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Impact of irrigation and mulching method on soil properties and date palm *Phoenix dactylifera* L. productivity

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Abstract

Aim of good soil and water management and the use of modern irrigation technology is to reduce water waste and increase the efficiency of its use, as it is important to adopt irrigation methods that ensure the balance of water salinity in the soil in proportion to crop growth and productivity. A field experiment was conducted in private date palm orchards in Hamdan/Abu Al-Khasib district, 10 km south of Basrah city, during the two growing seasons 2020-2021, on a land of 4 dunums, the aim of studying is the Impact of irrigation and mulching method on soil properties and date palm. The results showed that using irrigation from above by basin and drip irrigation led to an increase in soil moisture content, a decrease in soil electrical conductivity values, and an increase in palm productivity (weight, length, total sugars, and total yield) compared to using the traditional irrigation method (tidal). The results showed that the use of mulching for the irrigation basin significantly contributed to increasing the moisture content of the soil and decreasing the electrical conductivity values for different depths, especially when using mulching with polyethylene. The traditional irrigation method (tidal), which prepares water using subsurface irrigation, is no longer sufficient to provide the moisture necessary for the growth and productivity of palm trees. Therefore, other irrigation methods must be followed, such as using basin and drip irrigation, and improving environmental conditions using a soil mulching system.

Keywords: date palm, mulching, irrigation, soil depth, salinity, moisture content.

Introduction

The date palm tree is widely cultivated in the Middle East and North Africa, and it is a staple fruit in many Arab countries. Belonging to the order Palmae and the family Arecaceae, this important plant family includes nearly 220 genera and 2600 species and has been known to humans for a long time (Al-Yahyai & Al-Kharusi, 2012). The date palm is one of the oldest fruit trees known, with its cultivation dating back to 4000 BC in Iraq. The province of Basrah is particularly important for date palm cultivation, and this drought-resistant plant is known to adapt well to salinity stress, with the production decreasing by 3.6% per EC unit in a saturated soil extract (FAOSTAT, 2021). In arid and semi-arid regions, where precipitation rates are not sufficient to meet the needs of economic crops, irrigation is a crucial factor in agricultural production. As water resources become increasingly scarce in these areas, it is important to adopt irrigation methods that ensure a water-salinity balance in the soil, proportional to crop growth and productivity (Alhamd, 2010). Irrigation is sufficient when it maintains the availability of water within the limits of the root zone, and modern irrigation technologies have been shown to reduce the amount of water used for irrigation, increase the utilization efficiency of field water, and save up to 50% of the water used in irrigation (Mahdi, 2010). For high irrigation efficiency, two main factors must be present, according to Alhamd (2016): a well-designed and constructed irrigation system for complete water control in the field, and appropriate soil preparation to allow regular water distribution on the soil surface. Adil *et al*. (2015) note that soil salinity can rise under dripping irrigation systems due to the nature of water movement in the soil profile, which is characterized by slow and unsaturated radial movement from the source of supply at the drippings. As a result, the efficiency of salt washing is low and decreases further with decreasing levels of irrigation. Mazen *et al*. (2018) suggest that the basin irrigation method is suitable for washing off soil salinity, but its efficiency is negatively affected by poor design and inappropriate agricultural processes. Moreover, soil salinity varies horizontally and vertically in the soil depth depending on the irrigation method and added rates. Mazen *et al*. (2018) indicated that the basin irrigation method is suitable for washing salts from the soil and noted that the efficiency of this system is negatively affected by poor design and inappropriate agricultural practices. They also pointed out that soil salinity varies horizontally and vertically depending on the irrigation method and the added rates. They observed that the peak of salt accumulation was in the shoulder area, which resulted from the movement of salts due to the horizontal movement of water towards the wetting front, and their accumulation in this area and along the outer edges of the wet soil, which

