



Effect of foliar nutrition by seaweed extract marmarine and basfoliar aktiv in growth and yield of pepper sweet (Along type) Sierra Nevada Variety Under in Plastic Houses Conditions

Heba A Hussein¹, Dhafer H Jawad², Allawi K Abboud³

¹Al-Furat Al-Awsat Technical University, Al-Mussaib Technical College, Iraq

²Al-Qasim Green University College of Agriculture, Iraq

³Directorate of Agriculture Babylon, Iraq

Abstract

The experiment was conducted during season of 2017- 2018 in one of plastic houses at Azawia region Babylon. consisted the experiment of seven treatments such as spray by seaweed extract marmarine with concentration 1,1.5,2 ml. L⁻¹ water and the nutrition Basfoliar aktiv with concentration 1, 2,3 ml. L⁻¹ water as well as control treatment (without spraying) on sweet pepper plant (along type)Sierra nevada variety were grown in plastic house as follows three times, The first spraying was conducted during flowering and the second spraying after 15 days of the first and the third after 15 days of the second. The experiment was conducted in design using (CRD) with three replicates. The results indicated that in vegetative growth characteristics (plant length, the number of leaves and content of chlorophyll in leaves) and fruiting growth characteristics (long, weight fruit and the number of fruits.plant⁻¹ and the one plant yield) in spray of seaweed extract marmarine with concentration 1.5 ml. L⁻¹ 106.7 cm, 148.3 leaf,76.8 spad and 22.50 cm,83.30 gm,44.27 fruit.plant⁻¹ and 3.688 kg.plant⁻¹ respectively followed by treatment of Basfoliar aktiv with concentration 2 ml.L⁻¹ in vegetative growth characteristic 97.0cm,131.7leaf, 60.2spad and fruiting growth characteristic 20.33cm,77.00gm,39.70fruit.plant⁻¹and3.057kg.plant⁻¹respectively.

Keywords: foliar nutrition, pepper, spray, seaweed extract

Introduction

The *Capsicum annum* L. is considered a herbaceous plant belonging to the Solanaceae family, and is home to Central and south America, and from there it has spread to other parts of the world (Thang, 2007) [29]. It is grown in Iraq in the form of open agriculture at the beginning of spring, protected agriculture at the beginning of autumn and its economic and nutritional importance and its varied uses with many foods. Each 100 g of soft peppers contains 4.8% carbohydrate and 1.2% protein. It also contains mineral salts such as calcium Potassium, and iron as well as fluorine which protects teeth from decay, as well as contains vitamins A, C, B1, B2 and Niacin (Khalil, 2004) [20]. Pepper fruits also contain many chemical compounds, which are one of the most important antioxidants, which reduce the risk of chronic and cancerous diseases (Howard *et al.*, 2000 and Yaha, 2000) [17, 31]. As well as containing anti-inflammatory and allergy and also contains compounds Carotenoides which are components of non-enzymatic systems and antioxidant is necessary for human health (Lee *et al.*, 2005 and Rao and Roa, 2007) [21, 27]. In one study Wahba *et al.*, (2010) [30] reported that the fruits of pepper contain high-effective compounds against microbes. Al-Alossey (2002) showed that the foliar feeding of plants are a good outlet for the entry of some micro nutrients within the plant and makes it easier to include in the biological processes to avoid the emergence of symptoms of lack of minerals in the soil and plant. The importance of foliar feeding is the best method of nutrient supplementary when blocking the process of

