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RESPONSE OF DATE PALM CULTIVAR AL-HALAWI TO NANO- AND BIO-FERTILIZATION AND FRUIT THINNING AND THEIR EFFECT ON SOME FRUIT TRAITS AND YIELD QUANTITY

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Abstract

The experiment was carried out in one of the private orchards in Al-Saniya district, Al-Diwaniyah city, during the growing season (2020) on palm trees phoenix dactylifera L cultivar Al-Halawi to study the effect of spraying with nano-fertilizer (NPK) neutral (20: 20: 20) at concentrations (N1 =0. N2=1. N3=2) g. L^{-1} and mycorrhizal fungus at a rate of (B1=0, B2=75) g. tree-1, and thinning (T2=8 and T1= 12)bunches .Tree-1) and the interaction between the three treatments in some characteristics of the fruit and yield For Al- Halawi palm variety, it was implemented as a factorial experiment and was designed according to the design of randomized complete sectors (RCBD) with three factors distributed randomly in three sectors, and the study showed a significant effect for each of the spraying with nano-fertilizer and the mycorrhizal fungus, each separately. There was an increase in the fruit weight, size, seed weight,bunch weight and the increase in the amount of yield, The treatment of the thinning showed a significant effect on the physical characteristics of the fruits, as increasing the weight and size of the fruits, the weight of the seed and the weight of the bunches increased, and the quantity of the total yield was not affected Also, the bi-interactions (T*B), (N*T), (N*B) and the triple interactions (N*B*T) showed a significant effect in most of the studied traits, as they took the same course as the effect of the treatments of nanofertilizer and mycorrhizae with high interaction effect values.

Keywords: date palm, fruit thinning, yield quantity

Introduction

The date palm, L. Phoenix dactylifera, belonging to the family Arecaceae, is considered one of the perennial fruit trees of historical and economic importance. Its historical importance comes from its association with the culture of the peoples of the countries, which evidence indicates is the original home of the date palm. Some archaeological texts have mentioned (It is the sacred tree whose branches reach the sky and whose roots go deep into the distant depths of the soil (Ghalib, 2018). There are also references to it in the civilization of Sumer, Arida, and the Obelisk of Hammurabi in Mesopotamia 4000 BC, as well as the Pharaonic civilization in Egypt around 3000 BC. It was mentioned in the holy books, such as the Torah and the Bible, and dozens of places in the Holy Qur'an. Its economic importance comes from the nutritional value of the fruits, which are an important source of food and energy, where they contain a high percentage of carbohydrates, fiber, proteins and fats. They are also a rich source of potassium, iron, calcium, phosphorus, manganese, vitamins (A, B, E, B6) and some vital compounds (Al-Akeli, 2018) in addition to the entry of fruits and the rest of the date palm parts into many food industries and simple popular

industries. The sweet cultivar is considered one of the important and widespread varieties in Iraq, as the number of trees planted from it is (661.67) trees, and statistics indicate that there are approximately 100 million palm trees in The world and a few decades ago, Iraq was the first palm country in the world, as the number of palm trees reached more than 30 million palm trees, but due to wars, neglect and bulldozing, this number decreased to about 17.34 million palm trees, according to the data of the Central Statistical Organization (2020)The palm tree, like other fruit trees, needs service operations to obtain good vegetative growth and fruiting, and fertilization is one of the important service factors needed by the date palm, as fertilization plays an important and essential role in increasing vegetative growth rates and improving the qualitative characteristics of the fruits (Sharawy, 2005). With the process of good fertilization with the availability of ideal growth factors, an increase in the growth and production of crops (Shawki and Al-Jawthuri, 2011 (Foliar nutrition is one of the important methods of supplying plants with nutrients, especially in soils that suffer from low nutrients (Al-Tamimi, 2014). Saleh, 2001) Nanotechnology has been introduced in agriculture by using nano-fertilizers that increase yields, reduce agricultural costs, and the availability of nutrients, which reflects positively on crop quality and increased production (Saleh, 2015.(The rapid increase in the number of populations around the world requires a corresponding increase in food production to fill the shortfall, so the tendency towards developing crop production using biological alternatives began to compensate for the excessive use of chemical fertilizers and thus reduce environmental pollution, as well as increase production in soil conditions that suffer from salt stress. Or with the presence of plant pathogenic pests (Ball 2003). Mycorrhiza fungus has an important and significant role in supplying plants with macronutrients such as phosphorus, nitrogen, sulfur and some other elements (Zn, Cu) (Matrood, 2017). In his study, (Obeid, 2014) referred to the response of palm trees Dates were Al-Sultani cultivar for treatment with the mycorrhiza fungus, if the results showed significant differences in most of the vegetative traits, such as the number of leaves and their content of chlorophyll, nitrogen, potassium, phosphorus, and some traits of the yield, such as size, weight, and content of total soluble sugars .The thinning of the fruits is one of the important agricultural operations that play a distinctive role in the production of dates (Harhash, 2000), where the thinning process leads to improving the quality traits of the crop and raising the marketing value of the fruits, whether in the local or international markets. It also leads to a balance between the vegetative and fruiting aggregates, and thus reduces the state of resistance. The thinning process is carried out by removing the stalks, shortening them, or completely removing the stems, depending on the nature of the cultivar and the period of the thinning procedure (Ibrahim, 2019)

