

## The effect of spraying Basfoliar Kelp SL and calcium on some physiological and physical characteristics of date palm fruits, *Phoenix dactylifera L*, Al-Shwaithi cultivar

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### Abstract

This study was conducted during the 2023 growing season in one of the private orchards in Thi Qar Governorate, with the aim of studying the effect of spraying fruits with concentrations of Basfoliar Kelp SL (0, 2 and 4) ml L<sup>-1</sup> and calcium (0, 2.5 and 5) ml L<sup>-1</sup> and their interactions in Some physiological and physical characteristics of date palm fruits, Al-Shwaithi variety, at the Rubab stage.

The experiment was carried out as a factorial experiment according to a completely randomized block design with five replications to calculate the studied characteristics. Concentrations of Basfoliar Kelp SL and calcium were sprayed 21 days after pollination and upon completion of fruit set, and 6 sprays between one another (15 days) and until fruit growth was completed and the coloring phase began. The results can be summarized as follows.

The concentration of seaweed extract Basfoliar Kelp SL (4 ml L<sup>-1</sup>) showed a significant increase in most of the physiological and physical traits studied, and the highest rates were recorded for: maturity rate (87.68%), fruit length (3.76 cm), fruit diameter (2.41 cm), and fruit weight. (10.38 cm) and shoot weight (8.28 kg), in addition to the concentration (4 ml L<sup>-1</sup>) recorded the lowest rates, with a significant difference in the percentage of fruit drop (12.94%). The calcium concentration (5 ml L<sup>-1</sup>) showed a significant increase in most of the physiological and physical traits studied, and the highest rates were recorded in the maturity rate (86.38%), fruit length (3.68 cm), fruit diameter (2.38 cm), fruit weight (10.15 g), and bunch weight ( 7.61 kg) for the Rubab stage, in addition to recording the lowest rates with a significant difference in the percentage of fruit drop (10.66%).

As for the effect of the interaction parameters between Basfoliar Kelp SL (4 ml L<sup>-1</sup>) and Calcium (5 ml L<sup>-1</sup>), it was significant in giving the highest rates of physiological and physical characteristics during the retag stage.

### I. Introduction :

The date palm *Phoenix dactylifera L*. is one of the trees whose name and history have been linked to the Arab region since ancient times. The date palm belongs to the palm family Arecaceae (Al-Jubouri, 2002). It is one of the tropical and subtropical fruit trees whose cultivation is widespread in the Arab region, including Iraq, especially in the southern region (Al-Bakr, 1972).

The Al-Shwaithi variety is one of the well-known and widely grown varieties in the southern regions of Iraq, specifically in the provinces of Thi Qar and Basra. It is considered one of the late-ripening varieties. Its fruits are distinguished by their good quality, sweet taste, and high nutritional value.

The fruits are spindle-shaped, elongated, yellow in color, large in size, sweet in taste, and low in substance. They are astringent and have a good flavor and high nutritional value in the retag stage. However, in the tamr stage, the fruits are soft and have a skin attached to the flesh. The fruits are eaten in the retag and tamr stages (Al-Ansari and Al-Saleh, 2005).

Marine algae has been used in the agricultural field as a source of mineral elements and plant growth regulators, as it was found that their use affects the quality of fruits and increases crop productivity (Jameson, 1993 and Francesco et al, 2009), in addition to containing many macro- and micro-nutrients, and some algae extracts have been proven to Marine species play a role in preventing plant diseases and increase plant resistance to conditions of salt stress, drought, and freezing because they contain amino acids (Blunden, 1986).

Among the marine algae products is Basfoliar Kelp SL, which is a plant growth stimulant extracted from the marine algae *Ecklonia maxima* and is rich in amino acids, vitamins and some growth regulators.

Craig (2010) and Ankush (2017) found that calcium is essential in agricultural production from a quantitative standpoint, because calcium is mainly a determinant of plant growth and the quality of the product from a nutritional standpoint, and it is one of the essential nutrients that the plant needs.

