraulic conductivity value, it can be said that the area has a medium permeable soil property.

Keywords: Observation well, Permeability, Drainage surveying



Integration of in-Farm Development Services and Reclamation Studies with Land Consolidation in Turkey

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Abstract

In this paper; the necessity of planning and implying integrated land consolidation studies with in-farm development services(TİGH) in Turkey, and land reclamation requirements in land consolidation projects and the historical performers of land consolidation works General Directorate of Agricultural Reform (1984-2018) General Directorate of State Hydraulic Works (2009-). Furthermore, implementation objectives, implementation results, problems encountered in implementation and the current studies of General Directorate of State Hydraulic Works as the responsible institution, and an evaluation has been given based on experiences in practice. Until 1961-2018 Land consolidation activities on 8.2 million hectares of land, which were carried out by TOPRAKSU, General Directorate of Rural Services,(abolished), TRGM, DSI, Special Provincial Administrations and one by Baklan Municipality, and 3.9 million hectares of land consolidation have been registered yet. As a result of the recent legal regulation in 2018, DSI has gained the authority of execution of land consolidation. Ongoing 356 land consolidation and in-field drainage projects were transferred to DSI and all got started. When irrigation projects are planned together with land consolidation; With the most economical way, regardless of the boundaries of the parcel, irrigation, road and drainage investment costs are saved. 60.000 ha of land, needed for the main canal and irrigation networks planned by DSI within the scope of GAP, was provided without expropriation within the scope of consolidation projects. With these infrastructure services, the parcels reach the size that can be used in the most economical way and the irrigation rate and irrigation efficiency increases. Our country's target for agricultural infrastructure and rural development will be possible only through the implementation of comprehensive consolidation projects. Although the initial investment costs are considered, these services may be performed later, but the planned parceling along with TİGH will be more efficient. In addition, it was observed that farmers' participation in the project increased with TİGH. In particular, harmonious studies made by DSI with investments such as basin-based irrigation, drainage, and creek rehabilitation, and taking part in a integrated zone management approach in roads, leveling, land reclamation, irrigation, drainage planning and consolidation project in line with the needs of each parcel will be a solution to many problems in rural areas.

Keywords: Land consolidation, Land improvement, Expropriation, Irrigation, Drainage

Deep Percolation Evaluations in Subsurface Drip Irrigation

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Abstract

Efforts to feed the growing population and adaptation to changing climatic conditions have increased the pressure on water resources. For this reason, the optimum use of the existing water resources necessitates the provision of healthy and sufficient water for future generations as well as the minimum loss. Therefore, the design, use and management of pressurized irrigation systems make sense with the right operating conditions. In sub-surface drip irrigation, which is one of the preferred irrigation methods in terms of control and saving of water, control of deep percolation is important for effective water usage in determining plant water requirement. The aim of this study is to determine the amount of water infiltration in the corn plant irrigated by subsurface drip irrigation system at different irrigation levels including full irrigation and deficit irrigation subjects, when soil moisture is measured in different layers with soil moisture sensors at frequent intervals. In this study, the results of the research carried out in Haymana Research and Application Farm of Ankara University Faculty of Agriculture in 2018 were used. Soil moisture was monitored hourly with moisture sensors during the growing period with 4 different water applications (100% ETC, 70% ETC, 40% ETC and 0% (rainfed)). Soil moisture mobility was monitored at 90 cm and 120 cm depth at every 10 cm soil depth. Moisture values for deep percolation calculations were evaluated with IRSIS, AUACROP, Dual kc and developed Sensor Moisture Simulation (SNS) approach.

Keywords: Subsurface drip irrigation, Deep percolation, Moisture sensors, Corn

The Effects of Different Irrigation Application with Subsurface Drip Irrigation on Cotton Yield

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Abstract

Turkey is among the countries most affected by global warming and climate change, it makes inevitable the implementation of use effective irrigation water systems in agriculture. Sub-surface drip irrigation system can provide significant savings in efficient use of water and can create good irrigation performance. This study was carried out to determine the effects of different irrigation intervals and irrigation water applications by subsurface drip irrigation on yield of cotton under Menemen Plain conditions between 2013 and 2014. Laterals were placed every two-plant rows that were 140 cm away from each other and at 30 cm depth. The study was conducted with three repetitions within trial pattern in randomized blocks, main subject was irrigation interval (every 3 and every 6 days) and subtopic was Class A Pan Coefficients which are $K_p;1.20$, $K_p;0.90$, $K_p;0.60$, $K_p;0.30$ and $K_p;0$. Before amount of irrigation water was applied, it was adjusted to total evaporation and crop cover percentage applied maximum 70 %. Irrigation intervals (3 or 6 days) were not effect on cotton yield. Statistically, significant effect of irrigation water amount was determined at $P < 0,01$ level each two years. The highest yield was obtained under the treatment irrigated at 6 days which is total evaporation coefficient 120 %. The highest value of seasonal irrigation, water use and cotton yield were found between 458-488 mm, 631-605 mm and 520-499 kg da⁻¹ respectively for the treatment $K_{p1.2}$ between 2013-2014.

Keywords: Cotton, Subsurface drip irrigation, Yield, Water consumption

Water and Irrigation Water Use Efficiency of Sugar Beet Irrigated With Subsurface Drip Irrigation System

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Abstract

The aim of this study is to increase the yield and quality by reducing the water consumption by using subsurface drip irrigation system in sugar beet plant which is widely cultivated in our country. The research was carried out in the trial area of Sugar Institute with the support of Central Fertilizer and Water Resources Central Research Institute. The research was designed according to randomized block design with 3 replications and 4 irrigation subjects (S1:%100ETc, S2:%80 ETc, S3:%60 ETc, S4: %40ETc). Turkey is Irrigated Plants Water Consumption Guide from the kc values and ETc values using data obtained from automatic climate station were obtained. Irrigation was performed when the calculated ETc values reached $30 \pm 5\%$ of the water holding capacity. As a result of the research water use efficiency S1, S2, S3, S4 was found to be respectively 9.7, 9.6, 9.7 and 10.9 for and 15.4, 16.9, 19.9 and 27.9 for irrigation. The highest water and irrigation water usage efficiencies were obtained from the irrigation subject with 40% restriction. It has been determined that the amount of irrigation water applied under this system has an effect on yield and quality parameters.

Keywords: Subsurface drip irrigation, Sugarbeet, IWUE, WUE

The Effect of Different Irrigation Water Levels Applied with Sub-Surface Drip Irrigation on Yield and Some Morphological Properties of Alfalfa

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Abstract

Alfalfa, which is one of the best quality of forage used in animal production, has an important place in agricultural production. There is a growing concern about the supply of water, which is necessary to achieve maximum yield, due to the high need for irrigation water in alfalfa with a very large plantation area. For this reason, it is necessary to increase the applicability of irrigation methods that increase both yield and quality and save water. This study was carried out in Ankara University Faculty of Agriculture, Research and Application Farm in 2017 to determine the effect of different irrigation water levels applied by subsurface drip irrigation method on green weed yield and some important morphological characteristics (stem length, stem thickness and number of branches) of alfalfa. Four different irrigation water levels (S1: 100%, S2: 80%, S3: 60% S4: 40%) were applied. Irrigation water is given according to the accumulated ETc values when 30% (\pm 5%) of the moisture present in the soil is consumed. As a result of the research, green grass yield was obtained between 5063.857-3408.157 kg/da, plant height was 40.70-55.95 cm, stalk thickness 2.38-2.84 mm and the number of branches ranged between 6.19-7.58. It was observed that the highest green grass yield, stalk length, stalk thickness and number of branches were obtained from full water subject.

Keywords: Subsurface drip irrigation, Deficit irrigation, Alfalfa, Green grass yield, Morphological characteristics

Influence of the H₂FIO Wetting Agent to the Soil Hydrophysical and Chemical Properties in the Drip Irrigated Field

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Abstract

Use and influence of soil wetting agents or surfactants have recently taken a considerable attention. In the present study was investigated the influence of a liquid wetting agent with commercial name H₂FIO (ICL-SF, Inc.) on the properties and soil and water relationships of a non-structured, loamy sand soil formed on alluvial plain with planted potatoes under drip irrigation. Soil samplings before and after the wetting agent application were carried out on both control and H₂Flo treated soils in order to obtain chemical and physical soil properties. Soil unsaturated hydraulic conductivity measured by Mini Disk infiltrometer was assessed on artificially packed soils collected at both treatments. Hourly soil moisture content, soil water potential, electrical conductivity (EC) and temperature changes were monitored by 5TE and MPS6 sensors during the vegetation season. The H₂Flo agent was found to be rather successful in the experimental soil, with regards to its promoted effects on soil and water relationships such as more even distribution of water in the soil profile and lower value of hydraulic conductivity. The changes in pH, EC and organic matter (OM) content were observed, and especially a slight increase in pH and regulated OM distribution which were both achieved by H₂FIO treatment were found considerable. Since the influences of the H₂FIO may be easily affiliated to rather quick water and osmotic potential changes of the soils, the climatic conditions and on-going agricultural practices should be considered precisely before implementation of the wetting agent.

Keywords: wetting agent, subsurface drip irrigation, infiltrometer, soil moisture sensor, soil water potential sensor

Simulation of Water Harvesting with a Sand Ditch using WASH_2D

Haruyuki Fujimaki¹

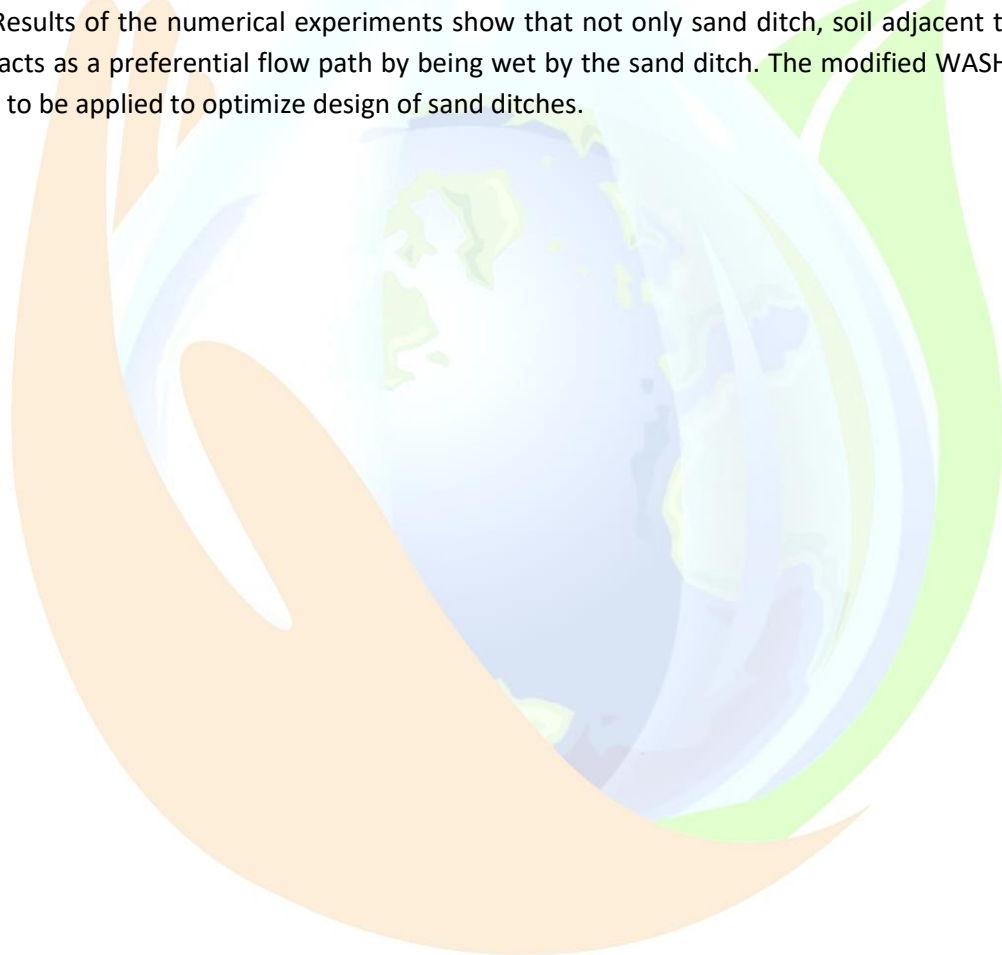
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Abstract

Capture of surface runoff by constructing ditches has been widely practiced. Filling the ditch with sands may be useful to conserve its shape and minimize area for ditch. Through a series of laboratory experiment, we have confirmed the effect of a sand ditch to enhance groundwater recharge. To optimize design such as width, depth, and spacing under various combinations of soil and climate, numerical model may be applied to save time and cost for experiments. The purpose of this study was to incorporate surface runoff process into a numerical model to solve two-dimensional water flow and solute movement, WASH_2D, and demonstrate its performance in a numerical experiment. We employed the Manning equation which presents overland flow velocity as square root of hydraulic gradient. Results of the numerical experiments show that not only sand ditch, soil adjacent to sand ditch also acts as a preferential flow path by being wet by the sand ditch. The modified WASH_2D is now ready to be applied to optimize design of sand ditches.



Prediction and Control of Salt Accumulation in the Upper Root Zone under Sub-Surface Drip Irrigation

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Abstract

Sub-surface drip irrigation may be ultimately water saving irrigation method, but salts inevitably accumulate into upper root zone above the tube. To remove the salts in that zone, we present an upward leaching method. To evaluate the effectiveness of the method, we conducted a greenhouse experiment using two soil tanks in each of which 16 TDR probes were inserted horizontally. Masa loamy sand and Kanto loam were filled into each tank and soybean was sown. After the leaf area became about 300cm², subsurface drip irrigation from a porous pipe inserted at a depth of 12 cm with 5 ppt CaCl₂ solution was started. When the soil became saline enough to retard transpiration, leaching through the subsurface porous pipe was performed. The wetting front reached to the soil surface and a part of salts presented above the porous pipe was transported to soil surface. We have also incorporated root water uptake submodel into our numerical model, WASH_2D, for two-dimensional water and solute movement. We have added thermal vapor diffusion by plainly inter/extrapolating measured soil temperature. The numerical solutions by WASH_2D were in fair agreement with the measured water content and salt concentration as well as those distribution at the end.

A stylized illustration featuring a hand in shades of orange and yellow, cupping a blue and green globe of the Earth. A large, light blue water drop is positioned above the globe, and a green leaf is on the right side. The text is overlaid on the right side of the globe.

ORAL SESSIONS
CLIMATE CHANGE & AGRICULTURAL
ECOLOGY

Climate Change Negotiations and Agriculture Process

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Abstract

The UNFCCC, which was signed in 1992 at the United Nations (UN) Conference on Environment and Development in Rio de Janeiro, is the first and the most important step taken internationally against the effects of global warming caused by human activities. The Convention is based on the principle of common but differentiated responsibilities and relative capabilities for the reduction of greenhouse gas emissions, taking into account the development priorities and special conditions of the countries and convention entered into force on 21 March 1994 and became a party to 196 countries, including Turkey, as well as the European Union (EU). Turkey joined the Convention on 24 May 2004. Taking into consideration historical responsibility, economic development level, technological accumulation, human development index, sensitive country position and similar indicators Turkey stated that he is in a different position from other countries and he has taken special decisions on this issue. Under the Convention, countries are negotiating on issues such as adaptation, mitigation, technology and finance to discuss the impacts of climate change and minimize or even reset these impacts on a global scale. Negotiations in which our country is actively involved are also under the umbrella of the United Nations; as in various sectors, it is tried to determine the impacts of climate change in agriculture and to reduce these impacts and to determine the road maps that countries will follow for food security and sustainable agriculture.