Materials and methods

Experiment location

The study was conducted in one of the orchards of Al-Diwaniyah city / Al-Sinya district during the growing season 2020.As 36 date palm trees of Al-Halawi cultivar were selected, and they were as homogeneous as possible in terms of height, size, age, and vegetative growth, and the number of leaves (fronds) was unified for all the selected trees.The process of preparing the orchard was carried out by placing the experimental marks in their places and placing the marks on the selected

trees to indicate the trees and the type of treatments for each tree, where each tree was considered an experimental unit.

study treatments

The study was conducted as a factorial experiment (3x2x2) according to the randomized complete block design and contained (12) treatments with three replicates, one tree for each replicate, with a total of (36) trees. The treatments were conducted as follows:

• Add neutral NPK 20,20,20, spraying on the leaves, with four appointments, between one date and the last 15 days, starting from May 5..... and ending with June 20, 2020 and on three levels

N1: (control treatment) 0 g/L spraying with water only

(1 g/L): N2 at an average of (25) liters per spray, equivalent to (100) gm for the four sprays

(,2 g/L): N3, at the rate of (25) liters per spray, equivalent to (200) gm for the four sprays.

• Bio fertilizer (mycorrhiza fungus) was added to the trees at two levels:

• B1 (zero gm / control tree)

• B2 (75 gm / tree), by tillag pits at a distance of one meter and a depth of (50 cm) from four sides around the treated tree, and the date of addition was May 4, 2020

• A thinning operation was performed immediately after the sets, whereby some weak bunch were removed and two levels of taste were preserved:

• T1: twelve bunch bunch / palm, which is the control treatment

•: T2 eight bunchs / palm tree.....

Service operations were conducted on time, including spider and insect control, hanging operations, and percussion of all the orchard trees.

Experimental design and statistical analysis

The experiment was implemented as a factorial experiment (3 * 2 * 2) with three factors and according to the levels mentioned above, and it was designed according to the Randomized Complete Block Design (R C B D) and the results were analyzed according to the V12 Genstat statistical program, and the averages were compared according to the least significant difference L.S.D At a significant level of 0.05 (Al-Rawi and Khalaf, 1980).

studied traits

Fruit size: The fruit size was calculated by placing ten fruits inside a graduated cylinder and calculating the volume of displaced water that represents the size of the fruits, and then extracting the average size of one fruit.fruit weight. The fresh weight of the fruits was calculated by taking (25) fruits randomly from each refined and weighing them with a sensitive scale and extracting the average.

Seed weight: The seeds of the fruits whose weight was measured were extracted, the seed weight was measured, and then the average seed weight was extracted.

The bunch weight: extracting the bunch weight for each treatment through the amount of the total yield divided by the number of bunches

Total yield quantity: The fruits of each palm tree were harvested separately and weighed with a field scale. The weight of the total yield was extracted in kilog.

Results

fruit size:

The results in Table (1) indicate a significant increase in the size of the fruit as a result of the treatment with nanofertilizer. Where the level (N3) recorded the highest rates in terms of volume compared to the rest of the treatments.The average volume was (13.39) cm3, and the lowest value was for (N1) treatment, which amounted to (12.49) cm3.The treatment with mycorrhiza fungus (B2) gave the highest rate of fruit size (13.59 cm3) compared to treatment (B1), which had the lowest rate of (12.29 cm3).The results indicated that there was a significant effect of the treatment of thinning() (T2), where it significantly increased the average fruit size, recording an average of (13.79) cm 3, compared to the treatment (T1), which reached the lowest rate of (12.08) cm 3.