Jameel (2016) mentioned that spraying Al-Sayer date palm trees with liquid university fertilizer at four concentrations (0, 10, 20, and 30%) had a significant effect on increasing the weight of the shoot and the amount of yield, and the spraying treatment with a concentration of (30%) was significantly superior in increasing the weight of the shoot and the quantity of the yield by higher rates. It reached (7.16 kg) and (24.65 kg Nakhla<sup>-1</sup>), respectively, compared to the control treatment, which recorded the lowest rates of (3.33 kg) and (13.34 kg Nakhla<sup>-1</sup>), respectively.

Al-Khafaji (2019) found that spraying date palm fruits of the Al-Shwaithi variety with Algazane marine algae extract at three concentrations (0, 3, and 6) ml L<sup>-1</sup>, significantly superior to the concentration treatment (6 ml L<sup>-1</sup>) by giving the highest average fruit length of (4.022) cm in comparison. With the control treatment, which recorded the lowest rate of (3.133) cm.

Sobeih (2021) showed that spraying date palm trees with calcium oxide of the Al-Sayer variety at concentrations of (0, 15, 30)%. The concentration (30%) led to a significant increase in the weight of the fruit amounting to (7.642 and 6.293) grams for the Khalal and Rubab stages, respectively. Compared with the control treatment, which amounted to (6.383 and 5.437) grams for the two stages, respectively.

Al-Mousawi and Al-Zubaidi (2022) indicated that there is a significant effect on the percentage of ripeness when spraying the fruits of the Barhi date palm variety with the Gorogreen nutrient solution at four concentrations (0, 0.5, 1, and 1.5) ml L<sup>-1</sup> for the Khalal and Rubab stages, as The concentration (1.5 ml L<sup>-1</sup>) gave the highest percentage of (49.12 and 87.14)% compared to the control treatment, which reached the lowest percentage of (43.04 and 77.07)%, respectively.

Attia (2022) found that spraying the fruits of the Barhi date palm variety with Biozyme stimulant at three concentrations (0, 1, and 2) ml L<sup>-1</sup> had a significant effect on increasing the maturity rate, and the concentration (2 ml L<sup>-1</sup>) was superior to giving the highest rate of (73.19%). Compared with the control treatment, which reached (60.78%) in the wet stage.

Al-Ibrahimi and Al-Assadi (2023) found that spraying the fruits of date palm varieties Al-Shuwaithi and Al-Sayer with three concentrations of microelements (0, 1, and 2) ml L<sup>-1</sup>, for the Khalal and Rubab stages, caused a significant decrease in the rate of fruit drop, and the concentration exceeded (2 ml L<sup>-1</sup>). In recording the lowest rate of (20.95 and 15.92)%, respectively, compared to the control treatment, which recorded the highest rate of (28.93 and 23.92)%, respectively.

Kazem (2024) found that spraying the fruits of the date palm variety Al-Shwaithi with the growth stimulant Bio 20 at concentrations of (0, 2, and 4) ml L<sup>-1</sup> had a significant effect on increasing the length,



diameter and size of the fruit, as the concentration exceeded (4 ml L<sup>-1</sup>) by giving the highest rate of (3.76 and 2.18) cm and (10.53 cm<sup>3</sup>), respectively, for the retag stage, compared to the control treatment, which reached an average of (3.01 and 1.72) cm and (9.39 cm<sup>3</sup>), respectively, for the retag stage.

Therefore, this study came with the aim of:

1-Study of the effect of calcium concentrations on some physiological and physical characteristics of date palm fruits, Al-Shwaithi variety, at the Rubab stage.

2- Study the effect of concentrations of Basfoliar kelp SL. In some physiological and physical characteristics of date palm fruits, Al-Shwaithi was classified in the retag stage.

3- Study the effect of the interaction coefficients between the two study factors on the studied traits.