minerals absorption by roots infected by pathogens or high content of lime or high salinity of soil (Malakouti, 2008) [22]. Horsley (1997) [16] indicated that there are many plant extracts that can be derived from different parts of the plant such as flowers, leaves, roots and fruits, which have a positive effect in encouraging the growth of plants that spray or add to it because of the containment of many Active compounds. Bayoumi and Hafiz (2006) [13] founded that Algean is a biomass containing good amounts of nutrients, growth regulators, amino acids and vitamins and is used as a spray. Al-Jabbar (2012) [3] reported that the spray of pepper plants was variety as Carisma with two kinds of liquid amino-alginate with a concentration of 2 cm³. L⁻¹ and amino quaint minors 1.5 cm³. L⁻¹. The addition of both fertilizers resulted in a significant increase in plant height, number of branches, plant yield and total yield. Al-Jubouir *et al.*, (2006) confirmed that the spraying of sweet pepper plants with yongurine leaves has significantly increased plant height and number of flowers. Balochl *et al.*, (2008) [12] showed that the spraying of pepper plants with Higrow foliar fertilizer at a concentration of 8 ml.L⁻¹ significantly increased the length of the plant, the number of branches, the weight of the fruit and the total yield. El-Bassiony *et al.*, (2010) [2] reported that the spraying of sweet pepper plant with potassium fertilizer has resulted in a significant increase in plant height, fruit weight and total yield. Al-Zubaidi *et al.*, (2004) [11] showed that the spraying of pepper plants with iron, zinc and boron together on the vegetative group resulted in a significant increase in the chlorophyll content

of the leaves compared to the control treatment. Al-Jubour *et al.*, (2002) reported that the spraying of two varieties of sweet pepper plants with foliar fertilizers and licorice extracts gave a significant increase in the ratio of dissolved solids to both types compared to the rest of the other treatments. Al-Mousawi (2015) [8] indicated that the spraying of the licorice and garlic extract was concentrated at a concentration of 50 cm³. L⁻¹ on the pepper plants planted in the green houses and for three sprinkles, the spray treatment was superior to the garlic extract and gave the best results in the foliar area and the early production and productivity of the plastic house. Mohammed (2009) [23] absorved that Seaforce2 seaweed extract on cucumber plant and several sprinkles resulted in a significant increase in plant height, dry weight of the plant and number of fruits. plant⁻¹ and the early and total yield. Sarhan *et al.*, (2011) [28] confirmed that the yeast is sprayed with a concentration of 6 g. L⁻¹ or Alga 600 seaweed extract with a concentration of 0.33 g. L⁻¹ and Seaforce2 at a concentration of 2.5 ml.L⁻¹ on the cucumber plant has a significant effect on the characteristics of vegetative growth and yield compared to the control treatment. Obeid *et al.*, (2011) [26] reported that the Algean seaweed extract was sprayed at a concentration of 1,2, 3 ml. L⁻¹ water for three times on the cucumber plants (Lihuluba cultivar) cultivated in the plastic house, where the concentration 2 ml.L⁻¹ was significantly excelled in the number of leaves per plant, the number of flowers, the percentage of set fruits and the number of fruits and the percentage chlorophyll.plant⁻¹. Al-layla (2011) [7] founded that spraying of the seaweed extracts plants (Algamax and Algreen) on the musk melon plants led to early maturity and increase the number of fruits per plant and the total yield. The aim of the study determine the effect of Foliar spray by seaweed extract marmarine and basfoliar aktiv in the growth and yield of sweet pepper grown in greenhouses.

Table 3: Explain physical and chemical Characteristics of plastic houses soil.

Traits									Texture
pH	Ece / ds.m-1	Organic matter%	N ppm	P ppm	K ppm	Clay	sand	Silt%	
7.4	3.7	1.13	52.5	8.7	360	4	80.20	15.80	Sandy loam

The soil of the plastic house was plowed and smoothed and divided into marshes and then divided into experimental units of (21) experimental units with length of 2 m and width 70 cm width. The seeds were planted in the nursery in 4/9/2017 and then the seedlings were transferred to the plastic house for the seedlings) on 20/10, where planted 40 cm between seedlings and other and on both sides of the plant and the number of plants in each experimental unit 10 plants were sprayed plants when the emergence of flowers on 12/1/2018 and conducted all the service and control of seedlings and plants as is the case in Service of pepper grown in green houses. Fruit reaping began on 5/2 and continued until 21/5/2018.

