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Effect of Hletab, Kelpak and Paisein on Vegetative Growth and Yield of Fig Trees (*Ficus carica* L.)

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ABSTRACT

An experiment was conducted on private orchard at Al- Abbasyia/Nijaf on fig trees cv. Aswad Diala to investigate the effects of spraying with Hletab, kelpak at 1% and 2% each other and Paisein at concentration of 300 mg/L at 15/3 and 15/5/2014 on leaf area, total chlorophyll, GA3, IAA in leaves, shoot length, number of shoots, total carbohydrates percentage in shoots, percentage fruit drop, percentage fruit cracking, total yield of tree, total soluble solids, vitamin C, anthocyanine pigment in fruit peel and fruit firmness. Results indicated that trees treated with Hletab, Kelpak and Paisein in single way or combination were a significantly increased the leaf area, total chlorophyll, GA3, IAA in leaves, shoot length, number of shoots, total carbohydrates percentage in shoots, total yield of tree and firmness of fruits and reducing percentage fruit drop, percentage fruit cracking, total soluble solids, vitamin C and anthocyanine pigment in fruit peel compared with control treatment. There were a significant effect between treatments. The treatment (Hletab 2% + Kelpak 2% + Paisein 300 mg/L) gave a significant effect and the best results for the season of experiment.

1. Introduction

The fig trees cv. Aswad Diala is local and important in the middle section of Iraq. The fig trees are medium in size and the branches are in outside direction. The fruits are medium size and the color is black to red. It belongs to normal fig group *Ficus carica* var. hortensis [1]. The new trend agriculture is using sea weed and extract of alga instated of chemical fertilizer in order to present the environment and increase the growth and producers of horticulture plant and lastly increase the activity of microorganisms in soil [2], and increase the nutrient absorption [3] It encores the growth of plant under bad conditions of soil and atmosphere [4]. The quantity of alge material use estimated by 15 million tons which used in agriculture prospect and it stimulates plant growth with small concentration and its contents the micro and macro nutrients, the stimulated material are auxins, cytokines, vitamins, amino acids, organic acids, semi auxins and cytokines and multi sugars such as Laminarin, Fucoidan and Alginate [5]. Basak [6] mentioned that spraying apple trees in the end of full bloom period with extract of algae Eckonia (Kelpak) at concentration of 0.5, 1 and 2% caused a significant increased the leaf area, total chlorophyll, hormones, IAA, GA3, and quality of fruits compared to control treatment. Dell [7] showed that sea weed and extract of algae's contenting high percentage of salicylic acid, cytokine, fume acid, GA^3 and auxins that increasing root and shoot of plant, process of photosynthesis and activate plant growth which led to enhance hormones synthesis and delay of senescence of leaves. Bondok [8] found that spraying grape trees with extract of algae's (Acadian, Goemar and BM86) at concentration of 0.5, 1 and 2 % caused increase in the vegetative growth and fruits quality with increase of concentration of extract of algae's. AL- Uajjani [9] noticed that spraying fig tress cv. Aswod Diala with BA at concentration 100, 150 mg/L at 15/3/2009 reduced the proportion of fruit cracking, percentage of dropping fruit and increased the total percentage of carbohydrate, total soluble solids, vitamin C and firmness of fruits compared to control treatment. Abo – Zaid [10] mentioned that spraying of extract of algae Oligo-x at concentration of 1 and 2% on mango trees in Egypt has increased the leaf area, content of leaves from total chlorophyll, yield and fruit quality. Bund and Norrie [11] observed that cherry trees when applied at (0.5, 1 and 2) kg/ H seaweed increased length, diameter of fruit,total yield of trees, total soluble solids, total sugar, vitamin C and anthocyanine pigment in fruit compared with control treatment. The main objective of this investigation is to study of the effect of spraying with Hletab, kelpak and Paisen on vegetative growth and fruits quality during ripening of fig trees cv. Aswod Diala.