## II. Materials and Methods :

This study was conducted during the 2023 growing season in one of the private orchards in Nasiriyah District, the center of Thi Qar Governorate, where (5) palm trees of the Al-Shwaithi variety were selected. The trees were as homogeneous as possible in terms of height, diameter, vegetative growth, service operations, and were free of disease and insect infestations. The palm trees were pollinated, and the shoots were bagged immediately after pollination with brown paper for a period of (21 days) to increase the set rate and leave (9 stems) for each palm.

The study was carried out as a factorial experiment according to a completely randomized block design for a two-factor study with five replicates. The first factor was spraying the fruits with Basfoliar Kelp SL at three concentrations. (0, 2, and 4) ml liter<sup>-1</sup> starting from the setting process and for six sprays between one and the other (15 days) until the fruits begin the coloring stage. The second factor is calcium, in three concentrations (0, 2.5, and 5) ml liter<sup>-1</sup> starting from completion. Contract process.

### Experimental measurements:

#### Precipitation rate (%):

The drop rate for all treatments was measured 60 days after pollination by taking 10 shoots at random from each duplicate shoot, then counting the number of fruits present and the number of fallen fruit sites and the empty scars on each shoot, according to the method of Ream and Furr (1970), and the drop rate was calculated according to the equation The following:

$$\text{Percentage of fallen fruits} = \frac{\text{Number of empty scars}}{\text{The number of empty scars} + \text{the number of fruits present}} \times 100$$

#### Maturity rate (%):

The maturity percentage was calculated at the end of the retag stage, as ten shoots were taken randomly from each stalk, and their maturity percentage was calculated according to the following equation:

$$\text{Percentage of fruit maturity} = \frac{\text{Number of ripe fruits}}{\text{Total number of fruits}} \times 100$$

#### Fruit weight (g):

The fresh weight of the fruit was measured by taking 10 fruits randomly from each replicate and for each treatment, and they were weighed using a sensitive digital balance. The average fresh weight of one fruit was extracted by dividing the total weight of the fruits by their number. The seeds were removed from the fruits and they were weighed, and the weight of one seed was extracted from dividing the total weight

of the seeds. Based on their number, the weight of the flesh of the fruit was extracted by subtracting the weight of one seed from the weight of the fruit, and the unit of measurement was in grams.

Weight of fleshy layer = weight of fruit \_ weight of seed

**Length and diameter of the fruit:**

10 fruits were taken randomly for each replicate in each treatment, and the length and diameter were measured using a digital Vernier measuring foot. Then the average length and diameter of the fruit was extracted by dividing the total length or diameter by the number of fruits, and the unit of measurement was in the centimeter.

**Stem weight:**

The weight of a single stalk was extracted by weighing it with a field scale for each of the study treatments, with five replicates for each treatment, with a unit of measurement (kg).

**Statistical analysis:**

The study was carried out as a global experiment according to a randomized complete block design with two factors. The first factor was spraying the fruits of the date palm variety Al-Shwaithi with three concentrations of Basfoliar Kelp seaweed extract (0, 2, and 4) ml liter<sup>-1</sup>. The second factor was spraying the fruits with three concentrations. Of the calcium element, it is (0, 5, 2, and 5) ml liter<sup>-1</sup>, as each palm tree was considered a sector and contained nine flower inflorescences (branches), and each frond was considered an experimental unit, with five replicates for each treatment.

The data were statistically analyzed using the 10 Gen Stat program in analysis of variance. The averages were tested using the Least Significant Differences Test (Least Significant Differences Test) at a probability level of (0.05) based on (Al-Rawi and Khalafallah, 2000).

**III. Results and discussion ;**

Table (1) Effect of spraying fruits with calcium and seaweed extract Basfoliar Kelp SL and their interactions on the percentage of defoliation (%).

