

Effect of the adding method of nourishing solution (Folia Stim Ultra) with some plant extracts on some traits of the date palm yield (Phoenix dactylifera L.) Zahdi cultivar

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ABSTRACT

This experiment was conducted on a private farm located in Saddat-Al-Hindya district, Babylon province, on the date palm (*Phoenix dactylifera* L.) Zahdi cultivar, with an age of twenty-five years during the seasons (2017-2018) to know the effect of spraying the leaves of the date palm A (A1 without spraying, spraying the leaves A2), trunk injection B (without injection B1 and trunk injection B2), and ground additives C (the control C1, on the surface C2, to depth 25 cm C3, to depth 50 cm C4) with a nourishing solution (Folia Stim Liquid with adding licorice extract 20 ml.L⁻¹, clove extract, and Cyperus tubers 10 ml.L⁻¹) at a concentration of (10 ml.L⁻¹). The fertilization process was conducted three times before opening the flowering buds, and in the two stages of Hababuk and Chemri, it was implemented as a factorial experiment according to The randomized complete block design (RCBD), with three replicates and a rate of one palm for the experimental unit and arithmetic averages were compared according to the least significant difference test (L.S.D) under the probability level 5%. The results of the study showed that the spraying treatment of the leaves date palm with a nourishing solution with some plant extracts had a significant effect on all studied traits (percentage of fruit set, fruit weight, the weight of bunches, number of bunches, and total yield) which recorded (73.1%, 7.19 g, 5.32 kg, 14.11, 75.13 kg), except for the seed weight, no significant difference was seen. As for the treatment of trunk injection, it showed a significant excelling in the trait of the percentage of fruit set, fruit weight, the weight of bunches, and the total yield which gave (72.2%, 7.13 g, 5.28 kg, 78.03 kg). As for the adding method to the soil, the addition at the depth of (50 cm) has excelled in all studied traits (percentage of fruit set, seed weight, the weight of bunches and total yield) which amounted to (75.4%, 0.90 g, 5.40 kg, 13,93,75.64 kg) except for the weight of the fruit, it has excelled in the adding treatment at a depth of (25 cm).

Keywords: spraying the date palm leaves, Trunk injection, ground addition, nourishing solution, plant extracts, palm trees.

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تأثير طريقة اضافة المحلول المغذي Folia Stim Ultra مع بعض المستخلصات النباتية في بعض صفات حاصل نخلة التمر *Phoenix dactylifera* L. صنف زهدي

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المستخلص :

اجريت هذه التجربة في مزرعة خاصة تقع في ناحية سدة الهندية في محافظة بابل على نخيل التمر *Phoenix dactylifera* L. صنف زهدي بعمر خمس وعشرين سنة خلال الموسمين 2017 و 2018 لمعرفة تأثير رش السعف A1 بدون رش ، رش السعف A2 (وحقن الجذع B بدون حقن B1 وحقن الجذع B2) الاضافات الارضية C (مقارنة C1 سطحي ، عمق 25 سم C2 ، عمق 50 سم C4) بالمحلول المغذي (Folia Stim Liquid مع اضافة مستخلص عرق السوس 20 مل. لتر⁻¹ ومستخلص القرنفل ودرنات السعد 10 مل. لتر⁻¹) وبتركيز 10 مل. لتر⁻¹ وتمت عملية التسميد ثلاث مرات قبل تفتح البراعم الزهرية وفي مرحلتي الحبابوك والجمري. نفذت كتجربة عاملية بتصميم القطاعات العشوائية الكاملة Complete Block Design Randomized وبثلاثة مكررات وبواقع نخلة واحدة للوحدة التجريبية وقورنت المتوسطات الحسابية حسب اختبار أقل فرق معنوي (L.S.D) تحت مستوى احتمال 5%. وأظهرت نتائج الدراسة إن لمعاملة رش السعف بالمحلول المغذي مع بعض المستخلصات النباتية تأثيراً معنوياً في جميع الصفات

