

The Importance of Amino Acids and Salicylic Acids for The Yield of Two Hybrids of Summer Squash (*Cucurbita pepo* L.)

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ABSTRACT

The experiment was carried out in the vegetable field of the Department of Horticulture and Landscape Engineering / College of Agriculture and Forestry / University of Mosul for the spring season 2021 to study the effect of amino acids and salicylic acid on the growth characteristics and yield of two squash hybrids. The experiment included three factors, represented by hybrids (Clarita and Crown), which were placed in the main plots of the experiment, while the second factor was amino acids and salicylic acid, with three concentrations of each (zero, 1.5 ml / l, 3 ml / l) and (zero, 250 ppm, 500 ppm) respectively which are placed in the secondary plots. The results showed the superiority of the hybrid Crown over the hybrid Clarita in the number of fruits per plant, while the hybrid Clarita outperformed the hybrid Crown in the early yield. The plants grown under the high level of salicylic acid excelled in the characteristics of the number of fruits, fruit weight, early yield, total and non-market yield compared with no spraying with acid. Plants grown under high levels of amino acid in the characteristics of plant yield, total yield and marketing yield in comparison with plants not treated with acid.

1. Introduction

Summer squash plant, whose scientific name is (*Cucurbita pepo* L.), is a vegetable crop of the Cucurbitaceae family. Its cultivation has spread in Iraq due to its economic importance and nutritional value, as well as its many medical uses as a treatment for diuresis and expelling excess fluids from the body's need and treatment of dermatitis and wounds (Al-Mosali, 2007).

There are genetic differences between squash varieties in terms of the nature of vegetative, flowering and fruiting growth, and zucchini squash varieties have a great nutritional value, whether for their fruits or for their ripe seeds (Maree et al. 2016). Therefore, plant breeders work to obtain the best qualities for the consumer and appropriate to the conditions of the country to obtain new varieties or strains, and for this reason, the selection of the appropriate variety is considered one of the important conditions for the success of vegetable production (Nerson 2005).

The results of research conducted in some areas similar to the conditions of Iraq show that it is possible to increase the productivity of the crop per unit area. Where Radiya (2002) indicated in his experiment on the squash plant in Egypt, he noticed the moral superiority of the Biruni variety in increasing the yield compared to the Mabrouka variety. Khalid and Elwan (2011) mentioned in a study to find out the effect of plant density and varieties on the yield of squash, it was found that the Dickinson cultivar was superior in giving it the highest yield of total fruits and the highest average weight of one fruit compared to the two cultivars Pro-gold and Frosty.

Abd-Elaziz et al. (2019) indicated in their study on squash using three concentrations of salicylic acid (3, 2, 1 mmol). They noticed from the results that treatment with a concentration of (2 mmol) salicylic acid gave the best results in terms of quantitative and qualitative yield characteristics. In a study by Shehata and Abdelgawad (2019) on the squash plant through their use of amino acids and at several spraying levels (1000, 500, 0) ppm and in three stages (45, 35, 25) days after planting, the results showed that the spray treatment with a concentration of (1000) ppm improved the quality and quantity of the crop. And (Suleiman and Suwwan 1990) in their study on the hybrid squash plant Victoria through the use of spraying with Agritone growth regulator with several concentrations and for several times at the beginning of flowering, they noticed that the two concentrations (1, 0.8 grams l-1) gave a significant superiority in the glands of fruits, weight and size of the fruit and the total yield for the plant. In view of the large demand for this crop, whether for consumption or manufacturing purposes and for the purpose of obtaining the best desirable qualities for this crop or to devise varieties with desirable production and quality

specifications, and for the purpose of promoting the current situation of production of this crop, this study aims to show the role of hybrids, salicylic acid and amino acid on the characteristics of the yield of squash plant. Courgettes.

