The effect of spraying with amino acids on the chemical characteristics of two hybrids of lettuce

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Abstract

This field experiment was conducted at the research station of the Department of Horticulture and Landscape Engineering of the College of Agriculture / Tikrit University in the agricultural season 2023-2024 to study the effect of spraying with amino acids Control Arginine Tryptophan Proline at a concentration of 50 mg L-1 on the chemical characteristics of two hybrids of lettuce Fajr and Paris Island Cos . The results showed that there were significant differences between The studied factors: The spraying treatment with the amino acid tryptophan was superior in terms of nitrogen, phosphorus, potassium, and carbohydrates, reaching 2.40%, 0.50%, 2.67%, and 4.9053%, respectively. While spraying with arginine was superior in terms of nitrate concentration, which gave the lowest value of 0.23%, compared to the highest value of 0.59% when spraying with tryptophan. As for hybrids, the Paris hybrid excelled in the characteristics of nitrogen, phosphorus, potassium, and nitrate by 1.87%, 0.45%, 2.20%, and 0.47%, respectively

Keywords: lettuce, amino acids, varieties, chemical characteristics

Introduction

Lettuce Lactuca sativa L. is one of the important food crops of the Asteraceae family. Lettuce is considered one of the important winter vegetable crops grown in both Iraq and the world due to its high nutritional value and frequent consumption. Its original habitat is the Mediterranean basin and Europe [1] and [2]. Its cultivation is widespread in Canada, the United States, South America, North Africa, Tunisia, Egypt and southern Russia. It is considered a cold-loving crop that grows well at a temperature ranging between 10-25 [3]. It has a high nutritional value and is one of the vegetables grown in winter in Iraq and the world, as every 100 grams of its leaves contain 95% water, 1 gm protein, 3 gm carbohydrates, 22 mg calcium, 25 mg phosphorus, and 540 international units of vitamin C [4]. In addition Fats and sodium are a good source of iron, folate, vitamin C, and a variety biologically active of compounds beneficial for health [5]. The area cultivated with lettuce in Iraq reached 17,766 dunums, with a total production of 31,232 tons [6]. Note that the cultivated area in the world in 2019 amounted to about 1.316 million hectares, with an average productivity per hectare of 21,138 tons, according to estimates by the Food and Agriculture Organization of the World [7]. It also stimulates cell growth and stores acidity in plant cells because they contain basic and acidic groups, and it has an important role in protecting cells from excess ammonia, which causes toxicity [8].

Many researchers have pointed out the importance of using amino acids in improving many chemical properties, [9] indicated that the use of the amino acid tryptophan at a concentration of 200 mg L-1 gave significant differences in nitrogen, phosphorus and potassium in the leaves of the red lhana plant. In a study conducted by [10], when using the amino acid tryptophan at a concentration of 50 mg L-1, it gave significant differences in nitrogen, phosphorus, and potassium in the leaves of the stevia plant.

There are many hybrids of lettuce that are characterized by having different shapes, sizes, and colors in terms of vegetative growth. The nutritional value of lettuce varies. It depends largely on the type of lettuce, and it is possible that the nutritional content of lettuce plants may be

Materials and work methods

This experiment was carried out at the research station of the Department of Horticulture and Landscape Engineering, College of Agriculture / Tikrit University for the agricultural season 2023-2024 to study the effect of spraying with amino acids on two hybrids of lettuce. The seeds were planted in one of the agricultural nurseries in Balad on August 25, 2023, in cork dishes with a capacity of 2.9 inches, using peat moss as a growing medium, by placing only one seed in each hole Number of plants 480. Two hybrids of lettuce were planted, namely Fair It is imported by Al-Rafidain Chrome Company for General Trading. The leaves are rough in texture and have a dark green color. They are characterized by their color being green on the outside and yellowish green on the inside. It is considered one of the

similar, and compared to other crops [11]. The local varieties and the majority of foreign hybrids grown in Iraq belong to the group of elongated heads (Cos or Romaine), and it is considered one of the most important and most widely used leafy vegetable crops. In the world and desired by consumers [12] The aim of this study is to know the effect of the types of amino acids on the growth and yield of the plant, as well as to know the best hybrids among the hybrid hybrids that give the best yield and determine the best interaction between amino acids and the hybrids .