The interaction between nanofertilizer and mycorrhiza had a significant effect on increasing the size of the fruit, where the highest value of the interaction was (N3B2) with a rate of (13.97), while the interaction(N1B1) had the lowest rate of (11.84) cm3.The interaction of nano-fertilization with moth had a significant effect on increasing the size of the fruit, as the interaction (N3T2) excelled in all treatments and recorded an average of (14.24) cm3. While the treatment (N1T1) recorded the lowest rate among the interaction treatments, which was (11.59) cm3. The interaction of biofertilization with slip (B2T2) showed a significantly excelled an average (14.28) cm3 on the interaction treatment (B1T1), which recorded the lowest value with an average fruit size of (11.26) cm3. The results indicate a significant effect of the interaction between nanofertilizers, macaws and moths, where the interaction (N3B2T2) was significantly excelled in the average fruit size on the rest of the treatments an average (14.63) cm3, while the control treatment (N1B1T1) recorded the lowest rate of (10.84) cm3.

Table 1: Effect of spraying with nano-fertilizer, fertilizing with mycorrhiza, and bunch thinning on fruit size (cm3)

interaction N*B	Thinning		bio-fertilizer	nano fertilizer
	T2	T1		
11.84	12.84	10.84	**B1**	**N1**
13.14	13.93	12.35	**B2**	
12.21	13.23	11.20	**B1**	**N2**
13.65	14.27	13.03	**B2**	
12.80	13.85	11.76	**B1**	**N3**
13.97	14.63	13.31	**B2**	
0.181	0.256		**L.S.D0.05**	
average N	**interaction N*T**			
12.49	13.38	11.59	**N1**	
12.93	13.75	12.12	**N2**	
13.39	14.24	12.53	**N3**	
0.12	0.181		**L.S.D0.05**	
average B	**interaction B*T**			
12.29	13.31	11.26	**B1**	
13.59	14.28	12.89	**B2**	

0.104	0.147		**L.S.D0.05**
0.104	13.79	12.08	**average T**

Fruit weight:

It appears from the results in Table (2) that there is a significant effect of the nano-fertilizer treatment on the average fruit weight, where treatment (N3) gave an average of (13.86) gm, with a significantly excelled on the rest of the treatments, while treatment (N1) gave the lowest values with an average of (12.89) gm. The results also indicate that there is a significant effect of treatment with mycorrhizal fungus (B2).It recorded a significant increase in the weight of the fruit at an average of (14.03) gm, compared to the treatment (B1), which recorded the lowest value at an average of (12.71) gm. The results of the table showed a significant effect of the decrease in the average weight of the fruit, as the treatment (T2) gave an increase Significantly in the weight of the fruit at a rate of (14.33) gm, while treatment (T1) recorded the lowest rate of (12.41) gm.The results indicated a significant effect of the interaction of nanofertilizer and mycorrhiza fungus on the average fruit weight.The interaction (N3B2) recorded the highest values with an average of (14.46) gm, excelled on the rest of the treatments, while the lowest value of interaction (N1B1) was (12.21) gm. The results also indicated that the interaction between the nano-fertilizer and the thinning gave a significant effect on increasing the weight of the fruit, as the interaction (N3T2) excelled on all treatments at a rate of (14.79), while the treatment (N1T1) gave the least values at a rate of (11.85) g.The interaction of biofertilization (mycorrhiza fungus) and thinning had a significant effect, where the interaction exceeded (B2T2) with the highest value, while the interaction value (B1T1) was the lowest, and the results were (14.83) and (11.60) g, respectively.The results indicate that there is a significant increase in the average fruit weight as a result of the triple interaction of nano-fertilizer, mycorrhiza and moth.

Table 2: Effect of spraying with nano-fertilizer, fertilizing with mycorrhiza, and bunch thinning on fruit weight (gm)

interaction N*B	Thinning		bio-fertilizer	nano fertilizer
	T2	T1		
0.818	0.833	0.804	B1	N1
0.848	0.862	0.833	B2	
0.834	0.854	0.815	B1	N2
0.877	0.892	0.862	B2	
0.845	0.865	0.826	B1	N3
0.892	0.913	0.871	B2	
0.006	0.009		L.S.D0.05	
average N	interaction N*T			
0.833	0.847	0.818	N1	
0.855	0.873	0.838	N2	
0.868	0.889	0.848	N3	

0.004	0.006		L.S.D0.05
average B	interaction B*T		
0.832	0.850	0.815	B1
0.872	0.889	0.855	B2
0.004	0.005		L.S.D0.05
0.004	0.870	0.835	average T

seed weight:

