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Response of Cherry Tomato to Foliar Spray of Amino Acid, Bio-Catalyst and Dotted Type in Qualities and Evaluation of Drip Irrigation System

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Abstract

The experiment was conducted in the winter season of 2020 at the Agricultural Research and Experimentation Station of the Faculty of Agriculture, the University of Kirkuk under non-warm plastic house conditions and the study included three factors, the first factor, the type of dotted in the main plot (GR, Turbo, Spiral) and the second factor spraying with determination arginine subplot of concentrations. 300 mg/L and the third factor spraying with Bio-Catalyst Hortiboots10Sub subplot with concentrations (0,5, 10) ml/l and interaction between them in the specific qualities of the cherry *Lycopersicon esculentum*. L And evaluates the drip irrigation system carried out the working experiment according to the design of the full random sectors R.C.B.D and by arranging the system of dissident splinter panels Split Split Plot and four replication.

The results show The amino acid arginine at a concentration of 300 mg/L was significantly superior to the content of lycopene and vitamin C in the fruits and the number of fruits amounted to 29.28 mg/100g, 17.22 mg/100gm, 76.84 fruits/plant compared to control, which amounted to 22.65 mg/100gm, 12.39mg/100gm , 65.18 fruits / plant As for the effect of spraying with humic acid, we notice that 10 ml / liter of humic acid has the highest percentage in the content of vitamin C in fruits, and the number of fruits reached 17.40 mg / 100 g and 74.80 fruits / plant and for the effect of the emitter type, the Spiral was superior to the vitamin C content of fruits, which amounted to 21.00 mg/100 g, while the superiority of the emitter GR in the number of fruits was 85.97 fruits/plant.

Keywords : Cherry tomato, Arginine , Bio-Catalyst, Vit.C , Lycopene, Number of fruits, Emitter.

1.Introduction

There are many crops of vegetables besides the nutritional importance and the high economic value, but they did not get their share of the importance, including the cherry tomato, the scientific name of *Lycopersicon esculentum* .L, which belongs to the Solanaceae family, an annual plant that is cultivated for its fruits rich in high nutritional value. The economic importance of the tomato is one of the important plants in local consumption, export and food industries [1]. And count the original habitat of the plant tomatoes in Peru and Mexico, and entered Europe in the sixteenth century and from there to the rest of the world [2]. The tomato crop is one of the most important vegetable crops [3], as its fruits contain vitamin (A, B, C) and contain phytochemicals such as: lycopene, beta-carotene, fulvic acid, fructose, and many necessary nutrients such as: Phosphorous, potassium, magnesium and calcium Its consumption by humans is beneficial to public health [4].

And as The use of amino acids is also a recent trend in improving plant growth and increasing production, where it represents the basic unit of the formation of proteins, hormones and some active compounds in the plant, and the addition of amino acids as a spray on the plant has a role active role in building such compounds within the plant, and as a result, Regulating vital metabolic activities and activating antioxidants, which leads to increased plant tolerance to the pressures exposed to it and overcome the nutrient deficiency that occurs during growth by spraying vegetative system [5,6], noted that spraying with seaweed extract and amino acids had a moral effect on the fruit content of Vit.C and the number of fruits and showed.[7] confirmed a concentration of more than 150 mg/L when pepper-sprayed with argenin amino acid in maintaining Vit.C while the concentration of 75 mg/L was superior in the number of fruits per plant

[8] defines drip irrigation as the addition of water through small vents known as droplets to the soil in small quantities and directly, i.e. in quantities equivalent to evaporation ET Evapotranspiration. [9] noted that Drip irrigation moisturizes a specific area of the root area and thus the accumulation of salts in the area of active roots decreases to the extent that it does not cause damage to the plant and help the plant to increase the absorption of nutrients and then increase its production of the



crop, [10] also noted that the coefficient of variation of the emitters is one of the main causes of the different homogenous distribution of irrigation water through drip process.

The purpose of the search

1. Because of the lack of scientific studies at the level of Iraq and the lack of studies of this crop and its modern importance and the study of this type in increasing awareness and consumption and its compatibility with the conditions of the province by influencing the studied factors as the first study in the College of Agriculture, University of Kirkuk
2. Find the best combination between the best concentration of amino acids arginine, horti Boost 10 and the drip type and compare the drip types to evaluate drip irrigation systems.

