

INFLUENCE OF BENZYL ADENINE, ADDITION OF ORGANIC FERTILIZERS AND THINNING ON SOME PHYSICAL AND CHEMICAL PROPERTIES OF DATE PALM CV. MEJHOUL

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ABSTRACT

This study was aimed to determine effect of foliar application of growth regulator benzyl adenine, adding organic fertilizers and thinning on some physical and chemical properties of date palm fruits Cv. Mejhoul, The experiment was carried out according to a randomized complete block design with three replicates and three factors: foliar application of benzyl adenine at concentrations (0, 100, 150 mg L⁻¹) and symbolized B0, B1, B2, and adding organic fertilizer at levels (0, 1 kg humic acid + 150 g seaweed extract for every tree, 2 kg humic acid + 300 g seaweed extract for every tree) symbols F0, F1, F2 and thinning at two levels (without thinning, removing 10 cm from tips of flower spikes and removing central area of branching from peduncle) symbols T0, T1 and included 54 experimental units, results showed superior treatment B2 increasing average fruit weight, fruit flesh weight, seed weight, and percentage of total, reducing, and non-reducing sugars, 30.82 g, 28.95 g, 1.80 g, 63%, 58.38%, and 4.62%, respectively. Treatment F2 gave highest average fruit weight, flesh weight, seed weight, total and reduced sugars, 29.16 g, 27.42 g, 1.76 g, 59.75%, 55.30%, respectively. Treatment T1 was significantly superior in increasing fruit weight, fruit flesh weight, seed weight, and percentage of total, reduced and non-reduced sugars, with values 31.80 g, 30.06 g, 1.75 g, 63.31%, 58.81%, 4.49%. T1 B2 F2 interaction had the highest average fruit weight, fruit flesh weight, seed weight, and percentage of total and reducing sugars. with values of 36.68 g, 34.46 g, 2.21 g, 72.55%, and 67.97%, respectively.

Key words: cytokinin's, humic acid, Improve productivity, marketable yield , seaweed extract.



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INTRODUCTION

The date palm (*Phoenix dactylifera* L.) is a monocot tree belonging to Arecaceae family. This family includes 200 genera and often more than 2,500 species (Elmeer et al.,2019); (Jubeir et al.,2023); (Khaleel et al.,2019). Palm trees are perennial, evergreen flowering plants and are among the oldest cultivated plants in Middle East (Abdul-Hamid et al., 2020); (Alotaibi et al.,2023). Palm trees have been an essential source of livelihood throughout history, dating back to more than 4000 years BC, and history of palm cultivation goes back to ancient civilizations such as Assyrians and

Babylonians (Ou-Zine et al.,2021). Mejhoul Cv. is considered one of most important and distinctive varieties that appeared for first time in Morocco, especially in Tafilalet region, and from there it was exported to rest of world (Al-Mayahi, 2025). This cultivar is characterized by its large, brown-colored fruits and excellent taste. It is considered one of most sought-after commercial varieties, not only because of its high price, but also because it is a high-calorie food and a good source of nutrients and vitamins. It is rich in sugars and antioxidants, free of cholesterol, low in fat, and contains high levels of phosphorus and potassium (Zaid