Keywords: Climate change, United Nations, Negotiation, Agriculture

Assessment of Climate Change in Thrace Region Using Trend Analysis

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Abstract

Sunflower in Thrace region is the most grown plant with wheat and rice. When a small percentage of the sunflower plant in Thrace is being irrigated, it is usually grown under rainfed conditions. For this reason, seasonal precipitation is very crucial in sunflower farming. In addition, important indicators of climate change are temperature extremes and rainfall changes. These effects of climate change directly affect the yield of sunflower plant in the Thrace region. For this reason, temperature and precipitation trend analysis provide a basis informations for decision-makers to work towards correct drought strategies, the scheduling of irrigation, and plans to cope with climate change. Therefore, monthly and seasonal average temperature and total monthly and seasonal precipitation trend analyzes in Thrace region were carried out between 1965 and 2018 in nine (Edirne, Kırklareli, Lüleburgaz, Uzunköprü, Çorlu, İpsala, Tekirdađ, Sاریyer, Florya) meteorological station in this study. Nonparametric Mann-Kendall and Sen's slope methods were applied. The seasonal trend analysis of the time series of rainfall and temperature was examined. According to the results, the lowest precipitation year was recorded as 326.6 mm in 2000 in Kırklareli station. The highest rainfall was recorded as 1215.2 mm at the Sاریyer station in 1981. Although a decrease trend was observed in precipitation, some stations showed a statistically significant increase in the 95 percent confidence interval for September and October. In June, July and August and annually, statistically significant increases were observed for average temperature in 95 and 99 percent confidence intervals at all stations.

Keywords: Trend analysis, Mann-Kendall, Sen's slope, Temperature, Precipitation, Climate change

Forecast of Monthly Mean, Maximum and Minimum Temperature by Time Series and Soft Computing Techniques

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Abstract

Effects of plant growth and development temperature which is important climate parameters on plant production. The main purpose of this study is to forecast monthly mean, maximum and minimum temperature time series employing three different soft computing techniques. The observed actual data using artificial neural network (ANN) algorithms provide the best prediction. The geographical location considered is Samsun province and 7 different present meteorological station data (Bafra, Çarşamba, Havza, Ladik, Alaçam, Beşpınar, Çakıralan). The methods used in this study are; (1) Multiple layer perceptron (MLP); (2) radial basis function (RBF) and (3), generalized regression neural network (GRNN). Predictions obtained with a multiple linear regression (MLR) model were compared to those of the different artificial intelligent methods. Different statistical parameters such as coefficient of determination (R^2), root mean square error (RMSE), mean absolute error (MAE) are used to evaluate performance of the methods.



Determination of Agronomic Water Use Efficiency in Three Different Cotton Areas in Turkey in 2016

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Abstract

Cotton plant is a strategic product that contributes to the increase in employment in textile industry, oil industry, animal husbandry and can be shown as an example of the integration of agriculture with industry. Along with climate change, changes in the ecology in which it is grown have led to an increase in the studies related to the water need of cotton. Increasing the rate of conversion of water used in the unit area to dry matter means increasing the water use efficiency. The aim of this study is to determine the current state of water use efficiency in cotton areas in three main cotton growing regions of Turkey (Şanlıurfa, Adana and İzmir). For this purpose, surveys were conducted with cotton producers, field measurements were made and the agronomic water use efficiency values were estimated over parameters such as irrigation water amount and yield and regional differences were revealed. At the end of the 2016 cotton harvest period, cotton harvest and yield data obtained from the Directorates of the Ministry of Agriculture and Forestry of the provinces and districts were compared with the data in the surveys. Seed cotton yield values and agronomic water use efficiency values of the selected cotton production areas were determined. Improvement of new drought-resistant varieties in cotton and the delivery of these varieties to our farmers is important for sustainable cotton farming in the future by spreading the measures and methods to be used for the efficient use of our water resources throughout the country.

Keywords: Cotton, Water use efficiency, Drought, Agriculture

Impact of Climate Change and Adaptation of Climate Change in Agriculture

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Abstract

Climate change is increasing its impact due to anthropogenic processes as well as natural processes. This is the subject of climate change and its effects are expected to emerge globally and regionally. Thus, climate change; agriculture, forest and vegetation, fresh water resources, sea level, energy, human health and biodiversity can directly or indirectly affect. In addition, climate change can put pressure as a problem on agriculture, socially and economically. Due to climate changes in soil and water regimes, agricultural production and food safety are in danger. Long term climate change; stresses on water and other resources, inefficiency of soil, aggravation of agricultural land, causing widespread desertification, causing damage to agricultural plants and proliferation of diseases, and destroying coastal ecosystems by raising the sea level. Over the past 100 years, the global climate has warmed to about 0.1 ° C due to greenhouse gas emissions from anthropogenic activities. This warming up process is continuing due to the intensive economic activities of today and the increase in atmospheric greenhouse gasses. Global warming will continue to increase 1 ° C over the next decade, even if no greenhouse gas emissions are released into the atmosphere from now on. According to scientist, predicts that the world will warm up over the next century if measures are not taken to significantly reduce greenhouse gas emissions. The aim of this study is to give information about climate change and adaptation of climate change in agriculture.

Keywords: Climate change, Agriculture, Adaptation of climate change, Irrigation

Climate Change Impacts on Crop Evapotranspiration and Irrigation Water Requirement in Izmir

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Abstract

The detection and attribution of past trends, changes and variability in climatic variables is essential for the understanding of potential future changes resulting from anthropogenic activities. For this purpose, various trend detection studies have been carried out in different parts of the worlds, mostly for identification of climate change. The Aegean region is one of the sensitive areas to climate variation in Turkey. Thus, knowledge of temporal variation in reference evapotranspiration is critical to water resource management strategies, irrigation scheduling and water allocation to meet current and future crop water demand under changing climatic conditions. In this study, trends in precipitation and reference evapotranspiration for the periods of 1975-2016 were examined for Izmir which is located in the Aegean region of Turkey. For the trend analysis, monthly climate data from 6 meteorological stations which are located in Izmir are used. Mann-Kendall trend test has been applied to that data for 0.05 significance level and the slopes of trend lines were computed using the Theil–Sen’s slope estimator. Additionally, crop evapotranspiration and irrigation water requirement values were computed for some plants grown in crop pattern of İzmir with a great agricultural potential. For the total precipitation values, trend analysis showed that all of the 6 stations in the region had a decreasing trend, but there is no statistically significant trend in the study area. On the other hand, statistically significant increasing trends were determined in reference evapotranspiration time series for the period of 1975-2016. The strongest positive trends were found in Dikili and Bornova stations with Theil–Sen’s slope equal to 5,75 mm year⁻¹ and 3,84 mm year⁻¹, respectively. Finally, changes in evapotranspiration and irrigation water requirements depending on climate change were evaluated.

Keywords: Climate change, Crop evapotranspiration, Irrigation water requirement, Trend analysis

Estimation of Possible Effects of Using Different Irrigation Levels on Future Periods Crop Productivity

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Abstract

Agriculture is one of the most vulnerable sectors in terms of climate change. In accordance with many conducted researches, it is expected there will be increasing trend on the average temperatures and decreasing trend on the annual precipitation in Turkey. Conscious and sustainable use of water resources is vital to prevent and adaptation to climate change. In this study, it is aimed to estimate the effects of different levels of water usage on crop productivity in the future periods with using DSSAT crop simulation model. Data related to sunflower experiment which conducted in Konya conditions were used as a material. Drip irrigation technique was used as irrigation method. Treatments of rainfed, full irrigated and fixed irrigation amount (250mm) were evaluated. Projections for 3 Global Climate Models (HadGEM2-ES, MPI-ESM-MR, GFDL-ESM2M) based on RCP4.5 scenario were used in order to determine the impacts of future climate change. According to the obtained results, it is expected that sunflower yield decreases up to 15-19% under rainfed conditions. It is determined that if the amount of irrigation can enhance by 8 -14%, the yields can be increase by 10-25% at the treatment of provided full water demands. On the other hand, both increases and decreases expectation have been put forward in terms of fixed irrigation amount in sunflower yield. As a result, it has been determined that it is possible to increase productivity by adapting to climate change in the future with effective water use.

Keywords: Climate change, Water resources, Agricultural productivity, Crop simulation models, DSSAT

The Effects of Global Climate Changes on the Flowering Time of Important Quince Varieties over a Twenty-Year Period

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Abstract

Global climatic changes in fruit species effects winter chilling, bud awakening parameters, as well as flowering times. Occurring of these changes in flowering period, that the plants are most sensitive to cold, determine quality and yield directly. In this study, first bloom date, full bloom date, blossom end date, effective flowering period and flowering period were established on Ege 2, Ege 22, Ege 25 and Altın 35 quince varieties between average of 1995-1996 & 2015-2016 years in Menemen/İzmir location. For the purposes of analysis, dates were converted to ordinal date (mathematical sum of days beginning at 1 January of each year). These phenological characteristics were evaluated together with analyzing mean daily maximum and minimum temperature for each month from 1994 to 2017. There has been a statistically significant decrease in all of these characteristics and first bloom, full bloom, blossom end occurred 5.8, 8.8, 12.6 days earlier than compared 20 years ago, respectively. The effective flowering period shorted by 2.9 days in the 20-year period and on the other hand flowering period was completed in 21.6 days in 1995-1996, while these values were determined as 14.9 days in 2015-2016. These changes over the twenty-year period show the serious impact of global climate change on flowering times. Occurrence of early flowering dates and shortening of flowering periods will have a significant effect on pollination and hence yield and quality.

Keywords: Climate changes, *Cydonia oblonga*, Flowering time, Full bloom, Effective flowering period

According to Phenological Periods the Effect of Climatic Variability on Olive Trunk Diameter Variation

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Abstract

The main purpose of agricultural production is to get high yield and quality product but the effects of climatic factors on plants begin to be seen primarily physiological and these effects can also cause some damage in future periods. In this study, some climatic effects were investigated on phenological and physiological features of olive trees over 30 years old in two growing periods (2016-2018) which can be considered dry and partly humid. The study was carried out on a table olive orchards *Domat* (*Olea europaea L.*) in Kemalpaşa / İzmir, Turkey; the phenological development of trees were followed in detail to using BBCH (Biologische Bundesanstalt, Bundessortenamt and CHEmical industry) scale and the trunk diameter variations of trees were monitored by hourly with dendrometer devices. During these two periods (2016-2018) it was observed that trees were significantly affected from climatic variability in terms of phenological development, as well as trunk diameter variations and fruit morphology and yield values at the end of the season.

Keywords: Trunk diameter variation, Climate, Phenology, Physiology, Olive

Estimation of Soil Moisture Content of Sunflower Cultivation Areas in Thrace Region by Water Budget Method

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Abstract

In this study, it is aimed to estimate the soil moisture contents of sunflower farms during the production period, which is a very important plant for Thrace agriculture. For this purpose, soil samples were taken from 483 different points and available soil moisture contents were measured for 120 cm soil depth. In order to calculate the reference plant water consumption (ET₀), the data of 35 stations of the General Directorate of Meteorology in the research area for 2016, 2017 and 2018 were used and calculated with the ET₀ Calculator 3.2 program developed by FAO. The Plant Water Consumption Guide published by the Ministry of Food, Agriculture and Livestock was used for the plant coefficient (k_c) values needed to calculate the evapotranspiration of sunflower. In evapotranspiration calculations, soil moisture content coefficients (k_s) were also used, which are based on the approach of plant water consumption decreases while soil moisture decreases. Soil water budget calculations were made at 10-day intervals during the sunflower production period and spatial distribution maps were prepared. At the end of the sunflower production period, the lowest soil moisture content was calculated in 2016. However, it is seen that the soil moisture content is high in the middle parts where the soil water holding capacity is higher in the research area.

Keywords: Soil Moisture, Sunflower, Thrace, Water Budget

Hydrologic Drought Period of Konya Closed Basin In the Future

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Abstract

There are many views and scenarios on climate variability. Potential problems to be encountered should be identified based on the conclusions of each opinion. It is of utmost importance for sustainable production to carry out the necessary studies to solve these problems. In this context, the prediction of possible future hydrological drought periods is one of the most important elements in the sustainable management of water. Estimation of future drought periods is directly relevant for all water-using sectors, especially for decision-makers. As it is known, Standardized Precipitation Index (SPI) is one of the most widely used drought indices in the world in terms of both ease of use and interpretation of its results. SPI is one of the indices accepted in the scientific world in the determination of meteorological, agricultural and hydrological drought turns. In this study, estimated monthly rainfall series until 2100, which is obtained HadGEM2 global climate model, were used for Konya Closed Basin. The time series includes both pessimistic (RCP 8.5) and optimistic (RECP 4.5) scenario results. The obtained rainfall series were subjected to SPI analysis and possible drought periods until 2100 were determined. As a result of the analyzes and calculations, six drought terms/periods (2026-2027, 2044-2048, 2062-2063, 2087-2088; 2090-2091 and 2097-2098) were determined in Konya Closed Basin until 2100 according to the RCP 4.5 scenario. At the same time, four drought periods (2026-2027, 2060-2063, 2074-2075 and 2092-2097) were determined for RCP 8.5 scenario. The changes of severity of the determined hydrological drought periods within the basin are shown by maps of severity distribution. Based on the results obtained, it is necessary to take the necessary precautions against the water crisis that will occur in the hydrological drought periods in Konya Closed Basin and prepare water management plans. Reducing the impacts of these droughts is great importance for both regional man and the national economy.

Keyword: Hydrological drought, SPI, HadGEM2, Drought severity maps

Possibility of Agricultural Drought Period for Konya Closed Basin Based on HadGEM2 Global Climate Model

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Abstract

Drought is one of the most dangerous natural disasters that can have serious impacts on the economy and environmental systems, especially on living life. When compared with other disasters, drought has many differences with respect to structure. In particular, agricultural droughts cause great costs as well as serious consequences. According to the IPCC report of 2014, Turkey will increase in the future temperature scenarios rainfall is expected to decrease the contrast. When this situation is taken into consideration, it is estimated that the duration and severity of drought disasters likely to be experienced throughout our country will increase. The determination of agricultural droughts that are likely to occur in the future affects not only sustainable agricultural production but also all other production areas. In this study, the monthly rainfall series estimated up to 2100 under the optimistic (RCP 4.5) and pessimistic (RCP 8.5) conditions of the Representative Concentration Pathway (RCP) in the HADGEM2 global climate model for Konya Closed Basin were used. The obtained monthly rainfall series were analysis with Standardized Precipitation Index (SPI). As a result of the analysis of SPI, it was detected 4 agricultural drought periods (2043-2044, 2046-2047, 2086-2087 and 2090-2091) for RCP 4.5 scenario. According to RCP 8.5 scenario, it was detected 4 agricultural drought periods (2060-2062, 2072-2074, 2092-2094 and 2095-2097). The severity distribution maps were prepared for the determined agricultural drought periods in the basin. It should be taken precautions in time against the water deficit that will occur in agricultural drought periods which may occur in Konya Closed Basin. In addition, losses in agricultural production should be minimized by preparing water management plans. Measures to be taken to reduce drought effects will directly contribute to the regional producer and contribute to the production and economy of the country.