المدروسة (نسبة العقد, وزن الثمرة, وزن العذق وعددها والحاصل الكلي) وسجلت (73.1%, 7.19غم, 5.32كغم, 14.11, 75.13كغم) باستثناء وزن البذرة حيث لم تظهر اي فرق معنوي أما معاملة حقن الجذع فقد أظهرت تفوقا معنوي في صفة نسبة العقد, وزن الثمرة, وزن العذق والحاصل الكلي وأعطت (72.2%, 7.13غم, 5.28كغم, 78.03كغم) أما طريقة الاضافة للتربة فقد تفوقت الاضافة على عمق 50 سم في جميع الصفات المدروسة (نسبة العقد, وزن البذرة, وزن العذق والحاصل الكلي) (75.4%, 0.90غم, 5.40كغم, 13,93,75.64كغم) باستثناء وزن الثمرة كان من نصيب معاملة التربة على عمق 25 سم.

الكلمات مفتاحية: رش السعف, حقن الجذع, اضافة للتربة, المحلول المغذي, مستخلصات نباتية, نخيل. البحث مستل من اطروحة دكتوراه للباحث الاول.

1. INTRODUCTION

Date palm (*Phoenix dactylifera* L.) belongs to the Arecaceae family and it is a monocotyledon. This blessed tree, which was called in the ancient texts the tree of life, and the Arabs appreciate the wealth of the farmer in the number of palm trees on his land and for their economic and nutritional importance. It was mentioned in the Holy Qur'an (21) times, and the greatest prophet (peace and blessings of Allaah be upon him) mentioned it by saying, "Honor your aunt the palm tree". The evidence for its high nutritional value is that the Arabs were eating dates and living on them for long periods without the symptoms of undernutrition, and the Date pits and poor cultivar used in feeding livestock (Ibrahim, 2014). The production of the Zahdi cultivar in Babylon province is 68.156 thousand tons from the total production of 98.722 thousand tons (Agricultural Statistics Directorate, 2017). The development and increasing date production can contribute to the diversification of exports, where dates are the only national product that has a surplus for export, but it suffers from a decline in the number of palm trees and the amount of production for many reasons, the most important of which is the phenomenon of neglecting palm groves and lack of service and the lack of special agricultural equipment, therefore, deep thought must be given to the ways of serving this historic tree, and in order to give the best quality of fruits and the most quantity of the crop in order to serve the palm in terms of nutrition and soil ventilation and to facilitate the service operations due to the high altitude of the trees, we thought about the technology of soil injection and trunk injection with manufactured organic solutions to ensure the availability of nutrients monthly and

especially During the flowering and fruit set stage, in addition to spraying the date palm leaves with nutrients. The use of natural and manufactured organic fertilizers in addition to having a significant impact on the quality and quantity of production, it affects the environmental side positively, especially in the current era in which we suffer from a high rate of environmental pollution and a large number of diseases and pathogens as a result of wars and the use of weapons and chemical materials in an unbalanced way contributed to increasing pollution (Al-Jizani, 2010). Researchers have also recently paid attention to using plant extracts because they work as growth regulators and do not have a negative impact on human health, including licorice extract (Mousa et al., 2003). Al-Hamdani, (2016) has found that spraying a total vegetative with Humic Acid (2 g.L⁻¹) and adding 4 g.L⁻¹ K-Humic Acid to the soil gave the highest fruit weight and total yield Al-Zubaidi, (2018) also concluded that spraying and injecting palm trees (Khestawe cultivar) and treating the soil with organic fertilizers. Abbas and Sharif (2009) obtained significant results when treating with licorice extract (8 g.L⁻¹) for palm trees (Sayer and Halawi cultivars) in the average weight of branches, mesocarp weight and fruit diameter, and an increase in the percentage of total soluble solids and to a decrease in the fruit content of the tannins, which led to a significant increase in the average weight of fresh fruit, seed weight, the average weight of branch and quantity of yield. Therefore, this experiment aims to know the effect of foliar spraying and trunk injection with nutrients on growth and yield. Finding techniques for nourishing palm tree soil through injecting nutrients into the soil in several depths

and delivering nutrients to this region are among the goals of this experiment.