and Wahbi, 2022). Growth regulators play a major role in plant life because they control growth and development processes (Farman et al., 2019). Cytokinin's are main stimulators and regulators of cell division and affect plants through many biological activities, as they stimulate biosynthesis of chlorophyll molecules, contribute to plant growth and development, regulate distribution of nutrients, enhance plant's response to biotic and abiotic stresses, which has a positive effect on delaying senescence (Vashi, 2023). Organic fertilizers are an essential factor in increasing agricultural production through their effect on chemical, physical, biological, and fertility properties of soil, as they provide plants with basic nutrients necessary for their growth and development (Liu et al., 2024). Sustainable agriculture, which relies on organic agriculture, is an important goal for many countries in the world that work on this type of agricultural system and move away from traditional agriculture that relies on use of chemicals, which is considered main cause of environmental pollution (Khalil, 2023). Improving plant growth and increasing productivity is controlled by adding organic fertilizers, which play an important and fundamental role in regulating plant growth and development, as well as improving quality properties of fruits (Yu et al., 2024). Seaweed is a biodegradable organic fertilizer that enhances plant growth by providing nutrients and improving vegetative, root and fruiting growth of plants because it contains many plant hormones such as cytokinin's as well as amino acids and vitamins (Singh et al., 2025); (Mukherjee and Patel, 2020). The fruit thinning process is considered one of important and necessary processes for palm trees, as it works to improve quality of fruits and increase their uniformity, regulate annual palm production, and reduce or limit the phenomenon of floating. It also works to achieve early maturity and reduce hormonal or nutritional stress on trees (Radwan et al., 2022). The aim of this study is to know effect of foliar application of benzyl adenine, organic fertilizers, and thinning on some chemical properties of date palm fruits cv. Mejhoul.

MATERIALS AND METHODS

The study was conducted starting in spring and continued until the end of summer of 2023 at Rashedia Palm Station, one of projects of Horticulture Department affiliated to Iraqi Ministry of Agriculture. All necessary horticultural services were performed, such as pruning, because cutting dry and dead palm leaves is an essential process for servicing the palm tree. Because it hinders workers from climbing palm trunks, which delays performance of important agricultural operations such as pollination, thinning, and harvesting (Abdelaziz et al., 2022). Other service operations were also carried out, such as fertilization, irrigation, weeding, removing bushes, and cleaning trees in preparation for pollination season. Pollination was carried out using a new electronic Wireless pollination system for purpose of extracting pollen grains and conducting pollination processes. The bagging process was performed on the female flower inflorescences after pollination to increase percentage of knots, especially in seasons when temperatures are low or when rain falls and winds blow during pollination process. Then these bags were removed 15 days after pollination process was carried out (Ibrahim and Abdul Wahab, 2019). The study was conducted on date palm trees of Mejhoul cultivar, after selecting good and strong-growing trees that were as homogeneous in size. The trees are 10 years old, planted in lines, the distance between one line and another is 10 m, and the distance between the trees is 10 m.

Experimental design: The study was implemented using Randomized Complete Block Design (RCBD) as a factorial experiment that includes three factors with their interactions, so that number of treatments was 18, with three replicates for each treatment, so that total number of experimental units was 54 experimental units, each of which included one palm tree, and pollination process was carried out using the male palm cultivar Gannamy, results were analyzed using GenStat program according to LSD test at a probability level of 0.05 (Seltman, 2012).

Study factors

First: foliar application the bunch using three concentrations of growth regulator benzyl adenine, which will be symbolized by B, as follows: Without addition B0, foliar application of benzyl adenine at a concentration of 100 mg L⁻¹ B1, foliar application of benzyl adenine at a concentration 150 mg L⁻¹ B2. The spraying process was carried out with two sprays, first three weeks after pollination process and the second at beginning of Khalal stage (7).

Second: adding humic acid with seaweed extract to soil at three levels: Without adding (comparison treatment) symbolized as F0, adding (1 kg humic acid + 150 g seaweed extract) F1, adding (2 kg humic acid + 300 g seaweed extract) F2. Humic acid and algae extract were added three times, first on 1 April second on 5 May, and third on 1 June for 2023.

Third: Thinning at two levels as follows:

Without thinning (control treatment) symbolized as T0, removing 10 cm from ends of the strands, including removal of central branching area, symbolized as T1.

RESULTS AND DISCUSSION

Average fruit weight (g): The results in Table (1) show that foliar application of benzyl adenine B2 led to significant differences in increasing the fruit weight, reaching 30.82 g compared to the control treatment B0, which gave 25.21 g. The organic fertilizers treatment (humic acid and algae extract) F2 also excelled in giving the highest fruit weight rate of 29.16 g compared to control treatment F0, which gave 27.13 g. Thinning treatment T1 excelled in giving the highest fruit weight rate 31.80 g compared to treatment without thinning T0, which gave 24.36 g. The interaction treatment T1 B2 F2 excelled in giving the highest fruit weight rate 36.68 g.