Keyword: Agricultural drought, SPI, HADGEM2, Irrigation water

Drought Analysis with Standard Precipitation Evapotranspiration Index in Büyük Menderes Basin

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Abstract

Decreasing precipitation, increasing temperatures and evapotranspiration negatively affect water resources and cause agricultural water amount to decrease, lead deficiency in soil moisture content and more severe and frequent drought cases. Standard Precipitation Evapotranspiration Index (SPEI) is a more efficient method comparing to other index based solely on precipitation as it is also able to present temperature and evapotranspiration changes. Within the study, SPEI values were calculated by using climate data between 1977-2016 from 8 stations in Büyük Menderes Basin. Thornthwaite Method was used in calculating potential evapotranspiration values. According to SPEI values, in different time scales there were severe droughts ($SPEI \leq -2$) in all stations. The lowest SPEI values were calculated in Nazilli 1 and 24 month-time scale, Uşak 3 month-time scale, Dinar 6 month-time scale, and Denizli 12 month-time scale. Mann-Kendall trend analysis was performed with annual total precipitation, PET, Di and SPEI values. In terms of precipitation, no trend was found, however; for PET in all station, for Di in Güney and Nazilli stations it was found that there was a downward trend ($\alpha=0.05$). According to the results of Mann-Kendall Analyses on SPEI values, in the whole basin, excluding Dinar station, there were significant downward trends. Also Precipitation, PET, Di and SPEI values were transferred to GIS and distribution maps were created according to Inverse Distance Weighted (IDW) method.

Keywords: Büyük Menderes, Drought, SPEI, Mann-Kendall, IDW

The Effect of Different Cover Materials on the Yield and Soil Moisture with Applying Negarim Type Micro-Catchment Water Harvesting Technique into Pistachio Orchards

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Abstract

It is very important to know different cultural measures and compare them for water and moisture saving in pistachio orchards in the region where rain is low. The moisture regime and saving should be known in the created micro catchment. Marginal areas are used more in agriculture in the World while land problem is always increasing. Most of these lands are in the arid and semi-arid zone where non-uniform rain occurs and the waters are losing with surface flow. Water harvesting is still known the best way in the semi-arid areas where tend to arid for protecting soil and water. Pistachio, which is one of the most important plant of Southeast Anatolia Region, has two major problems in the growing lands; insufficient rain and periodicity. This situation cause yield loss. Therefore, this project is needed. When the results of the yield years are considered, applied mulch treatments are concluded as expected in terms of utilizing from rain and preservation soil moisture. Four different mulch covers applied in the project, more moisture accumulation in the soil according to control treatment, which is applied by local farmers, outperformed in terms of yield and growing.

Evaluation of Temporal Changes of Evaporative Stress Index Values in Konya Basin

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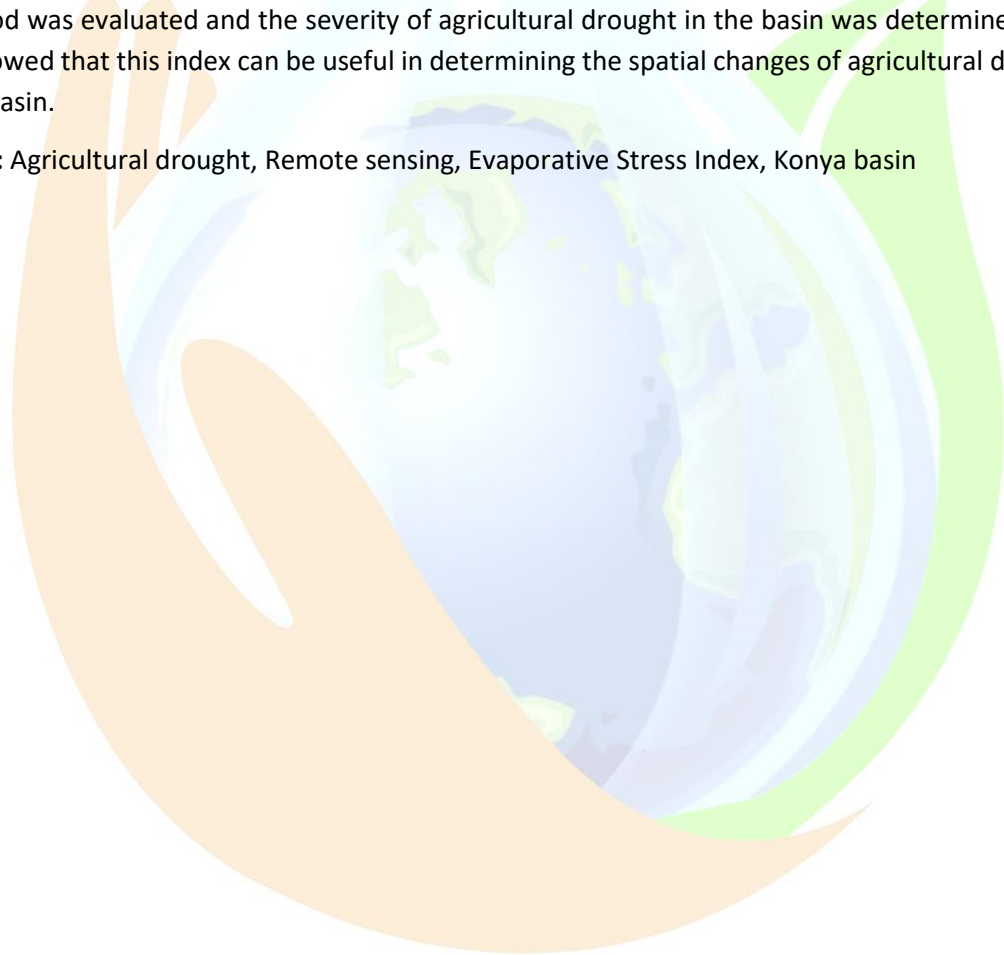
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Abstract

Drought is a natural climate phenomenon which is defined as water scarcity due to temporary imbalance of precipitation amount. It can occur at any time and location. Increasing temperatures and decreasing precipitation as a result of recently mentioned global climate change increase the frequency and severity of drought events. Drought has got a economic, social and environmental aspects. Drought can be effective in very large areas and sometimes even in a whole country. In this context, it is different from other meteorological events. Recently, Evaporative Stress Index (ESI) has been developed as a new agricultural drought index that works with remotely sensed data and does not require any calibration. In this study, the change of ESI values in Konya Basin between 2006 and 2008 period was evaluated and the severity of agricultural drought in the basin was determined. The results showed that this index can be useful in determining the spatial changes of agricultural drought in Konya Basin.

Keywords: Agricultural drought, Remote sensing, Evaporative Stress Index, Konya basin



Trend Analysis of Meteorological Parameters in Çukurova Region

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Abstract

Climate change is a concept that can be revealed by long-term change of meteorological parameters. Long-term changes are extremely important. The aim of this study was to determine the monthly average temperature, relative humidity and rainfall in the Adana, Ceyhan, Karaisalı, Karataş, Kozan and Yumurtalık stations. For this purpose, non-parametric Mann-Kendall rank correlation test was applied to the related stations. When the results obtained in the study were examined, it was observed that the average monthly average humidity values in Adana, Karaisalı, Kozan and Yumurtalık stations decreased in general and in other stations in the direction of increase. In average temperatures, increasing tendencies were determined at other stations except Karaisalı station. When the average monthly rainfall values were examined, it was determined that there were decreases in all stations in February, April, August, September and November.

Keywords: Adana, Climate change, Temperature, Precipitation, Relative humidity



Determination of Average Temperatures of Antalya and Alanya Stations by Şen Method

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Abstract

Climate change and global warming can be determined as a result of studies on parameters such as temperature, precipitation, evaporation, humidity, sunshine intensity and wind. Of these parameters, air temperature and rainfall are generally more important in terms of climate change than other parameters. The aim of this study is to determine the average annual temperatures in Antalya and Alanya. For this purpose, Şen method was applied to determine the average temperature data of 38 years (1981 - 2018) of Antalya and Alanya stations. When the results obtained in the study were examined, the tendency to increase in Alanya and Antalya stations was determined in average temperatures. These increases apply to all values. As a result, the increase in average temperatures in these regions will affect crop production.

Keywords: Mediterranean, Trend, Climate change, Mann-Kendall, Temperature



Estimate of Reduction Yields Maize and Soy-Bean in Drought Years in the River Drava Basin in Croatia

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Abstract

Maize and soy-bean are very important crops in the nutrition of the population and animals and are therefore cultivated on relatively large agricultural areas in Croatia. The goal of this research was to determine estimate of reduction yields maize and soy-bean in drought years in the part of Croatia (in the river Drava basin) based on the frequency of precipitation occurrence upon 25% ($F_a=25\%$) probability. In this study, climatic data from three major climate stations has been used for the period 1986 – 2015. Reference evapotranspiration was calculated according Penman-Monteith method, using the computer program "Cropwat". Effective precipitation was calculated by the United State Bureau Reclamation. Soil water balance for each crop was calculated using the Palmer method. Reduction of yield was calculated according to Doorenbos and Kassam method. In the river Drava basin is estimated reduction of maize in drought years up to 79%, and soy - bean up to 51%. The numerous studies pointed the reduction of crop yields, despite the use of standard agricultural technology. This is probably consequence of adverse climatic events.

Keywords: Reduction of yields, climatic events, maize, soy-bean

Estimation of Sediment Yield Based on Field Measurements and MUSLE Model in Kocadere Watershed

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Abstract

The geographical location, topography, soil characteristics, favorable geomorphological structure to erosion, land use changes and climatic conditions of Turkey, increase soil sensitivity to erosion. Therefore, soil erosion and consequent sedimentation are the most important problems that threaten our soil and water resources. In this research conducted between the year of 2009-2013 in Balıkesir-Bigadiç-Kocadere Watershed, it is aimed to determine sediment yield based on the rainfall, runoff and suspended sediment measurements in subwatershed. 5 year measurement results covering the years 2009-2013 were evaluated in the research. Sediment rating curve of the watershed has been derived from flow rate and suspended sediment measured with automatic sediment sampler at the subwatershed. With reference to this, annual average sediment yield of subwatershed was 2.11 ton ha⁻¹yil⁻¹. At the same time, in order to estimate of watershed sediment yield, MUSLE (Modified Universal Soil Loss Equation) equation was used. Sediment yield estimated by MUSLE for the research period was 2.22 ton ha⁻¹yil⁻¹. The applicability of the MUSLE model under watershed conditions was tested with sediment data measured in the field during 13 individual events and obtained coefficient of determination was 0.92. MUSLE gave better results in predicting sediment yield for high storms.

Keywords: Balıkesir-Bigadiç, Watershed, Soil erosion, Sediment yield, MUSLE

Determination of Suspended Sediment Movement Caused by Melted Snow

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Abstract

In this study, the amount and kind of sediment (sand, clay, silt) coming from the basin area and the amount of soil removed from the surface after erosive rainfall and melted snow was determined in the Karanlıkdere Basin, which is in Ilgaz Mountain National Park. US.DH-48 type sampling instruments conforming to international standards have been used to take suspended sediment load samples from the stream section. As a result of the analysis made according to the filtration method, the highest amount of sediment was determined as 58.21 tons day⁻¹ on 09.04.2016 with 1.710 m³ s⁻¹ of current runoff. The average amount of sediment in the basin 1891.124 tons year⁻¹, and it was determined that 889.947 tons of this amount was in the snow melting period. The amount of sediment coming from the unit area was calculated as 0.67 ton ha⁻¹year. Although the Karanlıkdere Basin has a 36.9% gradient, the basin sediment yield is found to be quite low.

Keywords: Sediment yield, Snow melt, Ilgaz, Karanlıkdere

Investigation of Changes in Crop Pattern in Manisa Akselendi Plain under the Effect of Wind Erosion

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Abstract

The Manisa Akselendi Plain in the Gediz Watershed contains interesting features in terms of the influence of wind erosion as well as the conversion of wetlands to agriculture. In recent years, there have been positive changes in the agricultural activities in the lands exposed to the accumulation of wind carried sediments and covered by sand dunes. Especially the widespread use of drip irrigation in these areas is quite remarkable. In this study carried out between 2014-2018, villages with partially or completely lands in the polygon area representing the Manisa Akselendi Plain were examined. It is aimed to examine the changes in agricultural crop pattern in these villages. Agricultural structure graphs of the villages were created by using the Farmer Registration System (FRS) cultivated area data between 2003 and 2017 and the changes in the 15-year crop pattern were examined. It was determined that instead of cotton with high plant water consumption in the plain, the production areas of drop irrigation vineyards, tomatoes, peppers and olives increased. In 2017, 43 crops were grown in this area and the main crops were respectively grapes, cotton, maize, olives, tomatoes, wheat, pepper. In Akçeşme, Akselendi, Beyoba, Rahmiye, Kumkuyucak, Kayaaltı, Hacıbaştanlar, Pınarcık, Sarıçalı and Tiyenli, cotton areas have declined over time, but the significant increase in grapes or olives is quite remarkable. In the villages such as Akçeşme, Deynekler, Hacıbaştanlar, Kayaaltı, Kulaksızlar, Pınarcık, Rahmiye, Sarıçalı, Beyoba and Tiyenli, which have mountainous and hillside lands, grape, olive, pepper, tomato, almond, melon production has come to prominence. It was determined that the production of grapes as well as maize, tomato, pepper and Cotton continued in the flat and slightly sloping villages such as Kumkuyucak, Moralılar, Sazoba, Akselendi.

Keywords: Crop pattern change, Drip irrigation, Dunes, Farmer registration system, Akselendi plain

Monitoring Temporal Changes in Land Use/ Land Cover in Manisa Akselendi Plain using Remote Sensing and Geographic Information System

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Abstract

Akselendi Plain is located within the districts of Akhisar, Gölarmara and Saruhanlı of Manisa Province. Because of wind erosion in plain dune movements occurred. Cases related to wind erosion and deposition occupy a large area in the plain. At the same time, severe wetland destruction has occurred. Improper intense agricultural practices caused significant environmental damages. The study was conducted between 2014-2018 in order to determine the temporal changes in land use/cover in the area. 1985 Landsat 5TM, 2016 Göktürk-2 satellite images and various cartographic material were used. CORINE land use / cover maps of 1985 and 2016 were created by using remote sensing and geographical information system techniques. Maximum like hood method was used for the land use /cover classification of 1985 and object-based classification method was used for 2016. Compared to 1985 and 2016 maps, artificial areas increased from 4.40% to 5.18%, agricultural areas increased from 45.33% to 74.88%, while natural and semi-natural areas decreased from 22.85% to 5.92%, and open spaces with little or no vegetation decreased from 14.39% to 6.16%. It is also quite noteworthy that the open sand areas have decreased from 5.80% to 0.83%. In this process, the areas that are belong to state with high dune activity were controlled by afforestation studies. The reduction of wetlands from 7.13% to 0.00% confirms wetland destruction. Rahmiye Lake and Akselendi Lake has been disappeared due to drying. Eğrigöl (Kumkuyucak Lake) which is a spring uvala has completely disappeared due to excessive water use for drinking and irrigation. Pınarcık Swamp, Sariçalı Swamp, Ilicasu Swamp, Akselendi Marsh etc. many wetlands and semi-wetlands have also disappeared. As a result, it has been determined that some land use/cover classes in the plain have changed significantly during the 31-year period.

Keywords: CORINE, Land use/cover, Change detection, Wind erosion, Wetlands

Formation of Sand Dunes, Lakes and Wetlands in Upper Kumçay Plain and Its Current Status

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Abstract

According to the land surveys and researches we have conducted since 1974 in Upper Kumçay Plain and its surrounding areas, small active faults, sediments carried by rivers, wind carried sediments and sand dunes formed as a result of this formation have been effective in the formation of surface shapes. Karstification in the plain is very effective. There are many doline and uvala. One of these is the Eğrigöl (Kumkuyucak Lake), which is a spring uvala. Because of Kumçay's capture of Gördes Stream, Marmara Lake and Selendi Lake, which are embankment lakes, were formed. Both the tectonic and embankment lake formation are effective together at the Rahmiye lake formation. The plain, was an old lake, is filled with sediments following from the Kumçay Stream after the capturing of Gördes bed and the sediments that are following by the side creeks. The Upper Kumçay Plain has become a wetland and semi-wetland paradise with many lakes and swamps. In addition to the lakes mentioned above, many wetlands and semi-wetlands have been formed, including Sarıçalı Swamp, Pınarcık Swamp, Selendi Marsh and Dana Marsh. At the present all lakes and wetlands were dried, and a very important part was transformed to agriculture in this area. Since the dominant texture is sandy in the Kumçay Plain and spread over large areas, sand dunes formed by easily with the effect of strong winds. Dune movements spread over large areas are formed in three generations. The surface of all of the dunes has been stabilized by the development of agricultural techniques (drip irrigation, etc.), afforestation and other sand dune stability works. In addition, one of the most beautiful examples of dune-farming. However, some sand dunes in the near Kumtepe continue to their activity.