2. MATERIALS AND METHODS

This experiment was conducted on a private farm located in Saddat-Al-Hindya district, north of Babylon province during the seasons (2017-2018), with three-factor:

1- The first factor: Spraying the total vegetative A

The date palm leaves were sprayed with a nourishing solution (Folia Stim) as shown in Table (A) at a concentration of (10 ml.L⁻¹), with a rate of five liters per palm and the spraying process was conducted before opening the flowering buds on 3/21/2017, It was re-sprayed on 12/5/2017 in the Hababuk stage, and it was sprayed the third one in Chemri stage after a month from the second spraying on 6/12/2017, The solution was sprayed again the following year, on 10/3/2018, before opening the flowering buds, and on 3/5/2018 in the Habbouk stage, and after a month from the second spraying, the third spraying was done in Chemri stage on 3/6/2018. As for the untreated tree, it was only sprayed with distilled water.

2- The second factor: trunk injection B

A hole was made in the trunk of the palm tree at a height of (1.5 m), with a screw at 10 mm diameter and a depth of 15 cm and diagonally down at an angle of (45 ° C) in order to allow the solution to flow smoothly, according to (Al-Juburi, 2001) method, which was modified from the method of American company (Mauget) used in treating red palm trees (Schionning and Christensen, 2004). The solution was injected with a syringe and after each addition, the end of the tube was blocked with cotton and then covered with clay to keep it from blockage. The three adding dates were after spraying date palm leaves with one week on 3/28, 5/12 and 6/12 for the season of 2017, on 3/17, 5/5 and 10/6 for the 2018 season, with the same concentration of (10 ml.L⁻¹) and the

amount of added fertilizer (20) ml per Palm every date and for two years.

3- The third factor: soil injection C:

The injection was conducted with the nourishing solution (Folia Stim) at a concentration of (10 ml.L⁻¹), with the amount of ten liters for each palm and added three times on 1/4/2017 before opening the flowering buds on 5/22/2017 and 22/6/2017. In the second year, fertilizer was added on 3/3/2018, 13/5/2018 and 6/13/2018 and the nourishing solution was injected into the soil with four ways, namely:

a- The control treatment C1

The estimation of the elements was done on a weight-to-weight basis with adding 20 ml of licorice extract (*Glycyrrhizin glabra L.*) and 10 ml for each of Nutgrass extract (*Cyperus rotundus L.*) and clove buds (*Dianthus caryophyllus L.*) per liter of fertilizer) where 500 g were taken for licorice, Nutgrass tuberoses, and clove buds, it was mashed and placed in a pint of cold water for 24 hours, It was filtered with a Gauze cloth, the filter was taken for each one, placed in a centrifuge, and shaken for 30 minutes (Harborne, 1984). It was implemented as a factorial experiment (2 × 2 × 4) using The randomized complete block design (RCBD), with three replicates per treatment and the averages were compared according to the least significant difference test (LSD) under a probability (5%) (Al-sahuki and Wahib, 1990) and the data was analyzed Using the Gen Stat program.

b- Surface dripping treatment on the soil C2:

An aluminum container with a capacity of (10 L) was made. Two tubes come out from the bottom of this container, which connected to each of them a faucet to control the speed and the amount of the solution descending on the soil surface, with a distance of (90-100 cm) from the trunk of a palm tree. This system was connected to the palm tree at a height of (1 m)

and ten liters of the nutrient solution was added with slow dripping.