common varieties grown in Iraq recently. It is one of the new hybrid varieties that is characterized by its tolerance to high temperatures of large size. Medium head and Paris Island Kos It is imported by Rawaa Al Khaleej Company, Iraq. It is an early-yielding variety with excellent quality and high production. It is characterized by a large plant size and dark green leaves with a delicious taste. The head is firm and lightly wrinkled., and after the seedlings reached the stage The third and fourth real papers: The seedlings were transferred to the permanent place in a mixed soil, explaining their chemical and physical characteristics, and all service operations were carried out, including irrigation, fertilization, weeding, removing weeds, etc.

Some physical and chemical characteristics of field soil before planting

Attribute	Value	Unit
Gypsum	59.5	g.kg ⁻¹
Lime	197.5	g.kg ⁻¹
Ec	1.63	Ds.m^{-1}
Ph	7.6	-
Sand	604	g.kg ⁻¹
Silt	233	g.kg ⁻¹
Clay	163	g.kg ⁻¹
Texture	Loamy sand	-
Organic Matter	2.10	%

The	study	included	the
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a - The first factor: spraying with amino acids The plants were sprayed with plant regulators twice. The first spray was scheduled for two weeks after transplanting, and the second spray was scheduled for two weeks after the first spray. The levels were as follows :

The first level: without addition (comparison treatment), adding water only

Statistical design

The experiment was carried out using a randomized complete block design (RCBD) with a split plot system. The taxa were placed in the main plots as less important and the amino acids in the second plots as they were more important. The Characteristics studied:

Nitrogen

percentage

-2Phosphorus percentage in leaves
-3Potassium percentage in leaves
-4Nitrate percentage in leaves
-5Carbohydrate percentage in leaves

-6Relative total chlorophyll SPAD

Results and discussion

Through Table No. 1, we notice significant differences in the single treatments and the double interaction, as the Paris cultivar treatment excelled in terms of nitrogen concentration and reached 1.87% compared to the Fajr cultivar, which gave

following factors : The second level: spraying with proline at a concentration of 50 mg L-1

The third level: spraying with arginine at a concentration of 50 mg L-1

Level Four: Spraying with tryptophan at a concentration of 50 mg L-1

b - the second factor. Two hybrids of lettuce plants -1Hybrid Fajr

-2Hybrid Paris Island Kos

results were analyzed using the SAS program [13] and the averages were compared according to Duncan's multinomial test. At a probability level of 0.05

in leaves-1 1.58%. As for the spraying treatment with amino acids, the spraying treatment with tryptophan excelled and reached Nitrogen concentration was 2.40% compared to the lowest nitrogen value of 1.21% when spraying with arginine .

We note from the same table that the double interaction treatment between the Paris variety and the tryptophan spraying treatment was superior, as it gave the highest nitrogen concentration of 2.56% compared to the lowest concentration of 1.36% for the Paris variety and the spraying with arginine

Table	(1)	The	effect	of	spraying	with	amino	acids	and	varieties	on	the	character	of	nitrogen
concer	ıtrat	ion%	,												

Hybrids Amino Acids	Control	Arginine	Tryptophan	Proline	average rate of varieties
Fajr	1.66	1.57	2.24	1.38	1.58
	C	E	B	D	B
Paris Island Cos	2.15	1.36	2.56	1.39	1.87
	B	D	A	D	A
Average Amino Acids	1.90 B	1.21 D	2.40 A	1.38 C	

Numbers with similar letters below them are not significantly different from each other according to Duncan's multinomial test at a probability level of 0.05

Through the results of Table No. 2, we notice significant differences in the single treatments and the double interaction, as the Paris cultivar treatment excelled in terms of phosphorus concentration, reaching 0.45% compared to the Fajr cultivar, which gave 0.36%. As for the spraying treatment with amino acids, the control

treatment and the spraying treatment with tryptophan were superior, which gave 0.49% and 0.50%, respectively, compared to the lowest value for phosphorus, which amounted to 0.23% when spraying with arginine. As for the double interference treatment, we note the superiority of the comparison treatment, the Paris variety, as it gave the highest phosphorus concentration of 0.63%, compared to the lowest phosphorus concentration of 0.17% in the Fajr variety and spraying with arginine.