Calcium rate	Extract Basfoliar Kelp SL ml l-1			Calcium 5 ml l-1
	4	2	0	
14.81	13.11	8.96	22.35	0
14.34	13.13	11.01	18.06	2.5
10.66	11.77	9.46	10.75	5
	12.94	9.81	17.06	Basfoliar Kelp SL
	Interactions	Basfoliar Kelp SL	Calcium	LSD 0.05
	1.128	0.651	0.651	

It is noted from the results in Table (1) that calcium treatments had a significant effect on reducing the rate of fruit drop, and the 5 ml L<sup>-1</sup> concentration treatment achieved the lowest rate of 10.66% compared to the control treatment, which recorded a rate of 14.81%, which did not differ significantly with the 2.5 concentration treatment. ml liter<sup>-1</sup>, which recorded a rate of 14.34%.

As for the effect of the treatments of seaweed extract Basfoliar Kelp SL, it was significant in reducing the rate of precipitation, and the concentration treatment of 2 ml L<sup>-1</sup> achieved the lowest rate, amounting to 9.81%, compared to the control treatment, which recorded the highest rate, amounting to 17.06%.



As for the effect of the interference treatments, some of them were significant in reducing the precipitation rate. The interaction treatment between (calcium at a concentration of 0 ml L<sup>-1</sup> and marine algae at a concentration of 2 ml L<sup>-1</sup> achieved the lowest rate of 8.96%), which did not differ significantly with the interference treatment (calcium at a concentration of 5 ml liter<sup>-1</sup> and marine algae at a concentration of 2 ml liter<sup>-1</sup>, which recorded a rate of 9.46%, compared to the control treatment, which recorded the highest rate of (22.35%).

**Maturity rate (%):**

Table (2)The effect of spraying fruits with calcium and marine algae extractBasfoliar Kelp SL etDaTheir acetate in percentage ofmaturity(%).

Calcium rate	ExtractBasfoliar Kelp SLml l <sup>-1</sup>			Calcium 5 ml l <sup>-1</sup>
	4	2	0	
79.27	86.69	85.32	65.81	0
83.11	78.80	84.63	78.80	2.5
86.38	90.45	84.80	83.90	5
	87.68	84.92	76.17	Basfoliar Kelp SL
	Interactions	Basfoliar Kelp SL	Calcium	LSD 0.05
	2.367	1.367	1.367	

It is noted from the results in the table (2)The calcium treatments had a significant effect on increasing the maturity rate of the fruits, and the concentration treatment (5 ml L<sup>-1</sup>) achieved the highest rate of 86.38%, followed by the treatment with a concentration of (2.5 ml L<sup>-1</sup>) of 83.11% compared to the control treatment, which recorded the lowest rate of 79.27% .

As for the effect of the treatments of seaweed extract Basfoliar Kelp SL, it was significant in increasing the maturity rate, and the concentration treatment of 4 ml L<sup>-1</sup> achieved the highest rate of 87.68% compared to the control treatment, which recorded the lowest rate of 76.17%. As for the effect of the interaction treatments, some of them were significant in increasing the maturity rate, as they were significantly superior. The interaction treatment between (Calcium at a concentration of 5 ml L<sup>-1</sup> and Basfoliar Kelp SL at a concentration of 4 ml L<sup>-1</sup>) achieved the highest rate of 90.45%, compared to the control treatment, which recorded the lowest. The rate reached 65.81%.

**Fruit weight (g):**

Table (3)The effect of spraying fruits with calcium and marine algae extractBasfoliar Kelps L etDaTheir acetate in percentage maturity (%).

Calcium rate	Basfoliar Kelp SLml l-1			Calcium 5 ml l-1
	4	2	0	
9.158	10.120	9.057	8.297	0
9.829	10.463	9.723	9.300	2.5
10.151	10.580	10.017	9.857	5
	10.388	9.599	9.151	Basfoliar Kelp SL
	Interactions	Basfoliar Kelp SL	Calcium	LSD 0.05
	0.3970	0.2292	0.2292	



It is noted from the results in Table (3) that the effect of calcium treatments was significant on increasing the weight of the fruit, as the concentration treatment (5 ml L<sup>-1</sup>) excelled and gave the highest rate of (10.151 g), compared to the control treatment which recorded the lowest rate of (9.158 g).