Table 1. Effect of foliar application of benzyl adenine, adding organic fertilizers, and thinning on Average weight of fruit (g).

| Thinning | Benzyl Adenine | Fertilization | | | T × B |
|----------|----------------|---------------|--------|-------|--------|
| | | F0 | F1 | F2 | |
| T0 | B0 | 17.20 | 22.72 | 24.56 | 21.49 |
| | B1 | 25.41 | 25.53 | 25.53 | 25.49 |
| | B2 | 25.90 | 25.83 | 26.53 | 26.09 |
| T1 | B0 | 28.76 | 27.32 | 30.68 | 28.92 |
| | B1 | 30.72 | 31.07 | 31.01 | 30.94 |
| | B2 | 34.77 | 35.20 | 36.68 | 35.55 |
| LSD 0.05 | | | 0.8915 | | 0.5147 |
| F | | 27.13 | 27.94 | 29.16 | |
| LSD 0.05 | | | 0.3640 | | |
| T × F | | F0 | F1 | F2 | T |
| T0 | | 22.84 | 24.69 | 25.54 | 24.36 |
| T1 | | 31.42 | 31.20 | 32.79 | 31.80 |
| LSD 0.05 | | | 0.5147 | | 0.2972 |
| B × F | | F0 | F1 | F2 | B |
| B0 | | 22.98 | 25.02 | 27.62 | 25.21 |
| B1 | | 28.07 | 28.30 | 28.27 | 28.21 |
| B2 | | 30.34 | 30.52 | 31.60 | 30.82 |
| LSD 0.05 | | | 0.6304 | | 0.3640 |

Average weight of fruit flesh (g): Results of statistical analysis in Table (2) shows that treatment with growth regulator benzyl adenine B2 had a significant effect on increasing the weight of fruit flesh, with values reaching 28.95 g compared to comparison treatment B0, which gave 23.70 g. The treatment of adding organic fertilizer F2 was superior in giving highest rate of fruit flesh

weight, which reached 27.42 g compared to Comparison treatment F0, which gave 25.31 g, outperformed thinning treatment T1 by giving the highest average fruit flesh weight of 30.06 g compared to treatment without thinning T0, which gave 22.75 g. The interaction treatment, T1 B2 F2 was superior in giving highest average fruit flesh weight 34.46 g.

Table 2. Effect of foliar application of benzyl adenine, adding organic fertilizers, and thinning on Average weight of fruit flesh (g).

| Thinning | Benzyl Adenine | Fertilization | | | T × B |
|----------|----------------|---------------|-------|-------|-------|
| | | F0 | F1 | F2 | |
| T0 | B0 | 15.81 | 21.26 | 23.15 | 20.08 |
| | B1 | 23.82 | 23.91 | 23.98 | 23.90 |
| | B2 | 24.30 | 23.98 | 24.56 | 24.28 |
| T1 | B0 | 25.74 | 27.23 | 28.99 | 27.32 |
| | B1 | 29.07 | 29.25 | 29.36 | 29.23 |
| | B2 | 33.11 | 33.27 | 34.46 | 33.61 |
| LSD 0.05 | | | 1.940 | | 1.120 |
| F | | 25.31 | 26.48 | 27.42 | |
| LSD 0.05 | | | 0.792 | | |
| T × F | | F0 | F1 | F2 | T |
| T0 | | 21.31 | 23.05 | 23.90 | 22.75 |
| T1 | | 29.31 | 29.92 | 30.94 | 30.06 |
| LSD 0.05 | | | 1.120 | | 0.647 |
| B × F | | F0 | F1 | F2 | B |
| B0 | | 20.77 | 24.25 | 26.07 | 23.70 |
| B1 | | 26.45 | 26.58 | 26.67 | 26.57 |
| B2 | | 28.71 | 28.62 | 29.51 | 28.95 |
| LSD 0.05 | | | 1.372 | | 0.792 |

