Al-Muthanna J. For Agric Sci Print ISSN: 2226-4086 Online ISSN:2572-5149
Vol. 11 , Issue 1. 2024

https://muthjas.mu.edu.iq/ http://doi.org/10.52113/mjas04/11.1/11

Humic Acid and Anti-Salt fertilizer Affecting Vegetative Growth and Yield Parameters of Strawberry Var Robby G.

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Received on 1/4/2024 Accepted on 15/5/2024 Published on 15/6/2024

Abstract

The study was implemented in the nursery of Al-Najaf Agriculture Directorate for the period from (12/1/2022) to (4/1/2023). The experiment aimed to study the effect of some chemical indicators of strawberry (Ruby GIM) seedlings under the influence of two factors. The first factor was adding (Anti-Salt) fertilizer at the rate of (0, 2.5, and 5) $ml.L^{-1}$ and organic fertilizer. The other factor was the application of liquid humic acid at the rate of (0, 5, and 10) $ml.l^{-1}$. The study layout was a factorial experiment utilizing a completely randomized block design.

Genstat, a statistical analysis program, was used for data analysis. Duncan's multiple range test was utilized to compare the means of the trial at a probability level of 0.05.

Humic acid at the rate of 5 $ml.l^{-1}$ had a significant effect on some vegetative growth indicators of the strawberry plant. It increased the characteristics of plant height, number of leaves, number of fruits, and fruit weight which recorded 1.908 cm, 19.45 leaves. $plant^{-1}$, 16.90 fruit. $plant^{-1}$, 42.07g. $plant^{-1}$ respectively.

Adding organic anti-salt fertilizer at the concentration of 5 $ml.L^{-1}$ increased the following characteristics of plant height, number of leaves, number of fruits, and weight of fruits which scored 1.681 cm, 18.92 $leaves.plant^{-1}$, 15.52 $fruits.plant^{-1}$, 37.20 $g.plant^{-1}$.

Introduction

The strawberry (*Fragaria ananassa* Duch) plant is one of the small fruit groups that belong to the Rosaceae family (Manganaris *et al*., 2014). It is a perennial plant. However, it adapts to a wide range of climates (Zhao, 2007). It includes more than 2000 varieties spread throughout Europe, Asia, and North America. The original homeland of the strawberry is believed to be the Alps and the Massif Central region in France. Then, strawberry cultivated and spread to the rest of Europe North Asia, and the rest of the world (Al-Saidi, 2000).

Recently, the cultivation of strawberries began to spread in Iraq on a commercial scale. Although there were modest attempts by the private and public sectors to cultivate strawberries, the lack of experience in the field prevented these crops from entering the production stage (Muhammad, 2018).

Adding the organic matter to the sandy soil can link the soil molecules together. Also, it can maintain the soil temperature due to its dark color, and then the soil will be suitable for the germination of seeds and plant growth (Taha, 2007)

In addition, OM can reduce the apparent density of the soil and improve porous, thus regulating the movement of water and exchanging gases.

OM also improves the physical, chemical, and biological soil properties, and also helps to increase the soil susceptibility to retain water and increase the stability of soil groups, which are a source of energy and carbon for microorganisms (Abu Rayan, 2010).

Organic acids, such as Humic acid and volphic acid tartaric acid, have a role in the growth of plants because they are carbon substances that build vegetable tissues (Shaftek *et al*., 2012).

Humic acid is the primary and most active component in the organic matter. Very few concentrations of Humic acid can improve plant growth, increase the yield, and increase the rate of many important vital processes in the plant such as Photosynthesis, respiration, protein building, water, and nutrient absorption (Ferrara ,G and Brunetti, 2010).

The plant roots can absorb the ions of the organic matter. Then it is easily released and moved quickly to benefit the plant by participating in the physiological processes. This can provide the plant with the energy needed to absorb it, especially in its critical growth stages (Hassan *et al*., 2010).

The research aims to study the effect of humic acid as well as anti-Salt fertilizer on the growth and yield of strawberries.

Material and methods

The study was implemented in the nursery of the Horticulture and Forestry / Plant Production Department /Al-Najaf Agriculture from (1/12/2022) to (1/4/2023).

On some chemical indicators of strawberry seedlings variety (Ruby C) grown in greenhouses. The first factor was the application of fertilizer (Anti-Salt) at the rate of (0, 2.5, and 5) $ml.L^{-1}$ while the second factor was the soil application of liquid organic fertilizer humic acid (0, 5.0, and 10) ml. L^{-1}.

Both fertilizers were applied to the soil three times, with an interval of 20 days between one application.

The study layout was a factorial experiment utilizing a completely randomized block design (RCBD) utilizing factorial experiment (3 * 3) with three replications. The means of the properties were analyzed by Genstat statistical analysis program. Dunkin's multiple range test at 0.05 probability was used to compare the means.

The soil analysis was done in the laboratory of the Al-Najaf Agriculture Directorate to measure the physical and chemical properties, and the results were as shown in Table (1)

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

the soil			
property		value	measuring unit
	sand	380	
Soil articulations	silt	308	gm.kg $^{-1}$
	clay	312	
texture	clay loam		----
pH		7.4	
EC		1.7	Decismens. 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}

Studied indicators:

Five plants were taken from each experimental unit for study properties including Plant height (cm), number of leaves (leaf.plant^{-1}), number of fruits (fruit.plant^{-1}), and Fresh weight of fruit (g) which were calculate according to the following equation.