As for the effect of the seaweed extract Basfoliar Kelp SL, it was significant in increasing the weight of the fruit, and the concentration treatment (4 ml L<sup>-1</sup>) excelled and recorded the highest rate of (10.388 grams) compared to the control treatment that recorded the lowest rate of (9.151 grams).

As for the effect of the interaction treatments, some of them were significant in increasing the weight of the fruit. The interaction treatment between calcium at a concentration of (5 ml L<sup>-1</sup>) and the seaweed extract Basfoliar Kelp SL at a concentration of (4 ml L<sup>-1</sup>) excelled and achieved the highest rate of (10,580 g), which did not differ. Significantly with the interaction treatment between (calcium at a concentration of 2.5 ml L<sup>-1</sup> and seaweed extract Basfoliar Kelp SL (4 ml L<sup>-1</sup>), which recorded a rate of (10.463 g) compared to the control treatment that recorded the lowest rate of (8.297 g).

**Fruit length (cm):**

Table (4) The effect of spraying fruits with calcium and seaweed extract Basfoliar Kelp SL and their interactions on fruit length (cm) during the retag stage.

Calcium rate ml l-1	Basfoliar Kelp SLml l <sup>-1</sup>			Calcium ml l <sup>-1</sup>
	4	2	0	
3.38	3.53	3.45	3.15	0
3.57	3.83	3.65	3.24	2.5
3.68	3.93	3.75	3.35	5
	3.76	3.62	3.25	Basfoliar Kelp SL
	Interactions	Basfoliar Kelp SL	Calcium	LSD 0.05
	0.030	0.0176	0.0176	

It is noted from the results in the table (4) Calcium treatments had a significant effect on increasing fruit length with increasing calcium concentration, and the concentration treatment (5 ml L<sup>-1</sup>) achieved the highest rate of 3.68. cm, which did not differ significantly with the concentration treatment (2.5 ml L<sup>-1</sup>), which recorded a rate of (3.57 cm), and compared to the control treatment, which recorded the lowest rate of(3.38 cm).

As for the effect of seaweed extract treatmentsBasfoliar Kelp SL There was a significant increase in fruit length with increasing concentration of the extract, and the concentration treatment (4 ml L<sup>-1</sup>) achieved the highest rate of (3.76). cm which did not differ significantly with the concentration treatment (2 ml L<sup>-1</sup>), which recorded a rate of (3.62 cm), and compared to the control treatment, which had the lowest rate of (3.25 poison).

As for the effect of the interference treatments, some of them were significant on the length of the fruit, as the results confirmed the superiority of the interaction treatment between calcium at a concentration of (5 ml L<sup>-1</sup>) and seaweed extract at a concentration of (4 ml L<sup>-1</sup>), achieving the highest rate of (3.93 cm) compared to the control treatment. Which reached the lowest rate (3.15 cm).



**Fruit diameter (cm):**

Table (5) The effect of spraying fruits with calcium and marine algae extract Basfoliar Kelp SL and their interactions in fruit diameter (cm) at the Rubab stage.

Calcium rate ml l <sup>-1</sup>	Basfoliar Kelp SL ml l <sup>-1</sup>			Calcium ml l <sup>-1</sup>
	4	2	0	
2.16	2.31	2.29	1.89	0
2.28	2.43	2.34	2.07	2.5
2.38	2.50	2.39	2.24	5
	2.41	2.34	2.07	Basfoliar Kelp SL
	Interactions	Basfoliar Kelp SL	Calcium	LSD 0.05
	0.067	0.387	0.387	

The results presented in the table (5) to the significant effect of calcium treatments by increasing the diameter of the fruit, and the concentration treatment (5 ml L<sup>-1</sup>) achieved the highest rate of (2.38 cm), then the concentration treatment (2.5 ml L<sup>-1</sup>) achieved a rate of (2.28 cm), and compared to the control treatment that was recorded The lowest rate was (2.16 poison).