Keywords: Wetlands, Karst, Capture, Dune afforestation, Dune farming



**ORAL SESSIONS
AGRICULTURAL MACHINERY
&
INFORMATION TECHNOLOGIES**

Wheat Simulation Using Aqua Crop Model in Precision Agriculture

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A. Glambedakis G. Madonanakis N. Tserlikakis

Abstract

The objective of this article is to perform a simulation of the wheat production. With this model will have the possibility to preview the development and the yield under different cultivation practices. The model will be an efficient tool in order to advice the farmers to improve their practices. In the plain of Thessaly an experimental field was established in the framework of FATIMA project, in order to evaluate the performance of a variable rate application (VRA) system for Nitrogen application. The field had a non-regular topography (there is an upper zone, a lower zone and a middle sloppy zone). This specific topography creates different soil conditions in the various zones of the field. In order to evaluate the capability of VRA, it was selected to adapt the application rate under various conditions. Along the cultivation period the soil moisture at 30 cm was recorded using portable data logger (twice per week). In every zone a soil profile (at least) was recorded using sensors up to 90cm. The data from the soil moisture sensors, the rainfalls and the irrigation doses applied using supplementary irrigation allowed us to evaluate the water balance in the field scale.

Keywords: Wheat, Cultivation practices, Aqua Crop model



The Development of a Low-Cost UAV-Based Image Acquisition System and The Procedure for Capturing Data in Precision Agriculture

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Abstract

Remote sensing is a method of monitoring the natural heterogeneity of vegetation. Although satellite-based remote sensing has been a popular method for monitoring the earth's surface, it has several drawbacks, such as the orbital period, unattended capture, and investment cost. On the other hand, an unmanned air vehicle (UAV) is more flexible in terms of deployment, monitoring a small area, and being easy to obtain at a low cost. From this point of view, the goal of this research was to develop a low cost and easy to implement technical solution for mapping spatial heterogeneity and research its relationship with plant conditions. The intention was to develop a cycling process starting with a UAV-based image-capturing tool for an easy and reasonable production of a normalized difference vegetation index (NDVI) and the resulting prescription maps, especially of vineyards. The main parts of this image acquisition system were the UAV and modified digital cameras purchased from the store. Two different fixed-winged UAVs were built for this study based on commercial airplane models and used open source autopilot. Two small digital cameras (Nikon and Canon) were tested for capturing the images. These were modified to capture electromagnetic energy ranging from 380 nm to 1100 nm. Camera calibration tests were conducted and a UAV-based image acquisition system was successfully developed. In the next step, future field tests will be conducted to assess the practical usage of running the cycling process.

Keywords: Smart agriculture, Viticulture, Variable rate application

Comparison of Unmanned Air Vehicle and Sentinel 2 Images for Sunflower Plants

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Abstract

Remote sensing is one of the most efficient technique that uses for vegetation monitoring during growing period. With the advancement of the technology, using of Unmanned Air Vehicle (UAV) was started in the agriculture and it has become an important alternative to satellite platforms. But UAV platforms must be evaluated both technical and scientific for decision support tool in agriculture. The aim of this study, comparison of vegetation index that acquired from UAV and Satellite images. Scope of work, 6 UAV flights was carried out in different date in between July and August 2017 and Sentinel 2 satellite images were acquired in same or 1-2 days before or after. As a result of this study, a significant correlation was found between vegetation index that belong to UAV and satellite images. Accordingly, obtaining spatial and temporal resolution images by using UAV platforms can be considered as an important alternative to satellite systems as a decision support tools in agriculture.

Keywords: UAV, Sentinel 2, NDVI, Sunflower, Multispectral



Application of Modern Data Science Techniques in Determination of Ideal Parcel Size and Number in Land Consolidation Projects

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Abstract

Most of today's data has become much more intense with spatial/geographical besides tabular attributes. Land Consolidation data should be handled simultaneously with relational integrity of geographical and tabular data. Moreover, hand, trends and developments in data science has enabled the diversification and the ability of the tools in the processing, visualization and interpretation of the data, and has led many researchers to carry the studies of their field to this media. Analyzing Land Consolidation input data before the implementation of the project and evaluating the findings can provide important information that will shape the design of the project. Accordingly, a decision support opportunity can be provided for the optimization of the objectives of the consolidation project. In this study, geographical data components and ownership data of the parcels within the scope of land consolidation project have been tried to be evaluated together by the usage of modern data science techniques, and some metrics those should be targeted after a high-quality land consolidation implementation have been tried to be put forward in a more concrete manner. It is aimed to make the expected results of Land Consolidation projects more measurable and to provide better design for the reallocation plans by implementing a decision support mechanism included in the form of Geographical Information Systems (GIS) plug-ins.

Estimation of Leaf Chlorophyll Content in Eggplant by Soft Computing Techniques

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Abstract

Chlorophyll is the main photosynthetic pigment found in typical green leaves that play an important role in carbon assimilation. Measurements and estimates of chlorophyll content are considered a significant indicator of plant health, including nitrogen deficiency, water stress, and certain diseases. In this study, the chlorophyll content of eggplant grown in different water deficit applications was estimated with two different artificial intelligence applications. In the modeling of total chlorophyll of eggplant with artificial intelligence applications, input data are number of days after planting (DSGS), the canopy-air temperature (T_c ; °C), cumulative solar radiation (CRs; MJm⁻²day⁻¹) and cumulative growth degree day (CDDD) data. used. In the determination of total chlorophyll value of eggplant plant, artificial neural network models were established for chlorophyll estimation in two different network structures according to combinations of 3 different years. In 2017 and 2016, the best results were obtained in the 3-5-1 network. The statistical performance criteria for the test years, the coefficient of determination (r^2) was 0.978 and 0.995, and the root mean square error (RMSE) was 0.426 0.455, respectively. Using four inputs in the determination of chlorophyll with fuzzy artificial neural networks, the model showed the highest performance in gauss (r^2 : 0.98) function type with the highest number of 3 * 3 * 3 * 3 functions in both education and test data set. Artificial intelligence techniques have been shown to be highly effective on the prediction of chlorophyll content of eggplant.

Keywords: Eggplant, Chlorophyll, Artificial intelligence, Fuzzy logic

Monitoring Pollen Count Using Satellite Observations in East Coast of the United States

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Abstract

Pollen exposure is associated with allergic diseases such as asthma and seasonal allergic rhinitis (hay fever), and also, it is closely related to agricultural activities. The intensity and frequency of the pollen exposures can be easily affected either positively or negatively by many factors such as climate, vegetation, and topography, which are difficult to predict in large scales. It is an urgent need to develop models or systems for predicting pollen events at large scales and providing early warning to prevent pollen effects on people. Unlike manual pollen counting at local sites, remote sensing facilitates the pollen estimates at large scales with temporally and spatially distributed observations, which significantly reduces the time and labor costs. With remotely sensed observations, Artificial Neural Network (ANN) helps us fill the gaps in understanding of the relationships between environmental variables and pollen concentration. At this point, I investigated pollen exposures estimates via satellite observations in the states of East Coast United States with long-term data. This region is highly populated with a population of 104 million. To predict pollen concentration using environmental variables which are land surface temperature (LST), precipitation and enhanced vegetation index 2 (EVI2), an ANN was performed. The results showed that strong correlations existed between pollen counts and environmental variables, except for precipitation in some locations. The validation analysis using regression models revealed strongly significant relationships between the observed and predicted pollen concentrations obtained for long-term data. The R squares (R²), were between 0.5 and 0.89, but most of the results were higher than 0.63 which is very useful results for environmental analysis. Moreover, results demonstrated that ANN is a suitable tool for complicated statistical analysis and EVI2 combining with LST and precipitation is a reliable predictor of pollen variation.

Keywords: Pollen Count, Artificial Neural Network, Remote Sensing Data, EVI2

Program R in Soil and Water Resources Protection

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Abstract

Programming language R is widely used in environmental science in the past decade. This paper offers an overview of some of main possibilities and strengths of R application in soil and water protection. The specific topics that are covered are related to mapping, spatial analysis and application of multi-criteria methods in R. In order to demonstrate the application of R, several case study examples from Serbia have been shown. These examples are related to mapping of water quality in the cities in Serbia, spatial analysis of soil erosion processes on the territory of Serbia and the process of selecting the optimal irrigation system by application of AHP (Analytic Hierarchy Process), as one of the most commonly used multi-criteria method. The paper provided an insight to the R packages that are used in solving above listed tasks, and explains how they can be applied in future research.

Keywords: R programming language, Water conservation, Soil conservation, Computer tools



The Effect of Some Parameters on the Use of Photovoltaics in the Internal Mechanization in Agricultural Holdings

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Abstract

Countering the need of electrical energy in the internal mechanization of agricultural enterprises with photovoltaic batteries has been evaluated in this study. A one-day energy “demand management” has been identified to manage the operating demand for electricity. The study carried out for this purpose indicated that energy consumption was realized at a maximum of 9 different points per day in animal shelters. It was observed that 6 activities consumed electrical energy together or sequentially during the day and that these activities were concentrated between 0600-1000 hours and 1400-1900 hours during the day. Work flow charts and schedules suitable for energy consumption behavior were developed in the study for the enterprises with the ‘Demand Management System’ that was prepared in accordance with these data. A comparison of the Electrical Power Demand Management System of the designed enterprise with those of some other sectors was carried out. Furthermore, some environmental factors such as occupational safety risk, increased temperature and carbon dioxide (CO₂) emission reduction in PV-roof systems have been evaluated. Depending on the activity in agricultural production, the electrical energy consumption of the enterprise was examined, the effects of the energy resources to counter the needs of the enterprise were determined and a techno-economic analysis was conducted. Data was obtained for such studies by determining the effect of some parameters in the use of photovoltaics in the internal mechanization of agricultural enterprises.

Keywords: Environment, Electrical energy, Economy, Photovoltaic, Demand management, Agricultural enterprise

Determination Change Residues Bioenergy Potential of Commonly Cultivated Products in Turkey

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Abstract

In general, biomass contains organic materials that can be burned as fuel. Usually the biomass materials measured by dry weight. Bioenergy is energy derived from biomass as a result of incineration. Biomass is agricultural wastes or residues that are the raw material of agricultural origin. In this study, the agricultural production data year of 2001 and 2018 were used for common six species; wheat, barley, sunflower, maize, cotton and sugar beet which have most cultivation area of Turkey. The amount of dry matter of agricultural residues was calculated around 10 906 331.9 tonnes in terms can be used to have of it in Turkey, 2001. The amount of bioenergy potential of this dry matter is determined to be about 53 493.863 GWh. In the same way, the amount of dry matter of agricultural residues was calculated around 14 009 147.85 tonnes in terms can be used to have of it in Turkey, 2018. The amount of bioenergy potential of this dry matter is determined to be about 67 984 MWh. The change for this 18 years period is approximately 27%.

Keywords: Turkey, Biomass, Bioenergy, Agricultural waste, Calorific values

Determination of Energy Use Efficiency in Peach Farming (*P. Persica*)

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Abstract

Energy, which constitutes the acceleration of the agricultural cycle, is an essential tool that contributes to the shaping of agricultural production with its components and to the country and producer economy. This research was carried out in İnegöl, Bursa, which is the center of peach in terms of ecological characteristics, and it is aimed to reveal the energy efficiency with all lines. The survey data of 330 peach producers determined by simple random sampling method in the production season of 2018-2019 were evaluated and the energy components of the inputs and the relationships between them were statistically analyzed. According to the data results evaluated, the total energy input is 128574.64 Mj ha⁻¹. Among the energy inputs, machinery production, including tillage, tools and materials, drip irrigation system production energies is 30.24 % and chemical fertilizer is 28.30% which are high rates. Other inputs accounted for 41.44 %. The total energy output is 102169.56 Mj ha⁻¹. Biomass (peach tree, stone, pruning chambers) accounted for 56.28 % of the energy output and fruit output accounted for 43.70 %. Energy use efficiency 0.79 Mj ha⁻¹, clear energy gain, -26405,08 Mj ha⁻¹ and drip irrigation system production energy was calculated as 948.27 Mj ha⁻¹. Indirect energy was calculated as 37.40 %, non-renewable energy 33.33 %, renewable energy 18.28 % and direct energy 10.96%. The statistical analysis results showed that there is a strong positive correlation between renewable energy and direct energy ($r = 0.954$).

Keywords: Biomass, Drip irrigation, İnegöl, Renewable energy

Investigation of Different Soil Tillage Methods in the GAP Region in Terms of Wheat and Maize Rotation

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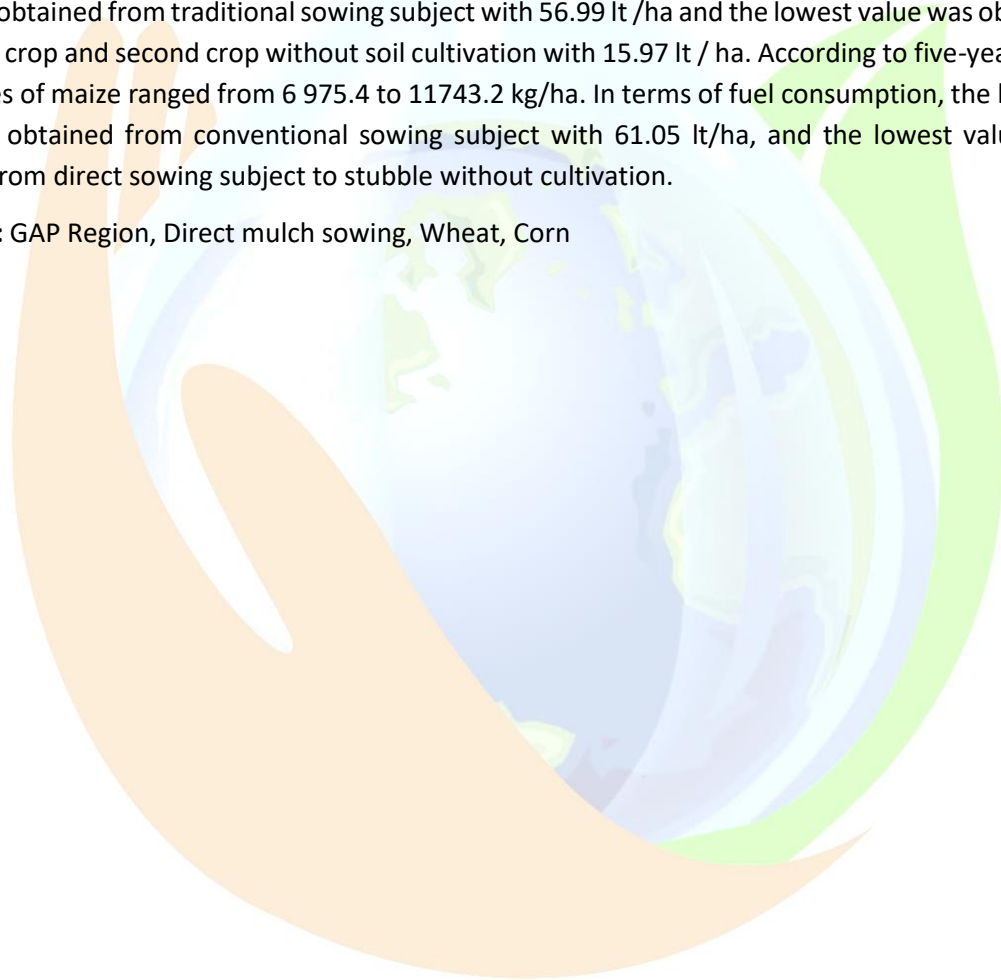
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Abstract

The increasing cost of energy and the increased erosion caused by intensive tillage have led farmers and researchers to alternative tillage methods. In this context, in this study conducted between 2010 and 2015 in the GAP Region, protective soil tillage methods that could be an alternative to traditional tillage were tried to be developed and adapted within the alternation system depending on the climate and soil conditions of the GAP Region. As a result of the research; According to the data of five years, yield values of wheat ranged between 5594 - 6300 kg/ha. In terms of fuel consumption, the highest value was obtained from traditional sowing subject with 56.99 lt /ha and the lowest value was obtained from main crop and second crop without soil cultivation with 15.97 lt / ha. According to five-year data, yield values of maize ranged from 6 975.4 to 11743.2 kg/ha. In terms of fuel consumption, the highest value was obtained from conventional sowing subject with 61.05 lt/ha, and the lowest value was obtained from direct sowing subject to stubble without cultivation.

