Plant Archives Vol. 20, Supplement 2, 2020 pp. 516-519 **e-ISSN:2581-6063 (online), ISSN:0972-5210**

GROWTH RESPONSE OF FIGS *FICUS CARICA* VAR. 'ASWAD DIALA' SAPLINGS TO FOLIAR SPRAY WITH BASFOLIAR KELP SEAWEED EXTRACT AND FETRILON COMBI 2

Nassier H. Hawi, Ghaleb B.A. Al-Abbasi* and Abbas M. Salman
Department of Horticulture and Landscaping, College of Agriculture, University of Kufa, Najaf, Iraq
* Corresponding E-mail: ghalib.alabbasi@uokufa.edu.iq

Abstract

The effects of foliar application with Basfoliar Kelp seaweed extract and Fetrilon Combi 2 were evaluated on growth response of figs sapling variety Aswad Diala. The experiment was conducted in the certified citrus nursery at Al-Hindiya district, province of Karbala during the growing season of 2019. Figs saplings at age of 6 months were sprayed with commercial seaweed extract Basfoliar Kelp at concentrations of 0, 1.5, 3 or 4,5 ml.L^{-1} and or with the nutrient solution Fetrilon Comb 2 at four concentrations (0, 1, 2 or 3 g.L^{-1}) four times during the experiment period. The results showed that spraying fig saplings with one or both factors resulted in a significant increase in the average saplings height, number of branches per sapling, number of leaves and leaf content of chlorophyll and nutrients (N, P, K). The highest rates for all the studied growth parameters were recorded in the interaction treatment of 4,5 ml.L^{-1} Basfoliar Kelp and 3 g.L^{-1}Fetrilon Comb2 with significant differences from all the other treatments including the untreated control.
***Keywords*:** Seaweed, Foliar spray, plant growth, Fetrilon Combi 2, Figs

Introduction

The fig (*Ficus carica* L.) belongs to the Moraceae family and is grown in Iraq in large separate areas in most of the provinces of the country. The annual fig production in Iraq was estimated at 3349 tons, and the average production per tree is 17.47 kg / tree, and the average productivity may reach (29.30) kg / tree (Central Statistical Organization, 2017). Many varieties of figs are cultivated in Iraq, including the Black Diyala variety, which is one of the desirable local varieties in agriculture in the central region, which farmers prefer to grow over the rest of the varieties for its high production and taste desired by consumers in addition to the large tree size and dense leafy area that protect the fruits from sunstroke, AL Hameedawi (2015).

Fig fruit has several nutritional and medicinal benefits as it is used as fresh and dried fruit and juice and wine making in addition to containing Latex, which is used in the manufacture of cheese. Most of the active substances in figs have laxative and antiseptic properties, so it is used in the treatment of chronic constipation and some intestinal diseases and is considered one of the aids in digestion (Darjazi, 2011).

And spraying seaweed extract is one of the modern techniques that are frequently used as a vital enhancer for physiological functions in the plant through its activities as a fertilizer for many horticultural crops. Spraying these extracts on the vegetative system of plants stimulates root growth, increases stem thickness and photosynthesis efficiency, which leads to increased vegetative and root growth (David *et al.*, 2013). The containment of seaweed extract of major and minor elements, growth regulators, polyamines and vitamins generally leads to increased indicators of vegetative growth for different fruit trees (Spinelli *et al.*, 2010).

Al-Rawi *et al.* (2016) found in a study conducted on peach variety Peento by spraying sea seaweed extract at three levels (0, 2, 4) ml.L^{-1} that the highest significant increase in the characteristics of vegetative growth and nutritional content was at a concentration of 4 ml. L^{-1}. AL-Hameedawi *et al.* (2018) concluded that spraying fig Diyala Black with seaweed extract Kelpak at a concentration of 3% and calcium at 1% individually or combined with irrigation periods resulted in a significant increase in leaf area per plant, leaf content of total chlorophyll, percentage of leaf moisture, branch length, number and percentage of total carbohydrates compared to untreated trees. Likewise, spraying nutrient solutions containing macro and micro nutrients improves the vegetative properties of fruit trees and increases their productivity (Spinelli *et al.*, 2010). It was also found that spraying aged two years fig Brown Turkey saplings with acrolef nutrient solution at different concentrations resulted in a significant increase sapling height, stem diameter, branches length, leaf area and leaf content of total chlorophyll (Dujaili and Naama, 2014).

