

**EFFECT OF PRUNING AND SPRAYING GROFALCS AND ZEATIN ON
VEGETATIVE GROWTH, YIELD AND QUALITY OF FIG TREE CV.
"WAZIRI" (*FICUS CARICA* L.)**

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ABSTRACT

An experiment was conducted in a private orchard at Abbasyia, Najaf Governorate during the growing seasons of 2011/ 2012 on fig cv. Waziri.

The branches at the age of one year were pruned at level of 25, 50% and sprayed Grofalcs and Zeatin at concentrations of 250 mg/L for each at 15 March for the tow growing seasons. Results showed that pruning treatments and spraying Grofalcs and Zeatin treatments and their interactions caused a significant increase in GA₃, IAA, Zeatin, total chlorophyll in leaves, total yield of tree, total soluble solids, vitamin C and fruit firmness, and decrease in fruit fall, fruit cracking percentage compared with control treatment. There was a significant effect between treatments. Treatment of pruning of branches at the age of one year as 50% + spraying Grofalcs and Zeatin, in concentrate 250 mg/L gave a significant effect and the best results for the two years of the experiment.

Keywords: pruning, Grofalcs, Zeatin, fig

INTRODUCTION

Fig trees are deciduous fruits, belong to genus "Ficus", which is follows to the Family "Moracea", where it believed that its origin is Arabian peninsula and spread to the subtropical regions, fig fruits are infected by a number of physiological damages, and the foremost damage is crack, the ratio of which increased due to the increase in periods of irrigation (IBRAHIM, 1996). AL-RAWI (1999) noticed that, the spraying of GA₃ concentration (50 and 100 ppm) on fig trees cv. Aswod Diala at depressed period reduced the proportion of fruit cracking and increased the firmness, leaf area, total chlorophyll, percentage of carbohydrate. This was agreed with BYERS ET AL. (1990) when apple trees cv. Styman sprayed with GA₃ conc. of 200 mg/L on 27 July, 1987 reduced cracking rate to 24.35%, while this ratio reached to 50.61% in the fruits of control treatment.

ABO-ZAID (2000) mentioned that spraying of GA₃ at conc. of 100 and 150 ppm on pear trees in Egypt has increased the vegetative growth and fruit firmness.

AL-DULAIMI (1999) observed that pomegranate trees cv. Salami when applied at 200 mg/liter GA₃ increased total soluble solids, total sugar, vitamin C and reducing percentage of crackings compared with control treatment. AL-NOUMANI (2013) found that spraying local apple after 50 days from full bloom with Grofalcs at concentrations of 200, 300 and 400 mg/L led to reduction in percentage of fruit dropping and cracking and increased total soluble solids, total sugar, vitamin C and firmness at ripening. AL-HMEEDAWI ET. AL. (2012) noticed that spraying fig tress cv. "Waziri" after one week from rest period of fruits with Zeatin at concentrations of 100, 150 mg/L caused a significant increased the leaf area, content of leaves of total chlorophyll, hormones, IAA, GA₃, Zeatin compared to control treatment. AL-UAJJANI (2011) noticed that, the pruning of fig trees cv. Aswod Diala at level 25 and 50% at 15/1/2009 and spraying fig tress with BA at concentrations 100, 150 mg/L at 15/3/2009 reduced the proportion of fruit cracking, percentage of dropping fruit

and increased the total percentage of carbohydrates, total soluble solids, vitamin C and firmness of fruits compared to control treatment. AL-HMEEDAWI AND AL-NUMANI (2012) mentioned that pruning trees of Fig cv. Aswod Diala at percentage 20, 40 and 60% increased the total soluble solids, total sugar, vitamin C, percentage of carbohydrate and firmness of fruits and reduced the type of cracking and total cracking on ripe fruits during the months of 7 and 8. The main objective of this investigation is to study the effect of using pruning, Grofalcs and Zeatin on vegetative growth and fruits quality during ripening of fig trees cv. "Waziri".

