

The effect of the microponic mixture and the female cultivar on some physical characteristics of date palm *Phoenix dactylifera* L., produced from tissue culture and grown in Thi Qar Governorate.

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Abstract

This study was conducted during the 2023 growing season at the palms Akkad station in Shatrah District, affiliated with the General Authority for Palms - Ministry of Agriculture, to study the effect of spraying with Microponic at four concentrations (0, 0.5 , 1, and 1.5) ml L⁻¹ and the female cultivar resulting from tissue culture (Barhi and Hilali) and the interaction between them in some physical characteristics of date palms. The results showed the following: Spraying with different concentrations of Microponic and the female cultivar had a significant effect in improving the physical characteristics of the fruits during the khalal stage, and the spraying treatment with Microponic at a concentration of 1 ml L⁻¹ significantly achieved the highest averages for: (fruit weight, core , fruit size and diameter) reaching (14.42 and 13.51) g fruit⁻¹ , 13.19 cm³ fruit⁻¹ and 2.650 cm.fruit⁻¹, respectively, for the khalal stage.

The Hilali cultivar was significantly superior in giving the highest averages of fruit weight, core , fruit size, and diameter reaching (16.16 and 15.24) gm fruit⁻¹, 15.08 cm³ fruit⁻¹, and 2.835 gm fruit⁻¹), respectively, in the Khalal stage. As for the effect of the interference treatments, it was significantly superior to the interference treatment between Microponic at a concentration of 1 ml L⁻¹ and the Al-Hilali cultivar gave the highest averages for (fruit weight, core, fruit size and diameter) reaching (17.36 and 16.40) g. fruit⁻¹ and 16.27 cm³ fruit⁻¹ and 2.927 cm , respectively.

Keywords: *Microponic - female cultivar - date palm - fruit weight.*

The research is taken from a master's thesis by the first researcher .

I. Introduction :

The date palm (*Phoenix dactylifera* L.) belongs to the order palmae and to the Arecaceae family, which is a monocotyledone fruit tree. The date palm is considered one of the oldest fruit trees in the world, and it is one of the tropical and subtropical fruit trees whose cultivation is widespread in the Arab region, including Iraq, especially its southern region. It includes about 220 genera and 2600 species (Al-Bakr 1972 and Ibrahim and Khalif 1998).

The Barhi cultivar is one of the Iraqi cultivars known internationally and desired by the consumer due to the sweetness of its fruits and their absence of astringent tannins. Its fruits are distinguished from other varieties in that they are eaten during the khalal, rutab and date stages and have a high nutritional value.

As for the Hilali cultivar , its cultivation is widespread in the Kingdom of Saudi Arabia, and its most important characteristic is large production. It is one of the late-ripening cultivars , and its fruits are



distinguished by their yellow color and distinctive taste. As for Iraq, its cultivation is widespread in Basra, and the date is distinguished by its high nutritional value.

Feeding the plant by spraying nutrients on the vegetative or fruiting system is one of the important matters that must be followed for plants grown in Iraqi soils, which have a basic reaction and have a great ability to stabilize and deposit elements in them. It is worth noting that most basic soils have a high content of calcium carbonate and clay, which limits the readiness of these elements for absorption, and as a result, a number of minor and major elements are stabilized when added to such soils . (Al-Hamdani *et al.* 2022).

Microponic is a mixture of micronutrients that the plant needs in small quantities compared to other elements. Also, the microelements are important to the plant and are necessary, just like the macro elements , for the plant to perform its functions fully.

Palm plants resulting from tissue culture remain in need of follow-up and study to improve their acclimatization and growth conditions in the field. Therefore, this study came with the aim of knowing the effect of concentrations of the microponic and the female cultivar in improving some of the physical characteristics of the fruits of the Barhi and Hilali cultivars .

II. Materials and methods :-

This study was conducted during the 2023 growing season at the palms Akkad station in Shatrah District, affiliated with the General Authority for Palms - Ministry of Agriculture. Eight palm trees were selected from tissue culture and were 12 years old from two cultivars : (Al-Barhi and Al-Hilali). Each cultivar had 4 palm trees. They were selected on the basis of similarity in the strength of vegetative growth and freedom from disease , which were irrigated using the basin method. The palm trees were identified in Experiment by marking it according to treatments and replicates.

