Effect of Foliar application of humic acid and boron on Vegetative and Yield Parameters of Cucumis melo Var flexuosus.

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Abstract

The experiment was conducted in the Horticulture and Forestry Division of the Najaf Agriculture Directorate for the period from (1/3/2021) to (1/7/2021) to study the effect of spraying liquid organic fertilizer humic acid at a concentration of (6,3,0) ml. L^{-1} and boron at a concentration of (10.5, 0) mg. L^{-1} in some vegetative growth and yield traits of the cucumber plants .The factorial experiment was conducted according to The Randomized Complete Block Design (RCBD) of the first factor, humic acid and the second factor, boron, bringing the nine treatments distributed over three sectors randomly, thus bringing the total number of experimental units to 27 experimental units. The averages of physiological traits and the yield were analyzed using the statistical analysis program Genstat, and the results of the averages were compared using Duncan's polynomial test at a probability level of 0.05. The most important results can be summarized as follows:-Humic acid showed a significant effect on all vegetative indicators and chemical traits of the cucumber plant. The following traits (plant height, number of leaves, leaf area, length of fruits, total yield per hectare, yield per plant) at the concentration 6 ml. L^{-1} in that gave) 213.6 cm. $plant^{-1}$, 42.70 leaves. $plant^{-1}$, 23.12 cm^{2}. $plant^{-1}$, 8.90 fruits. $plant^{-1}$, 2.28 kg. $Plant^{-1}$, 3.50 tons. ha^{-1}. The treatment, spraying with boron at a concentration of 10 ml. L^{-1}, gave an increase in traits (plant length, number of leaves, leaf area ,Fruit length, yield per unit area, yield per plant) and in order (212.9 cm. $plant^{-1}$, 41.55 leaf. $plant^{-1}$, 23.11 cm^{2}. $plant^{-1}$, 9.38 fruits. $plant^{-1}$, 2.32 kg. $plant^{-1}$, 3.60 kg.$plant^{-1}$).

Introduction

The snake cucumber plant belongs to the Cucurbitaceae family, and it is one of the groups of the melon plant(Cucumis melo L). It is a monoecious plant that bears male and female flowers separately on the same plant, and it is an important summer waist in Iraq .Its fruits are consumed fresh, and of the agricultural cultivars of cucumbers are soft Mosuli, rough Mosuli, al-Baghdadi and American, and the fruits of snake cucumbers contain vitamin A, vitamin B, vitamin C, carotene, dietary fiber, water, and other materials (Tlab et al., 1989)There are conflicting opinions about determining the original home of the cucumber.Boras (2006) clarified that the original country of the snake cucumber is India. The statistics of the Food and Agriculture Organization of the United Nations indicate that the area planted with the cucumber plant in the world for the year 2013 amounted to 782205 tons and that the global production of cucumbers for that year amounted to 893,855 tons. ha^{-1} (FAO, 2017,(The number of cultivated areas of the cucumber plant in Iraq reached 27,342 dunams, with average productivity of one dunum of 2574.8 kg/dunum, and the total production is 70,400 tons (Central Statistics Organization, 2020 .(Humic acid is the main and most active ingredient in organic matter and works in very low concentrations to improve plant growth and increase the yield and rate of many important vital processes in plants such as photosynthesis, respiration, protein synthesis, water absorption, and nutrients (Ferrara) and Brunetti, (2010.(Yousif (2201) showed that adding humic acid at a concentration of 6 ml / liter to cucumber plants, a Babylonian cultivar, caused a significant increase in the traits of vegetative growth (plant length, number of leaves, leaf

area, percentage of chlorophyll). Boron is usually found in the soil in limited quantities as it is absorbed into the plant in the form of Borate BO2 (Zahoor et al., 2011.(Boron helps in the germination of pollen grains and the growth of the pollen prophet, and the plant needs more of it in the flowering and fruiting phase. Therefore, its importance in the formation of seeds and fruits is clear, which is one of the most important essential mineral elements nourishing plants because of its role in controlling the degree of water absorption from the soil and the movement of sugars within the plant. To their storage places as well as its effect on the absorption of some nutrients such as nitrogen, potassium and calcium (Kumar et al., 2006.(The research aim -:

-1Studying the effect of levels of humic acid on some vegetative traits obtained from the cucumber plant.