Studied characteristics:

A. Vegetative growth characteristics:

1. Plant height (cm): it is measured at the end of the season by measuring tape and taking the average length of five plants from each experimental unit and each replicate.

2. Number of leaves per plants: The number of leaves at the end of the season was calculated for five plants from each experimental unit and each replicate.

Material and Methods

The experiment was carried out during the agricultural season 2018-2017 in one of the greenhouses in Azawia region north of the center of Babylon Governorate. The experiment included seven treatments: seaweed extract marmarine spray with a concentration of 1, 1.5, 2 ml. L⁻¹. the production of Jordan Ifc company and the basfoliar aktiv at 1, 2, 3 ml. produced by the Germany Compo expert company In addition to the comparator (without spraying) on the sweet pepper plant (along type) of Sierra nevada variety, produced by the Spanish Fito company, The first spraying was conducted during flowering and the second spraying after 15 days of the first and the third after 15 days of the second. The experiment was applied according to CRD Design with three replicates.

Table 1: Components of seaweed extract marmarine

rganic matter O	22.20 %
Organic matter substance from seaweed extract	12%
growth regulators Auxins, gebrilines and cytokinines	250 ppm
N	1.5%
P	2%
K	3%

Table 2: Components of foliar fertilizer basfoliar aktiv.

N%	P ₂ O ₅ %	K ₂ O %	B %	Cu %	Fe %	Mn %	Mo %	Zn %
3	27	18	0.01	0.02	0.02	0.01	0.001	0.01

Random samples were taken from the soil of the plastic house at a depth of 0-30 cm. Soil analysis was conducted in the Agricultural Research Laboratory of Babylon Agriculture Directorate in (Table 3).

3. The content of the leaves of chlorophyll (SPAD): This was calculated by taking random samples of the leaves and measured by the Chlerophyll meter SPAD-502 (Jemison and Williams, 2006).

B. Traits of fruits growth

1. Fruit length (cm): The average length of the fruit was calculated by the normal ruler and for three fruits.

2. Average number of fruits per plant: This trait was calculated from all genes throughout the harvest period for each experimental unit of all replicates and then divided the total number of fruits in each experimental unit on the number of plants in that unit.

3. The average weight of the fruit (g): Based on the total number of each experimental unit divided on the total number of fruits of that experimental unit throughout the season.

4. Plant yield (kg): Determination based on the unit of each experimental unit throughout the growing season divided on the number of plants in the experimental unit.

The results were analyzed according to the design (CRD), and the least significant difference was used to compare the averages at the probability level of 0.05 (Al-Sahuki and

Wahib, 1990). Genstat program was used in statistical analysis.

Results and Discussion

1. The characteristics of vegetative growth:

The results in Table (4) indicated that the treatment of spray with seaweed extract Marmarin at the concentration of 1.5 ml. L⁻¹ significantly exceeded the rate of plant length and the number of leaves and leaf content of chlorophyll, giving the highest rate as 106.7 cm, 148.3 leaf, 76.8 spad) followed by spraying with basfoliar aktiv spray at a concentration of 2 ml. (97.0 cm, 131.7 leaf, 60.2 spad) compared to the control treatment. The reason for the increase in the

characteristics of vegetative growth is to contain marine extracts on Auxins and cytokinines, which promote physiological events and increase total chlorophyll, which effects the vegetative structure and thus shows its effect on the characteristics of vegetative growth and the marine extracts contain the gebrilines, which work on elongation of the parasites, Plant height increase (Gallon and Wright 2006, Mohamed, 1985). The nutrients present in marine extracts play an important role in plant nutrition, as they are essential for plant growth and development. These results agreement with many studies (Al-Jabbar,2012 ;Al- Jubouri *et al.*,2006 ; El-Bassionyetal,2010; Al-Mousawi,2015;Mohamed,2009 ; Obaid *et al.*, 2011)

Table 4: Effect of spraying with seaweed extract Marmarin and Basfoliar Aktiv in the vegetative growth characteristics of the sweet pepper (along type).