Average seed weight (g): Data in Table (3) indicates that foliar application treatment with benzyl adenine B2 was superior in increasing seed weight at a rate 1.80 g compared to comparison treatment B0, which gave 1.52 g. Adding organic fertilizers led to an increase in seed weight, as treatment F2 gave the highest rate 1.76 g compared to the comparison treatment F0, which It gave 1.58

g. The data also indicates that the T1 thinning treatment was superior in giving the highest rate of seed weight, which amounted to 1.75 g, compared to the without thinning treatment, which gave 1.56 g. The interaction treatment T1 B2 F2 interaction treatment gave the highest average seed weight of 2.21 g.

Table 3. Effect of foliar application of benzyl adenine, adding organic fertilizers, and thinning on Average seed weight (g).

| Thinning | Benzyl Adenine | Fertilization | | | T × B |
|----------|----------------|---------------|--------|------|--------|
| | | F0 | F1 | F2 | |
| T0 | B0 | 1.39 | 1.46 | 1.40 | 1.42 |
| | B1 | 1.58 | 1.62 | 1.55 | 1.58 |
| | B2 | 1.60 | 1.45 | 1.97 | 1.67 |
| T1 | B0 | 1.58 | 1.53 | 1.75 | 1.62 |
| | B1 | 1.65 | 1.82 | 1.65 | 1.71 |
| | B2 | 1.66 | 1.94 | 2.21 | 1.94 |
| LSD 0.05 | | | 0.3544 | | 0.2046 |
| F | | 1.58 | 1.64 | 1.76 | |
| LSD 0.05 | | | 0.1447 | | |
| T × F | | F0 | F1 | F2 | T |
| T0 | | 1.52 | 1.51 | 1.64 | 1.56 |
| T1 | | 1.63 | 1.76 | 1.87 | 1.75 |
| LSD 0.05 | | | 0.2046 | | 0.1181 |
| B × F | | F0 | F1 | F2 | B |
| B0 | | 1.49 | 1.49 | 1.58 | 1.52 |
| B1 | | 1.62 | 1.72 | 1.60 | 1.64 |
| B2 | | 1.63 | 1.70 | 2.09 | 1.80 |
| LSD 0.05 | | | 0.2506 | | 0.1447 |

Total sugars (%): Results in Table (4) reveal that treating palm trees with the growth regulator benzyl adenine led to an increase in percentage of total sugars, as treatment B2 gave the highest percentage of sugars with values reaching 63.00% compared to comparison treatment B0 which gave 53.75%, Adding organic fertilizers led to significant differences In increasing percentage of total sugars, Where treatment F2 excelled in giving the highest percentage of total sugars, amounting to 59.75%, compared to

comparison treatment F0, which gave lowest value, amounting to 56.69%. The thinning process led to an increase in percentage of total sugars in the fruits, where treatment T1 gave the highest percentage of total sugars. It reached 63.31% compared to treatment without thinning, which gave lowest percentage of sugars, amounting to 53.21%. The interaction treatment, T1 B2 F2 gave the highest average percentage of sugars, with values reaching 72.55%.