2. Materials and Methods

2.1. Search location

The experiment was carried out at the Agricultural Research and Experiment Station of the College of Agriculture, University of Kirkuk in the Al-Sayada area in one of the unheated greenhouses with dimensions (51.5 * 9 m) and a height of 3.2 m. Five samples were taken randomly from the soil at a depth of 30 cm from the house and were mixed well for Homogeneity and one sample was taken for analysis in the laboratories of the Department of Agriculture / Kirkuk and table (1) shows this

Table 1. Some physical and chemical analyses for the soil.

| Sand | Silt | Clay | Tissue | organic matter | PH | EC | potassium | phosphorous | Nitrogen | test |
|------|------|------|-----------|----------------|------|---------------------------|-----------|-------------|----------|------|
| 82% | 10% | 8% | sand loam | 2.594% | 7.06 | 0.95Mmho-cm ⁻¹ | 80ppm | 33.9ppm | 0.299% | soil |

2.2. Preparing the land and planting seedlings

The house was cleaned from the remnants of the crop for previous agriculture, as the plastic house was tilled with the tipper plow and the smoothing and leveling operations were carried out and then divided the house into 6 terraces long 30 m and width 0.40 m and the distance between the terraces 0.50 m and four repeaters each includes 18 experimental units where the one experimental unit includes one mastaba with a length of 2.5 m and a width of 0.40 m and 6 plants were planted in one experimental unit and the distance between seedlings 40 cm. Animal manure was added to the house by scattering it on the terraces before dividing the experimental units, the drip irrigation system was used to irrigate plants and the drip irrigation system was installed in the field using three types of dotted (GR, Turbo, Spiral). The seeds were obtained for a local species (JERMO) and Seeds are sown on 2020/12/6 in plastic dishes with a capacity of 105 seeds in the nursery and after reaching the stage of four-five real Leaves transferred to the plastic house on 2021/1/28 Plants were planted in the middle of the terraces at a rate of 6 plants for the experimental unit and with in total of 432 plants and agricultural service operations were conducted for all experimental units in a similar manner from fertilization, Pest and disease control and weeding whenever needed [2].

2.3. Study factors

The first factor / amino acid argenin includes concentrations

-Without addition and symbolized (A0)

-Add 300 mg/L and symbolize it (A1)

The second factor /Bio-Catalyst Hortiboost10 which consists of (Amino&Humic Acids 10, 50%, Seaweed Extract 10, 00%, TE 1, 20%)

includes concentrations

-Without spraying and symbolized by H0

-Spray at a concentration of 5ml. liters⁻¹ H1

-Spray at a concentration of 10ml. liters⁻¹ H2[11]

The third factor is emitter type and includes

-Turbo features a whirlpool of water with a diameter of between (1-2) mm -

-GR characterized by a self-drip system-

-Spiral a tube consisting of several spiral rings and the tube with a small internal diameter of 0.8-0.5

2.4. Plant qualities include

2.4.1. Number of fruits

The number of fruits of the experimental unit was calculated cumulatively and divided by the number of plants of the experimental unit.

2.4.2. Fruit content of Vit.C

The fruit juice leaker was calibrated with dye (2,6, Dichlorophenol Indophenols) and then extracted the fruit content from ascorbic acid by method [12]

2.4.3. Juicy content of lycopine

I estimated the lycopine in tomato juice to extract lycopine using hexan solvent: ethanol: acetone along the 503 A wavelength by 2:1:1 and then measuring by the optical spectrometer by [13]

2.5. Drip-related qualities

2.5.1. CV coefficient of variation (%)

The variation factor (emitter-made variation coefficient) is the difference in the discharge of emitters resulting from the inability to manufacture similar emitters and calculated using the following equation [14]

$$CV(\%) = SD/qm$$

CV = Variation Coefficient(%)

SD= Standard Deviation of Discharges (L.H⁻¹)

Qm= average sample discharges (L.H⁻¹)

2.5.2. Water Additive Efficiency (%)

The efficiency of adding water is equal to the efficiency of the distribution of design water when designing the irrigation system is calculated by the following equation, as reported by [15]

$$EU(\%) = 100 \{ 1 - ((1.27 \times CV) / \sqrt{n}) \} \times qn/qm$$

Then- :