Table (2) Effect of spraying with amino acids and varieties on the character of phosphorus concentration%

Hybrids Amino Acids	Control	Arginine	Tryptophan	Proline	average rate of varieties
Fajr	0.37	0.17	0.56	0.33	0.36
	C	D	ab	C	B
Paris Island Cos	0.63	0.29	0.45	0.42	0.45
	A	Cd	cb	Cb	A
Average Amino Acids	0.49 A	0.23 C	0.50 a	0.38 B	

Numbers with similar letters below them are not significantly different from each other according to Duncan's test Polynomial at the probability level of 0.05

The results of the analysis in Table No. 3 showed that there were significant differences in the single treatments and the double interaction treatment, as we note the superiority of the Paris variety in terms of potassium concentration, which amounted to 2.20% compared to the Fajr variety, which amounted to 1.83%. As for the spraying treatment with amino acids We note the superiority of the tryptophan spraying treatment, which gave 2.67%, compared to the lowest potassium concentration of 1.57% when spraying with arginine

We note from the same table that the binary interaction treatment for both amino acids and varieties was superior between the Paris variety and the tryptophan spraying treatment, as it gave the highest potassium concentration of 3.10% compared to the lowest concentration of 1.45% for the Fajr variety and spraying with arginine

Hybrids Amino Acids	Control	Arginine	Tryptophan	Proline	average rate of varieties
Fajr	1.95	1.45	2.23	1.69	1.83
	D	e	C	De	B
Paris Island Cos	2.54	1.69	3.10	1.49	2.20
	B	de	A	E	A
Average Amino Acids	2.24 B	1.57 c	2.67 A	1.59 C	

Table (3) Effect of spraying with amino acids And the varieties in terms of potassium concentration%

The numbers with similar letters below them are not significantly different from each other according to Duncan's multinomial test at the probability level of 0.05

The results shown are shown. In Table No. 4, there are significant differences between the single agents and the double interaction treatment. We notice that the Paris variety is superior in terms of nitrate concentration, which reached 0.47% compared to the Fajr variety, which reached 0.32%. As for the spraying treatment with amino acids, we notice the superiority of the spraying

treatment with tryptophan, which gave the highest concentration. Nitrate concentration reached 0.59%, compared to the lowest value of phosphorus concentration, which was 0.23% when sprayed with arginine . While in the double interference treatment, we

note the superiority between the tryptophan spraying treatment and the Paris variety, as it gave the highest nitrate concentration of 0.69% compared to the lowest nitrate concentration of 0.16% in the Fajr variety and the arginine spraying treatment.

Table (4) The effect of spraying with amino acids and varieties on the character of nitrate concentration%

Hybrids Amino Acids	Control	Arginine	Tryptophan	Proline	average rate of varieties
Fajr	0.34 Da	0.16 D	0.49	0.29 Da	0.32 P
-	ВС	D	D	DC	В
Paris Island Cos	0.44	0.30	0.69	0.43	0.47
	Bc	Dc	а	Bc	А
Average Amine Aside	0.39	0.23	0.59	0.36	
Average Allino Acids	В	С	а	В	

The numbers with similar letters below them are not significantly different from each other depending on Duncan's multinomial test at the probability level of 0.05

Table No. 5 indicates the superiority of the tryptophan spraying treatment, which gave the highest value of 4.9053% compared to the rest of

the spraying treatments. As for the varieties, no significant differences were recorded

As for the binary interaction treatment between acids and varieties, it occurred Significant differences, as the spray treatment with tryptophan of the Paris variety excelled and gave the highest value amounting to 6.3123% compared to the rest of the spray treatments

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Table (5) Effect of	f spraving v	with amino	acids and	varieties on	the character	of carbohydrates
	/ *** **						

