

## Effect of the amino acid tryptophan in the growth and yield of two hybrid cucumbers under unheated greenhouse conditions.

Heba A. Hussein<sup>1</sup>

[com.hba88@atu.edu.iq](mailto:com.hba88@atu.edu.iq)

Marwa R. Mohmamd<sup>2</sup>

[marwa.mohamd.cms@atu.edu.iq](mailto:marwa.mohamd.cms@atu.edu.iq)

<sup>1,2</sup> Al-Mussaib Technical College, Al-Furat Al-Awsat Technical University, Iraq

### Abstract :

The experiment was conducted during the 2021 agricultural season in one of the greenhouses in the Al-Azzawiya area in Babylon province. The research aims to determine the effect of foliar spraying of four concentrations of the amino acid tryptophan (0, 50, 100, and 150 mg L<sup>-1</sup> water) on the growth and yield of two hybrid cucumbers, Jamila and Super Faris. The experiment was applied according to a randomized complete block design (R.C.B.D) with three replicates. The results showed the significantly excelled on of the Super Faris cultivar on the Jamila cultivar in average plant height (223.7) cm, number of leaves (40.58) leaf , stem thickness (13.60) mm, and dry weight of Vegetative growth (31.92) g . The results also showed significantly excelled of the Jamila cultivar on the Super Faris cultivar in average fruit length (16.75) cm, fruit weight (113.50) g , number of fruits (12.00) per plant and yield per plant (1.367) kg. All foliar spray treatments also showed significantly excelled in the rate of Vegetative growth traits, fruit traits, and yield compared to the control treatment. The results of the interaction showed the significantly excelled of the Super Faris cultivar at the concentration of 100 mg L<sup>-1</sup> in the average plant length (236.0 cm), the number of leaves (47.67) leaf , the thickness of the stem (15.26 mm), and the dry weight of Vegetative growth (40.00) g, while the Jamila cultivar was excelled on The concentration of 150 mg L<sup>-1</sup> significantly affected the average length of the fruit (19.00) cm, the weight of the fruit (120.00) g , the number of fruits (14.00) per plant, and the yield of one plant (1.676) kg.

**Keywords:** (cucumber, Cucurbitaceae family, tryptophan, yield).

### Introduction:

Cucumber (*Cucumis sativus* L.) This is a crucial crop for the summer season. The Cucurbitaceae family includes this vegetable, which is widely available in Iraq. India and

Africa are the original homelands of it, owing to their economic and nutritional value and their extensive use with various foods. Cucumber is the preferred choice of dietitians as it contains 95-97%

Water, making it the least calorie-dense option. Its composition comprises various vitamins, niacin, protein, carbohydrates, and essential nutrients such as iron, calcium, potassium, etc. [13],[15]. Cucumber has medicinal benefits such as reducing bloating, relieving headaches, detoxifying the body, and maintaining healthy skin [18]. The appeal of cucumbers to consumers drives up demand for them throughout the year. The demand for cucumbers has been met through significant progress in open and protected agriculture, Cucumber productivity in Iraq for the year 2021 reached 2206.2 kg dunums-1.[2]

Recently, the use of amino acids as foliar nutrients for plants, It plays a stimulant role for the plant because nitrogen is its main component and is prepared by the plant [7]. Amino acids play a role in the synthesis of proteins and the production of carbohydrates by forming chlorophyll and promoting photosynthesis, therefore spraying plants with them can boost physiological and biochemical processes. Additionally, they contribute to the development and promotion of numerous enzymes and enzymatic chaperones as well as the improvement of plant resilience to thermal and water stresses [12], [5], [17]. One of the well-known physiological precursors of Indole Acetic Acid is Tryptophan, and when used in the right amounts, it has beneficial effects. the slow and continual progressive release of

indole acetic acid from tryptophan has an impact on plant growth.[19]

[4]demonstrated in his study on two cucumber hybrids (Sayff and shade) produced in greenhouses that there were no significant differences in the dry weight of vegetative development, but that the shady hybrid significantly increased plant height when compared to the Sayff hybrid. In their study of two cucumber hybrids, Karima and Grass, grown in unheated green houses, [14] found that the Karima hybrid considerably outperformed the Grass cultivar in terms of plant length, number of leaves, and dry weight of vegetative development growth. fruit production and yield per plant.

Tryptophan was sprayed on cayenne pepper plants in six concentrations (0, 0.5, 1, 1.5, 2, and 2.5 mg L<sup>-1</sup>), [16] found that the dose of 1.5 mg L<sup>-1</sup> greatly improved plant height and number. compared to the control treatment in terms of branches, stem diameter, leaf area, number of fruits, fruit length, and fruit production.