EU = water add efficiency(%)

CV= Coefficient of Variation(%)

Qn= less dotted discharge (liter. hour⁻¹)

qm = average discharges (%)

2.5.3. FIELD EMISSION UNIFORMITY F.EU%

Field or Design emission uniformity is due to the indicator of the regular of emitters discharge in the system or the water distribution regularity of the plants, which are significantly affected by differences in Pressures and water levels along the sub-line, Coefficient of manufacturing variation on blockage of some emitters and Emission uniformity is important in the engineering design of the system. Following equation can be calculated that: [16]

$$F.EU\% = 100(Qn / Qm)$$

F.EU= Field emission uniformity.%,

Qn or Q25% = discharge rate of lowest quarter, L.h⁻¹.

3. Results and Discussion

The results of table (2) for evaluating the performance of the drip irrigation system indicate a comparison of three types of emitter: GR, Spiral, Turbo, where their evaluation depends mainly on the work of these types of emitters and indicators that reflect the system's ability to obtain a homogeneous distribution of water in all areas of the field. Note that the GR emitter exceeds by giving it the lowest value of 0.064686 which is considered the best value while the emitters Spiral and Turbo recorded the highest value of 0.082404 and 0.090255 respectively For the type of factors of factory difference, The results obtained are also consistent with [17] and the efficiency of water addition is also noted to have Significant differences , with GR emitter scoring a value of 98.0852, while Spiral emitter recorded a value of 97.6012 while turbo emitter recorded 97

4130, this emitter is found to have the ability to distribute water regularly to all existing plants. The efficiency of which reached 98.0852 and This is consistent with the results [18] and [19]. The regularity of field emissions in the same table indicates that there are difference significantly between the three emitter, with GR emitter exceeding 93.4195 and spiral drop-off scoring less than the first emitter at 91.6422, while turbo's value was 90.2750 less than the two emitter. [20] Consistent results were reached.

Table 2. Effect of the type of emitter on the drip irrigation system.

| Type of emitter | | | Characteristics of emitters |
|-----------------|----------|-----------|---------------------------------|
| Turbo | Spiral | GR | |
| 0.090255 | 0.082404 | 0.064686 | coefficient of variation(%) |
| a | ab | b | |
| 97.4130 | 97.6012 | 98.0852 | Water Additive Efficiency(%) |
| b | ab | a | |
| 90.2750 | 91.6422 | 93.4195 * | FIELD EMISSION UNIFORMITY F.EU% |
| b | ab | a | |

Table 3. Effect of spraying with arginine amino acid, humic acid and emitter type in the number of fruits (fruit.plant⁻¹).

| A x H | Types of emitter | | | H | A |
|----------------------|----------------------|--------|---------------------|---------------------------|------------------|
| | T | S | GR | | |
| 61.10 | 57.60 | 45.00 | 80.70 | H0 | A0 |
| 62.33 | 58.50 | 50.10 | 78.40 | H1 | |
| 72.10 | 61.90 | 69.90 | 84.50 | H2 | |
| 65.87 | 64.30 | 63.20 | 70.10 | H0 | |
| 87.17 | 75.00 | 77.90 | 108.60 | H1 | A1 |
| 77.50 | 67.20 | 71.80 | 93.50 | H2 | |
| average arginine | Types of emitter A x | | | | |
| 65.18 | 59.33 | 55.00 | 81.20 | | A0 |
| 76.84 | 68.83 | 70.97 | 90.73 | | A1 |
| average humic | Types of emitter H x | | | | |
| 63.48 | 60.95 | 54.10 | 75.40 | | H0 |
| 74.75 | 66.75 | 64.00 | 93.50 | | H1 |
| 74.80 | 64.55 | 70.85 | 89.00 | | H2 |
| | 64.08 | 62.98 | 85.97 | Average types of emitters | |
| LSD5% | | | | | |
| Types of emitter H x | Types of emitter A x | A x H | humic | arginine | Types of emitter |
| NS | NS | 9.78** | 7.17** | 5.92** | 9.68** |
| NS | | | Triple interference | | |

