

STUDY EFFECT OF SOME AGRICULTURAL FACTORS IN GROWTH AND YIELD OF GREEN ONION (*ALLIUM CEPA* L.)

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Abstract

The experiment was conducted in the field of vegetables / of Horticulture and landscape Design Department / Faculty of Agriculture / University of Mosul_ during the season 2021-2022, to study the effect of spraying with humic acid and seaweed extract on the growth and yield of green onion plant. The experiment from the first factor included spraying with humic acid (H) at a concentration (H0, H1, H2) ml.L⁻¹ and the second factor spraying with seaweed extract (Super 50) (S) at a concentration (S0, S1, S2) ml.L⁻¹ and control treatment and by four sprays, The experiment was conducted in a randomized complete block design (RBCD) and with three replications, the local onion cultivar (Crystal) was used. The results showed the spraying treatments with humic acid and seaweed extract excelled in some traits of vegetative growth and yield compared to the control treatment, except for the traits of the number of tubular leaves, bulb circumference and bulb length, there was no significant difference and the best measurements resulted from spraying treatment with the interaction of humic acid with seaweed at a concentration of 2 ml.l⁻¹ represented by (plant height, length of tubular leaves, weight of tubular leaves, dry weight of tubular leaves, bulb weight, experimental unit yield and the total yield where It amounted to 693.3 tons.ha⁻¹ and for the control treatment it amounted to 553.3 tons. ha⁻¹.

Key words: Onion, humic acid, seaweed, green onion.

Introduction

Onions (*Allium cepa* L.) . are considered one of the important winter vegetable crops in Iraq and countries of the world which is consumed by the individual in large quantities (Al-Tafel, et al., 2010). Onions are characterized by a high nutritional value because they contain a good percentage of minerals, especially calcium and phosphorous, in addition to the presence of large amounts of vitamins that strengthen the immune system (Hirschegger, 2011), Onions are characterized by their high nutritional value because they contain a good percentage of the main elements, especially calcium and phosphorous, as well as the presence of carbohydrates, proteins and vitamins (Gautam and Sinare, 2016). As for its medical importance, it contains kerosene, which is one of the flavonoid compounds, and it is one of the antioxidant and anti-cancer compounds. It lowers cholesterol, lowers the concentration of sugar in the blood, and prevents blood clots that cause clots. It also has an anti-bacterial effect in food and the gastrointestinal tract. The reason for this is due to action of lysine-like compounds (Patil et al., 1995), The average local production of onions in Iraq is (200.236 tons. ha⁻¹ with an area of 5813.25 hectares) for the year 2019, (Central Statistical Organization, Department of Agricultural Statistics, 2019), The onion crop is planted either for false