- c- Circular ground dripping treatment at a depth of (25 cm) C3:

where the soil surrounding the trunk was dug to a depth of (25 cm), the width of (20 cm), and a distance of (90-100 cm) from the trunk. In this hole, a plastic tube was placed in the form of a perforated circle from the bottom and the distance between one hole and another about 10 cm. The Palms Fibers has been placed under the tube to protect the holes from blockage, a tube comes out of it to pour nutrients through it. The soil feeding process was conducted with the same solution and with the same concentration and quantity that we mentioned at the same dates above.

- d- Injecting the soil to a depth of (50 cm) C4:

Where four plastic tubes were installed around the trunk and in different directions, with a diameter (3 inches) and at a distance from the

trunk (90-100 cm). The end of the tube was closed with a plastic sea, Two holes were made for each tube, from the trunk side, and the distance between one hole and another (17 cm) to ensure spreading nutrients. A dense fiber was placed in these holes to prevent clogging.

The used fertilizer and the treatments of the experiment:

It was used the organic fertilizer (Folia Stim Ultra Liquid) which is part of the FoliaStim Group for high-quality liquid fertilizers manufactured by Van Ebern, Netherlands, Europe production in February 2016, which is characterized by the integration between mineral nutrients such as nitrogen, phosphorous, potassium and micronutrients on the one hand and the seaweed extract (Ascophyllum Nodosum) Which is characterized by the bio-stimulation for the plant to give it the ability to resist the stresses caused by weather conditions, salinity, adverse conditions and restore activity and growth faster, knowing that the fertilizer density is (1.28 kg.L^{-1}), pH ranged between 4-6.

Table A: Chemical Composition of Folia Stim Ultra Liquid %

Element	Seaweed	N	P ₂ O ₅	K ₂ O	B	Cu	Mn	Mo	Zn
Concentration %	15	5	5	5	0.6	0.2	0.6	0.05	0.6

Table c: Some chemical and physical traits for the studied orchard soil.

Trait	Unit	Value 2018
Silt	g.kg ⁻¹	505.9
Sand		223.5
Clay		270.6
Apparent density	g.cm ⁻³	1.20
Soil texture	————	Clay silt loam
pH	————	7.1
Electrical conductivity (Ec)	dS.m ⁻¹	4.3
Total N	mg.kg ⁻¹	1.33
Total P		7.01
Total K		281
Organic matter	%	1.39

The studied traits:**1- percentage of fruit set:**

The percentage of fruit set was measured according to (Ream and Furr, 1970) method through knowing the number of empty scars and unvaccinated fruits to the total of fruits in one stalk by taking random samples at the rate of 8 stalks per branch and calculating the percentage of the fruit set according to the following equation.

$$\frac{\text{The percentage of fruit set}}{\text{the number of fruit set}} = \frac{\text{the number of fruit set}}{\text{the number of fruit set} + \text{the number of empty scars}} \times 100$$

2- Weight of fresh Fruit and Seed Weight:

It was measured using a sensitive balance, where 20 random fruits were taken from each replicate in the dates phase on 11/15/2018, The fresh weight of the fruit was recorded, then the seeds were removed from the fruits and weighed in the same balance. The seed weight was extracted.

3- The number of branches:

It was calculated after performing the process of thinning and removing unwanted branches, in which the percentage of the fruit set was not good and affected by Fruit- Stalk Borer, and it was during the third spraying and for the two seasons.

4- The weight of the branch:

The average weight of the branch (kg) for each treatment was calculated by dividing the total yield of each treatment by the number of their branches.

5- Total yield:

After reaping the fruits for each date palm separately, it was weighed by a field balance, and the average weight of total yield for each treatment (kg) was then extracted.