-2Studying the effect of levels of boron on some vegetative traits obtained on the cucumber plant.

-3Studying the effect of the interaction between the study factors on some vegetative traits of the cucumber plant.

Materials and Methods

2-1experiment location

The experiment was conducted in the Division of Horticulture and Forests located in the green belt of the Najaf Agriculture Directorate for the period from (1/3/2021) to (1/7/2021.(To study the effect of spraying with liquid organic fertilizer and boron on some characteristics of vegetative growth and yield of the cucumber plant .The cucumber plant was sprayed with organic fertilizer humic acid at a concentration of 0, 3, 6 ml. L^{-1} and boron were sprayed with a concentration of (10,5,0 mg. L^{-1}, and sprayed with three sprays, the first spray after a month from germination and the second spray at a time of flowering .As for the third spray, two weeks after the second spray, and between one spray and another, for a period of one week, spraying was conducted in the early morning until the degree of complete wetness of the vegetative group using an automatic sprayer (10 liters capacity) with the addition of the diffuser (T-20 with a concentration of 0.1%.(To reduce the surface tension. The area of the experimental unit is 5 m for each treatment so the total cultivated area for each sector becomes 45 m.The soil was analyzed in the laboratory of the Directorate of Agriculture in Najaf Governorate to measure its physical and chemical properties and the results were as in Table (1).

Table (1) Analysis of some chemical and physical properties of soil

Traits		values	units
Soil Separators	Sand	380	$g.kg^{-1}$
	silt	308	
	clay	312	
texture		Loamy clay	----
pH		7.4	
electrical conductivity		1.7	$Ds.m^{-1}$
CO3		Nil	
N		0.261	PPm
P		0.245	PPm
K		92.2	PPm
Ca		4	$mmol.L^{-1}$
Mg		9.6	$mmol.L^{-1}$

Cl	**5**	**mmol.L^{-1}**
HCO_3	**0.7**	**mmol.L^{-1}**
SO_4	**0.42**	**mmol.L^{-1}**

The experiment was designed as a factorial experiment within the Randomized Complete Block Design (RCBD) with two factors, where the first factor represents: the organic fertilizer Tecamin Max humic acid with three levels (3,06) ml.L^{-1}, which contains (amino acids 14.4% Nitrogen 12%,Organic matter 3.5%, pH 6.6%) and the second factor: Docson boron in three concentrations (5,010) mg.L^{-1}, which contains (45%) B. The treatments were distributed according to the design of randomized complete blocks R.C.B.D with a factorial experiment and three replications.The nine treatments were distributed on three replicates at random, thus bringing the total number of experimental units to 27 experimental units for the experiment.The results were analyzed according to the analysis of variance and the averages were compared using Duncan's Muliples Range Teset at a probability level of 5% (Al-Rawi and Khalaf Allah, 2000). Using the statistical program (Genstat).

studied traits

Five plants were taken from each experimental unit to study the studied traits as follows: -

vegetative growth traits

2-1-1 plant height (cm)

The length of the plant was measured from the area of contact of the plant with the soil to the end of the apical meristem by means of a metric tape for plants that were randomly selected.

2-1-2 the number of leaves (leaf. plant $^{-1}$.)

The total number of leaves of plants at the end of the season was calculated.

2-1-3 Leaf area (cm^2. Plant $^{-1}$.)

Leaf area was measured in each treatment by taking three leaves from the beginning, middle and end of the main stem of each of the treated plants, using the ImageJ program on the computer and calculating the area average for it and multiplying it by the number of leaves of the plant (Su and Messenger, 2000).

2-2 traits of the yield of the cucumber plant

2-2-1 The fruits length (cm).