stems, green leaves, or seedlings, and it may remain without harvest in tropical areas to grow as a perennial plant where the leaves are harvested and the plant bases are left to form new leaves (Hassan, 2004). The leaf is the main member of the photosynthesis process, so the lack of elements appears in the leaves and it is necessary to speed up the fertilization to treat this deficiency through the use of foliar spray (Hamad and Jumaa, 2000), As it is this complementary method of ground fertilization and works on distributing nutrients on the vegetable system in a homogeneous manner compared to adding nutrients to the soil (Hassan and Salman, 1989) and with an efficiency of 85% of its need of nutrients, (Abdoul, 1988 and Al-Sahaf, 1994). The results of the studies showed the importance of spraying nutritional elements on the vegetative total of agricultural crops, due to their important role in providing them with their needs of both micro and macronutrients (Kannan, 1980). (Mortvedt et al, 1072) indicated that spraying with nutrients in the early morning reduces the evaporation process and also helps to increase the absorption process due to the high humidity of the barn at this time and the opening of the stomata for the beginning of the photosynthesis process. The importance of using liquid fertilizers by spraying on the vegetative part emerged as a preventive measure by volatilization, washing, sedimentation and fixation in the soil, which leads to problems in its readiness. In addition, foliar feeding reduces the environmental pollution resulting from the addition of fertilizer compounds to the soil and its movement with irrigation water to water bodies (Wittwer, 1965 and Anonymous, 1985). Fertilizers are one of the important agricultural factors in increasing the productivity of vegetable crops in general, including onions. Previous studies focused on the use of chemical fertilizers, which studies have proven negative impacts on the environment and human and animal health. Therefore, interest was generated about the use of organic fertilizers that contain a high proportion of nutrients in a balanced and good manner. for plant growth (Hao et al., 2008), Among these organic fertilizers is humic acid fertilizer, where the acids represent a group of humic substances that have been extracted with solvents or other alkaline solutions in the form of dark-colored solutions or granules (Musalt, Musleh, 2012), Humic acid is one of the forms of organic matter and studies have shown that humic acid increases the permeability of cell membranes and enhances the absorption of nutrients, (Kaya et al., 2005), Dorer and Peacock, 1997) indicated that humic acid improves root growth, increases microbial activity in the soil, the abundance of nutrients in the soil, and increases soil water retention, thus improving plant growth. The use of humic acid derivatives contributes to the process of cell division as a result of the ability of humic molecules to enter the cell stream and make the cell membrane more permeable (Faust, 1998). A study was conducted by (Al - Khafaji et al ., 2009) on the effect of humic acid on onion plants, where three concentrations (1.5, 3, 4.5) ml.l⁻¹ were used. It led to a significant increase in the yield traits (diameter, length of the bulb, and total yield). The importance of humic comes in that it activates enzymes in the plant and increases and acts as an organic It is involved in stimulating vital processes lead to increased for growth and encourage Root formation and growth, This helps in absorbing water and nutrients and contributes to raising the efficiency of photosynthesis (Robert and Pettit, 2003), (Turkmen et al, 2004), Seen and Kingmant (98) and (Zaidan, 2004). It was found (Al-Qaisi, 2008), (Al -Qaisi et al., 2009), (Abdel et al ., 2012), (Abbas and Hammad, 2016) and (Al- Aboudi, 2017), that spraying with humic acid increased the vegetative growth traits of some vegetable crops. Another modern means of spraying on plants is the use of seaweed extracts to increase agricultural production due to their rapid effectiveness in providing

plants with nutrients. It also increases the plant's tolerance to external conditions as a result of its direct role in stimulating the metabolic pathways leading to the construction of antioxidant molecules in the plant cell, which increases plants' resistance to diseases and abiotic stresses to which it is exposed, and this is reflected in increasing plant growth and productivity and improving the quality of the crop (Cardozo, et al., 2007) and it also leads to an improvement in plant growth, And these extracts are natural extracts of seaweeds and algae and are now widely used in many fields as an important source of nutrients. One of the most commercially produced types is the seaweed extract *Ascophyllum nodosum*. These marine plants contain all the macro and micronutrients, alginic acid, vitamins and auxins, as well as two types of gibberellins GA7 and GA3 (Stephenson, 1968), The importance of seaweed extracts, which we describe as fertilizer, is not due to the fact that they contain nitrogen, phosphorous and potassium dissolved in water, but rather to the presence of many micro-nutrients necessary for plant growth and metabolic products, which leads to the rapid absorption of them by the plant, which treats the symptoms of nutrient deficiency (Booth, 1968), seaweed is tripartite chlorophyll plants that do not have a root, stem or true leaves. They live in sea water, fresh water, and high humidity. They grow strongly thanks to the mineral elements available in the water. (Abdul Hafez, 2011). (Akash, Sharma, 2017) indicated that the extract of the seaweed *Ascophyllum nodosum* was used on the onion plant at a concentration (0, 0.35, 0.45, 0.55, 0.65, 0.75) %, where it was found that the concentration of 0.55% was the best treatment in terms of plant height and number of leaves The yield of one plant, the diameter of the bulb and the wet weight of the bulb, (Mandrada, Dogra, 2012) confirmed in a study on the effect of these extracts of seaweed on onion plants when spraying at a concentration of (1.5, 2.0, 2.5 3, 3.5) g / m². It was noted that the concentration of 2.5 g / m² gave the highest yield. Al -Baili et al ., (2015) in Syria, the effect of seaweed extract on local red onions at two concentrations (5, 10) g/L⁻¹ It was found that the addition of 5 g/l⁻¹ of (SE) Led to a significant increase in the percentage of dry matter in the plant, plant height and average bulb weight. Hidangmayum, (2016) mentioned in a study on onions about the effect of seaweed extracts using six different concentrations (0, 3.5, 4.5, 5.5, 6.5, 7.5) ml/l⁻¹. Where the concentration of 5.5 ml / l Significantly superior in plant height than the rest of the treatments, bulb diameter and total yield of bulbs, youusif (2018) mentioned that the garlic plant treated with seaweed extracts Alga 600 at a concentration of 8 ml / l⁻¹ gave the highest significant increase in the total yield of the plant Compared to untreated plants .The study aims at knowing the possibility of knowing the use of natural organic fertilizers (humic acid) and seaweed extract (Super 50) in improving the growth and yield of green onions and compensating for the use of chemical fertilizers because of their negative impact on the environment and human health.