MATERIAL AND METHOD

This study was conducted in a privat farm at Abbasiya / Najaf governorate for the 2011 and 2012 seasons on fig trees cv. Waziri, 36 at same size and growth trees were selected with 10 years of age, that were planted on 5 x 5 m, they were watered every five days, and fertilized by nitrogen and phosphorous in two periods in March and May of each year at a rate of 500 g per tree, as well as by manure for the two years. The experiment included 12 treatments with three replicates. It is adopted 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, 2000). The branches at the age of one year were pruned at level of 25 and 50% on 15/01/2011 and 2012 and anther trees sprayed with Grofalcs (these were discs of GA₃ 50% from the production of Green River Company, India) and Zeatin at a concentration of 250 mg/L for each at 15/3 for both seasons. Spraying was done early morning until wetness was full addendum. Tween 20 was added at a concentration of 1 cm³/L as spreader material.

The experiment involved the following 12 treatments:

- 1- Control treatment (no pruning and sprayed with tap water)
- 2- Pruning the branches at the age of one year at level of 25%
- 3- Pruning the branches at the age of one year at level of 50%
- 4- Grofalcs as foliar sprays at concentration of 250 mg/L
- 5- Zeatin as foliar sprays at concentration of 250 mg/L
- 6- (Grofalcs + Zeatin) as foliar sprays at concentration of 250 mg/L
- 7- P 25% + Grofalcs as foliar sprays at concentration of 250 mg/L
- 8- P 25% + Zeatin as foliar sprays at concentration of 250 mg/L
- 9- P 50% + Grofalcs as foliar sprays at concentration of 250 mg/L
- 10- P 50% + Zeatin as foliar sprays at concentration of 250 mg/L
- 11- P 25% +(Grofalcs + Zeatin) as foliar sprays at concentration of 250 mg/L
- 12- P 50% +(Grofalcs + Zeatin) as foliar sprays at concentration of 250 mg/L

GA₃, IAA and Zeatin in leaves (mg/Kg dry weight) according to NURAY ET AL. (2002). Total chlorophyll in leaves mg/100 g according to AOAC (1985). Ten normal fruits were taken at random on 1/7/2011 and 2012 from each tree for quality determination. The juice was extracted and the total soluble solids were determined by hand refractometer. Total and reducing sugar % and vitamin C mg/100 ml juice according to AOAC (1985). Firmness was measured on two sides of each fruit with an Effegi penetrometer (Model NI, McCormick Fruit Tech, Yakima, WA) fitted with an 11.1mm tip. The percentage of total cracking was calculated during the months of July and August for both seasons.

RESULTS AND DISCUSSION

The content of leaves from GA₃, IAA, Zeatin, total chlorophyll

Data in *Table 1* and 2 shows that, pruned at level of 25, 50% and spraying Grofalcs and Zeatin and combination treatments led to increase in the content of leaves from GA₃, IAA, Zeatin, total chlorophyll, that gave the highest rates 31.47, 24.83, 27.22 mg/Kg dry weight and 23.15, 19.11, 17.37 mg/Kg dry weight and 122.44 and 121.99 mg/100 g in the treatment P 50% + (Grofalcs + Zeatin) 250 mg/L in comparison to the lowest values of 15.80, 15.62, 13.17 mg/Kg dry weight and 17.36, 16.47, 12.96 mg/Kg dry weight and 113.21 and 151.43 mg/100 g in control treatment for the 2011 and 2012 growing season, respectively. Above mentioned treatments led to the root system in absorption of the nutrient 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 (JUNDI, 2003).

The percentage of dropping, total cracking and total yield of fig fruits

Data in *Table 1* and 2 show that pruned at level of 25, 50% and spraying Grofalcs and Zeatin and combination treatments led to the reduction in the percentage of dropping and cracking of fruits and increasing total yield of trees significantly compared to control treatment that gave the lowest values of 9.33%, 16.00%, 17.45 Kg/tree, 11.10%, 13.64%, 19.45 Kg/tree, while the lowest percentages of 3.65%, 5.09%, 4.00%, 4.46%, and the highest yield of 23.50 Kg/tree and 24.76 Kg/tree in the treatment P 50% + (Grofalcs + Zeatin) 250 mg/L. The pruning and spraying with Grofalcs and Zeatin 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