Keywords: GAP Region, Direct mulch sowing, Wheat, Corn



Effect of Different Compression Pressures Applied to Seed Bed in Direct Seedling for Main Crop Soybean

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Abstract

The development of sustainable agriculture and conservation tillage/seeding systems is essential for preservation of natural sources, decontamination of environment deterioration and pollution. No-tillage is one of conservation tillage systems. Therefore, its necessity for farmers because of low fuel consumption is gradually increasing. In this study, soybean planted by pneumatic precision planter on ridge in stubble after harvesting of wheat sown on ridge. The sowing problems (no contact between seed and soil) that result from stubble density and no-tillage was aimed to be solved. For this, sweep row cleaner, soil and residue cutting component and furrow opener was arranged on a planter. In addition, the pressure load to be applied by the press wheels, which will increase the germination rate and provide soil-seed contact was found. Four different down forces (150-600 N) was applied to find suitable firming force on the press wheel. No-tillage and control methods was compared in terms of soil moisture, bulk density, penetration resistance and plant growth parameters (emergence, emergence rate index, mean emergence dates, maturation date numbers and yield). The highest penetration resistance at 0-10 cm depth was determined as P4 compressive load (1.87 Mpa) and the lowest penetration resistance at P1 compressive load (1.83 Mpa). Penetration resistance at 10-20 and 20-30 cm depth varied between 1.78-1.93 Mpa and 2.9-3 Mpa. The highest fuel consumption was determined as P4 compressive load (1.09 L da⁻¹) and the lowest fuel consumption at P1 compressive load (0.92 L da⁻¹). The percentage of emerged seedling was varied from 76.44% to 80.19%, while grain yield was varied between 210.58 kg da⁻¹ and 238.42 kg da⁻¹. Different pressure load applications have been positive result in terms of some parameters in direct (no-tillage) soybean cultivation.

Keywords: Seed bed, Direct seedling, Compression pressure, Main crop soybean, Çukurova

Determining Energy and Utilization Efficiency of Different Tillage Methods on Cotton Cultivation

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Abstract

By carrying out energy and cost analyses on different agricultural practices applied in cotton cultivation, energy equivalence of inputs per unit area, energy efficiency of the crop, total costs and profit have been calculated. This data has been acquired from the experimental plots with three repetitions on four different methods. The highest energy input is 15,545 MJ ha⁻¹ in Traditional Tillage, while the lowest is 13,564 MJ ha⁻¹ in Direct Drilling. When energy outputs compared, it's been understood that the highest energy output is in Traditional Tillage which has the highest yield and the lowest energy output is in Direct Drilling, which has the lowest yield. According to the experiments the highest energy ratio is 4.38 in Traditional Tillage, followed by Reduced Tillage 2 with the ratio of 3.99 and Direct Drilling with the ratio of 3.93. The lowest energy ratio is found in Reduced Tillage 1 with the ratio of 3.72. This study shows that in order to increase energy efficiency, first it is imperative to reduce the inputs and increase agricultural machinery in agricultural production.

Keywords: Energy input-output analysis, Cotton production, Cost analysis, Energy efficiency

Assessment Advantages and Disadvantages of Double Cropping Systems in Cotton

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Abstract

Climate change have a significant effect on agriculture in our country as well as in all over the world. Negative effects of climate change such as increasing temperature, decreasing water sources and uneven precipitation regimes have limited to agricultural area significantly. Thus, it was predicted that competition between agricultural products in terms of growing areas would arise in the next years. Assessment of **relay strip intercropping** and **second cropping** methods - that make possible to cultivate of cotton which is one of the strategic plants for our country with wheat which is most important food plant in the same year – is important. In our country, cotton is cultivated as second crop in most of the cotton region. Furthermore, in China, cotton is cultivated in huge areas by relay strip intercropping methods, but our country is not familiar to this method yet. In this review, **practicality**, **environmental impact** and **profitability** of these methods which are alternative between each other were examined. Previous studies suggested that cotton yields of double cropping systems were decreasing about 21-46% in comparison to monoculture cotton. On the contrary, it is observed that total output of double cropping system is 16,9-54,9% higher than monoculture system due to harvesting of two different crops. However, relay intercropping of cotton needs to labor more than second cropping of cotton because of harder integration of existing mechanization. It is possible that this relay intercropping of cotton would be featured cropping system if convenient mechanization is developed.

Keywords: Cotton, Intercropping, Double cropping, Sustainability, Productivity

Specific Draft Force, Draft and some Operating Parameters and Fuel Based CO₂ Emissions of Different Soil Tillage-Planting Methods in Sunflower Production

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Abstract

The sunflower, which is an important raw material source in the industrial sector as well as in human and animal nutrition, ranks first among the oilseed plants in terms of planting area and production amount in our country and accounts for about 69% of vegetable oil production and approximately 84% of total oil consumption and counters 32% of total oil use by itself. In many crops, unnecessary excessive tillage increases both production inputs and exposes agricultural soils to erosion and adverse environmental impacts. Plant cultivation techniques need to be revised in order to achieve sustainable agriculture, enable future generations to make the best use of these agricultural lands and minimize negative impacts on the environment. The aim of this study was to determine the impact of four different tillage–planting practices (conventional tillage (GT), reduced tillage I and II (AT1 and AT2) and direct planting (DE)); specific draft force–draft, some operating values, fuel consumption and fuel-based CO₂ emissions on sunflower cultivation. Among the agricultural machinery used the highest specific draft force (46.3%)–draft (68.2%), fuel consumption and consequent CO₂ emissions (49.8%) were determined to be made by the plow used in traditional practice. The plow, processing 0.26 hectares per hour, generated the lowest work performance and highest human–machine labor requirement (4.1–3.8 h ha⁻¹). It was determined that the direct planting method required 83.2% less specific draft force, 95.2% draft, 81.1% less fuel, 80.3% machine and 65.8% less manpower than the GT method. The time required for soil tillage–planting a cultivation unit area (ha) was 7.6 hours in the conventional method and 4.98 times less (1.5 hours) in the DE method. Furthermore, it was determined that the direct planting method polluted the environment 80.1% less and released 4.2 times less CO₂ emissions to produce one kg of sunflower.

Keywords: Draft force, Draft power, Sunflower, Direct sowing, Conservation tillage, Fuel consumption, CO₂ emission



Evaluation of the Opinions of the Farmers in District on the Effects of Yortanlı Dam

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Abstract

Dams provide socio-economic and environmental benefits in rural areas. However, the positive and negative effects of the dams may occur over time. Therefore, after each dam, scientific researches should be conducted and the results should be evaluated. In this study, the opinions of the farmers on the effects in the region of the opening of the Yortanlı dam in Bergama district of İzmir were determined. For this purpose, 9 settlements that will benefit from dam irrigation were included. In this research, data were collected from 87 farmers with proportional sampling and by the survey. In the analysis of the data, firstly the socio-economic characteristics of the farmers were examined. Then, the opinions of the farmers about the effects of the dam in various aspects were determined. Five-point Likert scale was used in this stage. According to the results of the research, 72.41% of the farmers stated that the dam had positive effects on agricultural production. 34.48% of the farmers think that the dam increases agricultural income. 85.06% of the farmers believe that agricultural lands are used more effectively after the dam. On the other hand, 65.52% of the farmers think that the dam will not reduce the migration from the region. However, 51.72% of the farmers stated that the dam will affect the young farmers positively. As a result, with the development of irrigation opportunities with the dam, income level and employment opportunities in the region may increase. Therefore, the young population in the region should be encouraged to agricultural production and private sector investments should be encouraged for processing agricultural products.

Keywords: Yortanlı dam, Agricultural irrigation, Land use, Rural development

Alaşehir Vineyard Producers' Attitude towards Production and Fertilizer Application Related Environmental Problems

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Abstract

A clean environment, water and soil are natural resources that must be preserved for future with protection. In order to live in a healthy environment, to use water cleanly and economically, and to maintain the sustainability of soils, it is essential to act with an active awareness for the conservation of natural resources with the farmers. Fertilizer is the most important input in production and its uncontrolled use damage soil, water and nature. In this study, evaluation of farmer behavior was determined by the survey of farmers' outlook on environmental problems arising from production and their usage habit of land use and fertilizer. Within the study, the surveys were made with 33 vineyard producers including both who requested soil analyses and who didn't in Alaşehir district of Manisa province. The data of the study was taken from the project of 'Evaluation of Farmers' Behaviors on Adopting Fertilizer Application According to Soil Analyses and Making Suggestions for Supports of Soil Analyses in Turkey, 2018-2019'. Descriptive statistics were used in the research. As a result of the evaluation, attitudes and behaviors of farmers' towards environmental problems arising from production were revealed.

Keywords: Alaşehir, Fertilizer, Environment, Farmer attitude, Vineyard producers

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Evaluation of the Effects of Land Consolidation in Rural Development (With the Sample of Eskişehir - Merkez / Gündüzler)

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Abstract

The Main problem of the agricultural sector in our country is having small, fragmented and scattered farm land. These structural problems causes some difficulties especially in the irrigation areas about irrigation and agricultural management also causes labor, capital and production losses. Therefore combining of the fragmented areas, which are not allowed to have production, development and implementation of sustainable policies, creation of healthy bussiness structure have great importance in terms of increasing of competitiveness of the enterprises. In our country, the number of enterprises was 2.2 million in 1950 and rising up to 3.1 million in 2001. In parallel, the average size of the enterprises was 100da in 1950 and it was identified as 61 da in 2001. Prepared to agricultural infrastructure for development to soil and water resources projects aim to increase the value of agricultural production and ultimately to maximize the welfare of workers in agriculture. Soil and water resources development and evaluation of a more effective manner possible through the implementation of land consolidation and farm development services. With primary target of land consolidation can be made more economical and efficient agricultural activity was brought to the optimum size to reach the size of agricultural holdings. Another issue here is not to be neglected in this work, the name of the farm development services to support the work of our agricultural infrastructure. In this paper, Gündüzler-Eskişehir province center town and covering the villages of Yakakayı, Kızılcaören, Gökdere and Danişment Land Consolidation Project (Gündüzler LCP) were studied, with the average parcel size of implementation of the project and parcel number of the total recovery is not possible to transport a large number of pre-project parcel, the parcel after the project plan as a result of the new roads and irrigation system applied in the framework of the project as a result of direct benefit and contribution to rural development are discussed.

Keywords: Rural Development, Land Consolidation, Scale of Agricultural Enterprises, Agriculture Structure, Gündüzler LCP

Management of Water Resources with Agricultural Organizations in Turkey

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Abstract

Management of water resources by the agricultural organizations for agricultural irrigation is quite important to conserve natural resources. Irrigation cooperatives and water users associations are the organizations at the water users level for the operation and maintenance. The purpose of this study is to reveal the status of agricultural organizations based on cooperatives and water users associations in water management for agricultural irrigation. In Turkey, a large part of groundwater irrigation is managed by irrigation cooperatives established in accordance with the Law on Cooperatives No. 1163. In addition, water users associations with the law No. 6172 are also an important part of the management of agricultural water resources. Although there are differences between the irrigation cooperatives and water users associations in terms of legislation and their functioning, both organizations carry out their activities with the same purpose within the understanding of organization. In this study, secondary sources are used to examine management of water resources in terms of agricultural irrigation.

Keywords: Water resource, Management, Cooperative, Association, Agricultural irrigation



CANCELLED





The Effect of Green Fertilizer Application on Physical Properties of Pomegranate Fruit

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Abstract

This study was carried out in order to determine the fertilizer need for pomegranate, investigate the use of organic and green manure instead of mineral nitrogen fertilizer and the effect of different fertilizer applications on the physical and chemical properties of soil at the Koruklu Talat Demirören Research Station under Harran Plain conditions in 2012-2016 growing seasons. Three trials have been established according to the design of the random blocks with three repetitions. Was designed as (control, vetch, vetch + 75 g N, vetch + 150 g N, vetch + 225 g N, vetch + 300 g N tree⁻¹). Pomological measurements were performed on 10 pomegranate fruits in 2012, 2013 and 2016 in order to determine the effects of green fertilization + reduced nitrogen fertilizer application on average pomegranate fruit weight, fruit width and length and crust thickness. According to the subjects, average fruit weight ranged between 349 and 389 g. The highest average pomegranate weight for three years was 377 g. Fruit width ranged from 83.92 to 96.0 mm. The three-year average highest pomegranate width was measured as 95.72 mm. Fruit length values ranged from 77.9 to 85.2 mm. The highest pomegranate length was found to be 83.1 mm. The thickness of the shell ranged from 2.8 to 3.7 mm, with an average of 3.4 mm.

Keywords: Harran Plain, Fertilizer Green Fertilizer, Pomegranate

The Effect of Selenium Applications on Yield Parameters and Selenium Content of Silage Maize

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Abstract

In this study, the effect of sodium selenite and sodium selenate applications on the plant characteristics, green forage yield and selenium content of maize herbage were investigated. Selenite was applied from the soil and selenate was applied from foliar at eight different levels (0-5-10-15-25-50-75-100 g Se ha⁻¹). There was no effect of the treatments on laying, plant appearance, number of worm cobs and random number of plants. Selenite applications affected the cob/plant ratio and leaf/stem ratio values, while selenate applications affected the leaf/stem ratio. Selenium applications did not affect the plant height, green forage yield, dry matter yield and dry matter ratio values, statistically. Selenite application did not affect the selenium content of maize herbage. Selenate application affected the selenium content of maize herbage. Also it is found that 99.88 µg Se kg⁻¹ (0.1 mg kg⁻¹) accumulates in maize herbage with 50 g of Se ha⁻¹ application; 208.51 µg Se kg⁻¹ (0.209 mg kg⁻¹) with 75 g Se ha⁻¹ application, and 332.5 µg Se kg⁻¹ (0.333 mg kg⁻¹) with 100 g Se ha⁻¹ application. Considering that the selenium concentration in food for human and animal nutrition should be 100-1000 µg kg⁻¹, it is understood that this result obtained from the research is sufficient for animal nutrition.

Keyword: Maize, selenium, soil application, foliar application, yield.