are areas of high evaporation near the soil surface. Soil cover is known to be an addition of a cover to the soil surface that acts as a barrier to regulate the transfer of heat, moisture, and air. There are several benefits to using soil cover, the most important of which are: preserving soil moisture and temperature for optimal growth, protecting the soil surface from erosion, adding organic matter to the soil, reducing soil salinity, improving the growth of plants under the cover system, reducing pollution by using pesticides, and increasing the availability of nutrients (Abdul-Aali, 2011). Al-Janabi *et al*. (2012) also reported that using a soil mulch method resulted in an increase in soil moisture retention and at a higher rate than the use of organic matter, especially at the 0-10 cm layer compared to the control treatment. Soil moisture content reached 25.2% under traditional irrigation and 30% under trickle irrigation. In addition, the use of soil mulch led to a decrease in soil salinity concentrations from 2.2 $dS.m^{-1}$ in the control treatment to 0.9 $dS.m^{-1}$ in the cover treatment, as well as an increase in organic matter addition. The changes that have occurred in the past years, represented by the decrease in water levels in the Shatt al-Arab due to the decrease in water imports from neighboring countries, have led to a decrease in the effectiveness of tides and reflected on the water supply values in the soil sector surrounding the river branches connected to the Shatt al-Arab, which affected the numbers, growth, and productivity of date palm trees in the south of Basrah province (Cattarossia, 2011). Given the above, the need has become necessary and urgent to conservate water consumption by focusing on soil management and adopting irrigation methods that contribute to reducing the percentage of waste in water.

Due to the scarcity of applied studies in this field, this study was conducted with the aim of studying the use of different irrigation methods and mulch the irrigation basin for date palm trees and their effect on the moisture content and salt balance in the root zone of date palm trees and comparing that with the traditional irrigation method (tides) and its impact on date palm productivity.

Materials and Methods

The study was conducted in a private date palm orchard in the Hamdan area, which is located in the Abi Al-Khasib district, 10 km south of Basra city, during the 2020-2021 growth season on a land area of 4 dunums. The irrigation system used in the orchard was the traditional ebb and flow system. The date palm trees were planted at a density of 25 trees per dunum, mainly of the sayer variety and approximately 20 years old. Irrigation basins with a diameter of 4 meters were created. On March 15, all date palm trees were pollinated with green Ghannami pollen, and the

number of bunches per palm was standardized at an average of 5 bunches per tree. The treatments were allocated according to the design used, and an irrigation system was installed, which included a dual-purpose drip irrigation system and basin irrigation. During the research process, no other field services were performed except for the experimental treatments used.

The study included the following factors:

1- Irrigation method factor, which included:

A- Drip irrigation method only

B- Basin irrigation method

C- Traditional irrigation method (tide)

2- Surface mulching factor of the irrigation basin, which included:

A- Treatment with polyethylene mulching. (PE).

B- Treatment with organic fertilizer mulching. (OF).

C- No mulching. (NC).

The required amount of water for irrigation was determined based on the measured evaporation value by the evaporation basin located in the experimental site. The treatments were arranged in a factorial experiment using a randomized complete block design, where the experimental unit was represented by a single palm tree, resulting in a total of 27 experimental units. Prior to the study, a soil profile was excavated with dimensions of (2 × 1 × 1) m to measure some of the physical and chemical properties of the soil and to isolate some fungi. Soil samples were taken from depths of 30-0, 60-30, and 90-60 cm, air-dried, and sieved through a 2 mm mesh. The physical and chemical properties of soil and irrigation water were analyzed prior run the experiment. (Table,1).

Table (1). The physical and chemical characteristics of soil and irrigation water.

Soil properties		**Depth of soil**		
		0-30	30-60	60-90
Sand	g Kg^{-1}	104.59	111.44	98.21
Loam		450.01	229.26	335.59
Clay		445.40	659.30	566.2
Soil texture		S.C	Clay	Clay
Bulk density Mg m^{-3}		1.16	1.29	1.39
pH		7.6	7.6	7.5
Total carbonates g Kg^{-1}		327.2	314.6	271.6
Organic matters g Kg^{-1}		5.15	3.04	0.23
EC ds m^{-1}		16.21	10.14	6.97

Dissolved ions at depth (0 – 30) Mmol.L^{-1}							
Ca++	**Mg^{++}**	**Na^{+}**	**$Hco3^{-1}$**	**$So4^{-}$**	**Cl^{-1}**	**$Co3^{-1}$**	**K^{+}**
24.23	18.27	73.71	1.98	36.34	99.11	0.00	3.21

Irrigation water properties	
EC	**pH**
4.22	7.2
Ground water depth	
1.25 m	

The experiment focused to measure the following:

Moisture and salinity distribution in the soil profile.

Soil samples were taken using a soil cylinder for all treatments at depths of 0-30, 30-60, and 60-90 cm at the end of the experiment. The percentage of soil moisture content was estimated using the method proposed by Gardner and described by Black (1965). In addition, the salt content of those samples at the depths mentioned above was measured by the electrical conductivity of the saturated soil extract using an EC meter.