Therefore, the experiment aimed to study the effect of spraying Basfoliar Kelp seaweed extract and Fetrilon Combi 2 and their interaction at best concentration on growth of fig saplings and their nutrient content to improve vegetative growth and reduce the time required for the production and marketing of the saplings.

Materials and Methods

Six months old as uniform as possible fig saplings planted in 3 Kg plastic pots were used in this experiment, which was conducted in a certified citrus nursery at Al-Hindiya district in the province of Karbala. During the experimental period, the saplings were sprayed four times (15/4, 15/5, 15/8 and 15/9/2019) with commercial seaweed extract Basfoliar Kelp at four concentrations (0, 1.5, 3 or 4.5) ml. L^{-1} individually or in combination with the nutrient solution Fetrilon Combi 2 (fortified with Mg) at four concentrations (0, 1, 2 or 3 g.L^{-1}). Both used factors in this experiment are manufactured by Compo Expert GmbH, Germany). A liquid soap at rate of 0.01 ml.L^{-1} was added to all the solutions before use to reduce surface tension. The experiment was RCBD included 16 treatments with three replicates and 5 Fig. saplings per experimental unit.

Data were recorded at the end of the experiment including the average increase in plant height measured from the plant crown area up to the highest developing apical

Patton (1984), average increase in number of branches/sapling, average increase in number of leaf/sapling, leaf content of total chlorophyll (Ranganna, 1977) using spectrophotometer at wave length of 645-663 nm, leaf content of macro-elements including Nitrogen N% using micro Kildal apparatus (Black, 1965), Phosphorous P% using Ammonium Molybdate and by the aid of spectrophotometer at wavelength of 880nm (Al-Sahaf, 1989), while the potassium K% was estimated using the Flame Photometer According to Black, (1965). After being collected, all the data were analyzed and analysis of variance ANOVA was performed using GenStat 2012 computing program. Mean were compared ($P \leq 0.05$) based on Duncan's multiple range tests whenever appropriate (Al-Rawi and Khalaf-Allah, 2000).

Results and Discussion

The results (Table1) showed a significant increase in all the characteristics of the vegetative and nutritional growth of fig saplings, including the rate of increase in plant height and number of branches, number of leaves, leaf content of total chlorophyll and percentage of nutrients N, P, K when treated at concentration of 4.5ml. L^{-1} of seaweed extract SWE compared to all other treatments, especially with the control treatment, which recorded the lowest rates for the mentioned characteristics. While spraying with the nutrient solution at concentration of $3g.L^{-1}$ was significantly higher in all studied traits compared to other concentrations and also compared to untreated saplings.

Regarding the interaction between the concentration levels of seaweed extract and the nutrient solution, the results showed (Table 1) that the interaction treatment of $4.5ml.L^{-1}$ SWE and $3g.L^{-1}$ nutritional Fetrilon Combi2 resulted in the highest increase in plant height, number of branches, number of leaves, total chlorophyll content in leaves and percentage of nitrogen, phosphorus and potassium that of 21.04 cm, 5.87 branches/sapling, 16.98 leaf/sapling,135.2 mg. 100 gm^{-1}FW, 1.86%, 0.539% and 1.353 %, respectively, compared to the lowest rates of 6.14 cm, 1.20 branches/sapling. 4.40 leaf/sapling, 122.1 mg. 100 gm^{-1}FW, 1.72%, 0.385%, 1.254%, respectively, recorded from the control.

The results showed a significant increase in the characteristics of vegetative growth and the nutritional content of fig saplings represented in the rate of increase in plant height, number of branches, number of leaves, leaf content of the total chlorophyll and the percentage of nutrients (N, P, K) in the leaves with the effect of spraying with seaweed extract (Basfoliar Kelp).