It is evident from the results of Table (3) that there is a significant effect when spraying with the amino acid arginine, as the A1 treatment outperformed the highest rate of the number of fruits, which amounted to 76.84 fruits.Plant⁻¹. Significant in average, where the H2 treatment excelled and gave the highest rate of the number of fruits reached 74.80 fruits. Plant⁻¹, which did not differ significantly from the H1 treatment compared to the measurement treatment that gave the lowest rate of 63.48 fruits of plant⁻¹. As for the average effect of the type of emitter, it was shown from the same table that the emitter GR was superior and gave 85.97. Fruit. Plant⁻¹ compared to Spiral, which gave the lowest value of 62.98 fruits. Plant⁻¹, In the bilateral overlap between the concentration of arginine amino acid and the concentration of humic, where the A1H1 level exceeded 87.17 fruits.Plant⁻¹ compared to the A0H0 treatment, which gave the lowest value of 61.10 fruits.Plant⁻¹ is due to the superiority of amino acids As a result of increased carbon representation rates and increased materials manufactured in leaf and transported to storage places in fruits due to its passage and transmission of materials through cellular membranes [21], this led to an increase in the number of fruits in the plant and the results are consistent with [22]. The cause of the superiority of the type of emitter to increase ground moisture and therefore shows its effect in the plant's physiological processes, which is represented by increasing the area and size of wet soil, which leads to the readiness of nutrients present in the soil and facilitates absorption by the plant, resulting in increased bloating pressure of the cells [23].

Table 4. Effect of spraying with arginine amino acid, humic acid and emitter type in fruit content of Vit.C (mg.100g⁻¹ Fresh weight).

| weight). | | | | | |
|----------------------|----------------------|-------|--------|--------------------------|------------------|
| A x H | Types of emitter | | | H | A |
| | T | S | GR | | |
| 9.60 | 9.55 | 9.10 | 10.15 | H0 | A0 |
| 12.98 | 12.25 | 13.30 | 13.40 | H1 | |
| 14.58 | 13.30 | 15.75 | 14.70 | H2 | |
| 13.47 | 13.60 | 14.20 | 12.60 | H0 | A1 |
| 17.97 | 14.25 | 22.55 | 17.10 | H1 | |
| 20.22 | 20.30 | 21.00 | 19.35 | H2 | |
| average arginine | Types of emitter A x | | | | |
| 12.39 | 11.70 | 12.72 | 12.75 | | A0 |
| 17.22 | 16.05 | 19.25 | 16.35 | | A1 |
| average humic | Types of emitter H x | | | | |
| 11.53 | 11.58 | 11.65 | 11.38 | | H0 |
| 15.48 | 13.25 | 17.93 | 15.25 | | H1 |
| 17.40 | 16.80 | 18.38 | 17.03 | | H2 |
| | 13.88 | 15.98 | 14.55 | average Types of emitter | |
| LSD5% | | | | | |
| Types of emitter H x | Types of emitter A x | A x H | humic | arginine | Types of emitter |
| 0.89** | 0.82** | 0.82* | 0.62** | 0.48** | 0.26** |
| | 1.51 | | | Triple interference | |

The results of Table (4) indicate that there were significant differences when spraying with the amino acid arginine, where the A1 treatment had the highest rate of fruit content of Vit.C, which reached 17.40 mg. 100 g⁻¹ fresh weight, while the effect of humic acid led to the superiority of H2 treatment with the highest rate of fruits containing Vit.C, which amounted to 17.40 mg. 100 g⁻¹. As for the effect rate of the emitter, the Spiral type was superior by giving it the highest rate of fruit content of 15.98 mg. 100 g⁻¹. The table itself shows a moral effect when interfering between arginine amino acid and humic acid, where the A1H2 treatment exceeds the highest rate of Vit.C 20.22mg.100g⁻¹ when compared to non-spraying of arginine amino acid and A0H0 humic acid, which Gave the lowest rate of 9.60mg.100g⁻¹, As for the interaction effect between the types of dripper and the amino acid arginine, the spiral type and the concentration of A1 outperformed with the highest rate of 19.25 mg. 100 g⁻¹ fresh weight, and the effect of interference between the types of emitter and humic acid was found to be greater than Spiral dotted type and H2 concentration the highest rate in fruit content of Vit.C which was 18.38 mg.100g⁻¹ Fresh weight, and the same table indicates that there are significant differences in the triple interaction between amino acid with a concentration of A1 and humic acid with a concentration of H1 and the type of drip spiral with the highest rate. In the fruits content of Vit.C, which amounted to 22.55 mg.100 g⁻¹ fresh weight. This is consistent with the results of [24] and [25], [26]. Also, the drainage of the spiral emitter had an important role in making the soil moisture level appropriate and appropriate for the dissolution of nutrients and major elements N and K and the extent of the readiness of these nutrients in the soil solution for absorption by the plant and for later use by [27]. In addition, amino acids are important in the formation of many vitamins, organic compounds, phenols, terpenes and others inside plant cells, as this led to an increase in ascorbic acid in the content of pepper or helped reduce the respiratory rate in fruits and increased carbohydrates [28,30].