Measuring Some Fruit Characteristics

Samples were collected at the end of the second season by randomly selecting 25 fruits from each palm tree and repeating the process four times. The weight of the fruits was measured using a sensitive scale, and the length of the fruit was measured using a Vernier caliper. These measurements were taken on the same fruits that had their weights measured, and the average length of each fruit was calculated. The total sugars in the fruits were estimated using the Folin-Sulfuric acid method described by Dobius et al. (1956). The average production rate of each palm tree was calculated after harvesting the fruits, by weighing them using a field scale for each palm tree and then calculating the average of four repetitions.

Results and Discussion

Soil Moisture Content:

The results of statistical analysis showed that these factors and their interactions were significant. on the soil moisture content values. (Figure, 1). The results showed that were significant differences irrigation methods (drip irrigation, basin irrigation, and tidal irrigation). The basin irrigation treatment significantly effects on the soil moisture content values followed by the drip irrigation treatment, while the tidal irrigation treatment showed the lowest values with a significant difference. The variation in the soil moisture content values among the treatments is due to the difference between the irrigation systems used. The movement of water through surface irrigation is a saturated flow that takes the form of a sudden inundation of the entire irrigated area. This causes the destruction of soil aggregates, especially at the soil surface layer, forming what is known as the surface crust, which has high density and low permeability. The presence of the surface crust reduces the amount of water lost through evaporation from the soil surface (Al-Taif and Al-Hadithi, 1988). The decrease in the values of the weight moisture content during tide irrigation is due to the nature of irrigation in this system, which occurs from beneath the soil surface through the movement of water upwards. This process depends on the feeding rates in the soil sector during the tidal process from the sub-tributaries of the rivers. Considering the decrease in the water inflows of the Tigris and Euphrates rivers in the past two decades, which has led to a decrease in water levels during tides in the Shatt al-Arab, this has in turn affected the feeding rates in the soil sector and the decrease in its moisture content (Cattarossia, 2011). The results also showed that, the effect of the mulching treatment used on the values of the soil moisture content was evident. There were significant differences between the treatments according to the type of mulch (polyethylene, organic fertilizer, no coverage). This is because the

mulching factor has a significant effect on increasing the soil moisture content by acting as a barrier to reduce the exposure of the soil surface to sunlight and wind, and thus reducing the rate of evaporation. In particular, the treatment with polyethylene mulching showed a higher soil moisture content compared to the other treatments. In a study found that, the superiority of black polyethylene in terms of moisture content values compared to the treatment with organic fertilizer mulching, and that may be because of the complete mulching of the soil surface, preventing water loss, as well as its significant impact in preventing the growth of weeds. (Chalker-Scott, 2007). According to the study, the highest moisture content was found at a depth of 60-90 cm, while the surface depth had the lowest moisture content. This may be due to the surface depth is more exposed to evaporation because of its direct contact with climatic factors such as temperature and wind, in a semi-arid climate. Additionally, the presence of cracks in the surface layer of the soil at high temperatures and during evaporation can lead to greater water movement in all directions and an increase in the evaporative surface area. In contrast, the depth of 60-90 cm is closer to groundwater and is affected by water movement through capillary action (Al-Janabi et al., 2012).