<i>reatment</i>	<i>(Plant height (cm</i>	<i>Number of leaves per plant¹</i>	<i>(Ratio of chlorophyll (Spade</i>
Control (without spraying)	79.7	93.3	35.4
Seaweed extract Marmarin 1 ml.L ⁻¹	84.7	117.7	49.3
Seaweed extract Marmarin 1.5 ml.L ⁻¹	106.7	148.3	76.8
Seaweed extract Marmarin 2 ml.L ⁻¹	89.0	120.0	50.2
Basfoliar Aktiv 1 ml.L ⁻¹	93.3	125.0	58.7
Basfoliar Aktiv 2 ml.L ⁻¹	97.0	131.7	60.2
Basfoliar Aktiv 3 ml.L ⁻¹	87.7	125.3	53.9
LSD 0.05	8.67	13.13	9.14

2. Characteristics of Fruit growth

The results in Table (5) indicated that the treatment of spray with seaweed extract Marmarin at the concentration of 1.5 ml. L⁻¹ significantly exceeded the rate of fruit length and weight of fruit and the number of fruits and plant yield, giving the highest rate in the above qualities of (22.50 cm, 83.30 gm, 44.27 fruit.plant⁻¹, 3,688 kg.plant⁻¹) followed by spray treatment with Basfoliar Aktiv spray at a concentration of 2 ml.L⁻¹ with 20.33 cm, 77.00 gm, 39.70 fruit.plant⁻¹, 3.057 kg.plant⁻¹) compared to the control treatment. The increase in the characteristics of growth may be due to that the seaweed extract Marmarin and Basfoliar Aktiv contains Auxins and cytokinines and also contains the micro and macro nutrients in foliar spray, which is reflected positively on the number of fruits and the rate of weight and

plant yield (Hassan, 2001). As well as increase the total yield result is due to the elements sprayed where it gave a good vegetative growth and a strong of the root total to control the absorption of elements as well as the role of elements in the activity of enzymes and the organization of vital events and this is reflected on the development of fruit growth and weight increase and thus increase yield the results and agree with many studies (Al-Jawari,2002 ;Jabbar,2012 ; El-Bassiony *et al.*,2010; Al-Mousawi,2015 ;Obaid *et al.*, 2011,Al-Obeidi *et al.*,2013).

In this study, the best treatment is the seawater spray treatment with Marmarin at the concentration of 1.5 ml.L⁻¹ in the vegetative and fruit growth characteristics, followed by the treatment of the Basfoliar Aktiv spray at 2 ml. L⁻¹ during the planting season.

Table 5: Effect of spraying with seaweed extract Marmarin and Basfoliar Aktiv in the fruit growth characteristics of the sweet pepper (along type).

<i>Treatment</i>	<i>Fruit length (cm)</i>	<i>Fruit weight(gm)</i>	<i>Number of fruit-plant¹</i>	<i>One Plant yield</i>
Control (without spraying)	15.50	57.92	18.10	1.058
Seaweed extract Marmarin 1 ml.L ⁻¹	17.17	70.93	23.03	1.638
Seaweed extract Marmarin.5 ml.L ⁻¹	22.50	83.30	44.27	3.688
Seaweed extract Marmarin 2 ml.L ⁻¹	18:50	74.31	38.67	2.873
Basfoliar Aktiv 1 ml.L ⁻¹	19.27	74.66	38.30	2.860
Basfoliar Aktiv 2 ml.L ⁻¹	20.33	77.00	39.70	3.057
Basfoliar Aktiv 3 ml.L ⁻¹	19:50	75.90	38.00	2.884
LSD 0.05	0.93	4.27	4.70	0.33