Hybrids Amino Acids	Control	Arginine	Tryptophan	Proline	average rate of varieties
Fajr	2.5970 B	3.7730 b	3.4983 B	3.1203 B	3.2471
	D	U	D	D	Π
Paris Island Cos	2.2873	3.1973	6.3123	2.9785	3.6938
Falls Island Cos	В	b	А	В	А
	2.4421	3.4851	4.9053	3.0494	
Average Amino Acids	b	b	А	В	

Numbers with similar letters below them are not significantly different from each other according to Duncan's multiplex test. The limits are at a probability level of 0.05

The results of Table 6 show that there are significant effects in the amino acid treatment, as we notice that the comparison treatment and the arginine spray treatment are superior to the chlorophyll content of the leaves, as they gave the highest value of 33.61 and 33.33 SPAD, respectively, compared With the proline spraying

treatment, which gave the lowest value, which amounted to 30.89 SPAD

As for the binary interaction treatment between amino acids and varieties, significant differences occurred, as the comparison treatment for the Fajr variety excelled, recording the highest value, amounting to 34.13 SPAD, compared to the lowest chlorophyll content of the leaves, which amounted to 30.95 and 30.83 SPAD. For spraying with proline for the cultivars Fajr and Paris, sequentially.

Table (6) Effect of spraying with amino acids and varieties on the relative total chlorophyll characteristic (SPAD(

Hybrids Amino Acids	Control	Arginine	Tryptophan	Proline	average rate of varieties
Foir	34.13	32.75	33.75	30.95	32.89
1 aji	а	ab	ab	В	А
Paris Island Cos	33.87	33.31	31.65	30.83	32.22
Paris Island Cos	ab	ab	ab	В	А
Average Amine Acids	33.61	33.33	32.70	30.89	
Average Amino Acids	а	а	ab	В	

The numbers that are Below are similar letters that are not significantly different from each other according to Duncan's multinomial test at the probability level of 0.05

It is clear to us from the results of Tables 1, 2, 3, and 4 that the Paris hybrid has a significant superiority in the traits of nitrogen, phosphorus, potassium, and nitrate, and the reason is mainly due to the difference in their genetic content. Each variety expresses the trait to a different degree depending on the genes responsible for absorbing nutrients. This result is consistent with the findings of [14]

We note from the results of Tables 1, 2, 3 and 4 the significant superiority of the spraying treatment with the amino acid tryptophan in the following characteristics: nitrogen, phosphorus, potassium, nitrates, and carbohydrates. The reason may be due to the fact that tryptophan contains nitrogen, as the plant absorbs it directly. When spraying on the leaves, this explains the increase in carbon representation, which increases the efficiency of absorption of nutrients in the leaves. Amino acids are considered biostimulants, as they stimulate growth and encourage plant growth under unfavorable climatic conditions. Amino acids have a significant impact on chemical and qualitative compounds, as they are considered a source. For energy and carbon [15], these results are consistent with the findings [9] and also agreed with the findings [10] on the stevia plant. The increase in the percentage of carbohydrates in the leaves is due to the fact that tryptophan is an important amino acid for the formation of IAA, and tryptophan has an effect on photosynthetic pigments and Then it leads to an increase in the proportion of carbohydrates [16]. This result is consistent with the findings of [8] on the gerbera plant

From the results of Table 6, we note the significant superiority of the spray treatment with

the amino acid arginine in terms of the chlorophyll content of the leaves. The reason for the amino acids' effect is that arginine is a growth stimulating factor in the plant and an important source of nitrogen, which It is one of the determining elements for plant growth, which the plant needs in large quantities to build nucleic acids and proteins. In addition, arginine plays an important role in many vital processes, whether it is one of the components of proteins or its presence in free form, and it has an important role

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in inhibiting the activity of the enzymes responsible for the formation of ethylene, which It is active when plants are exposed to salt and drought stress, which changes the osmotic potential of the plant tissue and thus increases vegetative growth. It is a source of energy and carbon, so giving ready-made arginine to the plant by spraying it on the vegetative part is easily absorbed and saves the energy that is used in manufacturing to carry out its vital functions [17.]

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