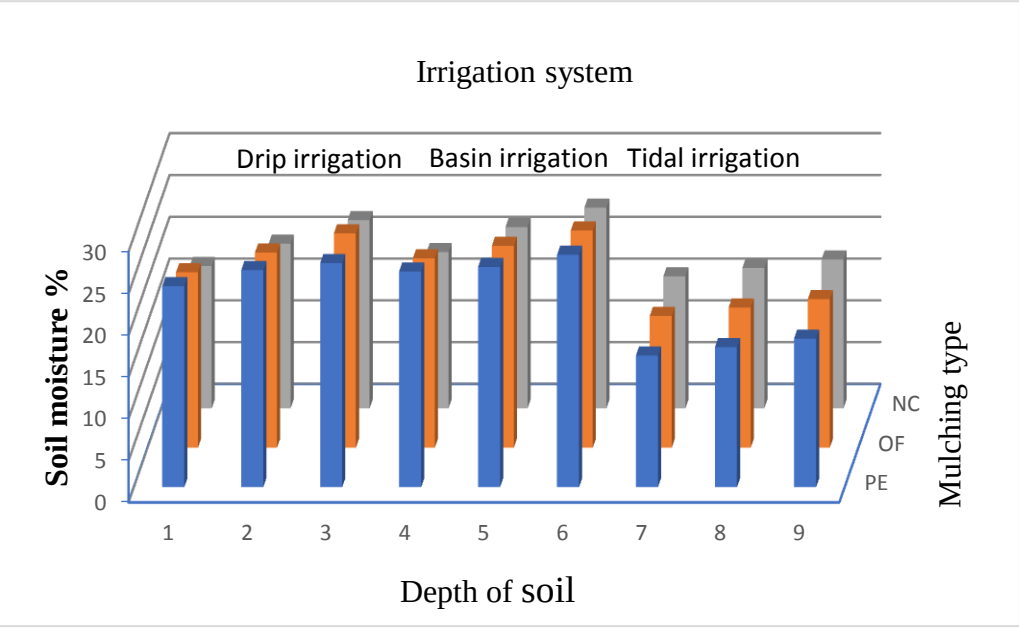

Figure 1. The effect of irrigation method and mulching type, as well as depth variation, on soil moisture content. Data is the mean for three replicates at each level. (PE) polyethylene, (OF) organic fertilizer, (NC) no coverage. (1, 4, 7) 0-30 depth. (2, 5, 8) 30-60 depth. (3, 6, 9) 60-90 depth.

Electrical conductivity

The results showed that the traditional irrigation had the highest values of electrical conductivity, followed by drip irrigation, while tidal irrigation recorded the lowest values and had high efficiency in washing salts from the soil. (Figure 2). The variation in the values of electrical conductivity for irrigation methods may be due to the nature of the moisture distribution for different irrigation systems. The high electrical conductivity values for tidal irrigation were due to the nature of the irrigation (sub-surface) for this method, in which water movement occurs upward by capillary action, causing the accumulation of salts in the soil sector adjacent to the water rise. This usually increases with neglect, lack of agricultural practices, high groundwater levels, and deterioration of their quality under hot climatic conditions with high evaporation rates. Al-Fayadh (2012) mentioned that capillary action activity leads to the movement of dissolved salts with groundwater to surface horizons and their accumulation after water evaporation due to high temperatures. The results of the experiment indicate that the type of mulching used influences the electrical conductivity values of the soil. The statistical analysis showed significant differences between the treatments, with the treatment with polyethylene mulching showed a significant reduction in the electrical conductivity values of the soil, followed by the treatment with organic fertilizer mulching. The uncovered treatment showed the highest values. This may be because coverage works to reduce the rate of evaporation from the irrigated soil, resulting in a higher moisture content, which helps to reduce the capillary action activity and the accumulation of salts compared to the uncovered treatment. The results showed that the surface depth (30-0) cm recorded the lowest values of electrical conductivity, followed by the depth of (30-60) cm, while the highest values were recorded at the depth of (90-60) cm. This may be due to the fact that the surface depth is more exposed to evaporation due to its direct contact with the air and other climatic conditions, especially in the uncovered treatment, in addition to being more exposed to salt washing downwards due to the direct addition of water during irrigation.

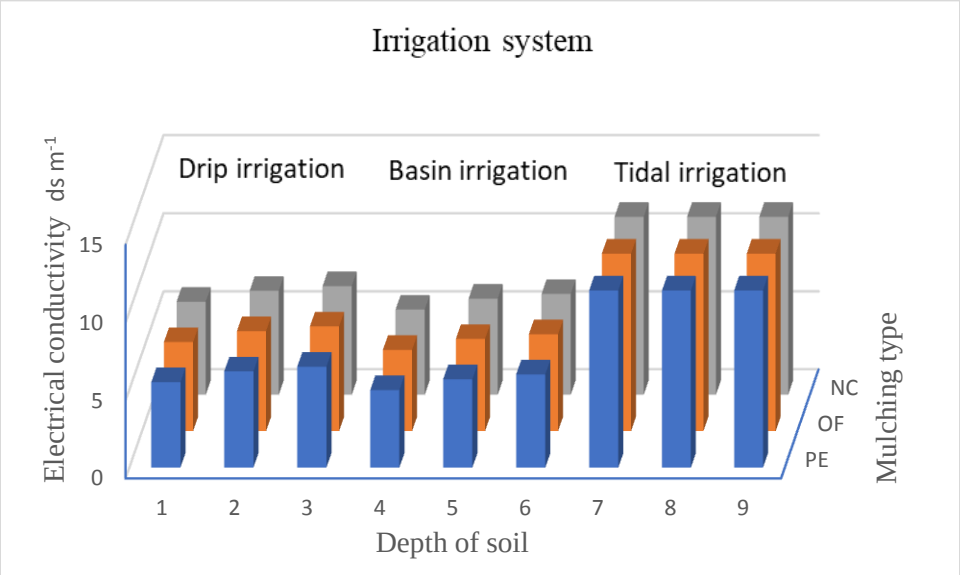

Figure 2. The effect of irrigation method and mulching type, as well as depth variation, on electrical conductivity. Data is the mean for three replicates at each level. (PE) polyethylene, (OF) organic fertilizer, (NC) no coverage. (1, 4, 7) 0-30 depth. (2, 5, 8) 30-60 depth. (3, 6, 9) 60-90 depth.