Fig 1

References

1. Al -Bassiony AM, Fawzy EH, Abd El-Samad, Raid GS. Growth, yield and fruit quality of sweet pepper plants (*capsicum annum* L.) as effected by potassium fertilization. Journal of American Science. 2010; 6:12.
2. Al- Jubouri, Abd, Al- JM, Al - Sahaf FRH, Al – Jowari ARK. Effect of spraying organic foliar nutrients in the growth of vegetative and flowers of the (*capsicum annum*). Journal of Iraqi Agricultural Sciences. 2006 36(5):43-50.
3. Al-Aloosy Y. Ah. Ma. Effect of spraying of iron and manganese in soil mixed with potassium processing in the growth and yield of wheat. PhD thesis. faculty of Agriculture. Baghdad University, 2002.
4. Al-Jabbar GA. Effect of Foliar feeding on the growth and yield of (*capsicum annum* L.). Al-Furat Journal of Agricultural Sciences. 2012; (2):57-62.
5. Al-Jawari, Abd Al-RKS. Effect of Spraying with different nutrients on the growth and yield of (*capsicum annum* L.). Master Thesis. Faculty of Agriculture, University of Baghdad. Iraq, 2002.
6. Al-Jubouri, Abd Al-JM, Jassim, Abd. Al-R. Kh. Al-Jawari. Effect of spraying with foliar fertilizers and water extract of licorice in the content of two varieties of sweet peppers from total soluble solids and vitamin G. The Ministry of Science and Technology. Department of Agricultural Research and Food Technology. faculty of Agriculture. Baghdad University. Arab Conference on Horticulture. Ismailia. Egypt, 2002.
7. Al-layla WB, Al-Din Mahmood. Effect of Urea fertilizer and spray with seaweed extracts of Algamax and Algreen on growth and yield of musk melon. Tikrit Journal of Agricultural Sciences. 2011; (1)11:145-136.
8. Al-Mousawi AAM. Effect of addition of humic and spray with the extract of licorice and garlic in the growth and yield of pepper grown in green houses is Unheated. Al-Furat Journal of Agricultural Sciences. 2015; 7(1):64-72.
9. Al-Obeidi AH, Wahbi R, Soufan N. Effect of plant extracts on the production of tomatoe cultivated in greenhouses. Journal of Iraqi Agricultural Sciences. 2013; 44(1):81-88.
10. Al-Sahuki M, Wahib KM. Applications in designing and analyzing experiments. Baghdad University. Ministry of Education and Scientific Research. Iraq,