Al-Jubouri and others (2001) found that when they studied seven pure strains of zucchini squash (S1, S2, S3, S4, S5, S6, S7), they noticed that the strain S4 was significantly superior in the total fruit yield over the rest of the strains. As noted by Russell et al. (1983). When comparing the productivity of three potato cultivars (Norchip, Norland, and carlton) L- for three consecutive years, Norchip cultivar significantly outperformed the other two cultivars in the total yield. Hussein ((2002) studied in his study at the University of Baghdad on several hybrids of cucumber. He noticed that there were significant differences in the number of fruits of the plant, the early yield and the total yield of fruits in both spring and autumn seasons. Al-Mamouri (2005) studied four hybrid varieties of zucchini squash, which are Opline, Amjad, Five stars, Tokay, it was found that the Opline cultivar was significantly superior to the physical characteristics of the fruits represented by the length, diameter and weight of the fruit for both lugs, while the Five stars cultivar outperformed the other cultivars in the number of fruits and yield during the spring season. In a study by Grazia (2005) to compare four genotypes of Pumpkin Maxima has two hybrid varieties (Espeja and Angelo) and two local varieties (Anu plus and Any). Note that the hybrid varieties gave more fruits. Plant 1- It gave a total yield, early yield and more marketing yield compared to the two local varieties.

And Black (2006) confirmed in his study in the United States of America on two strawberry cultivars (Seascape and Selva) that the cultivar Seascape was significantly superior in the total yield of the plant over the other cultivar Selva. Squid and Khashab (2010) also observed in a study to find out the effect of planting dates and distances and varieties on the seed yield of squash squash (Cucurbita pepo L). The results of the first season indicated that both cultivars Nadi and Asma did not differ significantly among themselves in the total yield of fruits prepared for seed production despite the superiority of The cultivar was named after the cultivar Nadi in this trait, but the increase did not reach. In the second season, the plants of the cultivar were significantly superior to the plants of the two cultivars Nadi and Mulla Ahmed in the total yield of fruits, and the plants of the cultivar Nadi were significantly superior to the plants of the cultivar Mulla Ahmed, who gave the latter variety the lowest yield Total fruits per unit area.

Sarhan (2011) indicated in his study on the zucchini squash plant in Dohuk for a comparison between the local variety (Mulla Ahmed) and the variety (Suchemie). The results showed that the local variety was significantly superior in the characteristics of early yield, total yield and number of fruits over the other variety. Abd El-Hamed and Elwan ((2011) In a study on three varieties of squash (Dickinson, oro-Gold, Frosty), the variety Dickinson significantly outperformed the characteristics of fruit yield and fruit weight over the other two varieties. Abdullah and others (2012) mentioned when they studied three indoor cucumber crosses Plastic in southern Iraq outperformed the hybrid Toshka for two consecutive seasons in the total yield compared to the hybrid Hadeel and Shabeh for both seasons.

Al-Hubaiti and Waisho (2013) indicated in a study of the effect of spraying with licorice extract on seed production of five cultivars of squash (Cucurbita pepo L.). The local class is local cv. The seed yield of the plant during the first season was superior to the rest of the cultivars and did not differ significantly with Tala cultivar, and this in turn did not differ significantly from Asma cultivar. In the second season, Local var outperformed. (And Zucchini and Tala) in the seed yield. It is also noted that the seed yield in the second season was higher than in the first season. Kazem and Ali (2015) mentioned a study in Babylon Governorate of two zucchini squash hybrids (Ardendo174 and Fadwa). The results showed that the Fadwa hybrid was significantly superior in the early yield of fruits compared to the Ardendo174 hybrid.

In a study by Richardson (2016) on three varieties of zucchini squash (Delta, Golden Glory, Spineless King, the cultivar Spineless king had the highest values in the characteristics of fruit length, weight and total yield per hectare compared to the variety Delta. Al-Jubouri and Al-Taher (2017) mentioned In a study at the University of Baghdad on three pure strains of zucchini squash (S3, S2, S1), the results showed that the third strain (S3) was significantly superior by giving it the highest yield per plant and the highest fruit weight rate compared to the first and second strains, indicated by Al-Rubaie and Abdul-Rasoul (2016). In a study using three concentrations of salicylic acid (4, 2, 0 ml) sprinkled on squash plants, it was found that the concentration (4) molar was significantly superior in all yield traits for both growing seasons. When salicylic acid was sprayed on tomato and cucumber plants at low concentrations, it increased the amount of production.