The productive characteristics of date palms.

fruit length

The results of statistical analysis showed a significant effect of irrigation method on the average fruit length of the Sayer date palm variety, and this effect varied depending on the different methods used in the study. The highest values were obtained from the drip irrigation treatment, followed by the basin irrigation treatment, while the lowest values were obtained from the tidal irrigation treatment and showed significant differences (Figure, 3A). The reason for this is the role of adding irrigation water from above in increasing the moisture content of the soil and meeting the necessary needs of the plant such as absorption processes, nutrient readiness, transport, and increasing cell turgor pressure, in addition to the role of adding water in these ways in washing salts from the soil sector and encouraging the growth of soil microorganisms (Ayotamuno et al., 2007), compared to the decrease in soil moisture content when irrigated by tidal irrigation (subsurface irrigation) and the increase in electrical conductivity values. Al-

Tamimi (2006) pointed out that the trait of fruit length is determined by environmental factors represented by soil, water, and weather conditions in addition to genetic factors. The significant superiority of drip irrigation treatment in fruit length values is due to the aforementioned reasons, which include maintaining soil properties from degradation, most importantly soil structure building, improving ventilation, root growth, and infiltration, and avoiding high moisture stress. The effect of the type of mulch on fruit length values showed significant differences between the values. The polyethylene mulching treatment achieved significant superiority, followed by the organic fertilizer mulching treatment, while the uncovered treatment showed the lowest values. The reason for this may be the decrease in moisture content and the increase in electrical conductivity values of the uncovered treatment compared to the other coverage treatments, which negatively affects physiological processes occurring inside the plant and their effect on production traits, including fruit length. Significant effects were observed for the interactions between irrigation methods and mulching types. The interaction between drip irrigation treatment and polyethylene mulching treatment showed the highest values in fruit length.

Fruit weight

The results showed that the effect of drip irrigation and basin irrigation on the average fruit weight differed significantly from the values obtained using the traditional method of tidal irrigation, which showed the lowest values. (Figure, 3B). This variation in fruit weight values is attributed to the differences in the irrigation methods used to supply and add water. The decrease in fruit weight when using tidal irrigation is due to the low water availability at this treatment, especially at the effective depth of palm tree roots (0-60 cm) (Alhamd, 2016), which negatively affects the productive characteristics of palm trees, including fruit weight, compared to the other two methods where water is added from above. Water plays a significant role in the process of photosynthesis and other physiological processes, and as the medium in which all biological chemical reactions occur, it is important in the process of nutrient transfer and distribution, in addition to its role in washing salts and providing a suitable environment for plant growth. The results also showed that the effect of the mulching treatments with polyethylene, organic fertilizer, and uncovered in the values of fruit weight. The mulching treatments showed significant differences among them, as the treatment with polyethylene recorded the highest rate of fruit weight, followed by the organic fertilizer mulching, while the lowest value was recorded in the uncovered treatment. The increase in fruit weight with mulching treatment is attributed to the fact that the covering increased the soil moisture content and encouraged root growth and

spread, increasing their ability to absorb water and nutrients, which positively affected the vegetative growth, production rate, and fruit weight (Al-Dougeji et al., 2009).

Total sugar content

The results of the study showed a significant effect of irrigation method on the total sugar content in the fruits of the Sayer date palm variety, and that this effect varies depending on the irrigation method used. (Figure, 3C). Drip irrigation treatment superiority on other treatments in terms of total sugar content in fruits, followed by the basin irrigation treatment, while the tidal irrigation treatment recorded the lowest level of total sugar content. The reason for the increase in total sugar content in fruits under drip irrigation may be because of this irrigation system on improving some physical soil properties, which reflected on the growth and production rate of date palms. The decrease in total sugar content under traditional irrigation (tidal irrigation) may be due to the decrease in moisture content and the increase in soil electrical conductivity values.