Table 1 : Effect of spraying with SWE Basfoliar Kelp and nutrient solution Fetrilon Combi 2 in growth and nutrient content of fig saplings

Treatments	Plant height increase (cm)	Increase in No. of branches	Shoot dry weight (g)	Leaf content of total chlorophyll	% Leaf content of		
					N	P	K
Control	6.14 i	1.20 i	4.40 i	122.1 k	1.69 m	0.385 k	1.254 i
Fetrilon Combi 2 $1g.L^{-1}$	6.83 i	1.60 k	4.86 i	123.2 j	1.72 k	0.418 i	1.276 g
Fetrilon Combi 2 $2g.L^{-1}$	7.58 h	2.11 j	5.60 h	124.1 i	1.73 j	0.429 h	1.287 f
Fetrilon Combi 2 $3g.L^{-1}$	8.29 h	2.64 i	6.14 h	126.3 g	1.75 h	0.418 i	1.298 e
SWE1.5 $ml.L^{-1}$	6.23 i	1.47 k	4.43 i	125.4 h	1.71 l	0.407 j	1.265 e
SWE1.5 $ml.L^{-1}$+ Fetrilon Combi 2 $1g.L^{-1}$	8.10 h	2.89 h	5.62 h	125.4 h	1.73 j	0.429 h	1.287 f
SWE1.5 $ml.L^{-1}$+ Fetrilon Combi 2 $2g.L^{-1}$	10.23 g	3.54 g	7.28 g	127.6 f	1.77 f	0.462 f	1.287 f
SWE1.5 $ml.L^{-1}$+ Fetrilon Combi 2 $3g.L^{-1}$	12.17 f	3.94 e	7.57 g	128.6 e	1.79 e	0.495 d	1.309 d
SWE $3ml.L^{-1}$	9.81 g	2.90 h	7.39 g	128.7 e	1.74 i	0.440 g	1.276 g
SWE $3ml.L^{-1}$+ Fetrilon Combi 2 $1g.L^{-1}$	12.10 f	3.66 fg	9.09 f	128.5 e	1.76 g	0.484 e	1.298 e
SWE $3ml.L^{-1}$+ Fetrilon Combi 2 $2g.L^{-1}$	13.71 e	4.33 d	11.37 d	131.1 d	1.79 e	0.495 d	1.309 d
SWE $3ml.L^{-1}$+ Fetrilon Combi 2 $3g.L^{-1}$	15.56 d	5.14 b	13.28 c	131.8 c	1.83 c	0.528 b	1.320 c
SWE $4.5ml.L^{-1}$	13.66 e	3.82 ef	10.15 e	132.1 c	1.76 g	0.495 d	1.298 e
SWE $4.5ml.L^{-1}$+ Fetrilon Combi 2 $1g.L^{-1}$	16.80 c	4.60 c	13.63 c	132.1 c	1.80 d	0.495 d	1.320 c
SWE $4.5ml.L^{-1}$+ Fetrilon Combi 2 $2g.L^{-1}$	18.74 b	5.08 b	15.52 b	134.2 b	1.84 b	0.517 c	1.331 b
SWE $4.5ml.L^{-1}$+ Fetrilon Combi 2 $3g.L^{-1}$	21.04 a	5.87 a	16.98 a	135.2 a	1.86 a	0.539 a	1.353 a
SWE average	7.21 d	1.89 d	5.25 d	123.9 d	1.72 d	0.413 d	1.279 d
	9.18 c	2.96 c	6.27 c	126.7 c	1.75 c	0.448 c	1.287 c
	12.80 b	4.01 b	10.28 b	130.0 b	1.78 b	0.487 b	1.301 b
	17.56 a	4.84 a	14.07 a	133.4 a	1.82 a	0.512 a	1.325 a
Fetrilon Combi 2 Average	8.96 d	2.35 d	6.60 d	127.1 c	1.72 d	0.432 d	1.273 d
	10.96 c	3.19 c	8.30 c	127.3 c	1.75 c	0.456 c	1.295 c
	12.56 b	3.77 b	9.94 b	129.2 b	1.78 b	0.476 b	1.303 b
	14.27a	4.40 a	10.99 a	130.5 a	1.81 a	0.495 a	1.320 a