It appears from the results in Table (3) that there is a significant effect of the nano-fertilizer treatment on the average seed weight, where the treatment (N3) gave an average of (0.868) g, with a significant increase on the rest of the treatments, while the treatment (N1) recorded the lowest values with an average of (0.833) g.The results also indicate that there is a significant effect of the treatment with mycorrhizal fungus (B2), where it recorded a significant increase in the seed weight at an average of (0.872) g, compared to the treatment (B1), which recorded the lowest value at an average of (0.832) g.The results of the table also indicated that there was a significant effect of thinning, where treatment (T2) showed a significant increase in seed weight at an average of (0.870) gm, while treatment (T1) recorded the lowest rate of (0.835) gm.It was noted from the results a significant effect of the interaction of nanofertilizer and mycorrhiza fungus, where the interaction (N3B2) recorded the highest value at a rate of (0.892) g, excelled on the rest of the treatments, while the lowest value was the interaction (N1B1) at a rate of (0.818) g.The results showed that the interaction between the nano fertilizer and the light had a significant effect on the increase in the weight of the seed, where the interaction (N3T2)excelled an average (0.889) gm, excelled on the rest of the treatments, while the control treatment (N1T1) gave the lowest values and an average of (0.818) gm.The interaction of biofertilization (mycorrhiza fungus) and thinning had a significant effect, where the interaction exceeded (B2T2) with the highest value, while the interaction value (B1T1) was the lowest, and the results were (0.889) g and (0.815) g, respectively. The results show that there is a significant difference for the triple interaction (N3B2T2) in the average seed weight, as it recorded the highest rate of (0.913) g, surpassing all treatments. While the control treatment (N1B1T1) gave the lowest value with an average of (0.804) g.

Table 3: Effect of spraying with nano-fertilizer, fertilizing with mycorrhiza and bunch thinning on seed weight (gm)

interaction N*B	Thinning		bio-fertilizer	nano fertilizer
	T2	T1		
0.818	0.833	0.804	B1	N1
0.848	0.862	0.833	B2	
0.834	0.854	0.815	B1	N2
0.877	0.892	0.862	B2	
0.845	0.865	0.826	B1	N3

0.892	0.913	0.871	B2
0.006	0.009		L.S.D0.05
average N	interaction N*T		
0.833	0.847	0.818	N1
0.855	0.873	0.838	N2
0.868	0.889	0.848	N3
0.004	0.006		L.S.D0.05
average B	interaction B*T		
0.832	0.850	0.815	B1
0.872	0.889	0.855	B2
0.004	0.005		L.S.D0.05
0.004	0.870	0.835	average T

bunch weight

It appears from the results in Table (4) that there is a significant effect of the nano-fertilizer treatment on the average bunch weight, where treatment (N3) gave an average of (8.46) kg, with a significantly excelled on the rest of the treatments, while (N1) gave the lowest value in the average bunch weight by (7.89). kg.The results also indicate that there is a significant effect of the treatment with mycorrhizal fungus (B2), where it recorded a significant increase in the weight of the bunch, with an average of (8.61) kg, compared to the control treatment (B1), which recorded the lowest value, with an average of (7.77) kg.The thinning treatment showed a significant increase in the average bunch weight, as the T2 treatment gave an average of (9.81) kg, while the T1 treatment rate was the lowest, reaching (6.57) kg. The results showed a significant effect of the interaction of nanofertilizer and mycorrhiza fungus, where the interaction (N3B2) recorded the highest values with an average of (8.89) kg, while the lowest value of interaction (N1B1) was (7.47) kg.From the same table, the interaction between nano-fertilizer and mitigation showed a significant effect on the height of the bunch weight, as the interaction (N3T2) excelled on the rest of the treatments at a rate of (10.11) kg, while the treatment (N1T1) gave the lowest values at a rate of (6.28) kg.The interaction of biofertilization (mycorrhizal diameter) and thinning had a significant effect, as the interaction exceeded (B2T2) with the highest value, while the interaction value (B1T1) was the lowest, and the results were (10.30) and (6.23) kg, respectively.The results indicate that there is a significant difference of the triple interaction (N3B2T2) in the average cluster weight, as it recorded the highest rate of (10.58) kg, excelled on all treatments, and the interaction record (N1B1T1) had the lowest value, with a rate of (6.01) kg.

Table 4: Effect of spraying with nano-fertilizer, fertilizing with mycorrhiza, and mycorrhiza and bunch thinning on bunch weight(kg)

interaction N*B	**Thinning**		**bio-fertilizer**	**nano fertilizer**
	T2	**T1**		
7.47	8.94	6.01	**B1**	**N1**

8.31	10.08	6.54	**B2**	
7.80	9.37	6.24	**B1**	**N2**
8.64	10.25	7.02	**B2**	
8.04	9.64	6.43	**B1**	**N3**
8.89	10.58	7.2	**B2**	
0.21	0.31		**L.S.D0.05**	
average N	**interaction N*T**			
7.89	9.51	6.28	**N1**	
8.22	9.81	6.63	**N2**	
8.46	10.11	6.81	**N3**	
0.15	0.21		**L.S.D0.05**	
average B	**interaction B*T**			
7.77	9.32	6.23	**B1**	
8.61	10.30	6.92	**B2**	
0.12	0.17		**L.S.D0.05**	
0.12	9.81	6.57	**average T**	