Table 4. Effect of foliar application of benzyl adenine, adding organic fertilizers, and thinning on total sugars (%).

| Thinning | Benzyl Adenine | Fertilization | | | T × B |
|----------|----------------|---------------|--------|-------|--------|
| | | F0 | F1 | F2 | |
| T0 | B0 | 46.30 | 48.86 | 52.35 | 49.17 |
| | B1 | 53.61 | 54.39 | 54.88 | 54.29 |
| | B2 | 55.74 | 56.10 | 56.69 | 56.17 |
| T1 | B0 | 57.42 | 58.39 | 59.18 | 58.33 |
| | B1 | 60.57 | 61.86 | 62.87 | 61.76 |
| | B2 | 66.50 | 70.44 | 72.55 | 69.83 |
| LSD 0.05 | | | 0.5854 | | 0.3380 |
| F | | 56.69 | 58.34 | 59.75 | |
| LSD 0.05 | | | 0.2390 | | |
| T × F | | F0 | F1 | F2 | T |
| T0 | | 51.88 | 53.11 | 54.64 | 53.21 |
| T1 | | 61.50 | 63.56 | 64.87 | 63.31 |
| LSD 0.05 | | | 0.3380 | | 0.1951 |
| B × F | | F0 | F1 | F2 | B |
| B0 | | 51.86 | 53.63 | 55.76 | 53.75 |
| B1 | | 57.09 | 58.12 | 58.87 | 58.03 |
| B2 | | 61.12 | 63.27 | 64.62 | 63.00 |
| LSD 0.05 | | | 0.4139 | | 0.2390 |

Reducing sugars (%): The results of this study in Table (5) reveal that treatment with growth regulator benzyl adenine B2 led to an increase in percentage of reducing sugars where B2 treatment gave the highest rate 58.38%, compared to the control treatment B0, which gave the lowest value 49.65%. The addition of organic fertilizers F2 also led to a significant increase in the percentage of reducing sugars. The F2 treatment gave the

highest rate 55.30%, compared to control treatment, which gave lowest value at 52.31%. Fruit thinning (T1) also led to significant differences in the reducing sugars. The T1 treatment gave highest rate 58.81%, compared to the without thinning treatment, which gave the lowest value of 49.11%. The interaction treatment T1 B2 F2 gave the highest rate 67.97%.

Table 5. Effect of foliar application of benzyl adenine, adding organic fertilizers, and thinning on reducing sugars (%).

| Thinning | Benzyl Adenine | Fertilization | | | T × B |
|----------|----------------|---------------|--------|-------|--------|
| | | F0 | F1 | F2 | |
| T0 | B0 | 41.80 | 45.56 | 48.19 | 45.18 |
| | B1 | 49.18 | 50.78 | 52.14 | 50.70 |
| | B2 | 51.72 | 51.14 | 51.46 | 51.44 |
| T1 | B0 | 52.97 | 54.41 | 54.98 | 54.12 |
| | B1 | 56.28 | 57.60 | 57.10 | 56.99 |
| | B2 | 61.90 | 66.09 | 67.97 | 65.32 |
| LSD 0.05 | | | 1.1316 | | 0.6533 |
| F | | 52.31 | 54.26 | 55.30 | |
| LSD 0.05 | | | 0.4620 | | |
| T × F | | F0 | F1 | F2 | T |
| T0 | | 47.57 | 49.16 | 50.59 | 49.11 |
| T1 | | 57.05 | 59.36 | 60.01 | 58.81 |
| LSD 0.05 | | | 0.6533 | | 0.3772 |
| B × F | | F0 | F1 | F2 | B |
| B0 | | 47.38 | 49.99 | 51.58 | 49.65 |
| B1 | | 52.73 | 54.19 | 54.62 | 53.84 |
| B2 | | 56.81 | 58.61 | 59.71 | 58.38 |
| LSD 0.05 | | | 0.8002 | | 0.4620 |

Non-reducing sugars (%): The results in table (6) show that foliar application treatment with growth regulator benzyl adenine was superior in giving highest rate of non-reducing sugars, as treatment B2 gave the highest rate of 4.62% compared to comparison treatment B0, which gave lowest value 4.10%. The T1 thinning treatment also led to an increase in

percentage of non-reducing sugars of It reached 4.49% compared to the T0 treatment, which gave 4.10%. There were no significant differences in effect of adding organic fertilizer on percentage of non-reducing sugars. The interaction treatment was also not significant in affecting percentage of non-reducing sugars.