3. RESULTS AND DISCUSSION

Table (1) indicates that the spraying treatment with nutrient solution (Folia Stim) and adding some plant extracts on the total vegetative (A2) has excelled in traits of the percentage of the fruits set and the weight of the fresh fruit amounted to (73.1%, 7.19 g) for the two cultivars, respectively, compared to the control treatment in which the percentage of the fruit set decreased to 67.3% and the weight of the fresh fruit amounted to (6.92 g). The injecting method with the nutrient solution into the tree trunk (B2) was significantly excelled in increasing the percentage of the fruit set and the weight of the fresh fruit which amounted to (72.2%, 7.13 g), respectively, while the control treatment decreased to (68.2% and 6.98 g), respectively for the two above cultivars. As for the adding method to the soil, it is observed from the same table the adding treatment at a depth of (50 cm) (C4) has excelled in increasing the percentage of the fruit set amounted to (75.4%), while it decreased to 64.0% in the control treatment. As for the trait of the weight of fresh fruits, It is observed that the circular dripping treatment of the nutrient solution (Folia stim Ultra) with some plant extracts at a depth of 25 cm (C3) has excelled, which amounted to (7.22 g) compared to the control treatment which amounted to (6.90 g). The reason is due to the fact that tree fertilization increased the concentration of important mineral elements, especially nitrogen, which contributes to the formation of growth regulators, including the Auxins that have a role in increasing the percentage of fruit set. The reason is also attributed to increasing the spread of the roots and their high efficiency in absorbing nutrients to a depth of 60 cm (Rain, 1991), where macro and micronutrients in the foliar nutrients contribute to increasing the activity of enzymes and hormones and regulating the bio-activities conducted by the plant, including stimulating flowering and increasing the number of flowers, thus increasing the percentage of fruit set that in turn led to an increase in the number of fruits and weight of the fruit. The reason may be

attributed to the importance of nutrients in stimulating cell division and expansion, thus the attraction of nutrients to them, which makes fruits a consuming center for nutrients, thus increasing their weight (Ibrahim, 1995; Shabana et al., 2006). Caliph and Almir, (2016) found that the use of Al-Jamiea fertilizer on Sayer cultivar gave a significant increase in the average weight of the fresh fruit. It agrees with (Saleh, 2008) in his study on date palm cultivars (Bayerum) and Al-Hamoud and Al-Abd, (2018) in their study on the two cultivars of palm trees (Bream and Halawi). As for the bi-interaction between the spraying treatment on the total vegetative and tree trunk injection, it is observed that the A2B2 treatment has excelled for the two traits (percentage of fruit set and weight of fresh fruit) which amounted to (75.3% and 7.27 g), respectively, while the A1B1 treatment for both traits decreased to (65.4% and 6.85 g), respectively. As for the bi-interaction between spraying on the total

vegetative and ground addition, it is observed that the treatments (A2C4 and A2C3) have excelled in the percentage of the fruit set and the weight of fresh fruit which amounted to (79.1% and 7.35), respectively, while the A1C1 treatment for the two traits decreased together which amounted to (59.7% and 6.68 g), respectively. As for the bi-interaction between trunk injection and addition to soil, it is observed that the treatments B2C4 and B2C3 have excelled in the percentage of the fruit set and the weight of fresh fruit which amounted to (78.5% and 7.28g)), respectively, while the B1C1 treatment for the two traits decreased together which amounted to (61.2% and 6.71g). As for the triple interaction, it was observed that the A2B2C4 treatment has excelled in the percentage of the fruit set and the weight of fresh fruit which amounted to (81.8% and 7.30 g), respectively, while the A1B1C1 treatment for the two traits decreased together which amounted to (58.8% and 6.38 g), respectively.

Table 1: Effect of spraying the date palm leaves, trunk injection and ground addition to soil with a nutritional solution (Folia Stim) and with some plant extracts on the average percentage of the fruit set (%) and the weight of the fresh fruit (g).