All the usual agricultural service operations were carried out, including pest control, hanging the fruit clusters, pruning, and pollinating the palm trees with green ghanami pollen in the form of batches , the clusters were bagged immediately after pollination with brown paper for a period of 21 days to increase the set rate , the number of fruit clusters was determined at eight clusters for each palm tree , the factors studied were as follows:

The first factor: Fruit bunches were sprayed with Microponic at four concentrations (0, 0.5, 1, and 1.5) ml L⁻¹ for the palm tree in six sprays, and the period between one spray and the next was 10 days, the first spray was on 1/5/2023. The second factor: The two female cultivars (Barhi and Hilali) resulting from tissue culture were adopted, with 4 palm trees for each cultivar. The experiment was designed according to a Completely Randomized Block Design , the results were analyzed using the Genstat 12 program, and the averages were compared using the least significant difference (L.S.D.) at the probability level. 0.05 (Al-Rawi and Khalafallah, 2000) .

Studied Characteristics:

1- Fruit weight (gm.fruit⁻¹):

Ten fruits of each cultivar were weighed randomly at the khalal stage using a sensitive electronic balance, and the weight of one fruit was calculated in grams by dividing the weight of the fruits by their number to calculate the average weight of the fruit.

2 - Weight of the core (gm fruit⁻¹):

A sharp knife was used to remove the fruit core and separate it from the seeds for 10 fruits from each replicate. Then the fruit core for the ten fruits was weighed on a sensitive scale and the total weight was divided by the number of fruits to calculate the average weight of the core of one fruit. The seeds for the



ten fruits were also weighed and the total weight was divided on the number of seeds to calculate the average weight of one seed .

3 - Length and diameter of the fruit (cm fruit⁻¹):

10 fruits were taken randomly in the khalal stage of each replicate, and the length and diameter were measured using a Vernier caliper , then the average length and diameter of the fruit was extracted by dividing the total (length or diameter) by the number of fruits.

4 - Fruit size (cm³ fruit⁻¹):

The size of the fruit was measured using the graduated cylinder and distilled water method, taking 10 fruits for each replicate , a known volume of distilled water was placed in the graduated cylinder and the fruits were immersed inside the graduated cylinder , the size was measured by finding the difference between the water level in the two cases and then extracting it average size of one fruit (cm³) by dividing the size difference by the number of fruits.

III. Results and Discussion :

1- Weight of the fruit (g fruit⁻¹):

The results in Table (1) showed that the effect of spraying with concentrations of Microponic and the female cultivar and their interactions on the weight of the fruit at the khalal stage had a significant effect on increasing the weight of the fruit, and the spraying treatment with the concentration of Microponic (1 ml L⁻¹) was significantly superior in giving the highest average fruit weight of (14.42 g Fruit⁻¹) compared to the control treatment, which gave the lowest average of (12.83 g Fruit⁻¹) .

As for the female cultivar, it had a significant effect on increasing the weight of the fruit (g) during the khalal stage, and the Hilali cultivar was significantly superior in increasing the weight of the fruit by (16.16 g Fruit⁻¹) , compared to the Barhi cultivar, which recorded an average of (11.18 g Fruit⁻¹) .

Microponic ml L ⁻¹	Cultivars		Microponic average
	Barhi	Hilali	
0	10.28	15.37	12.83
0.5	11.56	16.42	13.99
1	11.49	17.36	14.42
1.5	11.41	15.48	13.45
Cultivar average	11.18	16.16	
L.S.D_{≤0.05}	Microponic	Cultivar	Interactions



	0.964	0.681	1.363
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Table (1) The effect of spraying with Microponic and the female cultivar and their interactions on the weight of the fruit (g. fruit⁻¹) at the khalal stage of date palms produced from tissue culture

The results of the same table indicate that the interaction treatment between spraying with Microponic at a concentration of 1 ml L⁻¹ and the Hilali cultivar achieved the highest average of fruit weight at (17.36 g fruit⁻¹), while the control treatment for the Barhi cultivar recorded the lowest average of (10.28 g fruit⁻¹).