According to [9] arginine outperformed tryptophan in terms of plant height, number of leaves, dry weight of vegetative growth, number of fruits, yield per plant, and overall yield when sprayed on Hybrid Eggplant Aswad cultivar eggplant plants at a concentration of 50 mg L<sup>-1</sup> for each and three sprays. with a preventative measure. [3]

reported that spraying three concentrations of the amino acid tryptophan (0, 100, and 200 ml L<sup>-1</sup>) on three varieties of potatoes (Draga, Arnova, and Providento), where the concentration (200 ml L<sup>-1</sup>) outperformed the plant height and number of branches. Aerobics, number of leaves, leaf area, dry weight of shoots, yield per plant, and total yield, while the concentration exceeded 100 ml L<sup>-1</sup> in the number of tubers .

The study aimed to determine the effect of the amino acid tryptophan on the growth and yield of two hybrids of cucumbers, Jamila and Super Faris, grown in unheated greenhouses.

#### Materials and methods:

In one of the unheated greenhouses in the Al-Azzawiya region, north of the Babylon demonstration, the experiment was carried out for the 2021 growing season. Eight treatments

totalled the experiment's two hybrid cucumber cultivars, Jamila and Super Faris, with four concentrations of the amino acid tryptophan (0, 50, 100, and 150 mg L<sup>-1</sup> water) sprayed at flowering, the first and second sprays applied 15 days apart, and the third spray applied 15 days apart. It was used as a two-factor factorial experiment using a three-replicate R.C.B.D. (randomized complete block design). The types were counted in the first factor, which included:

A1: Jamila, created by US Agriseeds, an American business.

A2: Super Faris, created by Edersaten of Germany.

The second factor is the tryptophan foliar spray concentrations made by the Indian company Alpha Chemika, which are listed in Table 1 and include:

**Table 1: Components of the amino acid tryptophan according to the manufacturer**

<b>99%</b>	<b>Assay(titr.)</b>
<b>0.001</b>	<b>Heavy metals(as pb)</b>
<b>0.5%</b>	<b>Other amino acids</b>
<b>0.1%</b>	<b>Ammonium</b>
<b>0.02%</b>	<b>Chloride</b>
<b>0.02%</b>	<b>Sulfate</b>

Random samples were taken from the soil of the greenhouse, and the soil was analyzed in the Agricultural Research Laboratory -

affiliated with the Babylon Agriculture Directorate, Table (2).

Table (2) shows some physical and chemical traits of greenhouse soil.

texture	Traits								
	silt	Sand	Clay	K (mg kg <sup>-1</sup> )	P (mg kg <sup>-1</sup> )	N (mg kg <sup>-1</sup> )	Organic matter %	Ece / ds m <sup>-1</sup>	pH
	%								
Sandy loam	15.80	80.20	4	192.0	5.6	13.4	1.13	3.9	7.6

The greenhouse's soil was plowed, leveled, and separated into terraces before being divided into 24 experimental units, each measuring 2 meters and 60 centimeters in width. On 2 /9/2021 , the seeds were sown immediately in the greenhouse and on each side of the terrace. One line separated from another at a 50 cm distance, and there were 40 cm between each plant. There were 10 plants total in the experimental unit, and the plants were treated on 5/10 when the blossoms first showed. The technique used drip irrigation, and all other agricultural practices, such as irrigation, fertilizing, weeding, and treating diseases and insects in a similar way, were tried during the field's growing season. for all experimental units. Reaping the fruits began on 10/12 and continued until 12/11/2021.

#### Studied Traits:

##### First: Vegetative Growth Traits:

1- Average plant height (cm): The average height of five plants from each experimental unit and each replicate were measured at the

end of the growing season using a tape measure.

2 -Average number of leaves (leaf.plant<sup>-1</sup>): At the end of the growing season, the average number of leaves for five plants from each experimental unit and each replication was determined.

3 -Average stem thickness (mm): The average stem thickness was determined for five plants from each experimental unit and each replicate using a Vernia oven.

4 -Dry weight of Vegetative Growth Growth (g): Five plants were uprooted, cleaned, and dried in an electric oven at 70°C for 72 hours until the weight was stable.to determine this feature.

##### Second: Fruitful traits:

1- Average fruit length (cm): Three different fruits were used to determine the average fruit length.