The results also showed significant differences in total sugar content among the mulch treatments (polyethylene, organic fertilizer, and uncovered), with the polyethylene mulching treatment recording the highest values and the uncovered treatment recording the lowest values with significant differences. There were also significant interactions between irrigation methods and mulch types, with the drip irrigation and polyethylene mulching treatment showing the highest total sugar content rate and significant difference from other interaction treatments, while the tidal irrigation and cover treatments showed the lowest values and significant differences. The type of mulching has a significant effect on the total sugar content rate of fruits due to its positive role in increasing soil water retention and reducing salinity effects, as well as its effects in maintaining some physical soil properties and increasing soil biological activity, which positively affected plant production. (Gisela, 2007).

The total yield

The overall yield showed significant differences among the three irrigation methods (drip, basin, and tides) for date palm fruits. (Figure, 3D). The basin irrigation treatment performed significantly better than the other treatments, followed by the drip irrigation treatment, while the tides irrigation treatment had the lowest yield values with a significant difference. The decrease in the overall yield of date palms with the tides irrigation treatment may be due to the lower moisture content and higher electrical conductivity values of the soil compared to the other irrigation methods. The relationship between palm productivity and moisture content was found to be positively correlated and significant, while the relationship with soil salinity was negatively

correlated. The increase in soil salinity is known to cause damage to date palm trees, negatively impacting their productivity. Regarding the effect of the type of mulching on the overall yield rate, the results showed that the polyethylene mulching treatment outperformed the other treatments, followed by the organic fertilizer mulching treatment and then the uncovered treatment. This effect can be attributed to the mulch ability to increase soil water retention, decrease the salt effect, and increase the availability of nutrients, leading to positive effects on the growth and productivity of date palms. Chalker-Scott (2007) suggested that soil mulching techniques in dry and semi-dry areas are used to reduce evaporation losses and maintain soil moisture close to the field capacity limits in the effective absorption area, leading to an increase in water and nutrient use efficiency and ultimately reflected in increased productivity.