It appears from the results in Table (5) that there is a significant effect of the treatment with nanofertilizer on the rate of the amount of yield, as the treatment (N3) gave an average of (81.38) kg, with a significantly excelled on rest of treatment,While the treatment (N1) recorded the lowest values with an average of (75.86) kg. It also appeared from the same table that there was a significant effect of the treatment with mycorrhizal fungus (B2), as it recorded a significant increase in the weight of the total crop, with an average of (82.75) kg, compared to the control treatment (B1), which recorded the lowest value and an average of (74.75) kg. The results of the table indicated that there was no significant effect of lightness on the amount of the total yield, where the treatment with the second level of thinning (T2) showed a decrease in the quantity of the yield by an amount that did not amount to significant, as it gave a yield of (78.50) kg, while the control treatment (T1) recorded an increase Slightly (79.00) kg. The results showed a significant effect of the interaction of nano-fertilizer and mycorrhiza fungus, as the interaction (N3B2) recorded the highest values with an average of (85.53) kg, while the lowest value was for treatment (N1B1), which recorded an average of (72.16) kg.The results indicated that the interaction between nano-fertilizer and light had a significant effect on the increase in the amount of yield, as the interaction (N3T2) excelled on an average (80.93) kg, recording the highest value among the treatments, while the treatment (N1T1) gave the lowest values at a rate of (75.69) kg.The interaction of biofertilization (mycorrhizal diameter) and thinning had a significant effect on the amount of total yield, where it was significantly excelled on the interaction (B2T2) with the highest value, while the interaction value (B1T1) was the lowest, and the results were (82.43) kg and (74.69) kg, respectively.The study showed that the triple interaction (N3B2T1) showed an increase in the yield rate, as it recorded the highest rate of (86.4) kg, excelled on all treatments, and with a non-significant difference from the interaction (N3B2T2), which recorded an average

of (84.67) kg, while the control treatment was (N1B1T1).) is the lowest value, reaching an average of (72.82) kg.

Table 5: Effect of spraying with nano-fertilizer, fertilizing with mycorrhiza, and mycorrhiza and bunch thinning on amount of total yield (kg)

interaction N*B	Thinning		bio- fertilizer	nano fertilizer
	T2	T1		
72.16	71.49	72.82	B1	N1
79.57	80.58	78.56	B2	
74.86	74.99	74.74	B1	N2
83.15	82.05	84.24	B2	
77.22	77.20	77.24	B1	N3
85.53	84.67	86.40	B2	
2.13	3.01		L.S.D0.05	
average N	interaction N*T			
75.86	76.03	75.69	N1	
79.00	78.52	79.49	N2	
81.38	80.93	81.82	N3	
1.50	2.13		L.S.D0.05	
average B	interaction B*T			
74.75	74.56	74.93	B1	
82.75	82.43	83.07	B2	
1.23	1.73		L.S.D0.05	
1.23	78.50	79.00	average T	

Discussion :

There were significant differences in the physical traits of the fruits as a result of the study treatments, where the nano-fertilization (NPK) caused a significant increase in the physical characteristics of the fruits, and the increase was directly proportional to the increase in the fertilizer concentration, as the treatment (2 g / liter N3) gave higher significant differences than (the treatment 1 g / liter N2) and the comparison treatment as shown in Tables (1), (2) and (3). The reason may be due to the role that nitrogen plays in building proteins and nucleic acids in fruits and increasing the production of carbohydrates as a result of activating the process of photosynthesis (Mengel & Kirkby 1982).

Increasing the absorption of macronutrients increases their content in the leaves and thus improves the quality and quantity of the yield, as these elements contribute to encouraging the growth of meristematic tissues and increase the efficiency of the photosynthesis process, which causes an increase in the weight of the fruits, as the increase in the concentration of these elements in the leaves causes an increase in organic acids and proteins And carbohydrates that are transferred to the fruits to cause an increase in the weight of the fruits (Al-Nuaimi 1999) The

spraying with nano-fertilizer has encouraged the process of photosynthesis and vegetative growth as a result of the increase in the composition of chlorophyll and thus produced an increase in the amount of food processing that is transmitted to the fruits and causes an increase in their growth (Al-Rasool 2008) Consequently, there was an increase in the weight of the fruits (Table 2) and their size (Table 1), and the positive effect of nano-fertilizer on the fruits was also reflected in the weight of the bunch (Table 4), and thus the weight of the bunch and the amount of yield increased as in (Table 5).