2. Experimental Methods

The present study was conducted out during 2014 growing season on 9 years old fig trees cv. Aswad Diala grown in an orchard located at El-Abbasiya/Najaf governorate. The trees were planted at (5 x 5) m apart and received the same horticultural management. Fifty four trees similar size and growth were selected and divided into 18 treatments with three replicates. It is a dopted according to Randomized Complete Block Design (RCBD), and the results were statistically analyzed according to LSD test at the probability level of 5% Al-Rawi and Khalf Allah [12]. Treatments were adopted in 15/3/ and 15 /4 /2014. Trees spraying with h Hletab, kelpak at 1 and 2% each other and Paisein at conc. Of 300 mg/L at 15/3 and 15 /5/2014 alone or combined. Hletab, it was extract of alga Fucox that containing fucoxant pigment 70 mg/L, growth stimulator (methyl puntosan, 20 mg/L, fucodan, 23 mg/L, mantol 15 mg/L, riboflavin 30 mg/L, olego scoris 90 mg/L), IAA 20 mg/L,CKs 35 mg/L, Vit. C 9 mg/L, amino acid 6%, organic nitrogen 3%, phosphor 2%, potassium 3%, magnesium 2%, Iron 2%, Zinc 2%, organic matter 16%, Algonac acid 50%. Kelpak, it was natural extract of alga Eckonia that containing IAA 11 mg/L, CKs 31 mg/L, amino acid 3%, organic nitrogen 2%, phosphor 3%, potassium 2%, Magnesium 2%, Iron 2%, Zinc 2%, organic matter 12% Oyoo et al. [13]. Paisein, it was powder from root of plant Ampelopais. Hletab, kelpak and Paisein (It were from the production of Green River Company, India). Spraying was done early morning until wetness was full addendum. Tween 20 was added at conc. of 1 cm^3/L as spreader material. The experiment involved the following 18 treatments.

1. Control treatment (sprayed with tap water).
2. Hletab as foliar sprays at concentration of 1%.
3. Hletab as foliar sprays at concentration of 2%.
4. Kelpak as foliar sprays at concentration of 1%.
5. Kelpak as foliar sprays at concentration of 2%.
6. Paisein as foliar sprays at concentration of 300 mg/L.
7. Hletab 1% + Kelpak 1%.
8. Hletab 1% + Kelpak 2%.
9. Hletab 2% + Kelpak 1%.
10. Hletab 2% + Kelpak 2%.

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11. Hletab 1% + Paisein.
12. Hletab 2% + Paisein.
13. Kelpak 1%+ Paisein.
14. Kelpak 2%+ Paisein.
15. Hletab 1% + Kelpak 1%+ Paisein.
16. Hletab 1% + Kelpak 2%+ Paisein.
17. Hletab 2% + Kelpak 1%+ Paisein.
18. Hletab 2% + Kelpak 2%+ Paisein.

The vegetative and fruiting characteristics determination as leaf aria cm^2/leaf, shoot length cm and number of shoots, percentage of fruit drop, total yieldkg /tree and percentage of fruit cracking according to Gerber [14]. Total chlorophyll in leaves mg/100 g as per the literature [15]. GA3 and IAA in leaves (mg/kg dry weight) according to [16]. Ten normal fruits were taken at random on 1/7/2014 from each tree for quality determination. The juice was extracted and the total soluble solids were determined by hand refract meter. Vitamin C mg/100 mL Juice and anthocyanin pigment in fruit peel according to [15]. Firmness was measured on two sides of each fruit with an Effie penetrometer (Model NI, McCormick Fruit Tech, Yakima, WA) Fitted with an 11.1 mm tip.