Total soluble solids, vitamin C, and firmness of fig fruits

Pruning and spraying with Grofalcs and Zeatin in single way or combination has led to a significant increase in the percentage of total soluble solids, vitamin C and firmness of fruits for both seasons compared to control treatment. The highest significance result were recorded with treatment P 50% + (Grofalcs + Zeatin) 250 mg/L, that gave the highest percentages of total soluble solids, vitamin C and firmness of fruits, they were 19.43%, 9.03 mg/100 ml juice and 0.374 Kg/cm² and 19.07%, 8.78 mg/100 ml juice and 0.428 Kg/cm² comparison with 17.23%, 8.18 mg/100 ml juice and 0.361 Kg/cm² and 16.53%, 7.50 mg/100 ml juice and 0.370 Kg/cm² in control treatment for the two year of study, respectively. Increasing fruits from total soluble solids, vitamin C and firmness of fruits which results through pruning due to the fact that this compound reduces vegetative growth and thus encourages the accumulation of carbohydrate materials in fruits leading to increased content of these materials (FERGUSON ET AL., 1999).

CONCLUSIONS

It could be concluded from this experiment that pruning and spraying trees with Grofalcs and Zeatin in single way or combination led to increase in the content of leaves from GA₃, IAA, Zeatin, total chlorophyll, and the content of fruits from total soluble solids, vitamin C, firmness of fruits and total yield of trees and reducing percentage of dropping and cracking of fruits compared with control treatment for both growing seasons.

Table 1. Effect of pruning and spraying with Grofalcs and Zeatin on vegetative growth and fruits quality of fig fruits cv. Waziri for seasons 2011 and 2012

	GA ₃ in leaves mg/Kg dry weight	IAA in leaves mg/Kg dry weight	Zeatin in leaves mg/Kg dry weight	Total chlorophyll mg/100g	% dropping fruit	% total cracking	Total yield Kg/ tree	% total soluble solids	Vitamin C mg/100 ml juice	Firmness Kg/cm ²
Control	15.80	15.62	13.17	113.21	9.33	16.00	17.45	17.23	8.18	0.361
P 25%	17.03	18.00	14.71	114.90	8.60	14.23	19.30	17.55	8.29	0.375
P 50%	19.13	18.68	14.89	116.59	7.72	13.64	19.69	17.79	8.35	0.385
Grofalcs 250 mg/L	23.30	20.37	15.56	117.75	5.37	9.58	20.12	18.00	8.50	0.389
Zeatin 250 mg/L	20.48	16.59	25.86	117.43	6.75	10.25	20.87	18.22	8.53	0.382
(Grofalcs + Zeatin) 250 mg/L	22.71	21.16	18.98	119.36	5.13	8.39	22.20	18.15	8.41	0.380
P 25% + Grofalcs 250 mg/L	26.45	21.96	24.67	118.18	5.81	8.73	19.90	18.50	8.71	0.385
P 25% + Zeatin 250 mg/L	22.65	17.37	20.29	118.84	5.11	9.43	20.52	18.89	8.54	0.377
P 50% + Grofalcs 250 mg/L	27.92	22.80	21.78	119.93	4.88	7.84	22.63	18.95	8.80	0.384
P 50% + Zeatin 250 mg/L	23.30	19.32	26.95	120.62	4.60	8.69	21.46	19.01	8.69	0.405
P 25% + (Grofalcs + Zeatin) 250 mg/L	28.08	22.71	26.90	119.80	4.18	6.65	22.82	19.19	8.85	0.370
P 50% + (Grofalcs + Zeatin) 250 mg/L	31.47	24.83	27.22	122.44	3.65	5.09	23.50	19.43	9.03	0.374
LSD 0.05	0.66	1.12	0.30	0.49	0.51	0.78	0.61	0.12	0.05	0.009

Table 2. Effect of pruning and spraying with Grofalcs and Zeatin on vegetative growth and fruits quality of fig fruits cv. Waziri for seasons 2011 and 2012