As for the effect of seaweed extract treatments Basfoliar Kelp SL was significantly increased in fruit diameter, and the concentration treatment (4 ml L<sup>-1</sup>) achieved the highest rate of (2.41 cm), followed by the concentration treatment (2 ml L<sup>-1</sup>) at a rate of (2.34). cm compared to the control treatment, which recorded the lowest rate of (2.07 cm).

As for the interaction coefficients between calcium and marine algae extract Basfoliar Kelp SL, some of which had a significant effect on increasing the diameter of the fruit, and the interaction treatment between calcium at a concentration of (5 ml L<sup>-1</sup>) and the seaweed extract Basfoliar Kelp SL at a concentration of (4 ml L<sup>-1</sup>) achieved the highest rate of (2.50 cm) compared to the control treatment. Which gave the lowest rate (1.89 cm).

**Stem weight (kg):**

Table (6) The effect of spraying fruits with calcium and marine algae extract Basfoliar Kelp SL and their interactions in fruit diameter (cm) at the Rubab stage.

Calcium rate	Basfoliar Kelp SL ml l <sup>-1</sup>			Calcium ml l <sup>-1</sup>
	4	2	0	
6.67	7.83	6.67	5.50	0
7.17	8.33	7.67	5.50	2.5
7.61	8.67	8.17	6.00	5
	8.28	7.50	5.67	Basfoliar Kelp SL
	Interactions	Basfoliar Kelp SL	Calcium	LSD 0.05
	0.933	0.539	0.539	

It is noted from the results in the table (6) Calcium treatments had a significant effect on increasing shoot weight, and the concentration treatment (5 ml L<sup>-1</sup>) achieved the highest rate of (7.61). kg compared to the control treatment, which recorded the lowest rate of (6.67 kg).

As for the effect of seaweed extract treatments Basfoliar Kelp SL was significantly increased in shoot weight, and the concentration treatment (4 ml L<sup>-1</sup>) recorded the highest rate of (8.28 kg), followed by the



concentration treatment (2 ml L<sup>-1</sup>) at a rate of (7.50). kg), compared to the control treatment, which recorded the lowest rate of (5.67 kg).

As for the effect of the interaction treatments, some of them were significant with an increase in the weight of the shoot, and the interaction treatment between (calcium at a concentration of (5 ml L<sup>-1</sup>) and marine algae extract) achieved Basfoliar Kelp SL at a concentration of (4 ml L<sup>-1</sup>) had the highest rate of (8.67 kg), which did not differ significantly with the interaction treatment between (calcium at a concentration of 2.5 ml L<sup>-1</sup> and the seaweed extract Basfoliar Kelp SL at a concentration of 4 ml L<sup>-1</sup>), which achieved The rate reached (8.33 kg), compared to the control treatment, which recorded the lowest rate of (5.50 kg).

It is noted from the results in Tables (1 and 2) that there was a significant decrease in the rate of fruit drop due to the treatment of seaweed extract. Basfoliar Kelp SL (2ml l<sup>-1</sup>), and a significant increase in the rate of fruit ripening as a result of the treatment (4 ml l<sup>-1</sup>) compared to the control treatment. The reason for this may be attributed to the plant stimulant, marine algae extract. Basfoliar Kelp SL consists of amino acids, vitamins, and some growth hormones, such as auxins and cytokinins.