Some soil properties of the area where the crocuses grow in Turkey

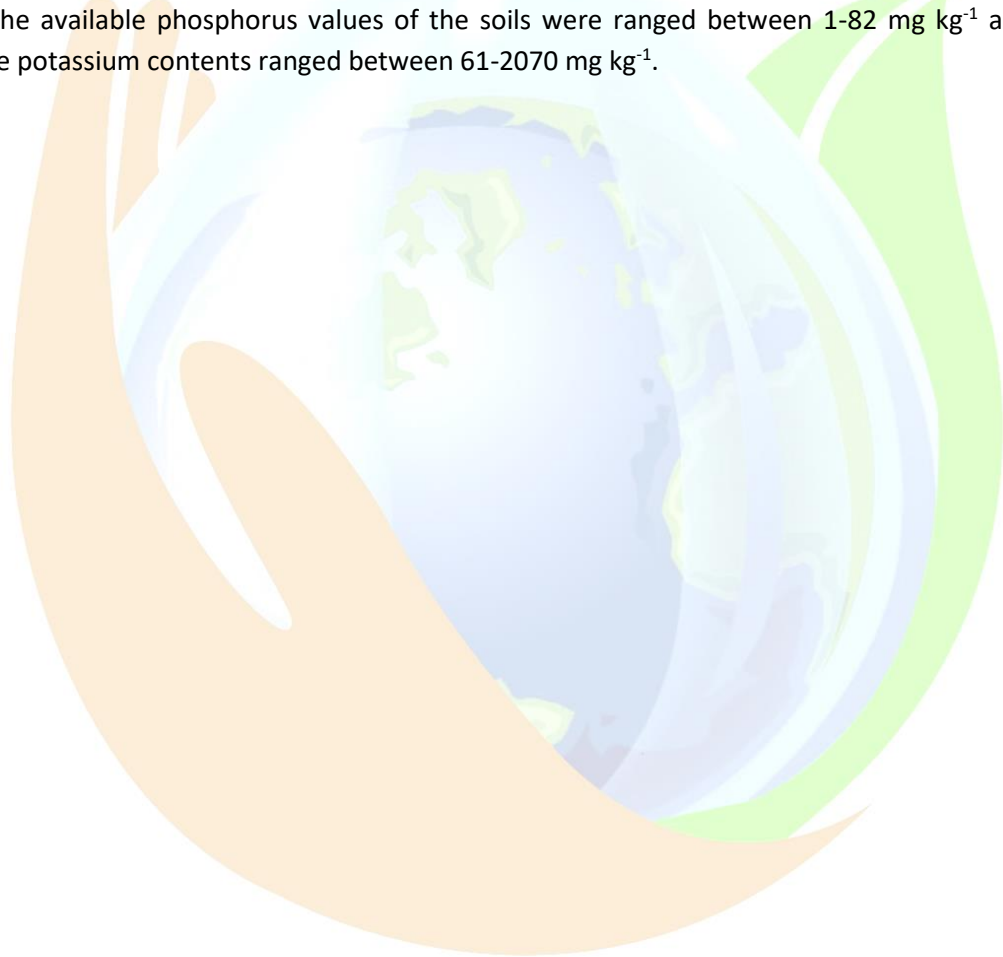
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Abstract

This study is conducted in order to determine some properties of the soils on which different species of *Crocus* genus that are natural grown in flora of Turkey. For this purpose 427 soil samples were taken from 54 provinces between 2010-2014. Soil pH, salinity, CaCO₃, organic matter, available phosphorus and exchangeable potassium of soil samples were detected. According to the result of study; the salinity rates of the soils are generally within the non-saline soil class; even though some result have reached to 2630 $\mu\text{mhos cm}^{-1}$. Mostly the soil samples within the observed area was determined to have light alkaline or neutral characteristics. Although the amount of CaCO₃ were generally low in soil samples, highly calcareous soils were also discovered. The result of study has determined that almost all of the soil samples from the areas where *Crocus* is grown at have high or very high levels of organic matters. The available phosphorus values of the soils were ranged between 1-82 mg kg⁻¹ and the changeable potassium contents ranged between 61-2070 mg kg⁻¹.



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The Effect of Boron Fertilizer Given to Soil on Berseem Clover (*Trifolium alexandrinum* L.) Yield

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Abstract

As in the world, new development methods are applied in our country in order to increase crop production capacity and obtain high quality products. The aim of this study was to determine the response of berseem clover (*Trifolium alexandrinum* L.) to the boron fertilization plant grown in irrigated areas which are well adapted to semi-arid climatic conditions. In this context, selected berseem varieties were cultivated in Ankara soil with insufficient organic matter and boron, the effect of boron fertilizer given to soil in different doses on the yield and quality of the plant was investigated. It was carried out as a field trial in the experimental fields of Ankara University, Faculty of Agriculture, Field Crops Department between the years of 2017 and 2018. The experimental field research was set up in 3 replicates compatible with split parcel experimental design technique in random blocks. Three different berseem varieties (Derya, Erix, Mario) were sown to main parcels and 5 different boron fertilizer doses (0, 100, 200, 400, 800 g/da) were applied to sub-parcels. According to the research results; boron requirement of plants showed significant differences between varieties. Significant yield increases were observed at the boron dose applied at 100 g/da, while decreases in yield and quality were observed in the parcels where boron levels were increased. In determining the amount of boron to be applied to soil; boron requirement of the plant, application of fertilizer, precipitation and calcification and the amount of organic matter in the soil are effective. Soil boron analysis is important in understanding whether plants need boron fertilization. It was seen that the levels of boron required for plants to develop health are very low amounts. The level of boron which causes toxic effects decreases the plant production capacity and causes product losses.



Effect of Phosphorus Fertilizer on Peach Yield in Aegean Region

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Abstract

This research was carried out with Redhaven variety planted at 6 m x 6 m rows in the established area in order to determine the phosphorus fertilizer demand of peach grown in Aegean Region at between 1998-2002. The experiment was conducted in randomized block design with 3 replications which is formed in 0 - 250 - 500 - 750 gr N/tree levels of phosphorus. Preliminary yield values of tree trials were determined in the first year of the study. In the next three years, the yields were obtained by applying different phosphorus levels. According to covariance analysis results based on yields, the values are examined; it was found statistically nonsignificant that there was no difference between corrected yields and fertilizer levels. It was concluded that there is no need to apply phosphorus fertilizer, if the amount of available phosphorus in soil depth of 0-20 cm in Aegean Region is more than 7 kg da⁻¹. Additionally; some microelement contents in the leaves and the effect of applied fertilizer to fruit quality properties were analyzed and found out statistically nonsignificant.

Keywords: Aegean Region, Peach, Fertilizer, Phosphorus, Yield



Expression of the Gene involved in Salt-Boron Tolerance of *Puccinella distans*

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Abstract

In Turkish soil and in different regions of the world, B deficiency and toxicity along with salinity are important abiotic stress factors causing a widespread agricultural problem. Thus, it is necessary to improve the tolerance level of cultivated plants towards such extreme conditions, which are affecting the agricultural yield and production. *Puccinellia distans* (Jacq.) Parl. is a hyper-accumulator grass plant with tolerance towards high levels of salt and boron toxicity, and is capable of surviving in boron mining regions and arid regions of Turkey. In our study, seeds of *P. distans* were collected from the boron mining area in Eskişehir Kırka and grown under controlled conditions in the hydroponic system. Further, *Puccinellia* plants were treated with different B (0 µM, 30 µM and 4 mM) and salt dosages (0 mM, 100 mM and 250 mM NaCl). B- and Na-efflux type transporters are thought to be effective in the high B and salt tolerance mechanism of this plant. Thus, the expression level of *Brachypodium distachyon* potassium transporter 5-like (Gene21) gene encoding a (B-efflux) transporter protein that promotes B efflux from the roots was determined in the trial. In the results, the expression of this gene decreased more than 4-times under the B deficiency and 100 mM salt treatment. However, under toxic B condition with 250 mM and 100 mM salt supply, gene expression was decreased by one and two-folds respectively. This showed that the gene of interest had different expressions under different B and salt conditions. Thus, by using the results obtained from the conducted study, and since *P. distans* belongs to the wheat family, it can contribute to the development of wheat varieties that can be grown in regions with B and salt stress.

Keywords: Boron, *Brachypodium distachyon* potassium transporter 5-like, Gene expression, *Puccinellia distans*

CANCELLED



New Generation Meets Mother Earth

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Abstract

The Secret of Soil project, prepared within the scope of The TÜBİTAK 4004 nature education and science schools, is carried out under the responsibility of our Institute. The 10th grade students of 5 different public schools in the Directorate of National Education in Yalova participated in the activities between 16 March 2019 and 25 May 2019. With the selected students, theoretical and practical activities were carried out on soil science and plant nutrition, irrigation, entomology, vegetable, fruit and ornamental crops. Meeting with Mother Earth, is one of the 6 activities carried out within the scope of the Project. The attendance levels of the participants were evaluated by asking simple questions in order to learn their knowledge and thoughts about the soil. In the activity, the attendance levels of the participants were evaluated by asking simple questions in order to learn the participants' knowledge and thoughts about the soil. The participants were shown the soils of different colors and characteristics in the Institute's archive. The importance of pH, EC and lime contents of the soil was discussed with the participants and pH, EC and lime analyzes were performed in the laboratory. Soil horizons and color changes are shown in the previously opened soil profile pit 120-150 cm in depth. The aim of this project is to enable the participants to recognize the soil science by experiencing the soil science, to assimilate the information, to recognize the soil ecosystem, and to develop a sense of responsibility towards nature and the environment.

Keywords: Earth nature education, Science schools

Determining the Fertility and Microelement Scopes of the Agricultural Soils of Alaşehir-Sarıgöl Plain

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Abstract

This research was carried out to determine the fertility and microelement scopes of the agricultural soils of Alaşehir-Sarıgöl district of Manisa province and to create a database between 2014-2017. Within the scope of the research, a total of 82 soil samples, representing agricultural areas, were taken from 0-20 cm soil depth with 2.5 km x 2.5 km grid intervals. In soil samples taken; texture, pH, EC, lime, organic matter, available phosphorus and potassium, extractable iron, copper, zinc and manganese analyzes were performed. Soil analysis results were classified according to certain criteria and deficiency, adequacy or excess levels of nutrients were determined. After the classification of soil parameters, a database was created within the scope of GI. According to the results it was found out that, 35.36% agricultural soils of Alaşehir-Sarıgöl was sandy loamy, 73.17% was mildly alkaline, 86.59% was non saline, 39.02% was calcareous, 65.85% did not have enough organic matter, 58.54% had very high available phosphorus, 79.27% had high potassium. In terms of microelements 70.73% had good levels of extractable iron, 51.21% had good levels of zinc, 97.56% had enough copper and all of it had enough manganese.

Keywords: Alaşehir-Sarıgöl plain, Soil fertility, Micro plant nutrient elements, Database

Soil Properties of Greenhouses in Kumluca, Antalya and Zinc and Boron Problems in Tomato Cultivation

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Abstract

As Antalya has climate advantages it has been leading greenhouse activities in Turkey since 1940s. According to 2018 data, there is 283,383 da greenhouse fields in Antalya. Kumluca has 42,501 da greenhouses made of both plastic and glass and tomato is grown in 29,580 da of the total greenhouse fields. Kumluca is a vital centre where 362,950 tomato was grown with respect to 2018 data. The aim of this study was determining Zn and B nutritional status of the plant and properties of soils used under tomato cultivation in those greenhouses in Kumluca, Antalya province. In the study, 45 soil and leaf samples representing the area were collected from greenhouses in which mono-season tomato cultivation is done. pH, EC, % lime, texture, % organic matter, available P, K, Ca, Mg, Fe, Mn, Zn, Cu, and B analysis were done by using the collected soil samples while leaf samples were analyzed for Zn and B plant nutrients. Then, results of the soil and leaf analyses were assessed by comparing with limit values. Considering results of the analyses, all soils were slight alkaline and alkaline. % 42 and 24.5 of those soils were slight salty and mediate salty, respectively. Calcitic and medium calcitic soils accounted for % 91 of the soils and % 71 of the soils have few and very few organic matter. The soils have high P, % 17.5 medium K, % 52.3 decent Ca, and adequate Mg while micronutrients of Fe (%28.9), Cu, Zn, Mn, and B (%88.9) were sufficient and high. % 26.7 and % 35.6 of leaf samples were insufficient with regard to B and Zn, respectively.

Keywords: Kumluca region, Tomato greenhouses, Soil fertility, Plant nutrition, Zinc, Boron

Determination of Plant Nutrient Element Contents of Çanakkale Province Soils

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Esra Albaz²

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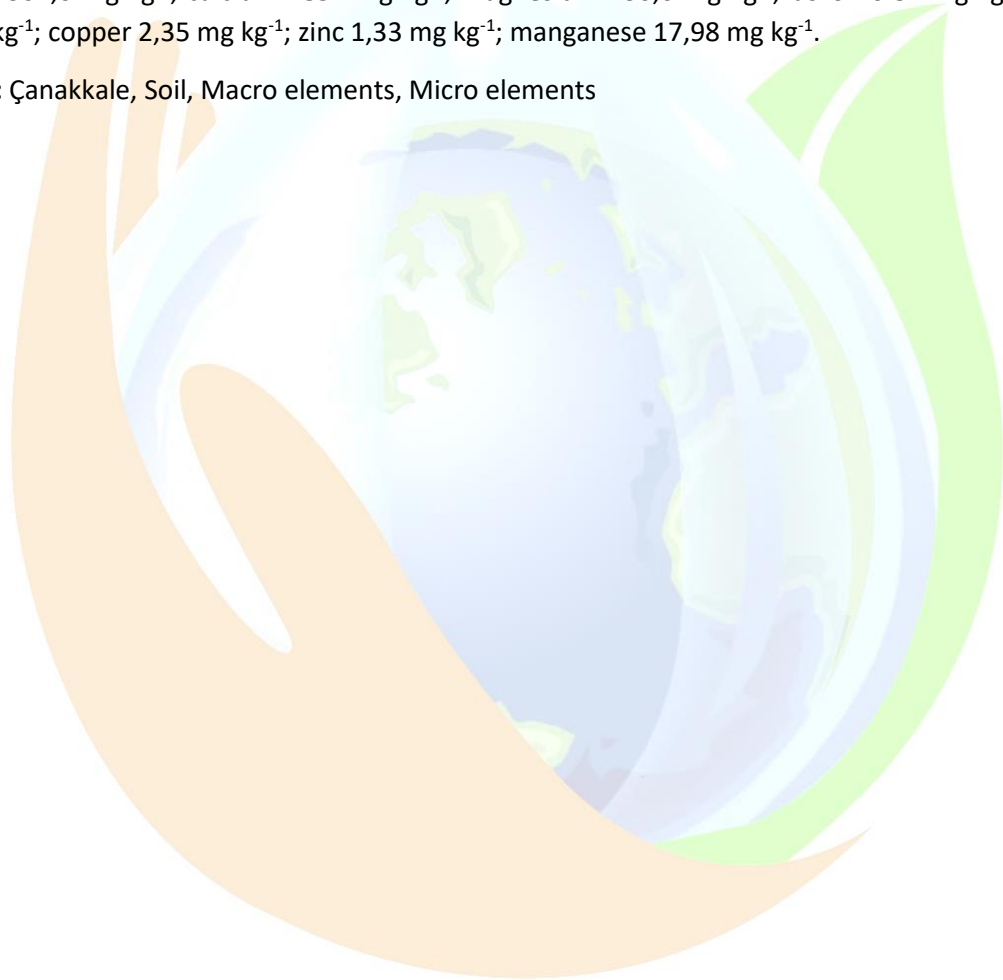
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Abstract

This study was carried out to determine macro and micro plant nutrient contents of agricultural areas belonging to Çanakkale Province. A 2,5km x 2,5km grid system is created in Çanakkale province to represent the scale of agricultural land of Turkey, and soil samples were taken from 387 different points. In the soil samples taken from (0-20) cm depth, available phosphorus, extractable potassium, calcium, magnesium, boron, plant-available iron, copper, zinc, and manganese amounts were determined. As a result, average values were determined as follows; phosphorus 29,33 mg kg⁻¹; potassium 302,0 mg kg⁻¹; calcium 4852 mg kg⁻¹; magnesium 430,0 mg kg⁻¹; boron 0.82 mg kg⁻¹; iron 14,69 mg kg⁻¹; copper 2,35 mg kg⁻¹; zinc 1,33 mg kg⁻¹; manganese 17,98 mg kg⁻¹.