2- Average number of fruits (fruit plant<sup>-1</sup>): The average number of fruits in each experimental unit was computed by dividing the total

number of fruits in each experimental unit by the number of plants in that unit.

3- Average fruit weight (g): Calculated by dividing the overall yield for each experimental unit throughout the course of the growing season by the total number of fruits produced by that experimental unit.

4 -Yield per plant (kg): calculated by dividing the total yield of each experimental unit throughout the course of the growing season by the quantity of plants in the testing area.

The results were utilized, the data were evaluated in accordance with the design used, and the means were compared using the least significant difference (LSD) test at the probability threshold of 0.05 [8]

in statistical analysis, use Genstat.

## Results and discussion:

### First: Vegetative growth traits:

The findings in Table (3) demonstrated that the average plant height, number of leaves, stem thickness, and dry weight of vegetative development varied significantly between the two cultivars. the Super Faris cultivar excelled in the average of the above traits, as it reached (223.7) cm, (40.58) leaf and (13.60) mm, (31.92) g, respectively . while The Jamila cultivar reached (208.5) cm, (33.08) leaf, (12.79) mm and (27.33) g, respectively,

whereas. The results indicated that foliar spraying with the amino acid tryptophan had a significant effect on the average of the above traits, as the spray treatment at a concentration of 100 mg L<sup>-1</sup> of water significantly outperforming the average plant height, number of leaves, stem thickness, and dry weight of vegetative growth, reaching (225.5) cm , (43.50) leaf and (14.97) mm, respectively. in comparison to the comparative treatment, and (38.33) grams . The outcomes of the same table also shown a strong relationship between the hybrid cultivar and tryptophan foliar spraying in terms of average plant height, number of leaves, stem thickness, and dry weight of vegetative development. The Super Faris cultivar in combination with foliar spraying at a dose of 100 mg L<sup>-1</sup> water considerably outperformed the control treatment in terms of rate. According to the other interaction treatments, the plant's length, leaf count, stem thickness, and dry weight reached (236.0) cm, (47.67) leaf , (15.26) mm and (40.00) g, whereas the interaction treatment between the Jamila cultivar when not spraying gave the lowest rate. It reached (198.3) cm, (24.67) leaf, (9.90) mm and (21.00) g respectively.

**Table (3) Effect of Cultivar, Spraying with the Amino acid Tryptophan, and their Interaction on the Vegetative Growth Traits of Cucumber Plants.**

Dry weight of vegetative growth(g(	stem thickness mm)(	Number of leaves ) (leaf.plant <sup>-1</sup>	Plant length )cm(	Concentrations  B	Cultivars  A
21.00	9.90	24.67	198.3	Spray with water only (control)	jamila
22.67	12.77	33.00	208.7	50 mg L <sup>-1</sup> water	
36.67	14.67	39.33	215.0	100 mg L <sup>-1</sup> water	
29.00	13.81	35.33	212.0	150 mg L <sup>-1</sup> water	
24.67	11.29	32.33	210.0	Spray with water only (control)	super faris
28.33	13.47	39.00	219.7	50 mg L <sup>-1</sup> water	
40.00	15.26	47.67	236.0	100 mg L <sup>-1</sup> water	
34.67	14.38	43.33	229.0	150 mg L <sup>-1</sup> water	
3.69	0.94	4.63	11.39	L.S.D 0.05(AxB)	
27.33	12.79	33.08	208.5	average cultivar	
31.92	13.60	40.58	223.7		
1.84	0.47	2.31	5.70	L.S.D 0.05 (A)	
22.83	10.59	28.50	204.2	Spraying average	
25.50	13.12	36.00	214.2		
38.33	14.97	43.50	225.5		
31.83	14.10	39.33	220.5		
2.61	0.67	3.27	8.06	L.S.D 0.05 (B)	

The results in Table (4) showed that the two cultivars differed significantly in the average fruit length, the weight of the fruit, the number of fruits, and the yield of one plant. The cultivar Jamila excelled in the average of the above traits, as it reached (16.75) cm, (113.50) g, and (12.00) fruits plant.<sup>-1</sup> and (1.367) kg,

respectively, while the Super Faris cultivar reached (15.92) cm, (109.49) g, (11.00) fruits plant<sup>1-</sup> and (1.210) kg, respectively. . The results indicated that foliar spraying with the amino acid tryptophan had a significant effect on the average of the above traits, as the spray treatment at a concentration of 150 mg L<sup>-1</sup> of

water was significantly excelled the average fruit length, fruit weight, number of fruits and yield per plant, reaching (18.33) cm and (117.76). (13.17) grams and (1.551) kg of plant fruit compared to the control treatment. The results of the same table also showed that the interaction between the hybrid cultivar and foliar spraying with the amino acid tryptophan had a significant effect on the average length of the fruit, the weight of the fruit, the number of fruits, and the yield of one plant. The interaction treatment between the cultivar

