

Effect of the auxin on the fruit quality and yield of date palm *Phoenix dactylifera* L. Barhi and Sayer cultivars.

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Abstract

The experiment was conducted at the horticultural station in Al-Mahaweel district, 20 km north of Babylon province, which is affiliated to the Horticultural Department / Ministry of Agriculture. To study the effect of three types of naphthalene acetic acid (NAA), Naphthalene acetic acid, Indole-3-butyric acid, and 2,4-D Dichlorophenoxyacetic acid, with three concentrations (0, 1, 2) ppm, on the two cultivars of palm trees, Al-Sayer and Al-Barhi. Three replicates for each treatment, in order to improve the quality of the fruits and increase the yield. The experiment conducted two factors (2 x 3 x 3) for the two cultivars according to the Randomized Complete Block Design (RCBD) , with a palm tree for each replicate. The results showed the 2,4-D excelled on the rest of the above-mentioned auxins in all the studied traits, and the concentration (2) ppm excelled on the other concentrations in all the studied traits. The results also showed the Al-Barhi cultivar excelled in the characteristics of diameter, fruit weight and yield quantity, while the Al-Sayer cultivar was excelled in trait of fruit length, and the weight of the bunch did not have a significant effect between the two cultivars. The bi and triple interaction had a significant effect on most of the traits studied above.

keywords: auxins, Al-Barhi, Al-Sayer, foliar nutrition, yield quantity

introduction

Date palm. *Phoenix dactylifera* L. The family *Arecaceae*, which is monocotyledonous. Iraq is one of the oldest date palm cultivation sites, where the first documented appearance of the date palm tree in the ancient world was in the historic city of Arida, located in southern Iraq (about 4000 BC), which was the main area for date cultivation. In Iraq, there are (627) agricultural cultivars of dates, of which about (50) are commercial, and among these cultivars (Al-Barhi, Al-Sayer) (7). Al-Sayer cultivar is considered one of the semi-dry Iraqi dates of commercial importance due to its advantages in terms of delicious taste and distinctive sweetness. It is an early and medium maturity cultivar . As for Al-Barhi cultivar , it is one of the Iraqi cultivars with a sweet taste and a special flavor. It is one of the basic and early cultivars of Iraqi palm trees with flowering and maturity(1). Growth regulators are among the organic compounds that can be synthesized in addition to their natural presence in the plant and have significant effects at a very low concentration in the vital

processes of growth, the most important of which are auxins, which are organic acids that have the ability to affect the vital processes within the plant, including IBA, NAA and 2,4 D- and others, auxins are found in nucleic acids, the cell wall, and the plasma membrane of the plant cell (5). The work of artificial growth regulators is often to modify or compensate for the action of natural hormones, which are responsible for regulating many vital activities in the plant. The foliar spraying technique is a safe, environmentally friendly and low-cost technology because it uses additives in small quantities and distributes them homogeneously on the plant. It also fills the plant's need for nutrients in conditions that hinder the roots from absorbing sufficient food, as well as helps to increase and improve plant production (8).

Materials and methods

The research was conducted during the growing season 27/4/2022 AD in one of the government orchards at the gardening station in Al-Mahaweel district, which is 20 km north

of Babylon provainc.The service operations of pruning, staking and bunch were carried out on it, and it was vaccinated with the green Ghanamy pollen for both cultivars. The Al-Sayer cultivar was vaccinated on 27/4/2022 , but only the Barhi cultivar was vaccinated on 4/4/2022.It was implemented as a factorial experiment using Randomize Complete Block Design.R.C.B.D with three factors:

The first factor,: the cultivars, namely the Al-Sayer cultivar, symbolized by A1, and the Al-Barhi cultivar, symbolized by A2.The second factor: types of auxins used in an experiment, where auxin NAA symbolizes B1 (the first growth regulator), auxin IBA symbolizes B2 (the second growth regulator), and auxin D - 2,4 symbolizes B3 (the third growth regulator). The third factor: concentration and denoted by C. Three concentrations were used for each type of auxins: (without adding any concentration 0 C1, adding auxin at a concentration of 1 ppm C2, and adding auxin at a concentration of 2 ppm C3).

Thus, the number of experimental units for the sector is (2×3×3).It was repeated with three replicates and the experimental unit included three palm trees, thus the total number of the experiment was (54) palm trees or an experimental unit. The averages were compared according to the Least Significant Difference (L.S.D) test under a probability of 5%. The data was analyzed using the GenStat statistical program.

Studied traits-:

1. The length and diameter of the fruit (cm.). The measurement was done using the Vernier Caliper, as 20 fruits were randomly taken from each replicate.
2. .Fresh fruit weight(g)

It was done by using a sensitive balance, as 20 fruits" were randomly taken from each treatment at the date stage, and the fresh weight of the fruit was recorded.