Keywords: Çanakkale, Soil, Macro elements, Micro elements



The Effects of Organic and Inorganic Fertilizer Applications on Sage Dry Herba Yield and Essential Oil Ratio

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Abstract

Sage (*Salvia officinalis*) is a very important medicinal-aromatic plant in terms of human health with its nutritious, digestive, relaxing, gas-expelling and breath-relaxing properties. The essential oil of sage is the most important bioactive substance of sage. Increasing mineral fertilizer prices are one of the most important economic inputs in aquaculture and are increasingly barren. From this point of view, it is important to find a more economical and environmentally friendly fertilizer source. The aim of this study is that to investigate the effect of different organic and inorganic fertilizer applications on sage dry matter and essential oil yield. Experiment Çukurova University, Faculty of Agriculture, Department of Field Crops Research and Application Area was established in 2018 according to randomized block experiment design. *Salvia officinalis* species were used in the experiment. Four different fertilizer applications (Control, Urea, Worm manure, Chicken manure) were applied. Fertilizers were calculated as 6 kg.da⁻¹ pure nitrogen. Sage was sown in viols as seeds in February 2018 and planted in the field as seedlings on May 24 and plants were harvested in November 2018. With the harvest, all the plants in the parcel were dried and the amount of dry herba per decare was determined. The samples taken from this herb were determined by the clevenger device and the essential oil content. Data were statistically analyzed by ANOVA using JMP 8 package program and subjected to LSD test. According to the research findings, the best results were obtained from chicken manure application in terms of dry herba yield (898.61 kg da⁻¹) and essential oil content (2.45%). As an alternative to mineral fertilizer application, it has emerged that chicken manure can be used as an organic fertilizer source in sage cultivation.

Keywords: Sage, Dry matter yield, Essential oil, Organic fertilizers

CANCELLED



Effects of Different Biochar Applications on Soil Biological Properties

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Abstract

The objective of this study is to evaluate the effect of Corn Cob, Pistachio Shells and Cotton Stalks biochar on soil biological properties. An incubation study was conducted using soils collected from 0-30 cm depth of ikizce series from the Harran Plain, and corn cob biochar (CC), pistachio shells (PS) and cotton stalks (CS). In this study, 0- 0.2- 0.4- 0.6- 1.2 and 2.4% rates of biochar were used. Soils and biochars were mixed well and wetted with water about 65 % of field capacity of soils. Prepared mixed materials were incubated 180 days under 25 ± 2 °C and experiment was designed as completely randomized. Soil sampling was done during the 15th, 30th, 60th, 90th, 120th and 180th days of the incubation period. Urease, Catalase, Alkaline phosphatase and Microbial biomass enzyme activity were determined in the soil samples. According to the results: soil Urease enzyme activity 4.3-107.97 mg NH₄⁺-N 100 g⁻¹ soil, Catalase enzyme activity 6.61-19.07 mg O₂ g⁻¹ soil, Alkaline phosphatase enzyme activity 3.52-360.52 mg fenol 100 g⁻¹ soil, Microbial biomass enzyme activity 150.57-1941.69 µg CO₂-C 100 g⁻¹ ranged values were determined. According to the result of incubation study; with regard to the effects of doses according to Ürease, Alkaline phosphatase and Microbial biomass were showed an increasing trend with increasing application rates. Ürease, Alkaline phosphatase, Microbial biomass analysis results were determined an increasing trend with increasing incubation days. Catalase enzyme activities were determined a decreasing trend with increasing incubation days. Overall, it can be concluded that CC, PS and CS applications on calcareous clay soil improved soil biological properties in an incubation study. Moreover, the biochar application was evaluated having a potential to be used as a soil biological activity to calcareous clay soils.

Keywords: Corn cob, Pistachio shells, Cotton stalks, Biochar, Harran plain, Calcareous clay soil

The Effects of Microbial Fertilizer on Lettuce Production

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Abstract

The most important plant nutrient in terms of fertilization is nitrogen. Nitrogen is one of the main nutrients because it is included in the organic structure of the plant and allows the plant to grow faster. Nitrogen-fixing bacteria have been used as a fertilizer at different plants for last decades. In recent years, people have turned to organic food consumption for a healthy life and healthy nutrition, and with the increased sensitivity to the environment, producers have directed to grow organic products. The use of microbial fertilizers in organic production has started to gain importance. Microbial fertilizers are less expensive than chemical fertilizers. In addition, microbial fertilizers contribute to the increase of organic matter of the soil. In this study, the effects of nitrogen-fixing bacteria on yield and some growth parameters of lettuce (*Lactuca sativa* L.) were investigated. The experiment was carried out according to randomized block design with 3 topics (microbial fertilizer, chemical fertilizer, control) and 3 replications at field conditions. According to duncan multiple comparison analysis, yield, fresh weight, dry weight, number of leaves and leaf width of lettuce were found the same group of chemical fertilizer and microbial fertilizer. It has been determined that the microbial fertilizer used in the trial, can be used in lettuce cultivation.

Keywords: Nitrojen, Microbial Fertilizer, Lettuce



A Comparison of the Effects of Hydrothermal and Pyrolytic Biochars on Selected Soil Physical, Chemical and Biological Characteristics

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Abstract

Biochar is a by-product of thermal decomposition of sustainable biomass feedstocks. The aim of this study was to investigate the effects of hydrothermal and pyrolytic biochars generated from different organic wastes on selected soil characteristics in an incubation experiment. Pyrochars and hydrochars derived from sewage sludge (SS), poultry manure (PM) and olive waste (OW) through pyrolysis and hydrothermal carbonization (HTC) were mixed with clayey soil on a dry weight basis in three different doses and incubated at 25 °C for 120 days. In order to reveal how different pyrochars and hydrochars affect soil quality and fertility, a range of physical, chemical and biological soil characteristics were analyzed at the end of the incubation period. The results indicated that pyrochar applications increased total nitrogen (N) better compared to those of different hydrochars while soil organic matter (SOM) and aggregate stability seemed to increase better in hydrochar applied soils. The highest total N determined under SS derived pyrochar and SOM under hydrochar of OW. No clear differences were observed in available phosphorus, lime content and cation exchange capacity under different pyrochar and hydrochar applications. However soil enzyme activities, especially β -glucosidase, were very responsive to hydrochar with increasing application rates. These findings indicated that the hydrochar obtained by HTC is more effective on the biological properties of soil compared to the pyrochar obtained by pyrolysis. Thus, it is possible to conclude that pyrochar was a very stable and recalcitrant C source than hydrochar according to microbial activities and could be an efficient, long-term strategy to sequester C in soils.

Keywords: Biological indicators, C sequestration, Hydrochar, Pyrochar, Soil health

Studying of the Change of Microbiological Process during the Composting of Tobacco Waste and Horse Manure

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Abstract

The use of compost in agriculture is the application of the product obtained from all kinds of plant and animal organic materials taken out of the system in different meanings by using different methods and techniques in various ways in accordance with the cultivation technique and purpose. Composting is one of the most successful methods for the sustainable recycling of organic waste into the natural cycle. However, the feasibility of these wastes in agricultural fields as compost depends first of all on the level of microbiological decomposition of these materials. In this research; microbiological changes in compost formation process of tobacco wastes (TW), horse manure (HM) and TA+HM mixing which have some drawbacks in direct use on agricultural soils were studied. Soil respiration, microbial biomass and some enzyme activities (dehydrogenase, phosphatase and urease) were determined in the compost samples taken on the 30th, 60th and 90th days of the experiment which took 3 months in total. According to the results of the research, TW compost had high soil respiration, microbial biomass-C and dehydrogenase enzyme activity compared to the other composts after a period of three months. In terms of these microbial parameters, HM and TW+HM mixture compost had initial values and even lower values after three months, whereas these parameters showed a tendency to increase in TW compost. These results showed that a 90-day composting process for TW compost was not sufficient for maturation and microbiological stability. Additionally, results of this study indicate that the highest total P value was determined in HM showing a higher phosphatase activity compared to the other composts; while the highest amount of inorganic nitrogen was determined in HM+TW compost having the highest urease enzyme activity.

Keywords: Horse manure, Tobacco waste, Compost, Enzyme activity, Soil respiration

Method Optimization of PAHs and Application to Real Samples

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Abstract

PAHs of the class of cyclic planar molecules are oxidation-resistant compounds and are formed by bonding 2 carbons of one ring with C-C bond. It is known that PAHs may occur naturally as a result of forest fires or volcanic eruptions and they are also present in the emission gases of industrial areas such as petrochemical, cement, rubber, plastic, oil, paint and leather. These components are also likely to be found in the Ergene Basin where the industry is dense. As the molecular weights of PAHs increase, their solubility is decrease in water. However, their toxic-carcinogenic properties are also increasing. It is seen in the studies that they can mobilize from atmosphere to soil and water resources. Thus, PAHs can also be found in products grown with contaminated soil, air and water. In this study, developed a method for the quantitative analysis of 16 PAHs on GC-MS and optimization studies were performed. And this method was applied to water, sediment and paddy samples collected from Ergene Basin. Liquid samples were enriched by using SPE system and modified QuEChERS extraction method was used in solid samples. The configuration of Agilent 7890A GC-MS and 5975C inert-MSD, which is in Kirklareli University ITUAM. The HP-5 MSUI column was selected as the stationary phase and 99.999% purity He was used as carrier gas. During the study, many different furnace programs, injection mode, flow parameter, detection parameter, scan and SIM parameters were tested for GC-MS system and the results were compared with the library data and literature results. As a result of optimization %RSD values were determined between 0.42-7.87 for 16 PAH species investigated. As a result of real sample, maximum values of anthracene 144 mg kg⁻¹ in water, pyrene 1099 mg kg⁻¹ in sediment and benz(a)anthracene 1717 ug kg⁻¹ in rice were found respectively.

Keywords: PAH, Gas chromatography-mass spectrophotometry, Solid phase extraction, QuEChERS.



CANCELLED



Importance and Evaluation of YSP (Leaf Water Potential) Parameter, Which Can Be Used As a Marker for Dealing with Olive Salt Stress

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Abstract

When plants are exposed to drought, salinity, high and low temperature, intense light, and environmental stresses such as excessive carbon dioxide or ozone, they activate various morphological, physiological and metabolic defense systems to maintain their viability and maintain their growth. Sensitivity and tolerance to abiotic stresses is a very complex system. Abiotic stresses cause loss of more than 50% of agricultural yield worldwide. Compared to other environmental stresses, salinity and drought stress are the most important negative factors affecting plant growth and thus agricultural production. The negative effects of soil salinity are caused by ion toxicity, hyperosmotic stress, unstable nutrients and oxidative stress. YSP (Leaf Water Potential) measurement by pressure chamber is a measure of the resistance and resistance of the leaf against the stress of not leaving the water in its structure. It is known that YSP is the easiest and useful method for determining the moisture level in the soil and provides the most accurate information about the moisture content in the root zone. In our experiment carried out in 2016, changes in YSP were observed with 3 olive varieties at different salt stress doses (Control, 100 mM, 200 mM and 300 mM) and the adaptation developed by olives to cope with salt stress was investigated. In all three olive varieties when the salt concentration increased, the measurement value had increased, even the lowest dose, 100 mM, was immediately reacted. The most reactive data were taken from salt concentrations of 300 mM. Kilis olive variety was found to be the most resistant in our experiment, Gemlik was followed it and Ayvalık was in the 3rd place. The fact that the YSP parameter had similar results with the other stress parameters used in our study revealed the importance and necessity of disseminating this measurement.

Keywords: Olive, Leaf water potential, Salt stress

Determination of Drip Irrigation Systems Performance Established in Antalya Korkuteli Region

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Abstract

This study was carried out to evaluate the performance of drip irrigation systems in Korkuteli region of Antalya between 2017-2018. Average dripper flow rates, average dripper pressures, changes of lateral pressure (ShL), lateral flow, dripper flow change coefficient (Cv), Christiansen's uniformity coefficient (CU), distribution uniformity (DU), application efficiency (Ea), potential efficiency of low quarter (PELQ) and actual efficiency of low quarter application (AELQ) were ranged between 0.86-4.68 L h⁻¹, 0.23-2.61 atm, 2.7-45.5%, 1.9-33.9%, 0.04-0.018, 85.1-97.1%, 78.7-95.3%, 77.1-200.4%, 57.2-173.2, and 77.2-236.3%, respectively in the test plots. It is concluded that the reasons why drip irrigation systems performances within different limit values are dripper flow rate, dripper pressure, irrigation time, technical characteristics of the irrigation system and different operating conditions.

Keywords: Drip irrigation, System, Performance, Antalya, Korkuteli



CANCELLED



The Effects of Different Irrigation Methods on Rice (*Oryza sativa* L.) Yield, Irrigation Water and Leaf Area Index (LAI)

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Abstract

This study was conducted to investigate the relationship between yield-total irrigation water and yield-leaf area index (LAI) of the rice irrigated by different irrigation methods. The research was carried out according to randomized blocks factorial trial design with three repetitions in 2015, 2016 and 2017 and three different irrigation methods (D: Drip irrigation, Y: Sprinkler irrigation, AWD: Alternate wetting and drying) were used for the irrigation of paddy plant. In every three methods, two different irrigation water levels (I1= The subject in which the 25% of the water between the saturation point and field capacity was applied when the soil moisture was around the field capacity, I2= The subject in which the water was applied until the field capacity when 25% of available water holding capacity was consumed) were used. As a result of the study, the highest average rice yield was obtained from traditional continuously flooded method with 7,95 t ha⁻¹. AWD –I1 application with 7,60 t ha⁻¹ and D-I1 application with 6,39 t ha⁻¹ followed this. The Total Irrigation Water for the 2015, 2016 and 2017 years changed as 774 – 1812 mm, 868 – 1939 mm and 930 – 1946 mm, respectively. The LAI values for the 2015, 2016 and 2017 years changed as 0,999-4,695 m² m⁻², 0,676-5,223 m² m⁻² mm and 0,918-5,897 m² m⁻² mm in all irrigation methods, respectively. As a result of the research, linear relationships between yield - total irrigation water and yield - LAI were obtained.

Evaluation and Mapping of Irrigation Water in Terms of Agriculture in Thrace Region

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Abstract

The quality and pollution parameters of the waters used for agricultural purposes directly affect the physiology of the plant, the quality of the product and amount of the yield. In order to produce more healthy and economical agricultural production, the quality class of the irrigation water should be determined. Irrigation water quality is classified by two main parameters. The electrical conductivity (EC) of water is used for the salinity classification, while the alkalinity classification uses sodium adsorption rate (SAR) or regulated SAR, which indicates the amount of sodium. The problem of salinity and alkalinity in soils is largely due to irrigation, so farmers need to know the water quality before irrigation. In this study, water samples coming from farmers from various parts of the Thrace Region, mostly from Kırklareli province, were evaluated for agricultural purposes in 2018-2019. Analyzes were made by Kırklareli Atatürk Soil Water and Agricultural Meteorology Research Institute, Water Analysis Laboratory. In the analyzes, pH, EC (umhos cm⁻¹), residual sodium carbonate (RSC), hardness (German), SAR parameters were determined, the concentrations of B, Na⁺, K⁺, Ca²⁺+Mg²⁺, CO₃²⁻, HCO₃⁻, Cl⁻, SO₄²⁻ ions were measured and samples were classified in terms of suitability for agricultural irrigation. Total number of samples was 55, and 54.5% of the samples were T2A1 (T: Salinity; A: Alkalinity) and 29% were T3A1. In addition, the spatial distribution of irrigation water quality was mapped.