Foliar spraying A	Injection trunk	Percentage of fruit set				AxB	Weight of fresh fruit				AxB
		Ground addition (C)					Ground addition (C)				
		C1	C2	C3	C4		C1	C2	C3	C4	
A1	B1	58.8	64.6	69.8	68.4	65.4	6.38	6.90	7.10	7.00	6.85
	B2	60.6	72.7	68.4	75.1	69.2	6.97	6.90	7.07	7.07	7.00
A2	B1	63.6	74.9	68.8	76.3	70.9	7.03	7.03	7.20	7.17	7.11
	B2	73.0	71.3	75.0	81.8	75.3	7.23	7.03	7.50	7.30	7.27
L.S.D 0.05		(A*B*C) 7.9				4.0	(A*B*C) 0.37				0.19
						A					A
AxC	A1	59.7	68.3	69.1	71.8	67.3	6.68	6.90	7.08	7.03	6.92
	A2	68.3	73.1	71.9	79.1	73.1	7.13	7.03	7.35	7.23	7.19
L.S.D 0.05		5.6				2.8	0.26				0.13
						B					B
BxC	B1	61.2	69.8	69.3	72.4	68.2	6.71	6.97	7.15	7.08	6.98
	B2	66.8	72.0	71.7	78.5	72.2	7.10	6.98	7.28	7.18	7.13
L.S.D 0.05		5.6				2.8	0.26				0.13
(C)		64.0	70.9	70.5	75.4		6.90	6.97	7.22	7.13	
L.S.D 0.05		4.0					0.19				

Table (2) indicates that the spraying treatment with nutrient solution (Folia Stim), adding some plant extracts, and the trunk injection

treatment with the nourishing solution did not have any significant effect on the seed weight. As for the adding method to the soil, It had a

significant effect and reached its highest value at the depth of 50 cm (C4) which amounted to (0.90 g). This agrees with (Al-Zubaidi, 2018). The reason is that increased nutrients in the soil have increased the activity of the roots in the absorption process for the nutrients that have turned into compounds stored in fruits and seeds (Jameel, 2016; Gobara et al., 2002). The bi-interaction between the spraying treatment on the total vegetative and tree trunk injection, it was observed from the table that there is no significant difference in it. As for the bi-interaction between spraying on the total vegetative and ground addition, the spraying treatment on the date palm leaves and ground addition at a depth of 50 cm (A2C4) gave an average amounted to (0.93 g) compared to the A1C1 treatment, which gave an average amounted to (0.77 cm). As for the bi-interaction between trunk injection and ground addition, it is observed that the B2C4 treatments gave an average amounted to (0.93 g), respectively, compared to the B1C1 treatment which gave an average amounted to (0.73 g). As for the triple interaction, it was observed that the A2B2C4 treatment has excelled in the trait of seed weight which amounted to (0.93 g), respectively, while the seed weight in the control treatment (A1B1C1) amounted to (0.75 g). Table (2) also shows that there was a significant effect on the trait of branch weight when spraying trees with the nutrient solution, where the trees treated with the A2 treatment gave the branch with weight amounted to (5.32 kg.palm⁻¹). This agrees with (Jasim and Al-Arab, 2016; Saleh, 2017) compared to untreated trees that gave an average amounted to (4.99 kg.palm⁻¹). It was observed in the table that the weight of the branch was significantly affected when injecting the trunk with the B2 treatment

which gave an average amounted to (5.28 kg.palm⁻¹) while untreated trees gave an average amounted to (5.03 kg.palm⁻¹). Table (2) shows a significant difference when adding a nutrient solution (Folia Stim) with some plant extracts to the soil where the ground addition at a depth of 50 cm (C4) gave the highest significant increase in the average branch weight amounted to (5.40 kg.palm⁻¹) compared to the control treatment (C1) which gave an average amounted to (4.91 kg.palm⁻¹). This is due to the fact that the nutrient solution and some extracts have benefited from the largest root system because the largest nutrient root density is found at the depth (40-60) cm. This agrees with (Ghaleb, 1980) that the highest percentage of roots is confined to a depth of 60 cm and in which the absorption ratio reaches 50%, followed by depth (60-120) cm. It was also observed from in table that bi-interactions between the experiment factors had a significant effect on the trait of the number of branches, where the results indicate that the bi-interaction between spraying leaves and trunk injection (A2B2) and between ground addition at a depth of (50 cm) and spraying leaves (A2C4) and between ground addition at a depth of (50) cm and injecting the trunk gave the highest averages amounted to (5.41, 5.62, and 5.54 kg.palm⁻¹), respectively, compared to untreated trees which gave the lowest average amounted to (4.83, 4.77, 4.78 kg.palm⁻¹), respectively. As for the nature of the interaction between the three experiment factors, it is clear from the two tables that there was a significant difference between them. The triple interaction between the spraying leaves, injection trunk, ground addition at a depth of 50 cm (A2B2C4) gave an average of branches weight amounted to(5.72 kg.palm⁻¹) compared to untreated trees.