3.The weight of the bunch and the quantity of the total yield: kg

The stalks were cut and completely removed during the date stage on 1/10/2022 and weighed using a field scale, then the average weight of the total yield was extracted for each treatment (in kilograms)

Results and discussion

1.The length and diameter of the fruit (cm)

Table (1) shows that the A1 cultivar excelled in trait of fruit length, reaching (3.74) cm, while the A2 cultivar gave average (3.03) cm. As for the average fruit diameter, the A2 cultivar excelled and gave an average of (1.94) cm, while the A1 cultivar gave less. The average diameter of the fruit was (1.60) cm. The addition of auxins sprayed on the trees led to a tangible increase in these traits, where treatment B3 (D-2,4) gave the highest average of the length and diameter of the fruit, which reached (3.82, 2.03) cm, respectively. They were (3.73, 1.98) cm, respectively. Compared to the control treatment, which gave the lowest averages of (1.53, 2.93) cm, the bilateral overlap between cultivars A and auxin B types had a significant effect on these two traits, where treatment A2B3 excelled in the length and diameter of the fruit and reached (2.30, 3.67) cm, respectively. While the interaction between cultivars A and concentration C gave the highest average in the characteristic of fruit diameter in treatment A2C3, as it reached (2.20) cm, respectively. The bi-interaction between auxins B and concentration C had a significant effect, where the treatment B3C3 excelled and gave the highest rate in the characteristic of the average length and diameter of the fruit, reaching (2.40, 4.55) cm. The interaction between the three factors of the studied experiment had a significant effect. Treatment A1B2C3 excelled in fruit length and gave an average of (4.60) cm, while treatment A2B3C3 recorded the highest rate in fruit diameter (2.90) cm.

2. Fruit fresh weight (g)

The results in Table (2) showed that the A2 cultivar excelled in the trait of fresh fruit weight, reaching (8.24) g, while the A1

cultivar gave the lowest weight, amounting to (7.43) g. It also appears from the same table that spraying with 2,4-D auxin gave the highest average of fruit weight, amounting to (9.13) gm compared to auxin NAA and auxin IBA. The mentioned table also shows that the concentration ppm (2) recorded an average weight of (8.58) gm. While the control treatment gave the lowest rate of (6.71) gm, as table (1) indicates that the interaction between cultivars A and types of auxins B had a significant effect, as treatment A2B3 excelled in trait of fruit weight and gave an average of (10.12) gm, while treatment A1B1 gave the lowest average of (6.79) gm. The interaction between cultivars A and concentration C gave the highest fruit weight in treatment A2C3, which amounted to (9.43) g, while treatment A2C1 recorded the lowest average fruit weight, amounting to (6.33) g.) Compared to treatment B3C1, which gave the lowest weight of (6.59) gm. As for the triple interaction between the experimental factors, treatment A2B3C3 gave the highest rate of fruit weight (12.69) gm, compared to treatment A2B2C1, which gave the lowest weight of (5.92) gm.

3. The weight of the bunch, the quantity of the yield: kg

The data in Table (3) indicate that there were significant differences between the cultivars, where Al-Barhi A2 cultivar excelled in the traits of the bunch weight and the amount of yield with a weight of (17.2 and 172.17) kg, respectively, while the class A1 gave the lowest weight, which amounted to (8.91 and 89.19) kg, respectively. The same table also shows the excelled of the 2,4-D auxin treatment with the highest amount of yield amounting to 3137.1 kg, while the auxin 2,4-D gave the highest average in the weight of the bunch of (13.72) kg. Also, the concentration (2) ppm was excelled in increasing the amount of yield, reaching (154.47) kg. Table (3) shows that the bunch weight was significantly affected at concentration (2) ppm, compared to the control treatment that gave the lowest rate for the two traits (the bunch weight and the amount of yield). Which recorded an average of (10.12 and 101.22) kg, respectively .It was

evident in the light of the results the significant effect of the interactions between the factors of the study in increasing the weight of the bunch and the amount of yield, especially the treatment A2B1, which recorded a weight in both traits, reaching (18.00 and 180.07) kg, respectively, when the overlap between cultivars and auxins, but when the overlap between cultivars and concentrations, it excelled The treatment A2C3 increased the average cluster weight and the amount of yield with a weight of (21.13 and 211.27) kg, respectively. While the treatment of interaction between auxins and concentrate B3C3 recorded the highest percentage of the amount of yield, which was (168.60) kg. The table also shows the excelled of the triple interaction with the highest result in the treatment A2B3C3 with a weight of (217.10) kg, while the treatment A2B1C3 gave the highest weight of the bunch (21.70) kg. From this it is clear that the cultivar has an effect in responding to foliar spraying with auxins due to the influence of the genetic factor .As the use of auxins sprayed on palm trees improved the physical characteristics of the fruits as a result of the role of auxins in stimulating cell elongation and increasing the flexibility of cell walls, which led to a clear increase in the length and diameter of the fruit due to the effect of auxins on increasing the plant growth hormones responsible for the processes of division and cell elongation and expansion (11). The treatment A2B3C3 excelled in increasing the weight of both the fruit weight and the total yield, and the treatment A2B1C3 excelled in increasing the weight of the cluster, and this was evident in Tables 2 and 3. It is attributed to the role of auxins in reducing the rate of respiration by inhibiting the biosynthesis of ethylene by closing the stomata and thus reducing the weight loss of the fruit (12). Auxins also increase the speed of transfer of processed carbohydrates in the leaves to the fruits and increase the proteins, and this is reflected in the increase in the weight of the fruit (2), and thus is reflected in an increase in the weight of the taste and the total yield of the palm tree. The reason for the increase in the length of the

fruit is due to the effect of auxins on increasing the flexibility and expansion of the cell walls, and thus an increase in the length of the fruit, as well as the foliar spraying method has an effect on increasing the length of the

fruit as a result of increasing the absorption of nutrients and encouraging fruiting growth and yield (1) These results are consistent with the findings of (9), (4), and (10).