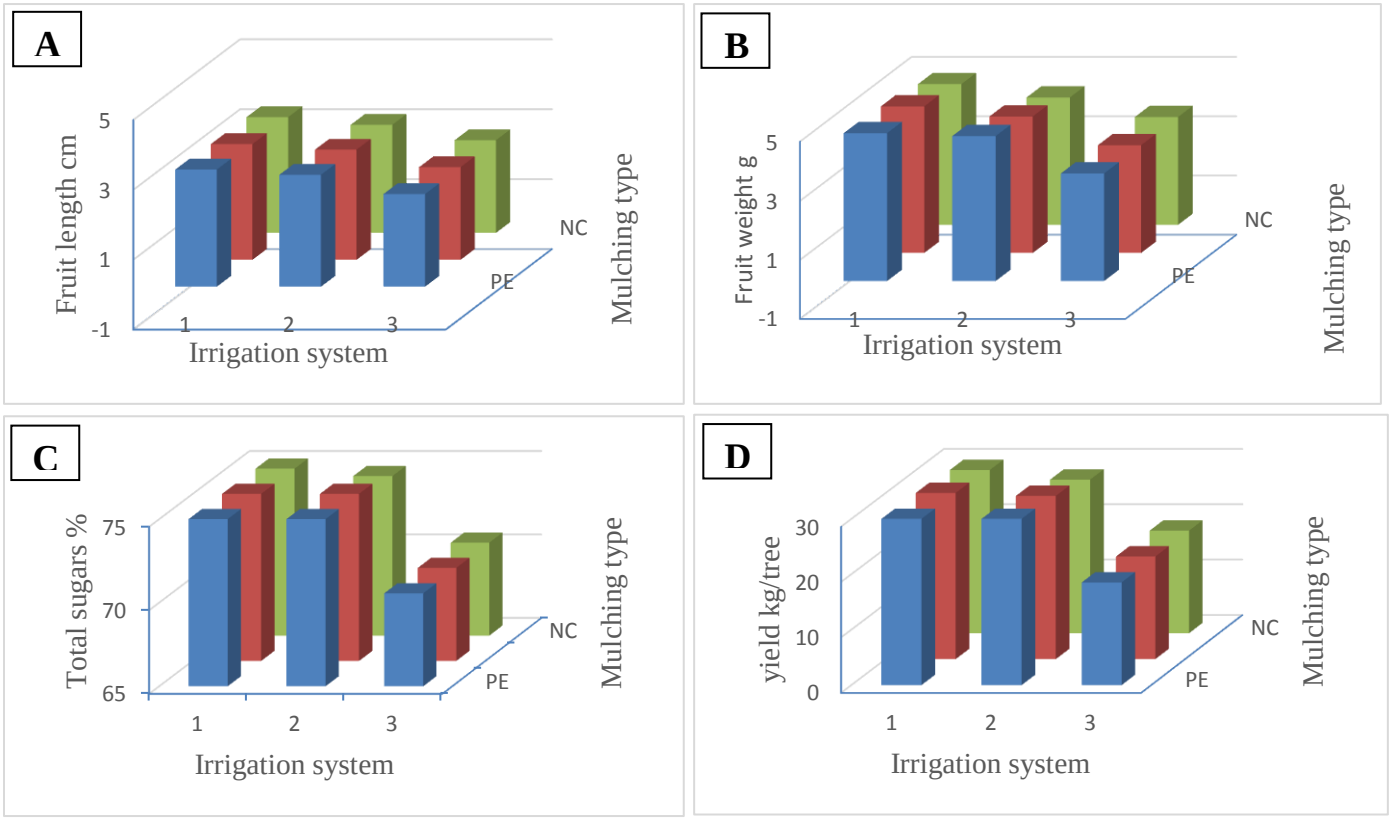

Figure (3). The effect of different treatments on productive of date palm and some fruit characteristics. (PE) polyethylene, (OF) organic fertilizer, (NC) no coverage. (A) The effect of different treatments on fruit length. (B) The effect of different treatments on fruit weight. (C) The effect of different treatments on total sugars. (D) The effect of different treatments on the yield of date palm. (1, 2, 3) represent the irrigation system, drip irrigation, basin irrigation and tidal irrigation respectively.

Conclusions

The traditional irrigation method (tidal), which prepares water for the plant using subsurface irrigation, is no longer sufficient to provide suitable moisture for the growth and productivity of date palms, due to the low water levels in the Shatt al-Arab. Therefore, it is necessary to follow other alternative irrigation methods such as using drip irrigation or basin irrigation. Using proper irrigation methods and soil mulching system may lead to improve the environmental conditions, soil characteristics, and improving the growth and productivity of date palms.

References

Abdul-Aali, H., H. (2011). The role of soil surface cover, irrigation levels, and fertilization in some soil properties and the growth and production of tomato plants. Ph.D. thesis, College of agriculture, University of Basrah, Iraq. (In Arabic)

Adil, M., Samia, H., Sakher, M., El Hafed, K., Naima, K., Kawther, L & Amor, H. (2015). Date palm (*Phoenix dactylifera* L.) irrigation water requirements as affected by salinity in Oued Righ conditions, Northeastern Sahara, Algeria. Asian Journal of Crop Science, 7(3), 174-185.

Al-Dougeji, E.H., Ubaid, A.K., Abdul-Rauf, T., Abdul-Imam, H., and Kazim, M.J. (2009). The effect of planting distances and soil cover on the growth and yield of tomato (*Lycopersicon esculentum* Mill) variety Newton grown in plastic greenhouses. Basrah journal of agricultural sciences, 2(2): 66-78.

Al-Fayadh, J.M.S. (2012). The effect of tidal water irrigation on some soil properties of date palm orchards and groundwater in the adjacent soil of Hamdan river in the Arabian Gulf. Ph.D. Thesis, College of agriculture, University of Basrah..

Al-Janabi, M., A., A.; Al-Hadithi, E., K., H., and Al-Marsoumi, H., G., K. (2012). The effect of organic matter, soil cover, and drip irrigation method on moisture and salt distributions. Al-Anbar Journal of agricultural sciences, 4 (2):104-109.

Alhamd, A. D. (2010). Effect of Irrigation water quality of Al-Sidoor and Al-Thanaaeb Locations on Some Productivity Properties for Date Palm Phoenix dactylifera L. C.V. Berhi and Hillawi. Journal of basrah researches sciences,36(3),57-65.

Alhamd, A. D.; Al-Najar, M. Shareef, H., J. (2016). Effect of Abu-Al-Khaseeb River Basin variations Saline Soils on the intensity and productivity of date palm *Phoenix dactylifera* L. Journal of basrah researches sciences, 2(42),92-105.

Al-Taif, Nabil Ibrahim and Al-Hadithi, E., K. (1988). Irrigation: Fundamentals and applications. College of Agriculture - University of Baghdad, 434 pages.