The reason for the increase in the weight of the nucleus (3) may be due to the role of macronutrients, especially nitrogen, in increasing the efficiency of photosynthesis, and thus the increase in its products that are transmitted to the fruit, resulting in an increase in the weight of the fruit (Hassan et al. 1990). The reason for the increase in the weight of the nucleus may be due to an increase in the concentration of phosphorous It affects the production of fruits and grains (Awwad, 1987), and these results were consistent with the study of Al-Tamimi and others (2019) on date palms Al-Zuhdi, Al-Khastawi and Al-Jadoui (2020) on grapes and Al-Awadi (2020) on figs, and the study showed significant differences in the traits of the physical fruits The weight of the fruit, the weight of the seed, in addition to the weight of the stalk, and the quantity of the yield as a result of the treatment with the mycorrhizal fungus.

The reason may be due to the great role of mycorrhiza in increasing the readiness of phosphorus in the plant, and this in turn works to stimulate the growth and branching of the roots, which reflects positively on the absorption of nutrients (Al-Mawsali et al., 2019). Phosphorus is also important in increasing the percentage of chlorophyll in the leaves, due to its entry into the synthesis of (ADP). , ATP), which are the energy-carrying compounds that indirectly affect the building of chlorophyll (Jundiyah 2003), in addition to that the compound (ATP) adenosine triphosphate is important in the process of photophosphorylation and increases the effectiveness of photosynthesis, so the result is an increase in the manufacture of nutrients and their storage in Histology (Zaid, 2002) In conclusion, the effect of mycorrhiza positively on vegetative growth, photosynthesis and food making will positively affect the physical characteristics of the fruits and the quality of the crop. On Orange and Awadi (2020)

The results also showed a significant effect of the peeling treatment on the physical traits of the fruits, where the weight and size of the fruit increased. The reason for the significant increase in the physical characteristics of the fruits may be due to the good balance between the vegetative and fruiting system, and this affects the productive capacity of the tree (Shabana et al. 2006). It may also be due The reason is to increase the share of the fruits of processed foodstuffs in the leaves and their transfer to the fruits, causing an increase in weight and size (Al-Bakr 1972), and the results are consistent with the findings of (Solama & Harhash 2012) in his study on palm slippers of the Sukkari cultivar and Sekhan (2009) in his study (2019) On palm slippers cultivar Omraheem, Ahmed and others (2019) On palm slippers cultivar Zaghloul, Al-Hayani, Badawy et al (2018) in his study on the Al-Saydi variety, the increase in the weight of the bunch is due to the significant increase in the weight of the fruits, and the study did not show a significant difference in the amount of yield The total yield between the treatment T2 and the control T1, where the

treatment T2 gave a slight decrease in the amount of the total yield at a rate of 78.5 kg, while the comparison was 79.00 kg, and this is a positive indicator for the treatment as it gave fruits with good specifications while maintaining the amount of yield Results with Mukhtar & Ali (2019) on palm fruit thinning Al-Barhi variety, The interaction between of the study produced significant differences in the physical traits of the fruits, where the triple interaction (N3B2T2) gave the highest rate in the size and weight of the fruit, the bunch weight amounted to (14.63 cm3), (15.21 g) and (10.58 kg), respectively, as well as other interactions that took the same direction It showed a significantly excelled in the aforementioned traits. The reason for this may be due to the state of compatibility between the nano-fertilizer treatments and mycorrhiza in providing the plant with sufficient nutrients that it needs, which are concentrated inside the cells, causing high osmotic pressure of the cells and increasing the absorption of water and nutrients into the cells, which causes an increase in their weight and volume (Sharaki, 1985). Weight and size are reflected in the increase in the weight of the bunch and the quantity of the crop.