Fruit weight (g.fruit^{-1}) = total weight of the fruits of one plant/number of fruits of the same plant

Results

Table (2) shows that the treatment of adding Anti-Salt fertilizer at the rate of 5 ml.L^{-1} showed significantly high performance. It recorded the highest value for the studied traits including plant height, number of leaves, number of fruits, and weight of fruits which scored 1.908 cm.plant^{-1}, 19.45 leaves.plant^{-1},16.90 fruits.plant^{-1}, and 42.07 m.plant^{-1} compared to the non-treated plants which gave the lowest value of 1.625 cm.plant^{-1}, 16.80 leaves.plant^{-1}, 12.27 fruits.plant^{-1}, 32.47 g. plant^{-1} respectively.

The same table shows that the organic fertilizer of Humic Acid at the rate of 01 ml.L^{-1} was superior regarding plant height, number of leaves, number of fruits, and weight of fruits. It gave 1.681 cm.plant^{-1}, 18.92 leaves.plant^{-1}, 15.52 fruits. plant^{-1}, 37.20 g. plant^{-1} compared to the control treatments which gave the lowest value of 1.631 cm. plant^{-1},

17.01 leaves. plant^{-1}, 15.20 fruits.plant^{-1}, 37.09 g. plant^{-1} respectively.

The interaction between adding the Anti-Salt fertilizer at the rate of 5 ml.L^{-1} and the organic fertilizer at the rate of 10 ml.L^{-1} shows a significant effect on the vegetative growth and yield of the strawberry plant. It gave the highest value of 1.923 cm.plant^{-1}, 22.50 leaf.plant^{-1},

23.27 fruit.plant-1, 47.07 g.plant^{-1} compared to the control treatment which gave the lowest value of 1.653 cm.plant^{-1}, 17.73 leaf.plant^{-1},

13.32 fruit.plant^{-1}, 32.47 g.plant^{-1} respectively.

The main reason for the increase in growth may be due to the role of organic fertilizer which is a good source of nutrients and increasing the availability of these nutrients in the soil (Ogendo *et al*., 2008). Humic acid is the basic and most active component in organic matter. It is effective at very low rates to improve plant growth, increase yields, and increase the rates of many important biological processes in plants such as photosynthesis, respiration, protein synthesis, and absorption of water and nutrients (Ferrara and Brunetti, 2010).

This increase in the leaf numbers per plant and leaf area causes an increase in carbon metabolism and the accumulation of the products of this process.

This includes an increase in carbohydrates and proteins in the stored part of the plant as well as an increase in the proportion of nutrients in the leaves, and then an increase in the dry weight of the plant. All of this reflects positively on the yield through an increase in the rate of the Number of fruits, average length, diameter, and weight of the fruit, and total yield (Neeraja et al., 2005). Many studies have also proven the importance of using liquid organic fertilizers in improving vegetative indicators of fig seedlings including plant height, stem diameter, leaf area, number of leaves, chlorophyll content of leaves, number of new branches, and fresh and dry weight of the shoot (Al-Alaaf, 2014). Al-Taie (2014) stated that when adding organic extracts to orange seedlings, they play a positive role in

the growth characteristics of the plant such as plant height, stem diameter, number of branches, and number of leaves.

Table (2) Effect of adding Anti-Salt fertilizer and liquid organic fertilizer (Humic Asad) and their interaction on growth and yield indicators of the strawberry plant

anti salt		Plant height (cm.plant-1)				Number of leaves (leaf. plant-1)			
		0	2.5 ml.L^{-1}	5 ml.L^{-1}	Means	0	2.5 ml.L^{-1}	5ml.L^{-1}	means
humic acid	0	1.653 abcd	1.783 bcd	1.44 abc	1.625 b	17.73ab	17.07ab	15.97ab	16.80 ab
	5 ml.L^{-1}	1.277 d	1.193 ab	1.68 abcd	1.383 ab	16.63ab	20.23ab	18.30ab	18.38 b
	10ml.L^{-1}	1.963 cd	1.84 bcd	1.923 a	1.908 a	16.67ab	19.20b	22.50a	19.45 a
	means	1.631 ab	1.605 b	1.681 a		17.01 a	18.83 a	18.92 a	
anti salt		Number of fruits (fruit.plant^{-1})				Fruit weight (g. fruit^{-1})			
		0	2.5 ml.L^{-1}	5 ml.L^{-1}	Means	0	2.5 ml.L^{-1}	5ml.L^{-1}	means
humic acid	0	13.32ab	12.34ab	11.17ab	12.27 a	32.47ab	38.07abc	26.87a	32.47 b
	5 ml.L^{-1}	14.17ab	15.23ab	12.13ab	13.84 a	43.73bc	35.47abc	27.80c	39.20 b
	10ml.L^{-1}	18.13a	9.31ab	23.27a	16.90 a	35.07abc	44.07ba	47.07a	42.07 a
	means	15.20a a	12.29 a	15.52 a		37.09 a	35.67 a	37.20 a	

Conclusions

This study showed that adding anti-salt fertilizer at a rate of 5 $ml.l^{-1}$, and organic fertilizer (humic) at a rate of 10 $ml.L^{-1}$ and their interaction significantly increased all the studied traits.

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