Jamali et al. 2011 mentioned that salicylic acid delays the ripening of strawberries, but it improves the yield and quality of the fruits. The 2012 study of Javaheri) on tomato plants showed that the use of salicylic acid at a concentration (M 10-6) increased the productivity of the plant, reaching 3.06 kg/plant while The productivity of the control plants did not exceed (2.22 kg/plant). As indicated by Sayyari et al. (2013) that spraying L. sativa Lactuca plants with salicylic acid at a concentration of 1.5 mmol led to an increase in the content of carotenes and proline. The results of the study conducted by Samra et al. (2015) showed) in Syria on cucumber plants when using salicylic acid at a concentration of (1, 0.5 mmol) in three different treatments which are

soaking the seeds for 12 hours and irrigating young plants and seedlings with the two concentrations studied, which gave the highest productivity compared to the control treatment.

In a study by AL-Rubaye and Abd Atia (2016), when using salicylic acid, it was sprayed on the shoots of zucchini squash with three concentrations (5, 3, 0) mmol. It was noted that the plants treated with concentration (5) mmol in the yield of one plant and the total area (i / e) and the proportion of major and minor elements (N, P, K) in the fruits compared with the comparison. Abd El-Mageed et al. (2016) mentioned in a study on the squash plant when using salicylic acid at a concentration of 1 mmol, where the research results were Good with the use of deficient irrigation of the plant, which indicated the role of acid in the plant's tolerance to water stress conditions with an improvement in the yield characteristics of squash plants. Also, Singh (Singh 2016) indicated that spraying salicylic acid on cucumber plants at a concentration (0.5 mM) led to an increase in the number of Fruits (30.4 fruits / plant). And between Baba et al. (2017) in a study to find out the effect of spraying with salicylic acid at a concentration of (2, 1, 0) mmol on the growth characteristics and yield of strawberry plants, cultivar Camarosa growing in the field, using salicylic acid spraying in two stages, the first at the stage of opening 3-4 leaves and the second after 15 days after the first spray, the results showed that the spray treatment with a concentration of 2 mmol was superior to the number of fruits. Plant 1- The yield of one plant and the yield of unit area, which amounted to 13.40 fruits. plant 1- and 143.04 g. Plant 1- 10596 kg. ha 1- Compared to the treatment without spraying, which recorded 11.37 fruits. plant 1- and 124.72 g. plant 1- and 9238.5 kg. hectares 1- .

Between Faten et al (2010) that foliar spraying of squash squash with amino acids, resulted in high yields.

Ullah (2001) indicated that when treating cucumber seeds with different concentrations of ethephon (3800, 2750, 1750, 700) mmol / liter, the results showed that the two low concentrations (1750 and 700) mmol / liter led to an increase in the number of knotted fruits and the yield of one plant. . Hussein (2002) noted that spraying with organic fertilizers on cucumber plants led to an increase in the total yield of the plant. Al-Ghanmi et al. (2003) indicated that foliar spraying with organic fertilizers on squash plants led to an increase in the number of fruits of the plant, as well as an increase in the early yield and total yield of the plant. Zucchini squash Norman (2006) showed in a study after using humic acid extracted from vermicompost led to an increase in the number of fruits of cucumber plants Abou- El-Yazeid et al. (2007) mentioned that spraying with boron on squash plants at a concentration of 25 mg L⁻¹ - It gave a significant superiority in the number of fruits, early yield and yield.