Materials and methods

A field experiment was conducted in the vegetable field of the Department of Horticulture and Landscaping at the College of Agriculture and Forestry, University of Mosul, during the growing season of 2021-2022 to study the effect of spraying with humic acid and seaweed extract on the growth and yield of green onions. The experiment included two factors, the first factor being spraying with humic acid Acid (H) at a concentration (H0, H1, H2) ml .L⁻¹ The second factor was spraying with seaweed extract (Super 50) (S) at a concentration of (S0,S1,S2) ml.L⁻¹. The experiment was conducted in a randomized complete block design (RBCD) and with three

replications, the local onion cultivar (Crystal) was used. The bulbs were planted in the month of 11 on furrow with a length of 3.5 m and the distance between one plant and another 10 cm. All agricultural operations of irrigation, hoeing and weeding were carried out in a uniform manner for all treatments (Required, 1989). The bulbs were harvested manually in the month of 3 with the beginning of the appearance of the flowering groin in some plants and for all plants of the experimental unit, and the following measurements were recorded:

First: Vegetative growth measurements: Five plants were taken from each experimental unit to record the vegetative growth measurements:

- 1- Plant height (cm): The measurement was recorded from the area of the disc stem to the longest tubular leaf.
- 2- Length of the longest tubular leaf (cm): recorded from the beginning of the emergence of tubular leaves.
- 3- The number of tubular leaves per plant (leaf/plant⁻¹).
- 4- Fresh weight of tubular leaves (g).
- 5- Dry weight of tubular leaves (g).

Second: Yield measurements: Five plants were also taken from each experimental unit to record the yield measurements:

- 1- The average weight of one bulb (gm): the weight of the bulb was measured for five plants for each experimental unit after cutting the tubular leaves and divided by the number of total bulbs to extract the average weight of the bulb.
- 2- The average circumference of the bulb (cm): It was measured by measuring tape and at the widest area in the bulb for five bulbs in the experimental unit.
- 3- The bulb length (cm): It was measured by measuring tape from the area of the disc stem to the beginning of the formation of tubular leaves.
- 4- plant yield (kg plant⁻¹): It was calculated from the yield of the experimental unit and divided by the number of plants and extracted as the average.
- 5- The total yield of bulbs (tons. ha⁻¹): It was calculated according to the following equation:

$$\text{total yield} = (\text{ton} \cdot \text{ha}^{-1}) = \frac{\text{experimental unit yield (tons)} \times 10000}{\text{Experimental unit area (m}^2\text{)}}$$

The results were analyzed according to the program (SAS, 1998), The averages were compared according to Duncan's polynomial test at a probability level of 0.05 (Al-Rawi and Khalaf Allah, 2000 .).