The fruits length was measured using the metric tape and the average for the length of the fruit was taken for each experimental unit.

2-2-2 The amount of yield per unit area (tons. ha^{-1}).

The cumulative sum was calculated from the beginning of the genie until the last guinea according to the following equation:

Total yield (tons. ha^{-1}) = (Product of the experimental unit / area of the experimental unit * 10,000.

10000: represents the area of a hectare.

2-3-2 Yield per plant (kg. plant^{-1}). According to the yield of one plant from the sum of the fruit yield, the experimental unit of all harvests was divided by the number of its plants.

Results and discussion

3-1 Effect of spraying humic acid and boron and the interaction between them on indicators of vegetative growth of cucumber

We note from Table (2) that the treatment of spraying with humic acid (6 ml. L^{-1}) was significantly excelled, where it gave the highest value for the studied traits (for plant height, number of leaves and leaf area) (213.6 cm. plant^{-1}, 70.42 leaf. plant^{-1}, 23.12).

$dm^2.plant^{-1}$) compared to the control treatment that gave the lowest value (137.7 cm.plant$^{-1,}$36.2 leaf.plant^{-1},22.43 $dm^2.plant^{-1}$).The same table shows the superiority of the concentration of 10 mg.L^{-1} of boron on the rest of the concentrations where it was (212.9 cm.plant-1,55.41 leaf.plant^{-1}, 23.11 cm.^{2}.plant^{-1}) compared to the control treatment that gave the lowest value (138.6 cm. Plant^{-1}, 27.16 leaves. Plant^{-1}, 22.48 dm^2. Plant^{-1}.While the interaction between spraying with humic acid and boron at a concentration (6 ml. L-1 + 10 mg. L^{-1}) showed a significant effect on the vegetative growth treatments of the cucumber plant if it gave the highest value (234.2 cm. plant^{-1}, 45.15 leaf.plant^{-1}, 23.60 $dm^2.plant^{-1}$) compared to the control treatment that gave the lowest value (105.7 cm.plant^{-1}, 33.0 leaf.plant^{-1},21.83 $dm^2.plant^{-1}$).

Table (2) The effect of spraying humic acid and boron and their interaction on the vegetative growth indicators of cucumber plant

Traits		Leaf area ($dm^2.plant^{-1}$)				Number of leaves (leaf. $plant^{-1}$)				Plant height ($cm.plant^{-1}$)			
humic		0	3 ml.L^{-1}	6 ml.L^{-1}	average	0	3 ml.L^{-1}	6 ml. L^{-1}	average	0	3 ml.L^{-1}	6 ml.L^{-1}	average
Boron	0	**21.83c**	**22.7b**	**22.91ab**	**22.48ab**	**33.0b**	**38.2ab**	**40.3a**	**27.16b**	**105.7c**	**106.5bc**	**200.9bc**	**137.7c**
	5 mg. L^{-1}	**22.70b**	**22.75ab**	**22.87ab**	**22.77ab**	**37.8ab**	**40.3a**	**42.67a**	**40.25ab**	**109.4ab**	**109.9ab**	**205.8ab**	**141.7b**
	10 mg. L^{-1}	**22.78ab**	**22.96a**	**23.60a**	**23.11a**	**37.8ab**	**41.7a**	**45.15a**	**41.55a**	**200.7ab**	**203.9ab**	**234.2a**	**212.9a**
average		**22.43ab**	**22.80ab**	**23.12a**		**36.2b**	**40.06ab**	**42.70a**		**138.6c**	**140.2b**	**213.6a**	

2-3 Effect of spraying humic acid and boron and their interaction on yield indicators of snake cucumber plants