3. Results and Discussion

Table 1 Effect of spraying with Hletab, kelpak and Paisein on egetative growth of local fig trees c.v Asowd Diala for season 2014

Treatments	leaf aria cm^2	Total chlorophyll mg/100 g	GA3 in leaves mg/Kg dry weight	IAA in leaves mg/Kg dry weight	Shoot length cm	Number of shoot	% Total carbohydrate in shoot
Control	127.75	115.63	18.23	12.97	22.65	3.00	11.42
Hletab 1%	132.90	118.25	20.61	14.56	25.17	4.75	13.16
Hletab 2%	135.41	118.97	20.86	13.90	27.91	5.50	15.25
Kelpak 1%	130.65	117.12	19.55	14.24	24.83	3.33	12.91
Kelpak 2%	131.97	117.85	20.11	13.95	25.00	4.70	13.38
Paisein 300 mg/L	129.50	117.94	18.79	14.60	24.62	5.77	12.56
Hletab 1% + Kelpak 1%	133.72	118.45	20.92	14.81	25.56	5.15	13.44
Hletab 1% + Kelpak 2%	134.88	119.33	21.17	15.10	26.19	5.70	13.67
Hletab 2% + Kelpak 1%	136.48	119.13	21.25	15.31	26.81	6.00	14.30
Hletab 2% + Kelpak 2%	136.48	119.27	21.47	14.75	30.75	5.95	14.79
Hletab 1% + Paisein	133.94	118.31	20.80	14.97	26.43	6.15	13.65
Hletab 2% + Paisein	135.73	119.46	21.53	13.94	29.27	6.30	14.80
Kelpak 1%+ Paisein	132.62	117.22	19.94	13.72	62.42	5.91	13.42
Kelpak 2%+ Paisein	133.18	118.00	20.36	14.11	29.90	6.13	13.87
Hletab 1% + Kelpak 1%+ Paisein	134.89	119.35	21.07	14.88	31.54	6.33	15.13
Hletab 1% + Kelpak 2%+ Paisein	134.12	119.24	21.40	14.96	33.87	6.75	15.56
Hletab 2% + Kelpak 1% + Paisein	136.25	119.56	22.13	15.00	36.24	7.00	16.75
Hletab 2% + Kelpak 2% + Paisein	138.36	119.89	22.62	15.43	39.70	7.75	17.29
L.S.D. 0.05	1.18	0.98	0.86	0.41	1.95	0.39	0.77

1-Leaf aria and the content of leaves from GA3, IAA, shoot length, number of shoots and total carbohydrates percentage in shoot.

Data in Table 1 shows that, spraying Hletab, kelpak and Paisein and combination treatments led to increased leaf aria, total chlorophyll, content of leaves from GA3, IAA, shoot length, number of shoots and total carbohydrates percentage in shoots, that gave the highest rates (138.36 cm^2/leaf, 119.89 mg/100 g, 22.62 mg/kg dry weight, 15.43 mg/kg dry weight, 39.70 cm, 7.75 and 17.29 %) in the treatment (Hletab 2% + Kelpak 2%+ Paisein 300 mg/L) in comparison to the lowest values(127.75 cm^2/leaf, 115.63 mg/100 g, 18.23 mg/kg dry weight, 12.97 mg/kg dry weight, 22.65 cm, 3.00 and 11.42 %) in control treatment . The reason of increasing the leaf aria, total chlorophyll, content of leaves from GA3, IAA, shoot length, number of shoots and total carbohydrates percentage in shoots as a result of the experiment treatments. Above mentioned treatments led to the root system in absorption the nutrients elements in which some of them are parts of chlorophyll which led to increase its quantity in comparison control treatment. This process increases photosynthesis an activate plant growth which led to enhance hormones synthesis [17, 18]. Few of authors mentioned that applying of seaweed extract to the trees gave the higher growth vegetative and yield compared with control treatment [5].

2-The percentage of dropping, Total cracking, total yield and firmness of fruits fig.

Data in Table 1 shows that, spraying Hletab, kelpak and Paisein alone or combination treatments led to reduce the percentage of dropping and cracking of fruits and increasing total yield of trees and firmness of fruits significantly compared to control treatment. The highest values in the treatment (Hletab 2% + Kelpak 2%+ Paisein 300 mg/L) it were (5.57 %, 5.80 %, 27.17 kg/ tree and 0.401 kg/cm^2), while the lowest percentages (17.72 %, 14.20 %, 19.85 kg/ tree and 0.332 kg/cm^2) in control treatment. The spraying with Hletab, kelpak and Paisein led to increase in the content of leaves from growth hormones and total chlorophyll, these led to increase the length and number of branches and carbohydrates in fruits. These factors due to decrease the percentage of dropping and cracking of fruits and then increasing production of trees and firmness of fruits.