Table 6. Effect of foliar application of benzyl adenine, adding organic fertilizers, and thinning on non-reducing sugars (%).

| Thinning | Benzyl Adenine | Fertilization | | | T × B |
|----------|----------------|---------------|------|------|--------|
| | | F0 | F1 | F2 | |
| T0 | B0 | 4.50 | 3.29 | 4.16 | 3.98 |
| | B1 | 4.42 | 3.61 | 2.73 | 3.59 |
| | B2 | 4.01 | 4.96 | 5.23 | 4.73 |
| T1 | B0 | 4.45 | 3.98 | 4.20 | 4.21 |
| | B1 | 4.29 | 4.26 | 5.77 | 4.77 |
| | B2 | 4.59 | 4.35 | 4.58 | 4.50 |
| LSD 0.05 | | | N.S | | N.S |
| F | | 4.38 | 4.07 | 4.44 | |
| LSD 0.05 | | | N.S | | |
| T × F | | F0 | F1 | F2 | T |
| T0 | | 4.31 | 3.95 | 4.04 | 4.10 |
| T1 | | 4.44 | 4.19 | 4.85 | 4.49 |
| LSD 0.05 | | | N.S | | 0.3333 |
| B × F | | F0 | F1 | F2 | B |
| B0 | | 4.47 | 3.64 | 4.18 | 4.10 |
| B1 | | 4.36 | 3.93 | 4.25 | 4.18 |
| B2 | | 4.30 | 4.65 | 4.90 | 4.62 |
| LSD 0.05 | | | N.S | | 0.4082 |

The increase in fruit weight, fruit flesh weight, seed weight, and increase in percentage of total and reducing sugars may be attributed to role of growth regulator benzyl adenine in stimulating cell division, cell elongation, building chlorophyll, flower development, and movement of nutrients, as well as its role in activating RNA, thus increasing biological reactions, and attracting nutrients to fruits. Which makes it a center for withdrawal of food, especially sugars, as well as its role in stimulating starch- and protein-degrading enzymes and enzymes controlling sugar transformations, thus increasing weight of fruits and flesh fruits, and increasing their sugar content. These results are consistent with Al-Shammari (2017), as he found that treating date palm trees, a Khadrawi and Makawi varieties, with a growth regulator. Benzyl adenine at a concentration 100 mg L^{-1} led to an increase in average weight of fruits and percentage of total and reducing sugars. The role of organic fertilizers in increasing average weight of fruits, weight of fruit flesh, and their content of total and reduced sugars can be attributed to the content of these fertilizers of various nutritional elements such as Nitrogen, Phosphorus, Potassium, Boron, and Iron, in addition to containing growth-promoting substances such as auxins, cytokinin's, amino acids, and antioxidants, as they work These substances enhance plant nutrition, improve photosynthesis efficiency, increase nutrient absorption and availability, enhance root growth, stimulate beneficial microorganisms in soil, and increase availability of nutrients, which ultimately leads to improved physical and chemical properties of fruits (Mohamed, S.H.F. and Khodair, O.A., 2022); (Ali, and Jayaraman., 2021). These results are consistent with findings of Al-Zubaidi (2018) that use of organic fertilizers such as seaweed extracts led to a significant increase in average weight of fruit, fruit flesh, and seed weight, as well as achieving a significant increase in percentage of total and reduced sugars. It was found that thinning has a significant effect on improving weight of fruit, fruit flesh, and weight of seeds. This may be attributed to fact that thinning works to regulate distribution of nutrients to a smaller number of fruits, and works to

improve fruit ventilation, and reduce tree hormonal and nutritional stress, as well as improving process of inducing and early flowering of flowers, which works to increase natural and chemical properties of the fruits. These results are consistent with what Sallam (2023) found that thinning by removing fruits and the tips of the central branches led to a significant increase in average weight of fruit, fruit flesh, total and reducing sugars. These results are also consistent with what was found by Ghazzawy *et. al*, (2023) that the thinning process led to a significant increase in average fruit weight, seed weight, and percentage of total and reducing sugars.