2. Materials and methods

A field experiment was carried out in one of the fields of the Department of Horticulture and Landscaping, College of Agriculture and Forestry, University of Mosul, during the spring season 2021 for the purpose of knowing the effect of hybrids, salicylic acid and amino acid on the vegetative and flowering growth characteristics of summer squash in Nineveh Governorate. Then, smoothing and leveling of the soil surface was carried out, and the experiment field was cut into terraces with a length of (4 m) and width (70 cm) and the distance between the repetitions (50 cm). Random surface layer with a depth of (0-30) cm to determine some of the physical and chemical properties of the soil (table) as well as record the average maximum and minimum temperatures and rainfall during the study period from the weather station in Mosul (table).

The seeds of two zucchini squash hybrids (Clarita and Crown) were planted in small plastic containers (8 cm in length and 9 cm in diameter) and soil consisting of a mixture of (garden soil (1), peat moss (1) and animal manure (2)) on 3/12/2021. Irrigation by spraying the seeds using a fungicide Stroma at a concentration (1 g / 1 liter) of water to get rid of diseases and the seeds began to germinate 5 days after planting in plastic containers, and the real leaves appeared to appear 10 days after planting, the seedlings were moved to the permanent place and seedlings were planted on 4/4/ 2021 and then carry out service operations such as irrigation, hoeing and spraying with the insecticide (Super Serene) whenever needed. The study included three factors, namely:

The first factor: Hybrids. Two hybrids of squash (clarita) will be used, the country of origin is the United States of America, with a germination rate of 90%, and another hybrid is (crown) the country of origin is China, with a germination rate of 90%.

The second factor: amino acid in three levels (zero, 1.5 ml / liter, 3 ml / liter).

The third factor: salicylic acid in three levels (zero, 250 ppm, 500 ppm), where the plants are sprayed in three batches, the first one week after planting and the second when flowering, with the third batch spraying 15 days after the second spray, this experiment was organized using a split cutting system according to a split design – plot system with in (RCBD) and with three

replications, where the hybrids are placed in the main plots, while acids are placed in the sub-plots with the same importance. Thus, the experiment included 18 factorial treatments (2 x 3 x 3) and with three replications. Plants are planted on terraces with a width of 70 cm and a length of 4 m for the terrace, and the distance between the repetitions is 50 cm.

The readings were taken for the following characteristics:

- 1 - the number of fruits / plant, 2 - the weight of the fruit (g). 3- The yield of one plant (kg/plant). 4- Early yield (tons/ha). 5- Total yield ton/ha. 6- Marketing yield (tons/ha). 7- Non-marketing yield ton/ha.

3. Results and discussion .

1 - The number of fruits / plant.

The results of the analyzes of Table (1) indicate that the hybrid Crown was significantly superior in the number of fruits to the hybrid Clarita. We note from the same table that the spraying treatment with a concentration of (500ppm) salicylic acid was significantly superior to the treatment without spraying, which gave the lowest values, while no significant differences were observed. Among plants treated with amino acid and untreated for number of fruits.

Through the binary interaction, we notice that for the interactions of the hybrids with salicylic acid, the superiority of plants treated with a concentration of (500ppm) salicylic acid in the hybrid Crown was significantly superior, which scored (7.9333), while the treatment without spraying gave the lowest values, which recorded ((7.9333 fruits/plant).

And we notice through the interaction of the hybrids with amino acid, the superiority of plants grown without treatment in the hybrid Crown significantly with the highest number of fruits, which recorded (10.8967) fruits/plant, while the plants grown without treatment in the hybrid Crown gave the lowest number of fruits, which recorded (8.4333) fruits/plant. .

We also notice from the interaction of salicylic acid with the amino acid a significant superiority of plants treated with a concentration of (500ppm), which amounted to (11.083 fruits/plant compared to the untreated plants, which gave (8,733) fruits/plant. As for the triple interaction, it is clear from the table that the hybrid Crown under The level of ((250ppm) and the treatment compared to the amino acid gave more number of fruits, which amounted to (12,490) fruits / plant and it differed significantly with most of the treatments, while the treatment without spraying in the hybrid Clarita gave less number of fruits, which amounted to ((7,767) fruits / plant.