Also, the treatment of fruit thinning reduced the process of fruit competition for food, and thus increased the share of fruits from food (Al-Bakr, 1972). Also, the interation between bio-fertilizer and nanoparticles leads to an increase in the concentration of elements in the leaves, and thus an increase in the vital processes inside the plant, where nitrogen enters into the formation of acid The amino tryptophan, which is the main compound of auxin (IAA), stimulates the process of photosynthesis, the formation of carbohydrates, encourages the construction of proteins and the chlorophyll molecule, and helps in the process of cell division, and these vital processes are positively reflected on the physical traits of fruits such as weight, size, and total yield (Al-Arab, 2015). Mycorrhiza fungus and nano-fertilizer have a major role in increasing the percentage of mineral elements, especially nitrogen, as increasing its concentration in the leaves positively affects the increase in the weight of the flesh in the fruits, due to its activities in the process of photosynthesis and the transfer of the products to the fruits (Hussein et al., 1993).This result is consistent with Al-Tamimi (2006) and that an increase in the percentage of phosphorus is necessary in increasing the weight of the kernel, as it helps in the formation of carbohydrates and starch (Al-Nuaimi, 1999), and this result is consistent with Al-Ghazi (2014) in his study on palm trees of the Al-Shwathi cultivar. A significant increase in the amount of yield was observed as a result of the interactions of fertilizer treatments, where the interaction of (N3B2) gave an average of (85.53 kg) and so on the rest of the interactions with a significantly excelled on the comparison treatment, and the triple interaction (N3B2T2) the interaction of nano- and biological fertilizer and thinning decreased from the triple interaction (N3B2T1) the interaction without dilution The decrease was by an amount that did not reach the significant difference, as the rates were (84.68 kg) and (86.40 kg), respectively, which is an insignificant amount when compared to what the study gave of improvement in the qualitative characteristics of the yield from the size of the fruit and its measurements, in addition to the other quality traits that give More marketing value

Conclusions and recommendations

Conclusions:

1- The treatment of spraying with nano-level fertilizer (N3) had a significant effect on all studied traits.

2- The use of biofertilizer (mycorrhiza fungus) at a rate of 75 gm.tree-1 had a significant effect on all studied traits.

3- The treatment of thinning (retaining eight stems) showed a significant and clear effect on the characteristics of the fruits and did not affect the quantity of the yield.

4- The interactions between the three treatments had a significant effect on the quantitative and qualitative traits of the fruits

References

• Al-Rasoul, Hama Taher Saeed, 2008, The Effect of Pruning and Nutrition with Boron and Zinc on the Quantity, Quality and Yield of Three Varieties of Grapes, PhD thesis, College of Agriculture, University of Sulaymaniyah, Iraq

• Saleh, Hamad Mohammed, 2001, the suitability of adding chemical fertilizers with sprinkler and drip irrigation water, Iraqi Journal of Agriculture, University of Baghdad 5 (4): 16-18

• Obaid, Emad Ali 2014. The effect of irrigation, mineral and biofertilization, and salicylic acid on the growth and yield of date palm. PhD thesis - College of Agriculture - University of Baghdad

Al-Bakr, Abdul-Jabbar, 1972. The date palm, its past and present, and what is new in its cultivation, industry and trade. Al-Ani Press. Baghdad. Iraq

• Saleh, Mahmoud Mohamed Selim. 2015. Nanotechnology and a new scientific age. King Fahd National Library. King Abdulaziz City for Science and Technology. Riyadh. Kingdom of Saudi Arabia.

• Al-Jadoui, Fatima Hassan. 2020. Effect of spraying with NPK nanoparticles, Bio health, and Prosol on some growth and yield characteristics of Khalili grapes. Master thesis submitted to the College of Agriculture. Al-Qasim Green University. Iraq

• Central Statistical Organization. 2020. Dates production report, Iraqi Ministry of Planning

• Al-Salhi, Qais Jamil and Muhammad Ali, Tahani Jawad.2016. Response of local orange trees to mycorrhiza fungus and putrescine spraying, Euphrates Journal of Agricultural Sciences, (8) (1) (12-7)

• Hassan, Nuri Abdel-Baqer, Hussein Yousef Al-Dulaimi and Latif Abdullah Al-Ithawi (1990) Soil fertility and fertilizers, Dar Al-Hikma Press for Printing and Publishing, University of Mosul - Iraq

Sharaki, Mohamed Mahmoud, Abdel-Hadi Khudair, Mohamed Fawzi Abdel-Hamid (1985). Plant physiology. Arab Group for Publishing. The Egyptian Arabic Republic

• Al-Arab, Emad Hamid Abdel-Samad, 2015, The Effect of Adding Compound Fertilizer NPK and Cultivation of Leguminous Plants on Flowering, Nodules, Physical and Chemical Characteristics, and Productivity of Date Palm Fruits Phoenix dactylifere L. Al-Sayer Cultivar, Master Thesis, College of Agriculture, University of Basra, Iraq.