Values are means of 3 replicates (5 plants). Means followed by the same letter are not significantly different according Duncan's multiple range test ($P \leq 0.05$)

This is often due to the role of marine algae extract in the physiological processes of the plant and in the building of chlorophyll and organic compounds in addition to the substances similar to plant hormones increase in plants treated with marine algae extract and these extracts may play as an antioxidant (Spinelli *et al.*, 2009). Perhaps it is attributed to the algae extract containing plant-like hormones such as oxins and cytokinins and substances that encourage growth such as amino acids, proteins and vitamins that have a role in encouraging cell division and elongation, which has

stimulated efficiency of carbon reactions and thus improved the vegetative growth of Osman *et al.* (2010). As for the increased content of leaves from the nutritional elements (N, P, K) as a result of spraying the algae extract, it can be attributed to the presence of amino acids which have a physiological role in changing the osmotic tension in plant tissues as they reduce the water potential, which increases the cell's ability to absorb water and dissolved nutrients. This is positively reflected in the increased plant growth (Amini and Ehsanpour, 2005).

This has been reflected in the overall increase in the leaf content of these elements. In general, the way that how the SWEs work is not fully understood yet and there is no precise explanation about their effect on increasing plant growth and productivity, but it can be attributed to a set of direct and indirect effects contribute to the effect of these changes (Spinelli *et al.*, 2009). These results are consistent with the findings by Thazeb *et al.* (2018) when spraying seaweed extract passing on pomegranate saplings effect significantly on the vigor of vegetative growth, as well as the results of AL-Hameedawi (2019) when spraying fig trees with SWE (Oligo-x). The results were also consistent with AL-Hameedawi and AL-Malikshah (2017) when spraying fig trees with seaweed extract *Ascophllum nodosum*, which resulted in a significant increase in leaf and branches content of the nutritional elements N, P and K.

As for the nutrient solution (Fetrilon combi 2), its role in increasing vegetative growth is due to its containment of a number of nutrients that meet the need of the vegetative group, which leads to an increase in cell division and amplitude, then increasing the breadth of the leaves and improving the strength of the vegetative growth of the seedlings, increasing the efficiency of photosynthesis and the leaf content of chlorophyll Singh, (2003). The increased leaf content of N, P, and K may be attributed to the direct absorption of the nutrient solution by the leaves through the stomata after foliar spraying, which positively reflected in the increased concentration of nutrients within the plant (Mansour *et al.*, 2008). A previous study (Dujaili and Naama, 2014) showed that spraying fig saplings with the nutrient solution Agroleaf led to a significant increase in vegetative growth and nutritional content, which also agrees with Abdul-Amir *et al.* (2011) when spraying Citrus saplings with the nourishing solution of Bruceol that increased the leaf content of nutrients (N, P, K).

References

Abdul, A.; Hamid, K.; Qais, J.; Abdul, M. and Etedal, S.H. (2011). The effect of spraying with leaf fertilizer Bruceol and garlic water on the growth of *Citrus aurantium* L. seedlings. Al-Furat Journal of Agricultural Sciences, 3(4): 54 - 65.

AL-Hamdawi, A.M.S., Saqur, R.A. and Mezial, W.H. (2018). Influence of seaweed extract, ca and irrigation, on some characteristics of vegetative and fruits of local fig cv. Asowd Diala. Biochem. Cell. Arc 18(1): 875-897.

AL-Hamdawi, A.M.S. and AL-Malikshah, Z.R.J. (2017). Influence of amino acids, bleed grape and seaweed extract vegetative growth yield and its quality of fig .International Journal of environmental & Agriculture Research (IJOEAR). 3(4):1-5.

Al-Dujaili, J.A. and Zainab, J.N. (2014). Fig seedlings response to spraying gibberelin and agroleaf. Tikrit University Journal for Agricultural Sciences. 14 (2): 170-180.

AL-Hameedawi, A.M.S. (2019). Influence extracts of bud populous, algae and swamp morning glory on vegetative and Fruiting growth of Fig cv. Kadota. Journal of scientific and engineering Research. 6(9): 199- 205.