Table (1) Effect of the response of two cultivars of date palms (Al-Barhi and Al-Sayer) Phoenix Dactylifer L. to auxins on fruit length and diameter (cm)

cultivars (A)	Auxins (B)	auxin (C) concentration			B × A	auxin (C) concentration			A × B
		C1	C2	C3		C1	C2	C3	
A1	B1	3.20	3.50	3.60	3.43	1.40	1.50	1.60	1.50
	B2	3.40	3.90	4.18	3.83	1.30	1.50	1.80	1.53
	B3	3.30	4.00	4.60	3.97	1.80	1.60	1.90	1.77
A2	B1	2.70	2.80	2.90	2.80	1.70	1.80	1.90	1.80
	B2	2.50	2.80	2.60	2.63	1.50	1.90	1.80	1.73
	B3	2.50	4.00	4.50	3.67	1.50	2.50	2.90	2.30
L.S.D. 0.05		0.36			0.21	0.35			0.20
C × A					A	C × A			A
A1		3.30	3.80	4.13	3.74	1.50	1.53	1.77	1.60
A2		2.57	3.20	3.33	3.03	1.57	2.07	2.20	1.94
L.S.D. 0.05		0.21			0.12	0.20			0.12
C × B					B	C × B			B
B1		2.95	3.15	3.25	3.12	1.55	1.65	1.75	1.65
B2		2.95	3.35	3.39	3.23	1.40	1.70	1.80	1.63
B3		2.90	4.00	4.55	3.82	1.65	2.05	2.40	2.03
L.S.D. 0.05		0.25			0.15	0.25			0.14
C		2.93	3.50	3.73		1.53	1.80	1.98	
L.S.D. 0.05		0.15				0.14			

Table (2) Effect of the response of two cultivars of date palms (Al-Barhi and Al-Sayer) Phoenix Dactylifer L. to auxins on fruit weight (g)

cultivars (A)	Auxins (B)	(C) auxin concentration			B × A
		C1	C2	C3	
A1	B1	6.85	7.32	6.21	6.79
	B2	7.18	7.22	7.69	7.36
	B3	7.25	7.90	9.27	8.14
A2	B1	7.03	7.43	7.31	7.26
	B2	6.04	7.72	8.28	7.35
	B3	5.92	11.74	12.69	10.12
L.S.D. 0.05		0.42			0.24
C × A					B
A1		7.09	7.48	7.72	7.43
A2		6.33	8.96	9.43	8.24
L.S.D. 0.05		0.24			0.13
C × B					B
B1		6.94	7.38	6.76	7.03
B2		6.61	7.47	7.99	7.36
B3		6.59	9.82	10.98	9.13
L.S.D. 0.05		0.29			0.17
C		6.71	8.22	8.58	
L.S.D. 0.05		0.17			

Table (3) Effect of the response of two cultivars of date palms (Al-Barhi and Al-Sayer) Phoenix Dactylifer L. to auxins on the weight of the bunch and the quantity of yield (kg)

cultivars (A)	Auxins (B)	auxin concentration (C)			B × A	(C) auxin concentration			A × B
		C1	C2	C3		C1	C2	C3	
A1	B1	6.90	8.70	7.60	7.73	69.40	87.40	75.80	77.53
	B2	7.70	9.40	9.70	8.93	76.50	94.30	97.10	89.30
	B3	7.80	10.40	12.00	10.07	78.40	103.70	120.10	100.73
A2	B1	13.10	19.30	21.60	18.0	131.00	193.10	216.10	180.07
	B2	12.20	16.60	20.10	16.30	122.00	166.10	200.60	162.90
	B3	13.0	17.40	21.70	17.37	130.00	173.50	217.10	173.53
L.S.D. 0.05		0.89			0.51	7.57			4.37
C × A					A	C × A			A
A1		7.47	9.50	9.77	11.8	74.77	95.13	97.67	89.19
A2		12.77	17.77	21.13	17.2	127.67	177.57	211.27	172.17
L.S.D. 0.05		10.25			8.91	4.37			2.52
C × B					B	17.22			B
B1		10.0	14.0	14.6	17.3	100.20	140.25	145.95	128.80
B2		9.95	13.0	14.9	12.6	99.25	130.20	148.85	126.10
B3		10.4	13.9	16.85	13.7	104.20	138.60	168.60	137.13
L.S.D. 0.05		0.63			0.36	5.35			3.09
C		10.12	13.63	15.45		101.22	136.35	154.47	
L.S.D. 0.05		0.36				13.72			

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