Jamila and the foliar spray at a concentration of 150 mg L<sup>-1</sup> of water significantly excelled on the average length of the fruit. The weight of the fruit, the number of fruits, and the yield of one plant reached (19.00) cm, (120.00) g, (14.00) fruits of one plant and (1.676) kg according to the other interaction treatments, while the interaction treatment between the Super Faris cultivar when not spraying gave the lowest rate, as It amounted to (13.67) cm, (100.46) g, (9.67) fruit plant<sup>-1</sup> and (0.970) kg, respectively.

**Table (4) Effect of cultivar, spraying with the amino acid tryptophan, and their interaction on the fruit growth traits of cucumber plants.**

Yield per plant (kg)	Number of fruits (fruit plant <sup>-1</sup> )	Fruit weight (g)	Fruit length (cm)	Concentrations B	Cultivars A
1.062	10.00	106.17	14.33	Spray with water only (control)	jamila
1.262	11.33	111.75	16.33	50 mg L <sup>-1</sup> water	
1.469	12.67	116.08	17.33	100 mg L <sup>-1</sup> water	
1.676	14.00	120.00	19.00	150 mg L <sup>-1</sup> water	
0.970	9.67	100.46	13.67	Spray with water only (control)	super faris
1.125	10.33	108.97	15.67	50 mg L <sup>-1</sup> water	
1.318	11.67	113.04	16.67	100 mg L <sup>-1</sup> water	
1.426	12.33	115.51	17.67	150 mg L <sup>-1</sup> water	
0.16	1.74	6.92	1.52	L.S.D 0.05(AxB)	
1.367	12.00	113.50	16.75	average cultivar	
1.210	11.00	109.49	15.92		
0.08	0.87	3.46	0.76	L.S.D 0.05 (A)	
1.016	9.83	103.31	14.00	Spraying average	
1.193	10.83	110.36	16.00		
1.394	12.17	114.56	17.00		
1.551	13.17	117.76	18.33		
0.12	1.23	4.89	1.08	L.S.D 0.05 (B)	

The above results showed that there are significant differences between the two hybrids, and the reason is due to the nature of the hybrid's genotype and its suitability to the conditions of the region in which it is grown [6]. This is in agreement with [4] ,[14] regarding cucumber. The significant superiority of spraying may be due to the abundance of the nitrogen element in this acid, in sufficient quantities necessary for its growth, specifically with regard to its role in increasing cell division and expansion, as well as improving the performance of plant growth regulators that directly intervene in cell expansion and elongation [11] .The results showed the significantly excelled of the treatment. The interaction between the genotype and the content of the amino acid tryptophan. The results showed a positive effect in increasing vegetative traits and yield. The reason may be due to the important physiological roles played by amino acids, as they change the osmotic potential of the plant tissue, as increasing them leads to reducing the osmotic potential, and this in turn leads to reducing The water potential of the cell increases, and thus the cell's ability to withdraw water and nutrients dissolved in it from the growth medium increases, thus increasing the vegetative growth of the plant [1] ,[10].This agrees with [16] ,[3] on Potatoes.

### Conclusions:

It is concluded from this study that the Super Faris cultivar showed a significant superiority over the Jamila cultivar in vegetative growth traits, while the Jamila cultivar showed a significant superiority over the Super Faris cultivar in fruit growth traits and yield. Foliar spraying at a concentration of 100 mg L<sup>-1</sup> of water led to a significant increase in the traits of vegetative growth, and a concentration of 150 mg L<sup>-1</sup> of water led to a significant increase in the characteristics of fruitful growth and yield of cucumber plants. It was found that the interaction between the hybrid cultivar Super Faris and foliar spraying at a concentration of 100 mg L<sup>-1</sup> of water gave the best rate of vegetative growth traits, while the interaction between the hybrid cultivar Jamila and foliar spraying at a concentration of 150 mg L<sup>-1</sup> of water gave the best rate of fruit growth characteristics and the yield during Planting season.