The results shown in table (5) show an increase in the Juicy content of lycopene in the arginine amino acid coefficients, giving the highest rate of 29.28 mg.100 g⁻¹ in the A1 transaction compared to the comparison treatment of 22.65mg.100g⁻¹, and observed in humic transactions there are moral differences The H0 treatment in containing its fruits exceeded the highest rate of lycopene dye, which was 26.88 mg.100g⁻¹ compared to H1 and H2 with an average of 25.49.25.53 mg.100g⁻¹, and in the A1H0 interference treatment exceeded the highest rate of fruit content from Lycopene dye, which reached 30.26mg.100 g⁻¹, while the A0H1 transaction recorded the lowest value of 21.01 mg.100g⁻¹. In the same table, it indicates that there are significant differences in the GR emitter type interference treatment with A1 concentration From amino acid arginine to 31.34mg.100g⁻¹, while giving the treatment of overlap between emitter type and concentrations of humic acid where the type of GR emitter and non-spraying of humic acid exceeded 29.20mg.100g⁻¹ compared to the treatment of H1 and GR which was less The value of 22.36mg .100g⁻¹, in the triangular overlap between emitters types, arginine amino acid and humic , the

A1H1T transaction was found to exceed and gave the highest value of 35.37mg.100g⁻¹ while A0H1T in triple interference gave the lowest value. The results are consistent with his findings [29] and [6].

Table 5. Effect of spraying with arginine amino acid, humic acid and dotted type in the Juicy content of lycopene (mg.100g⁻¹ Fresh weight).

| A x H | Types of emitter | | | H | A |
|----------------------|----------------------|--------|-------|---------------------------|---------------------|
| | T | S | GR | | |
| 23.50 | 24.72 | 21.14 | 24.63 | H0 | A0 |
| 21.01 | 16.50 | 28.05 | 18.49 | H1 | |
| 23.44 | 21.40 | 29.44 | 19.48 | H2 | |
| 30.26 | 26.36 | 30.65 | 33.76 | H0 | A1 |
| 29.97 | 35.37 | 28.32 | 26.22 | H1 | |
| 27.62 | 26.93 | 21.89 | 34.03 | H2 | |
| average arginine | Types of emitter x A | | | | |
| 22.65 | 20.87 | 26.21 | 20.87 | | A0 |
| 29.28 | 29.55 | 26.95 | 31.34 | | A1 |
| humic average | Types of emitter x H | | | | |
| 26.88 | 25.54 | 25.90 | 29.20 | | H0 |
| 25.49 | 25.94 | 28.19 | 22.36 | | H1 |
| 25.53 | 24.17 | 25.67 | 26.76 | | H2 |
| | 25.21 | 26.58 | 26.10 | Average types of emitters | |
| LSD5% | | | | | |
| Types of emitter x H | Types of emitter x A | A x H | humic | arginine | Types of emitter |
| 1.84** | 1.71** | 1.52** | 1.08* | 0.99** | NS |
| | 2.64** | | | | Triple interference |

Conclusion

1. The triple interaction treatments recorded significant superiority, as spraying with a concentration of 300 mg / liter of amino acid arginine and a concentration of 10 ml / liter of Bio-Catalyst and the type of drip spiral in the fruit content of Vit.C, as for the concentration of 300 mg / liter of amino acid arginine and a concentration of 5 ml / Liter of Bio-Catalyst and Turbo dropper type showed a significant increase in the juice content of lycopene.
2. The dripper type recorded a significant superiority for all characteristics of the system, which represent the coefficient of plant variation, the efficiency of water addition, and the regularity of field broadcasts.

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