These components play an important role in pushing the fruits toward growth, completing their stages, reducing the rate of shedding and accelerating their ripening, and increasing their maturity by increasing the effectiveness of enzymes that are related to ripening transformations, including the invertase enzyme, which works to decompose sucrose into sugars. Monohydrates (glucose and fructose), which are important indicators of fruit maturity, as shown by the results of this study in Tables (1 and 2) (Al-Douri and Al-Rawi, 2000).

Or the reason is that calcium plays a role in the nutritional balance within the plant, which leads to reducing competition between fruits for nutrients and thus reducing the rate of fall (Matar, 1991), in addition to the fact that calcium is a secondary messenger in the cell that works to regulate many vital activities. Cellular, including preventing separation and loss of flowers or fruits after setting (Al-Tamimi, 2020).

As for the nature of the interaction between marine algae extract Basfoliar Kelp SL and calcium, some of the interaction coefficients were significant in increasing the rate of fruit maturity and decreasing the rate of fall. The reason may be due to the combined effect of the two factors of the study above, as their addition, especially in the stage of rapid division of fruit cells at the end of the Hababouk stage and the anthrax stage, has led to an increase in fruit growth and thus Accelerating and increasing the rate of ripening due to the abundance of amino acids, vitamins and plant hormones, which makes them ripen faster than untreated fruits. (Ghalib, 2011 ), The results of this study agreed with the results of studies conducted on date palms, including (Al-Khalifa and Al-Mir, 2016, Al-Saeedi, 2018, Al-Khafaji, 2019, Attia, 2022, Al-Ibrahimi, 2023, and Kazem, 2024).

Note the results in the tables (3, 4, 5 and 6) There is a significant effect of spraying palm fruits of the Al-Shwaithi variety with concentrations of the plant stimulant (seaweed extract) Basfoliar Kelp SL by increasing (the weight of the fruit, the length and diameter of the fruit, and the weight of the stalk), and the significant increase in these physical characteristics is a positive indicator of the quality of the quality of the fruits and they become good and desirable characteristics for the consumer, who prefers them because they are long fruits and have a large flesh weight and size (Al-Ghazi, 2015 ).

The reason for this may be attributed to the seaweed extract Basfoliar Kelp SL contains in a combination of amino acids, vitamins, auxins and cytokinins. All of these components, especially plant hormones (auxins and cytokinins), work to increase cell division and expansion. They also increase the strength of the consumption centers in the fruit and thus work to increase the length, diameter and weight of the fruit and thus the weight of the bunch and the yield.

In addition to their role in the process of cell division, they also work to increase the movement of the products of the photosynthesis process and nutrients toward the fruits, which is reflected in an increase





in the weight of the fruit, the weight of the shoot, and the total yield, as well as an increase in length. Qatar the fruit (Ozaga and Rienecke, 2003 and Sakr, 2010).

In addition, the construction of nucleic acids, enzymatic conjugates, enzymes and proteins in fruits is therefore considered an important factor in the process of growth and development of fruits and improving their physical characteristics mentioned above. (Khayyat et al., 2007).

As for the effect of spraying the fruits with concentrations of calcium, it was significant in increasing the rates of some of the studied physical characteristics of the fruits of the date palm variety Al-Shwaithi, such as (the weight of the fruit, the length and diameter of the fruit). The reason for this may be attributed to the role of the calcium element in building amino acids and proteins in the fruits, which are a factor. It is important in the process of growth and development of fruits and the improvement of most of their physical characteristics (Khayyat) et al., 2007).

As for the effect of the interaction coefficients between the study factors, which were significantly superior to the increase in physical characteristics, it may be attributed to the joint effect of the marine algae extract. Basfoliar Kelp SL and calcium.

The results of this study are consistent with the findings of a number of researchers who studied the effect of seaweed extracts and calcium on date palms, including (Al-Tamimi and Al-Bazuni, 2015, Al-Ghazi, 2015, Al-Taha and Al-Mubarak, 2016, Al-Mana, 2018, Al-Khafaji, 2019, Attia, 2022, Al-Ibrahimi, 2023, and Kazem, 2024).

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