Table (3)showed that there are significant differences when spraying with humic acid (6 ml. L^{-1}).It gave the highest value for the following indicators (number of fruits, yield per plant and quantity of yield per unit area) (8.90 fruits. plant^{-1}, 2.28, 3.50 tons. ha^{-1}) compared to the control treatment which gave the lowest value (6.32 fruits. plant^{-1}). , 2.01, 2.78 tons. ha^{-1}).The results of the same table indicate that the concentration of 10 mg.L^{-1} of boron was excelled to the rest of the concentrations where it was (9.38 fruits.plant^{-1}, 2.32 kg.plant^{-1}, 3.60 kg.ha^{-1}) compared to the control treatments that gave the lowest value (5.49 fruits . Plant^{-1}, 1.55 kg, plant^{-1},2.59 tons, ha^{-1}.As for the interaction between spraying with humic acid and boron at a concentration (6 ml.L^{-1} + 10 mg.L^{-1}) The results in Table (3) showed a significant effect on the yield indicators if they gave the highest value (9.97 fruits. plant^{-1}, 2.57 kg. plant^{-1}, 3.94 tons. ha^{-1}) compared to the control treatment that gave the lowest value (3.61 fruits). plant^{-1}, 1.01 kg. plant^{-1}, 2.22 tons. ha^{-1}).

Table (3) Effect of spraying humic acid and boron on yield indicators of snake cucumber plants

Traits		Yield quantity (tons. ha^{-1})				Plant yield (kg.plant^{-1})				Number of fruits (fruit.plant^{-1})			
humic		0	3 ml.L^{-1}	6 ml.L^{-1}	average	0	3 ml.L^{-1}	6 ml.L^{-1}	average	0	3 ml.L^{-1}	6 ml. L^{-1}	average
Boron	0	**2.22 c**	**2.75 bc**	**2.81 bc**	**2.59b**	**1.01 c**	**1.70 d**	**1.96 bc**	**1.55a b**	**3.61 cd**	**5.13 d**	**7.75b**	**5.49c**
	5 mg. L^{-1}	**2.92 bc**	**3.12 ab**	**3.77 ab**	**3.45a**	**1.57 cd**	**2.05 bc**	**2.32 ab**	**1.31a b**	**6.72 d**	**7.29 b**	**8.99a**	**7.66b**
	10 mg. L^{-1}	**3.21 ab**	**3.67 ab**	**3.94 a**	**3.60a**	**2.12 ab**	**2.29 ab**	**2.57 a**	**2.32a**	**8.95 a**	**9.22 a**	**9.97a**	**9.38a**
Average		**2.78 b**	**3.18 a**	**3.50 a**		**1.56 ab**	**2.01 a**	**2.28 a**		**6.32 b**	**7.21 ab**	**8.90a**	

Humic acid is the main and most active ingredient in organic matter and works in very low concentrations to improve plant growth and increase yield and the increase in the rates of many important biological processes in the plant, such as photosynthesis, respiration, protein synthesis, and absorption of water and nutrients (Ferrara and Brunetti, (2010).The spraying of humic acid on the cucumber plant Babylonian cultivar, led to a significant increase in plant height, number of leaves, and leaf area (Yousif, 2012)and the addition of humic acid to the soil or spraying at a concentration of 20 ml .L^{-1} of it several times on the tomato plant has increased the growth of plants and also increased the weight of the fruit and the fruit yield (Ertan, Yildirim, 2007).Ibrahimi (2011) noted that there were significant differences when spraying sweet pepper plants with boron at a concentration of 5 ml .L^{-1} in the vegetative growth characteristics represented by plant height, number of leaves and leaf area. As for the increase in the total number of leaves, the reason is due to the role of boron in raising the efficiency of the carbonization process and the representation of nutrients and its contribution to the formation of nucleic acids, especially DNA, which are necessary for cell division, which encourages the formation of leaf buds, and then increases the number of leaves for the eggplant plant, and this corresponds to what he mentioned (Youssef, 2011).).

Conclusions

1- The results of the study showed that spraying with humic acid led to a significant superiority at a concentration of 6 ml .L^{-1}, Where it gave positive results in most of the studied traits, while there were no significant differences in the control treatment.

2- The results of the study showed that spraying with boron at a concentration of 10 ml. L^{-1} gave a significant increase in all studied traits.

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