.2- Weight of the core (g fruit-1):

Table (2) shows the effect of spraying with Microponic and the female cultivar and their interaction on the weight of the core in the khalal stage. Microponic concentrations significantly affected the increase in the weight of the core of the fruits, and it was significantly superior to the treatment with a concentration of 1 ml L⁻¹ in giving the highest average weight of the core, it reached (13.51 g Fruit⁻¹), compared to the control treatment, which gave the lowest average of (11.95 g Fruit⁻¹).

As for the effect of the female cultivar, it was significant on the weight of the core, as the Hilali cultivar was significantly superior in increasing the weight of the core and recorded the highest average of (15.24 g Fruit⁻¹), compared to the Barhi cultivar, which recorded the lowest average of (10.35 g Fruit⁻¹).

Table (2) The effect of spraying with Microponic and the female cultivar and their interactions on the weight of the core (g fruit⁻¹) at the khalal stage of date palms produced from tissue culture.

Microponic ml L ⁻¹	Cultivars		Microponic average
	Barhi	Hilali	
0	9.45	14.45	11.95
0.5	10.72	15.50	13.11
1	10.63	16.40	13.51
1.5	10.62	14.61	12.61
Cultivar average	10.35	15.24	
L.S.D≤ 0.05	Microponic	Cultivar	Interactions
	0.974	0.689	1.377

As for the effect of the interaction between Microponic and the female cultivar, the interaction treatment between Microponic at a concentration of (1 ml L⁻¹) and the Hilali cultivar was superior in giving the highest average weight of the core of the fruit, amounting to (16.40 g Fruit⁻¹), while the control treatment for the Barhi cultivar gave the lowest average, amounting to (9.45 g fruit⁻¹)

3 - Fruit size (cm³ Fruit⁻¹):

The results in Table (3) indicate the significant superiority of the spray treatment with a microponic concentration of (1 ml L⁻¹) in achieving the highest average fruit size of (13.19 cm³ fruit⁻¹), compared to the control treatment, which recorded the lowest average of (11.71 cm³ fruit⁻¹).

As for the effect of the female cultivar, it was significant on the size of the fruit, and the Hilali cultivar excelled by achieving the highest average of (15.08 cm³ fruit⁻¹), compared to the Barhi cultivar, which recorded the lowest average of (9.91 cm³ fruit⁻¹).

Table (3) The effect of spraying with Microponic and the female cultivar and their interactions on the fruit size ($\text{cm}^3 \text{fruit}^{-1}$) at the khalal stage of date palms produced from tissue culture.

Microponic ml L^{-1}	Cultivars		Microponic average
	Barhi	Hilali	
0	9.42	14.00	11.71
0.5	10.05	15.53	12.79
1	10.12	16.27	13.19
1.5	10.06	14.52	12.29
Cultivar average	9.91	15.08	
L.S.D\leq 0.05	Microponic	Cultivar	Interactions
	1.017	0.719	1.439

As for the effect of the interaction between spraying with Microponic and the female cultivar, the results of Table (3) indicated that there were significant differences in the size of the fruit, and the interaction treatment between Microponic at a concentration of (1 ml L^{-1}) and the Al-Hilali cultivar was superior in giving the highest average fruit size of ($16.27 \text{ cm}^3 \text{Fruit}^{-1}$), while the control treatment of the Barhi cultivar gave the lowest average of ($9.42 \text{ cm}^3 \text{Fruit}^{-1}$).

4 - Fruit length (cm Fruit^{-1}):

The results in Table (4) showed that the effect of spraying treatments with concentrations of Microponic was not significant on the length of the fruit at the khalal stage.

As for the effect of the female cultivar, it was significant on fruit length, and the Hilali cultivar excelled in achieving the highest average of fruit length, reaching ($3.523 \text{ cm. Fruit}^{-1}$), compared to the Barhi cultivar, which recorded the lowest average of ($3.194 \text{ cm Fruit}^{-1}$).

Table (4) The effect of spraying with Microponic and the female cultivar and their interactions on the fruit length (cm fruit⁻¹) at the khalal stage of date palms produced from tissue culture.