AL-Rawi, W.A.A.; AL-Hadethi, M.E.A. and Abdul–Kareem, A.A. (2016). Effect of Foliar Application of Gibberellic acid an seaweed Extract Spray on Growth and Leaf Mineral content on Peach Trees. Iraq. J. Agric. Sci., 47: 98–105.

Al-Rawi, K.M. and Abdul Aziz, M.K.A. (2000). Design and analysis of agricultural experiments. faculty of Agriculture. University of Al-Mosul. Ministry of Higher Education and Scientific Research. Iraq.

Al-Sahaf, F.H.R. (1989). Applied plant nutrition. Ministry of Higher Education and Scientific Research. Baghdad University. Bayt Al-Hikma for Publishing, Translation and Distribution. Iraq.

Amini, F. and Ehsanpour, A.A. (2005). Soluble Protein Proline, Carbohydrates and $Na^+\backslash K^+$ Changes in Tow Tomato (*Lycopersicon esculentum* Mill.) Cultivars under in vitro Salt Stress. American Journal of Biochemistry and Biotechnology, 1(4): 204 – 208.

Black, C.A. (1965). Methods of soil Analysis part. 2 Chemical and Microbiologcal properties. Amer. Soc. Agron. Inc. Publisher Madison. Wisconson, USA .16.

Darjazi, B.B. (2011). Morphological and pomological characteristics of (*Ficus carica* L.) cultivars from Varamin, Iran. African Journal of Biotechnology, 10(82): 19096-19105.

Dawood, Zuhair Ezz Al-Din and Iyad Tariq Shyal Al-Alam (2013). The effect of spraying with marine extract 21 and urea on the growth of green bean seedlings (*Pistacia khinjuk* stocks), Mesopotamian cultivation journal.4(1): 81-69.

Dhebib, I.J.; Al-Mayahi, F.H.R. and Al-Badri, L.T. (2018). The effect of spraying with seaweed extract on some of the vegetative and chemical properties of the pomegranate seedlings under saline stress *Punica granatum* cultivar under waterfall. Thi-Qar University Journal for Agricultural Research, 7(2): 1-14.

Gerber, H.J. (2010). Tree Training and Managing Complexity and Yield in Fig (*Ficus carica* L.). M.Sc. Thesis College of Agriculture. University of Stellenbosch. Florida. USA.

Mansour, A.E.M; Ahmed, F.F.; Shaaban, E.A. and Amera, A.F. (2008). The Improving Productivity of LE- Conte Pear Trees. Research Journal of Agriculture and Biological Sciences, 4(3): 245- 250.

Osman, S.M.; Khamis, M.A. and Thorya, A.M. (2010). Effect of mineral and Bio-NPK soil application on vegetative growth flowering, fruiting and leaf chemical composition of young olive trees. Res. J. Agric. and Biol. Sci., 6(1): 54-63.

Patton, L. (1984). Photosynthesis and growth of willow used for short rotation .Ph.D. Thesis submitted to the univ. of Dublin (Trinity College). 1990. Studies of variation in primary productivity growth and morphology in relation to the selective improvement of broad –leaved trees

species. Ph.D. Thesis submitted to the National Univ. Irland.

Ranganna, S. (1977). Handbook of Analysis and Quality Control for Fruit and Vegetable Products. Tata McGraw-Hill publishing Company Limited. New Delhi. India. PP.1112.

Singh, A. (2003). Fruit Physiology and Production. 5th ed. Kalyani Publishers. New Delhi–110002.

Spinelli, F.; Giovanni, F.; Massimo, N.; Mattia, S. and Guglielmo, C. (2009). Perspectives on the use of a sea weed extract to moderate the negative effects of alternate bearing in apple trees. J. Hort. Sci. Biotechn,17(1): 131-137.

Spinelli, F.; Fiori, G.; Noferini, M.; Sprocatti, M. and Costa, G. (2010). A novel type of seaweed extract as a natural alternative to the use of iron chelates in strawberry [rodue. Scientia Hortculturaae, 125(3): 263-269.