### References

1. Amini, F.; A. A. Ehsanpour .(2005). Soluble Proteins, Proline, Carbohydrates and Na<sup>+</sup> /K<sup>+</sup> Changes in Two Tomato (*Lycopersicon esculentum* Mill.) Cultivars under in vitro Salt Stress. American Journal of Biochemistry and Biotechnology. 1 (4): 204-208.
2. Annual Statistical Collection.(2021). Annual Report on Vegetable Crops



- Production. Central Bureau of Statistics. Ministry of Planning and Development Cooperation. Iraq.
3. Al-Dawjaji, Essam Hussein Ali, Nawal Mahdi Hammoud, and Abbas Kazem Obaid .(2016). The effect of the amino acid tryptophan on the growth and yield of three varieties of potatoes (*Solanum tuberosum* L.) grown in desert lands. Karbala University Scientific Journal. 14 (1): 104-98.
  4. Al-Mutawri, Aqeela Juma Hajim . (2010). The effect of calcium on the growth and yield of two varieties of hybrid female cucumber,(*Cucumis sativus* L.), grown in greenhouses, and its effect and storage temperature on storability. Master Thesis . faculty of Agriculture. University of Albasrah . Iraq
  5. Al-Said, M. A. and A. M. Kamal. (2008). Effect of foliar spray with folic acid and some amino acids on flowering , yield and quality of sweet pepper. Journal of Agriculture Sciences Mansoura Univ. 33(10): 7403 – 7412.
  6. AL-Sahaf, F.H; M.Z.K. AL-Mharib and F.M. Jawad .(2011).Response of Cucumber Hybrids to Chemical and Organic Fertilizers .The Iraqi Journal of Agricultural Sciences. 42(4) :52-62.
  7. Al-Sahaf, Fadel Hussein Reda. (1989a). Soilless farming systems. faculty of Agriculture . Baghdad University. Ministry of Higher Education and Scientific Research. Iraq.
  8. Al-Sahuki, Medhat and Karima Muhammad Wahib.( 1990). Applications in designing and analyzing experiments. Baghdad University. Ministry of Education and Scientific Research. Iraq.
  9. Al-Sultani, Amer Murad Muhammad. (2020). Response of eggplant *Solanum melongena* L. to spraying with nanopotassium, tryptophan, and arginine on the phenotypic and physiological characteristics of growth and yield. Master Thesis . faculty of Agriculture . University of Kufa . Iraq.
  10. Claussen, W. (2004). Proline as a measure of stress tomato plants .Plant Science, 168 (1): 241- 248.
  11. Davis, D.D. (1982). Physiological aspects of protein turnover. Encycl. Plant Physiol. New Series, 14 A (Nucleic acids and proteins): Structure, biochemistry and physiology. of proteins.
  12. El-Shabasi, M. S.; S. M. Mohamed and S. A. Mahfouz .(2005). Effect of foliar spray with some amino acids on growth, yield and chemical composition of garlic plants. The sixth Arabian Conference for Horticulture, Faculty of Agriculture, Suez University, Ismailia. Egypt.
  13. Hammadi, Fadel Musleh and Abdul-Jabbar Jassim Al-Mishaal. (1987). Vegetable production. Printing presses of the Ministry of Higher Education and Scientific Research. Baghdad University . Iraq.

14. Hussein, Heba Ali and Hakeem Shamran Atallah .( 2017). The effect of foliar spray fertilizer on the growth and yield of two hybrid cucumbers grown in unheated greenhouses. Al-Furat Journal of Agricultural Sciences. 9(1):48-39.
15. Kobeissi, Hassan. (2007). Dictionary of herbs and medicinal plants. Library science, Beirut . Seventh edition. p..347
16. Rahman,S.U; G. Nab i; M.N. Khan; F.A. Shah ; S. Rukh ; W. Ali ; M.U Rahman ; A. Zaib and M . Hilal .(2021). Influence of Tryptophan on the growth, yield and quality of chilli with and without fertilizer. Pure Appl. Biol., 10(4):1287-1302.
17. Shafeek, M. R.; Y. I. Helmy; M. A. F. Shalaby and N. M Omer. (2012). Response of onion plants to foliar application of sources and levels of some amino acid under sandy soil conditions. J. of Appl. Sci. Res, 8(11): 5521-5527
18. Sumathi, T.; V. Ponnuswami and B.S.Selvi .(2008).Anatomical changes of cucumber (*Cucumis sativus* L.) leaves and roots as influenced by shade and fertigation .Res.J of Agric. and Biol .Sci.4(6):630-638.
19. Zahir, A. Z.; M. A. R. Malik and M. Arshad .(2000). Improving crop yield by the application of an auxin precursor L-TRP. Pak. J. Biol. Sci., 3: 133-135.