Al-Tamimi, I., H. (2006). Using mathematical modeling to predict the productivity of the date palm (Phoenix dactylifera L.) variety Al-Halawi under the influence of variations in some production factors. College of Agriculture, University of Basrah - Iraq. Dissertation.

Al-Yahyai, R., & Al-Kharusi, L. (2012). Sub-optimal irrigation affects chemical quality attributes of dates during fruit development. African Journal of Agricultural Research, 7(10), 1498-1503.

Ayotamuno, J. M.; Zuofa, K.; Ofori, S. A. and Kogbara, R. B. (2007). Response of maize and cucumber intercrop to soil moisture control through irrigation and mulching during the dry season in Nigeria. African, J. of Biotech, 6(5): 509-511.

Black, C. A. D. D. Evans; J. L. Whit; L. E. Ensminger and F. E. Clark, (1965). Methods Of Soil Analysis. Part 1, No.9. Am. Soc. Agron. Madison, Wisconsin, USA.

Cattarossia (2011). Andrea Republic of Iraq Ministry of water Resources Shatt AL-Arab Irrigation Project Analysis of the Salinity problem along the river.

Chalker-Scott, L. (2007). Impact of mulches on landscape plant. J. Environ. Hort. 25(4): 239-249.

Dobius, M.K.; K.A. Crills; J.K. Hamiltor; D.A. Rebers and F.Smith (1956) . Colorimetric method for determination of sugars and substances. Anal. Chem., 28: 350 – 356.

FAOSTAT, F. (2021). Agriculture Organization of the United Nations Statistics Division 2019. Production Available in: http://www.fao.org/faostat/en/#data/QC

Gisela, R. R. (2007). Effect of rice bran mulching on growth and yield of cherry tomato. Cien. Inv. Agr., 34(3): 181-186.

Mahdi, N., T. and Mohammed, H., A. (2012). Using irrigation systems for Alfalfa and evaluating water use efficiency. Journal of agricultural sciences, 43(4): 136-149.

Mazen, S. B., El-Gindy, A. M., Arafa, Y. E., & Ibrahim, AA, A. (2018). A Comparative Study of Traditional and Modern Irrigation Systems Management for Irrigating Date Palm Trees in Newly Reclaimed Lands. Arab Universities Journal of Agricultural Sciences, 26(Special issue (2C)), 1957-1965. DOI: 10.21608/ajs.2018.31663.

أثير طريقة الري والتغطية بالتربة على خصائص التربة وإنتاجية نخيل التمر *Phoenix dactylifera L*

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الخلاصة

يهدف تحسين إدارة التربة والمياه واستخدام تقنيات الري الحديثة إلى تقليل هدر المياه وزيادة كفاءة استخدامها، حيث يعد تبني طرق الري التي تضمن توازن ملوحة المياه في التربة بما يتناسب مع نمو وإنتاجية المحاصيل أمرًا بالغ الأهمية. تم إجراء تجربة حقلية في بساتين نخيل التمر الخاصة في منطقة حمدان/ قضاء أبو الخصيب، على بعد 10 كم جنوب مدينة البصرة، خلال موسمي النمو 2020-2021، على أرض مساحتها 4 دونمات، بهدف دراسة تأثير طريقة الري والتغطية على خصائص التربة وإنتاجية نخيل التمر. أظهرت النتائج أن استخدام الري من الأعلى بطريقة الأحواض والري بالتنقيط أدى إلى زيادة محتوى التربة من الرطوبة، وانخفاض قيم التوصيل الكهربائي للتربة، وزيادة إنتاجية النخيل (الوزن، الطول، السكريات الكلية، والإنتاج الكلي) مقارنة باستخدام طريقة الري التقليدية (المد والجزر). كما أظهرت النتائج أن استخدام التغطية للتربة في أحواض الري ساهم بشكل ملحوظ في زيادة محتوى التربة من الرطوبة وتقليل قيم التوصيل الكهربائي عند أعماق مختلفة، خاصة عند استخدام التغطية بالبولي إيثيلين. تبين أن طريقة الري التقليدية (المد والجزر)، التي تعتمد على توفير المياه عبر الري تحت السطحي، لم تعد كافية لتوفير الرطوبة اللازمة لنمو وإنتاجية أشجار النخيل. وعليه، يجب اتباع طرق ري أخرى، مثل الري بالأحواض والري بالتنقيط، وتحسين الظروف البيئية باستخدام نظام تغطية التربة

الكلمات المفتاحية: خيل التمر، تغطية التربة، الري، عمق التربة، الملوحة، محتوى الرطوبة.