	GA ₃ in leaves mg/Kg dry weight	IAA in leaves mg/Kg dry weight	Zeatin in leaves mg/Kg dry weight	Total chlorophyll mg/100g	% dropping fruit	% total cracking	Total yield Kg/ tree	% total soluble solids	Vitamin C mg/100 ml juice	Firmness Kg/cm ²
Control	17.36	16.47	12.96	115.43	11.10	13.64	19.45	16.53	7.50	0.370
P 25%	17.98	17.09	13.48	115.89	9.83	11.20	20.21	16.91	7.89	0.377
P 50%	18.09	17.35	14.09	116.26	8.42	9.42	20.89	17.21	7.94	0.379
Grofalcs 250 mg/L	21.90	18.00	14.46	116.95	6.54	7.34	22.34	17.43	8.00	0.384
Zeatin 250 mg/L	18.83	17.59	15.70	117.05	7.18	9.57	20.52	17.20	8.11	0.388
(Grofalcs + Zeatin) 250 mg/L	22.45	18.16	15.98	118.68	6.00	6.39	22.81	18.00	8.15	0.390
P 25% + Grofalcs 250 mg/L	20.37	18.28	14.64	119.32	6.31	6.23	21.65	17.88	8.36	0.382
P 25% + Zeatin 250 mg/L	19.26	17.71	16.22	119.50	5.87	8.14	20.96	18.52	8.30	0.389
P 50% + Grofalcs 250 mg/L	22.75	18.43	15.48	119.77	5.62	6.81	23.16	17.91	7.99	0.395
P 50% + Zeatin 250 mg/L	20.89	17.90	16.83	119.85	4.13	7.08	23.40	18.67	8.50	0.399
P 25% + (Grofalcs + Zeatin) 250 mg/L	22.89	18.84	17.24	120.48	4.22	5.33	24.28	18.90	8.67	0.415
P 50% + (Grofalcs + Zeatin) 250 mg/L	23.15	19.11	17.37	121.99	4.00	4.46	24.76	19.07	8.78	0.428
LSD 0.05	0.21	0.23	0.13	0.36	0.75	0.91	0.84	0.12	0.07	0.011

REFERENCES

ABO-ZAID, A.N. (2000): Plant Hormones and Application Agricultural . Arabic home for putolishing . Cairo .

- AL-DULAIMI, R.M. (1999): Influence of some Factors effecton on the splitting of pomegranate fruits. Ph.D. Thesis. Dept. Hort. Agric. Coll. Univ. of Baghdad, Iraq
- AL-HMEEDAWI, A.M., AL-NUMANI, R.M. (2012): Effect of Pruning and spraying with Paclobutrazol and Zinc sulphate on fruits quality of fig cv. Asowd Diala and percentage of cracking. The International Journal for Sciences and Technology (IJST). 7 (4): 5-10.
- AL-HMEEDAWI, A.M., AL-NUMANI, R.M., W.H. MEZIAL AL-SHEMMERYI (2012): Effect of Pruning and spraying Zeatin on vegetative characteristics and biochemical containing of Fig cv. Kadota (*Ficus carica L.*). J. Jordan of Agricultural Science 8 (3): 500-510.
- AL-NUMANI, R.M.H (2013): Effect of spraying with Salicylic acid and Grofalcs on physical and chemical characteristics of local apple fruits. J. Alphart of Agricultural Science 5 (1): 34–39.
- AL-RAWI, K.M., A.M. KHALF ALLAH (2000): Design and Analysis of Agricultural Experiments . College of Agric. Univ. Mosel, Iraq
- AL-UAJJANI, Z.A. (2011): Effect of Pruning and spraying of some of regulators on growth and yield of fig trees (*Ficus carica L.*) cv. Aswad Diala. Ph.D. Thesis. Dept. Hort. Agric. Coll. Univ.of Kufa, Iraq
- ASSOCIATION OF OFFICIAL ANALYTICAL CHEMIST (1985): Official Methods of Analysis. 13th Ed. APAC. Washington DC, USA
- BYERS, R.E., D.H. CARBOUGH, C.N. PRESLEY (1990): Stayman Fruit cracking as affected by surfactants, plant growth regulators and other chemicals. J. Amer. Soc. Hort. Sci. 115 (3): 405–411.
- FERGUSON, L., T.J. MICHAILIDES, H.H. SHOREY (1999): The California Fig Industry. Univ. California, USA
- IBRAHIM, A.M. (1996): Deciduous Fruit , Growth and Production. College of Agric. Univ. Alex. Egypt
- JUNDI, H.M (2003): Physiology of tree fruits. Arabic home for putolishing. Cairo.
- NURAY, E., E. ERGON, N. FATIH, Y. ATILLA (2002): Auxin (Indol-3-acetic acid), Gibberellic acid (GA₃), Abscisic acid (ABA) and Cytokinin (Zeatin) production by some species of Mosses and Lichens. Turk. J. Bot. 26: 13-18.