Microponic ml L ⁻¹	Cultivars		Microponic average
	Barhi	Hilali	
0	3.173	3.400	3.287
0.5	3.220	3.547	3.383
1	3.200	3.667	3.433
1.5	3.183	3.477	3.330
Cultivar average	3.194	3.523	
L.S.D_{0.05}	Microponic	Cultivar	Interactions
	N.S	0.1129	0.2258

The interaction treatment between the microponic at a concentration of (1 ml L⁻¹) and the Hilali cultivar was significantly superior in achieving the highest average of fruit length at the khalal stage, which amounted to (3.667 cm fruit⁻¹), while the control treatment of the Barhi cultivar recorded the lowest average of (3.173 cm fruit⁻¹).

5 - Fruit diameter (cm Fruit⁻¹):

The results of Table (5) showed that the spraying treatment with Microponic at a concentration of (1 ml L⁻¹) was significantly superior and achieved the highest average of fruit diameter at the khalal stage, which amounted to (2.650 cm fruit⁻¹), compared to the control treatment, which recorded the lowest average of (2.510 cm fruit⁻¹).

As for the effect of the female cultivar, it was significantly superior to the Hilali cultivar and achieved the highest average fruit diameter of (2.835 cm Fruit⁻¹), compared to the Barhi cultivar, which recorded the lowest average of (2.327 cm Fruit⁻¹).

The interaction treatment between the microponic at a concentration of (1 ml L⁻¹) and the Hilali cultivar was significantly superior in giving the highest average fruit diameter of (2.927 cm fruit⁻¹), while the control treatment of the Barhi cultivar recorded the lowest average of (2.240 cm fruit⁻¹).



Table (5) The effect of spraying with Microponic and the female cultivar and their interactions on the Fruit diameter (cm Fruit⁻¹) at the khalal stage of date palms produced from tissue culture.

Microponic ml L ⁻¹	Cultivars		Microponic average
	Barhi	Hilali	
0	2.240	2.780	2.510
0.5	2.337	2.850	2.593
1	2.373	2.927	2.650
1.5	2.357	2.783	2.570
Cultivar average	2.327	2.835	
L.S.D_{0.05}	Microponic	Cultivar	Interactions
	0.0632	0.0447	0.0894

It is noted from the results in Tables (1, 2, 3, 4, and 5) that there is a significant effect of spraying fruits with concentrations of Microponic by increasing the weight of the fruit, the core, and the diameter and size of the fruit at the khalal stage, as increasing these averages for these characteristics is a positive indicator of the quality of the fruits. It is good and desirable by the consumer, who prefers long fruits with good core weight and large size (Al-Ghazi, 2015).

The reason may be due to the role played by the microelements involved in the composition of microponic in stimulating and building the growth hormones auxins, cytokinins, and gibberellins, which lead to increased cell division and expansion. For example, cytokinins work to increase the movement and transport of the products of the photosynthesis process and nutrients into the fruits, and this has a positive effect on improving the physical characteristics of the fruits (Ozago and Reinecke, 2003; Al-Musawi and AL-Zubaydi, 2022).

Or the reason for the increase may be due to the role of Microponic in preparing the fruits with microelements such as iron, zinc, copper, boron and manganese, as they are included in its composition, which greatly help in increasing the division of plant cells in the fruits and their elongation and expansion, which led to an increase in the size, length and diameter of the fruit in particular zinc is an important element in the manufacture of the amino acid tryptophan, the initiating compound for the synthesis of auxin (IAA), which is important in cell division and expansion (Saqr, 2010).

The results of the study showed a significant effect of the two cultivars (Barhi and Hilali) on the physical characteristics of the fruits. The reason may be due to the difference between the cultivars in genetic characteristics, which has a major role in determining the characteristics of the fruits due to the difference in morphological and physiological characteristics between the cultivars (Al-Zubaidi *et al.*, 2020).

The results of this study are consistent with a number of researchers during their studies on date palms, including (Al-Ibrahimi, 2023 ; Al-Moussawi , 2022 ; Al-Nimrawi , 2023, and Attia , 2022).

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