• Al-Akaidi, Hassan Khaled. 2018. The date palm, the lady of the trees and the pearl of the fruit. Safe for publication and distribution. the Hashemite Kingdom of Jordan .
• Al-Awadi, Amir Ali (2020) Response of Abbasi fig trees to spraying with nano-fertilizers, anti-transpiration agents and bio-fertilizers. Master's thesis - College of Agriculture - Al-Qasim Green University.
• Ghaleb, Hossam Hassan Ali. 2018. Botanical classification, morphological description and anatomical structure of the date palm. Iraqi network of date palm
• Al-Nuaimi, Saad Allah Abdullah Najm (1999). Fertilizers and Soil Fertility, Dar Al-Kutub for Printing and Publishing - University of Mosul - Scientific Iraq, University of Basra,
• Al-Tamimi, Ibtihaj Handal, Muayad Fadel Abbas and Ali Shaker Mahdi Al-Sardah. 2014. Effect of spraying fetrloncombi2 fertilizer and application times on the physical and productive characteristics of date palm Phoenix dactylifera L. Halawi cultivar. Basra Journal of Date Palm Research. 13 (1-2) 67-90.
• Ibrahim, Abdel Baset Odeh. 2018. Palm cultivation and date production in Jordan. Khalifa International Award for Date Palm and Agricultural Innovation
• Awwad, Kazem Mashut, 1987, Fertilization and Soil Membership, Ministry of Higher Education and Scientific Research, University of Basra, Iraq.
• Shabana, Hassan Rahman, Abdel-Wahhab Zayed, and Abdel-Qader Ismail Al-Sunbul (2006) Date Palm Fruits and Care After Harvesting. Food and Agriculture Organization of the United Nations (FAO)

- **Ahmed, B.H; S.A. Mehana; O.A.Zagzog and E.M.qauod 2019**.. Improving of yield and Fruit Quality of Zagloul Date plam by using different thinning treatment .Zagzig University. Egypt.Jr. Products and dev 24(4)743-756.2019.
- **Al- sekhan ,S.Mohammad 2009** bunch thinning improve yield and fruit quality of Omraheem Date palm (phoenix dactylifera L) Scientific Journal of king Faisal university Vol (10) No 2 1430
- **Ball.phillip (2003)** Nanotechnology science next frontier or just a load of bull?
- New Statement, http:ll www.findarticles.com/p/articles/mi-m of Qp/is-4643-123/ai-
- **Bashir, M.A;M. Ahmed; F.Altaf and K. shabir.2014**
- fruit quality and yield of data palm (phoenix dactylifera) L. as effected by strand thinning. the journal of animal and plant science 24(3);2014 p 951-954
- **El.Badawy.H.E.M , S.F gioushy and A.M.A hmed.2018.** yield fruit of sewy date palm in Farfra Region Asian Journal Agriculture and Horticultural Re search 2(3):1-20.2018
- **Focus. 2003.** The importance of micro- nutrients in the region and benefits of including them in fertilizers Agro-Chemicals Report, 111(1):15-22
- **Ghazzawy, H.S., M.R. Alhajhoj, A.A.M. Sallam and M. Munir, 2019**. Impact of chemical thinning to improve fruit characteristics of date palm cultiv ar khalas. Iraqi journal of Agriculture Science – 2019: 50(5): 1361-1368

- **Harhash, M .**M and solimanS.S. 2013 Effect of strands thinning on yield and fruit Quality Date palm – African Journal of Biotechnology VOL.11(11)PP 2672-2676
- **Harhash,M.M(2000).** Effect of the fruit thinning and potassium fertilization on "seewy"date palm grown at siwa oasis. Advanges in Agricultural Research . Vol (5)No3: 1519-1531
- **Mengel, K. and E.A. Kirkby. 1982**. Principle of plant nutrition- 3rd edition . Botash Institute Bern Switzerland.
- **Mukhtar,samiahmed; Abdolazimmohamad Ali (2019).** Bunches and different types of strand thinning effects on yield and fruit characters of barhi date palmcultivar under River Nile state. Sudan… Shendi University Journal Applied Science 2019(1)(14-18)
- **Sharawy, A.M.A., 2005**. Response of Balady lime trees to organic and biofertilizaion. Minia J. of Agric. Res. and Develop., 25: 1-18 .
- **Al temimy, H.M,A;H.H altemimy and A.M.Abed..2019** Evalution the efficacy of nano- fertilization and Disper osmotic in treating salinity of irrigation water in quality and productivity properties of date plam (phoenix dactylifera L.) Eerth and Environmental science. Volume 388. The 4th international conference onAgricultural Science (4th)CAS)17-18 November 2019. Agriculture college/ university of Kerbalab. Kerblacity,Iraq
- **Harhash,M.M(2000).** Effect of the fruit thinning and potassium fertilization on "seewy"date palm grown at siwa oasis. Advanges in Agricultural Research . Vol (5)No3: 1519-1531
- **Zaid, A. (2002)**.Datepalm cultivation. Food and Agriculture Orgabization of the United Nation (FAO), Roma, Italy.

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