- 1990.
11. Al-Taey, D.K.A. 2017. Mitigation of Salt Stress by Organic Matter and GA3 on Growth and Peroxidase Activity in Pepper (*Capsicum annum* L.). Advances in Natural and Applied Sciences, 11(10): 1-11
12. Al-Taey, D.K.A. and Z.Z. Majid .2018. Study Effect of Kinetin, Bio-fertilizers and Organic Matter Application in Lettuce under Salt Stress. Journal of Global Pharma Technology.10(1): 148-164
13. Al-Zubaidi HJK. Effect of spraying with iron, zinc, boron and sulfuric gebrilic acid in the growth, yield and quality of sweet pepper. Master Thesis - Faculty of Agriculture - University of Kufa. Iraq, 2004.
14. Balochl QB, Chacharl QI, Tareen MN. Effect of foliar application of macro and micro nutrient on production of green chilies (*capsicum annum* L.) Journal of Agricultural Technology. 2008; 4(2):177-184.
15. Bayoumi YA, Hafiz YM. Effect of organic fertilizers com-bined with benzo (1, 2, 3) thiadiazole -7- carbothioic acid s-methyl-ester (BTH) on the cucumber powdery mildew and the yield production. Acta. Biol. Szegediensis. 2006; 50(3-4):131-136.
16. Burhan A. K. and D. K. A. AL-Taey .2018. Effect of Potassium humate, humic acid, and compost of rice wastes in the growth and yield of two cultivars of Dill under salt stress conditions. Advances In Natural And Applied Sciences. 12(11): pages 1-6
17. Gallon JR, Wright JT. Limited grazing pressure by native herbivortes on the invasive seaweed cualerpa.taxi frlia in atemperate. Ausrralia Estuary marine and fresh water research. 2006; 7:685-694.
18. Hassain AH, Abd Al-M. Cucurbitaceae, watermelon, cantaloupe, cucumber, summer squash. First Edition. Arabic Publishing House. The Egyptian Arabic Republic, 2001.
19. Horsley SB. Allelopathy inhibition of black cherry by ferograss Golden rod and Aster condition, J. Forestay. 1997; 67.205-208.
20. Howard LR, Talcott ST, Brenes CH, Villalon B. Changes in phytochemical and antioxidant activity of selected pepper cultivars (*Capsicum* sp) as influencedby maturity. J. Agri. Food Chem. 2000; 48:1713-1720.
21. Jemison J, Williams M. Potato grain study project Report. Water quality office. University of Maine, cooperation Extension, 2006.
22. Khalil M, Abd Al- Az. I. Vegetables and propagation plants - Nurseries - Cultivation of plant cells and tissues - Division - Vegetation description - Varieties. University of Zagazig. Knowledge facility. Alexandria, 2004.
23. Lee JJ, Crosby KM, LM Pike KS, Yoo DI. Lescober. Impact of genetic and environmental variation of development of flavonoids and carotenoids in pepper (*Capsicum* spp.). Sci. Hort. 2005; 106:341-352.
24. Malakouti MJ. The effect of micronutrients in ensuring efficient use of macronutrients. Turk. J. Agric. For. 2008; 32:215-220.
25. Mohammed Abd Al-RS. Effect of nitrogen fertilization and spraying with seaweed extracts on the growth and yield of cucumber plant. Diyala Journal of Agricultural Sciences. 2009; 1(2):134-145.
26. Mohammed Abd.Al—AK. The science of plant physiology. Part II. Dar Al Kutub Printing & Publishing

- Est. Ministry of Higher Education and Scientific Research. University of Al Mosul. The Republic of Iraq, 1985.
27. Nelson WR, Vanstaden J. The Effect of seaweed concentrate on nutrient stressed greenhouse cucumber. Hortscience. 1984; 19(1):81-82.
 28. Obeid Abd. Al RA, Hammad HS, Abd S. Effect of spraying with Algean seaweed extract and Ationk in growth and cucumber grown in greenhouses. Tikrit University Journal of Agricultural Sciences. 2011; 11(1):146-152.
 29. Rao AV, Roa LG. Carotenoides and human health. Pharma. Res. 2007; 55:207-216.
 30. Sarhan TZ, Ali ST, Rasheed SM. Effect of bread yeast application and seaweed extract on cucumber (*Cucumis sativus* L.) plant in growth, and fruit quality. of Agric. 2011; 39(2):26-34.
 31. Thang PTN. Ripening behavior of (*capsicum annuum* L.) fruit. Thesis for the degree of Doctor of Philosophy. Unv. of Adelaide, South Australia, 2007, 149.
 32. Wahba NM, Ahmed AS, Ebraheim ZZ. Antimicrobial effects of pepper, parsley and dill and their roles in the microbiological quality enhancement of traditional Egyptain kareish cheese. Foodborne pathog. Dis. 2010; 7:411-418.
 33. Yaha EM. The contribution of fruit and vegetable consumption to human health. In fruit and vegetable phytochemicals, chemistry, nutritional value, and stability (Ed. Laura A. de la Rosa, Emilio Alvarezparrilla, Gustavo A. Gonzalez-Aguilar) Black well pub. Iowa, USA, 2000.