Keywords: Irrigation Water, Salinity Class, Thrace, Water Quality

Statistical Effects of Irrigation from Different Sources on Some Soil Properties

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Abstract

This study was carried out to investigate the effects of irrigation with domestic treated wastewater on some physical and chemical properties of the soil by randomized plot design with three replications for three years. In this study, the effects of domestic wastewater, well water and their mixtures on silty loam and loamy soils were studied. The contents of the waters used in the experiment were examined; the harm of treated wastewater use was found to be “low-medium” in terms of Electrical Conductivity (EC) “tolerable” in terms of Suspended Solids (SS), “low-medium” in terms of Nitrate (NO₃-N), “none” in terms of Boron (B) and “high/harmful” in terms of fecal coliforms. At the beginning of the experiment, it was determined that there was a positive correlation between organic matter in soil and N, P₂O₅, K₂O, EC, FCd (FC in disturbed soil sample), and at the end of experiment a positive correlation was found between SN, clay, and N, P₂O₅, K₂O, SN, HA, clay. Also, a negative correlation was found between CaCO₃, B, ESP and silt at the beginning of the experiment and another negative correlation was found between B, ESP and silt at the end of the experiment. There was a positive correlation between EC in the soil at the beginning of the experiment and a positive correlation was found between FCd, SN and lock, and ESP at the end of the experiment. At the beginning of the experiment, a negative correlation was found between EC and silt. All correlations mentioned here are statistically significant at the 0.01 error level.

Effect of Different Irrigation Levels Effect Applied By Subsurface Drip Irrigation on Vitamin C Content of Tomato

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Abstract

Water is one of the most important input for tomato production. Limited water resources and increasing water demand among industrial and urban establishments have caused a decrease in the quantity of water available for agricultural use. Plants' water demand vary according to growth period and region, hence determining irrigation schedule is very important. In case of excessive irrigation decrease of fruit formation and decrease of some quality parameters may occur whereas some quality parameters may indicate better results however deficient irrigation lead to low yield. The study aims to determine the effects of different irrigation treatments and water stress on crop yield and some quality parameters of tomato. The experiment has been conducted at International Agricultural Research and Training Center Menemen / İzmir / Turkey in 2018. The experiment has been designed in randomized block design with three replications. Treatments has been formed according to available soil moisture with enough water to fill the soil depth of 60 cm until field capacity was reached S1:100% full irrigation, and 25, 50, 75% decreased water supply levels were applied as treatments S2, S3 and S4 respectively. In the results; as the amount of irrigation water increased, vitamin C values of tomato decreased, therefore, the lowest vitamin C value was obtained in S1, which is the full irrigation treatment, and the highest vitamin C value was obtained in S4, which was given less irrigation water amount. As the result of statistical analysis of obtained vitamin C values, S1, S2 and S3 subjects were in the same group and S4 subject was in a different group.

Keywords: Irrigation, Subsurface drip irrigation, Deficit irrigation, Tomato, Vitamin C

A stylized illustration featuring a hand in shades of orange and yellow, cupping a blue and green globe of the Earth. A large, light blue water drop is positioned above the globe, and a green leaf is on the right side. The text is overlaid on the right side of the globe.

POSTER SESSIONS
CLIMATE CHANGE & AGRICULTURAL
ECOLOGY

Importance of Land Consolidation in Stream Improvement Projects

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Abstract

Due to the irregular rainfall regime in our country, drought is observed in some years and sometimes floods occur as a result of excessive rainfall. This leads to loss of property and lives in floods. It has a negative impact on the national economy. The change of the stream beds as a result of floods leads to slippage in the cadastre and ground mismatches. Landowners are suing the General Directorate of State Hydraulic Works for their parcels whose agricultural land is under stream and river. As the General Directorate of State Hydraulic Works (DSI), the construction of the Küçük Menderes River and Antalya Aksu Stream reclamation projects were carried out together with land consolidation. In this way, the grievances of landowners have been reduced. In-field roads, modern irrigation systems, drainage plans and creek rehabilitation were performed. Similarly, there are lawsuits due to the change of beds of Murat stream in our Eastern Anatolia region. Aggregation planning was made in 7 districts of Ağrı and Muş. Surface evacuation planning has been made by considering the contour maps and land uses of the project site. With the implementation of the project, lawsuits will be dropped. The owners of the victims will have land. Rural to urban migration will be reduced. Agricultural income will increase. Land fragmentation caused by floods is prevented, the cost of irrigation projects is saved, landowners are given land instead of expropriation cost, their land is prevented from being separated, irrigation and modern agricultural techniques are facilitated, distances between operating center and parcels are reduced and each parcel is connected to road network usage area and parcel sizes are increasing, parcel shapes are regulated, labor saving is provided in agricultural enterprises and social peace is provided in the project area with the increase of income in agricultural enterprises.

Keywords: Land consolidation, Stream rehabilitation, Expropriation, Parcel

Climate Change and Agriculture

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Abstract

Agricultural applications such as rapid increase in population, domestic waste, waste out of increase in industrialization, increase in fossil fuel, pesticide and chemical fertilizer which are applied unconsciously cause, with human effect, increase in greenhouse gas in atmosphere and it ultimately leads climate change. The climate change that emerged with global warming shows the biggest effect as drought. Agriculture is the sector that is most affected by the effects of climate change because it works with live material. Climate change has effects such as decrease in yield and quality in crop production in agriculture sector, decrease in yield of meat, milk, reproduction in animal production, increase of plant diseases and pests, change of damage types and negative effects of biological diversity. Thus, Turkey is also under threat of food safety. Food assurance means that people can have the necessary and timely access to the food needed to survive. In this study, proposals have been made for the solution of the problem by making use of statistics and studies on the effects of climate changes on the agricultural sector.

Keywords: Global climate change, Agricultural products, Food safety



Comparison of Commonly Used Calculators for the Determination of GHG Emissions in Agricultural Lands

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Abstract

With the increase of greenhouse gases in the last century, climate change has become an environmental challenge that affects the whole world. The agricultural sector has a role that both contribute to increase of climate change and mitigation. According to the Intergovernmental Panel on Climate Change (IPCC), changes in agriculture, forestry and land use represent approximately 20-24% of total greenhouse gas emissions in the world. In order to reduce global greenhouse gas emissions and ensure food safety, innovations need to be followed in agricultural sector. Recently, many greenhouse gas calculation tools have been developed to evaluate greenhouse gas emissions from agricultural activities. These tools differ according to their objectives, geographical focus and computational methodologies. This study considers the web, excel or other software based calculators for developed the measuring greenhouse gas emissions from agricultural activities. Totally 18 calculator identified including such as EX-ACT, Cool Farm Tool, USAID FCC and ALU. These calculators were analyzed according to various criteria, such as ease of use, input requirement, calculation methodology, purpose of use, geographical coverage, data and skill requirement. The calculators differ in reporting, calculation method and scope. This makes it difficult to compare the results with each other. The main problem with the calculators is calculation of the the land use change. Other emission factors can be calculated in acceptable way.

Irrigation and Climate Characteristics Effect on Fruit in Yalova

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Abstract

In this study, the climate characteristics of Yalova province and the effect of irrigation on orcharding were investigated. Yalova province is one of the provinces with high fruit production potential in Marmara Region. There are occasional fluctuations in the amount of fruit production due to global warming. The climate characteristics of Yalova is a transition between the Mediterranean and Black Sea climates. It also reflects the continental climate characteristics in some periods. Summers are dry and hot, winters are warm and rainy. Rainy months were determined as December, November and January and the least rainy months as July, May and August by the based on long term data. Kiwi, olive, apple, peach-nectarine, cherry, persimmon and pear are the main fruits grown in the economic sense. Due to the irregular distribution of precipitation, it is seen that irrigation is necessary in order to maintain productivity and product quality.

Keywords: Irrigation, Fruit growing, Climate change



Importance of the Maximum Rainfall in Batman – Bingöl and Diyarbakır for Euphrates – Tigris Basin

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Abstract

Tigris river is one of the important transboundary waters in Turkey which one take the source at the eastern heights of Turkey. The changes in the flow regime are influenced not only by our country but also by other countries (Syria, Iraq) located downstream. In this study, maximum rainfall data were analyzed at standard times of 6,12 and 24 hours from Batman, Bingöl and Diyarbakır precipitation stations. For this purpose, normality and homogeneity tests have been applied to the obtained data from the stations. Then trend has been researched by Graphical Approach (Sen Method), and Unit Root Test on data. Finally, Pettitt Test and Standard Homogeneity Tests were used to determine the trend change points. As a result of the tests applied to maximum rainfall data at standard times of 6,12 and 24 hours in each station, the statistical significance is; increased trend presence have been detected in Diyarbakır station since 1957 in 6 and 12 hours of data.

Keywords: Mann Kendall test, Pettitt test, Şen method, Trend analysis, Unit root test

Leguminous Crops and Mixtures as Elements of Sustainable Agriculture

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Abstract

Consequent upon climate change, increasing frequency and duration of droughts strongly require adaptation of agricultural crops and their diversification under changed agro-pedological conditions. The permanent climate changes having occurred in the last decade requires to study species having pronounced resistance to unfavorable abiotic factors and good adaptive capacity towards the new conditions. Both, to develop and access new management practices in cultivation of plants are needed also. In this regard forage crops have always had, but nowadays, in the system of sustainable agriculture, they are becoming more and more important. With the unique ability leguminous crops (incl. leguminous forage crops) to establish symbiotic relationships with *Rhizobium* bacteria and to fix atmospheric nitrogen they allow obtaining high yields without, or using less nitrogen fertilizers. Fertilizer inputs are essential for achieving improved crop yields, but they are increasing cost of production of farmers, and there is a major concern for environmental pollution. The usage of leguminous forage crops is an alternative to industrial nitrogen fertilizer and way for environmental protection – so up-to-date these days, so they are important component for ecology friendly systems. Because of its nitrogen-fixing ability legume forage crops are a desirable component in mixtures as well, where nitrogen can be transferred from the legume into the soil; hence grasses can use it during their growth. Grass mixtures incorporating legume component (-s) are more productive, on the other hand, high protein content of legume led to more balanced chemical composition and increased nutritive value of forage biomass obtained. Due to the increase of global warming, the establishment of legume grass associations is considered as a new issue concerning more forage biomass production under drought conditions.

Keywords: Leguminous, Sustainable agriculture, Mixtures

Effects of Climate Change on Agricultural Ecology

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Abstract

Human beings, who intervened in the relations of all living things with each other and with the environment in which they live, with the activities carried out in order to obtain plant and animal products, became the decision maker of the sustainability of agricultural ecology. In many regions of the world, because of the changing phenology with climate change can have positive or negative changes affecting the development of plants. The temperature rise in some climatic zones may result in reduced yields, as some plants cannot meet the need for chilling requirements. Excessive rainfall, hail damage or frost damage, which may occur during flowering time in plants, may adversely affect yield. These changes affect the rural population, which provides livelihood from agriculture and the industrial sector providing raw material from agriculture in economically, socially and environmentally. Ecological environment and biodiversity are among the topics that attract the attention of researchers as the systems that are most affected by climate change. The researchers focus on determining the extent of changes in some climate parameters occurring on a global basis and identifying the measures that can be taken and narrowing the impact area of possible negativities. Climate change affects agricultural ecology and creates a threat to food safety. In order to mitigate the negative effects of climate change on agricultural ecology, it is necessary to prevent the misuse of agricultural areas. With the determination of climate change adaptation strategies as a priority for biodiversity conservation, evaluation of forest areas with plants suitable for the ecology of the forest regions, the studies to be done for the protection of soil fertility and water resources, the development of varieties of plant species resistant to the effects of climate change, with the help of awareness-raising activities, we can reduce the degree of negative effects of climate change.

Keywords: Climate change, Ecology, Agriculture, Plant species, Water resources

Effects of Different Tillage Systems on Sustainable Organic Matter Management

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Abstract

The organic matter, which plays an important role in the formation of many physical, chemical and biological characteristics of the soil as well as being a source of nitrogen which is most needed by the plants but which is not found in the mineral part of the soil, is accepted as the most important indicator of soil quality and agricultural sustainability. The amount of organic matter in soils is affected the applied rotation system climate factors such as temperature and precipitation regime as well as controllable factors such as the duration of soil treatment, soil treatment techniques, the status or destruction level of vegetation, the burning or burial of plant wastes. In this study, it was explained to summarize how soil management affected soil organic matter. Soil treatments have a great influence on the N mineralization with decomposition of organic matter, carbon and nitrogen distribution. Therefore, soil treatment in general can reduce the content of organic matter in the soil and cause soil degradation. Adoption of protective soil tillage systems and their application for the purpose can increase the quantity and quality of soil organic matter so that the chemical and physical properties of the soil can be improved and preserved. Along with reduced tillage management, suitable chemical and organic fertilizer additives can be maintained in a sustainable manner of soil organic matter.

Keywords: Soil organic matter, Conventional tillage, Conservation tillage



CANCELLED





**POSTER SESSIONS
AGRICULTURAL MACHINERY
&
INFORMATION TECHNOLOGIES**

The Role of Artificial Intelligence in Developing Agricultural Technologies and Possibilities of Use in Turkey

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Abstract

815 million people in the world are chronically hungry and 64% of them are in the Asian continent. In addition, it is estimated that the agricultural product need of the human population, which is expected to reach nine billion by 2050, will increase by 50% of the current situation. On the other hand, maximum 10% of this increasing need can be met with the expansion of agricultural lands. For this reason, it is very important to benefit from developing technology in order to make the best use of limited resources. Drone use, precision farming, driverless tractors, sensor networks, internet of things, big data, etc. technologies will become indispensable tools in future agriculture. Artificial intelligence, on the other hand, will provide great advantages with its structure that can develop itself and provide the most appropriate solutions by processing all kinds of data that is effective in production in order to benefit from all these tools in an optimum level. The researches to be carried out in this regard are of critical importance in terms of meeting the increasing needs of agricultural products in our country, sustaining competitiveness with other countries in the field of agricultural production, obtaining the highest yields obtained from each decare and developing the sustainability of natural resources. In this review, the role and importance of agricultural technologies and artificial intelligence, which can be used in practice and suitable for the widespread agricultural enterprise structure in our country, are examined.

Keywords: Artificial intelligence, Intelligent agriculture, Sensitive agriculture, Agricultural technologies



POSTER SESSIONS
AGRICULTURAL ECONOMICS

CANCELLED



Socio Economic Characteristics and Agricultural Production Purposes of the Farmers Utilizing and not utilizing from Drip Irrigation Subsidies: Case of Edirne Province

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Abstract

The aim of this study was to determine the socio-economic characteristics and agricultural production purposes of the farmers who utilized and did not utilize from drip irrigation subsidies and make the comparison of the groups. For this purpose, total of 41 producers who utilized from drip irrigation subsidies between 2012-2017 years in Edirne province participated in the survey. Besides, the same survey was also conducted with the same number of producers who did not utilize from drip irrigation subsidies but had the similar characteristics with the producers who utilized from drip irrigation subsidies for the comparison of the enterprises. During the analyzes of the data, normally distributed continuous data obtained for the groups were subjected to t-test, the data which were not normally distributed were subjected to Mann-Whitney U test. Best-worst analysis was used for the determination of the farmers' preferences. According to the results, the difference between the household sizes who participated in the agricultural activities and irrigated land size of the farmers was determined to be statistically significant in 5% difference level. According to best-worst analysis results, the most significant purpose of the farmers who utilized and did not utilize from drip irrigation subsidies was determined as "to obtain the highest profit" and "to maintain the family" and "to keep and maintain the current land" criteria followed this. The furthest purpose of the farmers who utilized from drip irrigation subsidies was determined as "no occupation except farming" whereas the "to make less harmless production to environment" criteria was determined as the furthest purpose of the farmers who did not utilize from drip irrigation subsidies.

Keywords: Drip irrigation, Subsidy, Farmer purposes, Edirne

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