CONCLUSION

The study showed that applying the three factors (benzyl adenine, organic fertilizers, and thinning) significantly improved the physical and chemical properties of the fruit of the unknown date palm cultivar.

- 1 .Benzyl adenine (B2): led to a significant increase in fruit weight, pulp, and seed weight, and to the highest percentage of total, reducing, and non-reducing sugars (63% total).
- 2 .Organic fertilizers (F2): gave the highest average fruit weight, pulp, and seed weight, and an increase in total and reducing sugars.
- 3 .Thinning: achieved the highest increase in fruit weight, pulp, and seed weight, and in the percentages of total, reducing, and non-reducing sugars (63.31% total).
4. Combined interaction (T1 B2 F2): recorded the highest absolute values for all parameters, with the average fruit weight reaching 36.68 g and the total sugar percentage reaching 72.55%.

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CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

DECLARATION OF FUND

The authors declare that they have not received a fund.

AUTHOR/S DECLARATION

We confirm that all Figures and Tables in the manuscript are original to us. Additionally, any Figures and images that do not belong to us have been incorporated with the required permissions for re-publication, which are included with the manuscript.

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تأثير رش البنزل أدنين وإضافة الأسمدة العضوية والخف في بعض الصفات الفيزيائية والكيميائية لنخيل التمر صنف مجهول

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المستخلص

اجريت دراسة لمعرفة تأثير الرش بمنظم النمو البنزل أدنين وإضافة الأسمدة العضوية والخف في بعض الصفات الفيزيائية والكيميائية لثمار نخيل التمر صنف مجهول. نفذت التجربة وفق تصميم القطاعات العشوائية الكاملة بثلاثة مكررات وبثلاثة عوامل: الرش بالبنزل أدنين بالتراكيز (0، 100، 150 ملغم لتر-1) ورمز لها B2،B1،B0 وإضافة السماد العضوي بالمستويات (0، 1 كغم حامض الهيومك + 150 غم مستخلص الطحالب البحرية لكل نخلة، 2 كغم حامض الهيومك + 300 غم مستخلص الطحالب البحرية لكل نخلة) ورمز لها F2،F1،F0 والخف بمستويين (بدون خف، إزالة 10 سم من أطراف الشماريخ الزهرية مع إزالة المنطقة المركزية للفرع من العنق) ورمز لها T1،T0 وتضمنت 54 وحدة تجريبية، أظهرت النتائج تفوق المعاملة B2 بزيادة معدل وزن الثمرة ووزن لحم الثمرة ووزن البذرة ونسبة السكريات الكلية والمختزلة وغير المختزلة بقيم 30.82 غم، 28.95 غم، 1.80 غم، 63 %، 58.38 %، 4.62 % على التوالي، تفوقت المعاملة F2 بزيادة متوسط لوزن الثمرة ووزن لحم الثمرة ووزن البذرة والسكريات الكلية والمختزلة بقيم 29.16 غم، 27.42 غم، 1.76 غم، 59.75 %، 55.30 % على التوالي، تفوقت المعاملة T1 بزيادة وزن الثمار ووزن لحم الثمار ووزن البذور ونسبة السكريات الكلية والمختزلة وغير المختزلة بقيم 31.80 غم، 30.06 غم، 1.75 غم، 63.31 %، 58.81 %، 4.49 % . اعطت معاملة التداخل F2 B2 T1 أعلى معدل لوزن الثمار ولحم الثمار ووزن البذور ونسبة السكريات الكلية والمختزلة بقيم 36.68 غم، 34.46 غم، 2.21 غم، 72.55 %، 67.97 % على التوالي.

الكلمات المفتاحية: السايوتوكاينينات، حامض الهيومك، تحسين الانتاجية، الحاصل القابل للتسويق، مستخلص الطحالب البحرية.