Table 2: Effect of spraying the date palm leaves, trunk injection and ground addition to soil with a nutritional solution (Folia Stim) and with some plant extracts on the average seed weight (g) and the weight of branches (kg.palm⁻¹).

Foliar spraying A	Inject in trunk	The weight of the branches				AxB	Seed weight				AxB
		Ground addition (C)					Ground addition (C)				
		C1	C2	C3	C4		C1	C2	C3	C4	
A1	B1	4.62	4.71	4.98	5.02	4.83	0.75	0.81	0.85	0.84	0.81
	B2	4.92	5.11	5.24	5.35	5.16	0.80	0.77	0.82	0.92	0.83
A2	B1	4.94	5.18	5.28	5.52	5.23	0.70	0.87	0.86	0.93	0.84
	B2	5.16	5.25	5.49	5.72	5.41	0.81	0.82	0.83	0.93	0.85
L.S.D 0.12		(A*B*C) 0.24				4.0	(A*B*C) 0.10				n.s
						A					A
AxC	A1	4.77	4.91	5.11	5.18	4.99	0.77	0.79	0.84	0.88	0.82
	A2	5.05	5.22	5.39	5.62	5.32	0.76	0.85	0.85	0.93	0.84
L.S.D 0.05		0.17				0.08	0.07				n.s
						B					B
BxC	B1	4.78	4.94	5.13	5.27	5.03	0.73	0.84	0.86	0.88	0.83
	B2	5.04	5.18	5.37	5.54	5.28	0.80	0.80	0.83	0.93	0.84
L.S.D 0.05		0.17				0.08	0.07				n.s
(C)		4.91	5.06	5.25	5.40		0.76	0.82	0.84	0.90	
L.S.D 0.05		0.12					0.05				

Table (3) indicates that treating trees when adding a nutrient solution (Folia Stim) with some plant extracts had a significant effect on increasing the number of fruit branches and the amount of the total yield, where the spraying treatment on leaves A2 gave an average number of fruit branches amounted to (14.11 branch.palm⁻¹) and the amount of the total yield amounted to (75.13 kg) compared to untreated trees (A1) which gave a number of fruit branches amounted to (12.75 branch.palm⁻¹) and the amount of the total yield amounted to (63.82 branch.palm⁻¹). Table (3) also shows that the trunk injection treatment (B2) did not have a significant effect on the number of fruit branches, but it significantly affected the increase in the total yield, where the amount of the yield in the treated trees amounted to (72.38 kg.tree⁻¹). It also appears from the table that the ground addition with fertilizer (Folia Stim) with some extracts significantly affected the number of fruit branches and the amount of yield, and the ground addition at a depth of 50 cm (C4) gave an average fruit branch amounted to (13.93 branch.palm⁻¹) and yields (75.46 kg.tree⁻¹) compared to untreated trees that gave an average number of fruit branches amounted to (12.53 branch.palm⁻¹) and yield (61.74 kg.tree⁻¹). The reason is attributed to the increase in the amount of elements in the plant tissues and as a result of the delivery of nutrients to the active area responsible for absorbing nutrients and water, which is called (Feeder roots) that located at a depth of 50 cm. This agrees with (Khaleel, 1985; Ibrahim, 2014) stated that the highest percentage of root activity is confined to a depth of 60 cm, where the absorption rate is about 50%, followed by a depth of 120 cm, where the absorption rate is about 30%, and the rest of the absorption ratio is distributed to Distant depths, This agrees with (Abdel-Hussein, 1995) who mentioned that the cultivar, the spread of roots, the number of green leaves, fertilization and other factors affect the yield of the date palm. It is clear from the above table that the bi-interactions had a positive effect on the number of fruit branches and increasing the final yield, where the interaction between the spraying of leaves and the trunk injection (A2B2) gave an average number of fruit branch amounted to (14.34 branch.palm⁻¹) and a yield amounted to (77.61 kg.tree⁻¹). The bi-interaction between spraying leaves and ground addition at a depth of 50 cm (A2C4) gave an average number of branches (14.53 branch.palm⁻¹) and yield (81.71 kg.tree⁻¹). The bi-interaction between the trunk injection and ground addition at a depth of 50 cm (B2C4) gave an average number of branches amounted to (14.06