3- Total soluble solids, vitamin C and anthocyanine pigment in fruit peel.

Results indicated in Table 2 that, spraying with Hletab, kelpak and Paisein in single way or combination has led to significantly decrease the percentage of total soluble solids, vitamin C and anthocyanine pigment in fruit peel compared to control treatment. The highest significance result were recorded in control treatment, that gave the highest percentages of total soluble solids, vitamin C and anthocyanine of fruits, they were (12.93 %, 7.17 mg/100 mL Juice and 413.25 mg/100 g peel) comparison with (11.49 %, 6.31 mg/100 mL Juice and 381.10 mg/100 g peel) in treatment (Hletab 2% + Kelpak 2%+ Paisein 300 mg/L) respectively. Decreasing fruits from total soluble solids , vitamin C and anthocyanine of fruits which results through spraying with Hletab, kelpak and Paisein due to the fact that this compound increase in the percentage of fruit water contents which intern reducing the concentration of materials in fruit juice. Generally, growth regulator application decreased chemical companied of juice of fig fruits. These results are in agreement with some other published works [19].

Table 2 Effect of spraying with Hletab, kelpak and Paisein on fruits quality of local fig trees c.v Asowd Diala for season 2014

Treatments	% Fruit drop	% Fruit cracking	Total yield Kg/ tree	% Total soluble sold	Vitamin C mg/100 ml Juice	Anthocyanine pigment in fruit peel mg/100g peel	Firmness kg/cm^2
Control	17.72	14.20	19.85	12.93	7.17	413.25	0.332
Hletab 1%	9.80	10.67	22.17	12.75	7.01	402.68	0.359
Hletab 2%	7.66	7.85	24.50	12.61	6.90	400.41	0.368
Kelpak 1%	11.45	11.78	21.95	12.79	7.05	409.36	0.354
Kelpak 2%	9.78	9.53	22.36	12.72	6.98	401.70	0.365
Paisein 300 mg/L	10.13	12.90	21.78	12.70	7.08	408.96	0.362
Hletab 1% + Kelpak 1%	8.34	10.14	22.40	12.68	6.96	399.83	0.370
Hletab 1% + Kelpak 2%	8.00	9.41	23.66	12.71	6.90	398.69	0.374
Hletab 2% + Kelpak 1%	6.96	9.28	25.81	12.55	6.86	398.57	0.376
Hletab 2% + Kelpak 2%	6.75	7.12	26.12	12.34	6.85	397.18	0.383
Hletab 1% + Paisein	7.61	9.50	24.91	12.46	6.89	401.29	0.380
Hletab 2% + Paisein	7.43	6.81	25.23	12.22	6.81	397.85	0.382
Kelpak 1%+ Paisein	8.20	8.45	23.87	12.40	6.92	396.61	0.385
Kelpak 2%+ Paisein	7.86	8.57	24.58	12.31	6.88	395.38	0.391
Hletab 1% + Kelpak 1%+ Paisein	6.41	6.92	26.35	12.08	6.84	387.28	0.388
Hletab 1% + Kelpak 2%+ Paisein	6.45	6.55	26.24	11.95	6.72	382.92	0.392
Hletab 2% + Kelpak 1% + Paisein	6.27	6.36	26.64	11.80	6.59	380.81	0.395
Hletab 2% + Kelpak 2% + Paisein	5.57	5.80	27.17	11.49	6.31	376.10	0.401
L. S. D. 0.05	0.64	0.52	0.50	0.11	0.09	2.27	0.12

4. Conclusion

It could be concluded from this experiment that, spraying trees with Hletab, Kelpak and Paisein in single way or combination led to increased leaf aria and the content of leaves from, total chlorophyll, GA3, IAA, shoot length, number of shoots, total carbohydrates percentage in shoots, total yield of tree and Firmness of fruit and reducing percentage of dropping and cracking of fruits, total soluble solids, vitamin C and anthyanine pigment in fruit peel compared with control treatment.

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