Results and discussion

It is evident from the table that there is a significant improvement in the spraying treatments with humic acid and seaweed extract in the traits of vegetative growth and yield compared to the control treatment and that the best measurements resulting from the spraying treatment with the interaction of humic acid with seaweed at a concentration of 2 ml/L^{-1} represented by (plant height and The length of the tubular leaves, the weight of the tubular leaves, dry leaf weight, onion head weight, the product of the experimental unit and the total product of the control treatment, Except for traits of the number of tubular leaves, the circumference of the bulb and the bulb length, they did not differ significantly with the control treatment, The reason for the increase is the effect of humic acid, which improves the traits of vegetative growth, which is due to its role in increasing cell division and elongation of cells. It directly affects biological processes such as photosynthesis, respiration, and the synthesis of carbohydrates and proteins, and this effect is similar to that of plant hormones (Turkmmen et al (2004), It also increases the permeability of cell membranes and the absorption of nutrients (Kaya et al ., 2005), activates enzymes in the plant, increases and acts as an organic Stimulates biological processes that increase the growth of the vegetative and root system which Increasing the absorption of water and nutrients and contributes to raising Photosynthesis efficiency (Robert and Pettit, 2003) and (Zaidan, 2004). It was found (Al-Qaisi, 2008), (Al- Qaisi et al., 2009), (Abbas and Hammad, 2016) and (Al-Aboudi, 2017), that spraying with humic acid increased the vegetative growth traits of some vegetable crops. As well as for seaweed extract, Improvement of photosynthesis and increasing its products, which in turn leads to an increase in the accumulation of processed nutrients in the leaves and their transfer from the source to the estuary (Saieed, Sheekh, 2000). As well as because it contains organic materials, vitamins, mineral elements and natural plant hormones such as auxins (Khan, 2009), which have an effective role in cell division and widening, which leads to an increase in plant height and an increase in dry weight (Callon, Wright, 2006). It also contains many macro and micro nutrients such as iron, which is important in activating the oxidation and reduction enzymes in the chain of electron transfer in the process of respiration and its help in building chlorophyll and storing iron in chloroplasts in the form of Phytoferritin, which leads to greater vegetative growth (Al -Sahaf, 1989). It can be concluded from this study that there is an improvement in the vegetative growth traits and yield of onion plants by using modern methods of fertilization such as organic fertilizers and seaweed instead of chemical fertilizers and their negative effects on soil environment and human health .

Table (1) Effect of spraying with organic humic acid fertilizer and seaweed extract (Super 50) on the growth and yield of green onion plant

total yield is tons. ha ⁻¹	yield of the experimental unit is kg. plant ⁻¹	Onion Weight (g)	onion length (cm)	bulb Circumference (cm)	Tubular leaf weight (g)	Tubular leaf weight (g)	Tubular leaf length (cm)	Number of leaves leaf/plant ⁻¹	plant height (cm)	spraying treatments
553.3 b	1.936 b	50.00 b	15.00 a	8.66 a	23.67 b	253.33 b	45.33 b	7.33 a	60.33 b	control treatment
633.3 a	2.216 a	68.00 a	15.66 a	9.33 a	26.51 a b	333.33 a b	49.66 a	8.00 a	65.00 a b	H1
660.0 a	2.310 a	66.00 a	16.33 a	10.00 a	29.40 a b	373.30 a b	48.33 a b	6.33 a	66.00 a b	H2
620.0 a	2.170 a	55.00 a b	15.6 a	8.33 a	33.58 a b	263.33 a b	49.00 a b	7.00 a	64.66 a b	S1
600.0 a	2.100 a	60.00 a b	15.66 a	9.66 a	26.67 a b	333.33 a b	49.33 a b	8.33 a	65.00 a b	S2
620.0 a	2.1700 a	68.00 a	16.000 a	9.66 a	31.00 a b	366.67 a b	48.667 a b	8.000 a	64.667 a b	H 1+ S1
686.7 a	2.403 a	68.67 a	17.6 a	9.66 a	27.65 a b	386.67 a b	50.33 a	8.00 a	64.00 a b	H1+ H 2
660.0 a	2.310 a	66.00 a	17.33 a	9.33 a	25.39 a b	416.60 a b	47.00 a b	8.11 a	67.33 a	H 2 +S1
693.3 a	2.426 a	69.33a	17.58 a	9.88 a	35.91 a	503.30 a	50.00 a	8.33 a	68.00 a	H 2+ S2

* The averages that share the same alphabetic letters for each factor and for each interaction do not differ significantly among themselves according to Duncan's polynomial test at the 0.05 probability level.

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