branch.palm⁻¹) and yield (78.03 kg.tree⁻¹) compared to untreated trees. The triple interaction for the treatments of the experiment showed a significant increase in the number of fruit branches and total yields, where the total yield amounted to (84,47 kg.tree⁻¹) for the treatment spraying leaves, trunk injection and ground addition at a depth of 50 cm (A2B2C4) compared to untreated trees. This may be attributed to the increase in the average number and weight of fruit branches as shown in Table (2 and 3). These results agree with (Al-Khalifa and Al-Mir, 2016) in their study date palm (Sayer cultivar) and (Saleh, 2017) in his study on date palm trees (Halawi cultivar).

Table 3: Effect of spraying the date palm leaves, trunk injection and ground addition to soil with a nutritional solution (Folia Stim) and with some plant extracts on the average number of branches (branch.palm⁻¹) and total yield (kg.tree⁻¹).

Foliar spraying A	Inject in trunk	Total yield				AxB	Number of branches				AxB
		Ground addition (C)					Ground addition (C)				
		C1	C2	C3	C4		C1	C2	C3	C4	
A1	B1	50.04	59.49	65.66	66.82	60.50	10.81	12.63	13.19	13.31	12.48
	B2	61.17	65.85	69.96	71.60	67.14	12.43	12.88	13.36	13.36	13.01
A2	B1	64.73	72.74	74.22	78.95	72.66	13.10	14.04	14.05	14.30	13.88
	B2	71.01	73.98	80.97	84.47	77.61	13.76	14.08	14.75	14.75	14.34
L.S.D 0.05		(A*B*C) 5.88				2.94	(A*B*C) 1.66				0.83
						A					A
AxC	A1	55.60	62.67	67.81	69.21	63.82	11.62	12.76	13.27	13.34	12.75
	A2	67.87	73.36	77.59	81.71	75.13	13.43	14.06	14.40	14.53	14.11
L.S.D 0.05		4.16				2.08	1.17				0.59
						B					B
BxC	B1	57.39	66.11	69.94	72.88	66.58	11.96	13.34	13.62	13.81	13.18
	B2	66.09	69.91	75.46	78.03	72.38	13.10	13.48	14.06	14.06	13.67
L.S.D 0.05		4.16				2.08	1.17				0.59
(C)		61.74	68.01	72.70	75.46		12.53	13.41	13.84	13.93	
L.S.D 0.05		2.94					0.83				

Through this experiment, it is possible to conclude the necessity of liquid organic fertilization because it can be added in several ways and it is effective in stimulating growth and production. The process of spraying leaves or injecting the trunk or soil with organic fertilizer individually or triple or bi-interaction greatly improved the quantity and quality of data production. The treatment of organic fertilization at a depth of 50 cm was significant in most growth and yield trait.

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