Table (1): Hybrids and spraying with amino acid and salicylic acid and the interaction between them in the number of fruits / summer squash plant.

Hybrid	Salicylic acid	amino acid			Hybrid × Salicylic acid	Hybrid effect
		control	1.5 m/l	3 m/l		
Clarita	0	7.767 c	7.800 c	8.233 bc	7.9333 b	8.9596 b
	250 ppm	8.400 bc	11.103 a-c	8.800 a-c	9.4344 ab	
	500 ppm	9.133 a-c	9.300 a-c	10.100 a-c	9.5111 ab	
Crown	0	9.700 a-c	9.833 a-c	9.867 a-c	9.8000 ab	10.6544 a
	250 ppm	12.490 a	10.267 a-c	10.400 a-c	11.0522 a	
	500 ppm	10.500 a-c	10.767 a-c	12.067 ab	11.1111 a	
Hybrid × amino acid	Clarita	8.4333 b	9.4011 ab	9.0444 ab	effect Salicylic acid	
	Crown	10.8967 a	10.2889 ab	10.7778 a		
Salicylic acid × amino acid	0	8.733 a	8.817 a	9.050 a	8.8667 b	
	250 ppm	10.445 a	10.685 a	9.600 a	10.2433 a	
	500 ppm	9.817 a	10.033 a	11.083 a	10.3111 a	

effect amino acid	9.6650 a	9.8450 a	9.9111 a
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2 - Weight of the fruit (gm).

The results of Table (2) indicate that there are no significant differences between the two hybrids (Crown and Clarita) in the characteristic of the weight of the fruit. We note from the same table that the spraying treatment with a concentration of (500ppm) salicylic acid obtained more value, while the lowest values were obtained in the treatment without spraying in the trait. The weight of the fruit, as well as the same case for the spraying treatment with amino acid, where the treatment with a concentration of (3 ml/liter) of amino acid got more weight for the fruit, while the treatment without spraying got the least weight for the fruit.

From the binary interactions, it is clear from the same table. Regarding the interaction of hybrids with salicylic acid, the treatment of hybrid Clarita with a concentration of (500ppm) obtained the highest weight of the fruit, which amounted to (287.42 g/fruit, while the spray treatment with a concentration of (250ppm) gave the lowest weight of the fruit, which recorded ((219.21 g/fruit in the hybrid crown.

It is noted from the interaction of the hybrids with amino acid that the treatment with a concentration of (3 ml / liter) in the hybrid Clarita gave the highest weight of the fruit, while the lowest weight of the fruit was obtained in the hybrid Crown with the comparison treatment.

Regarding the interaction of salicylic acid with the amino acid, it is clear from the same table that the spray treatment with a concentration of (500ppm) salicylic acid and a concentration of (3 ml/liter) of amino acid gave more weight to the fruit compared to other treatments in the same interaction in the characteristic of the weight of the fruit. In the triple interactions, it is noted from the same table that the hybrid crown obtained with salicylic acid spraying at a concentration of (500ppm) and amino acid at a concentration of (3 ml/L) had the highest values, which amounted to (326.28 g/fruit in the hybrid Crown and differed significantly with most of the treatments in this interaction). Whereas, treatment with a concentration of (250ppm) salicylic acid in the same hybrid gave a decrease in the fruit weight characteristic, which gave (158.06) g/fruit.

Table (2): Hybrids and spraying with amino acid and salicylic acid and the interaction between them in the weight of the fruit (gm) for summer squash.

Hybrid	Salicylic acid	amino acid			Hybrid × Salicylic acid	Hybrid effect
		control	1.5 ml/l	3 ml/l		
Clarita	0	228.30 a-c	248.63 a-c	257.38 a-c	244.77 ab	257.75 a
	250 ppm	266.82 a-c	177.37 a-c	279.04 ab	241.08 ab	
	500 ppm	281.10 ab	282.67 ab	298.48 ab	287.42 a	
Crown	0	204.10 bc	238.87 a-c	239.99 a-c	227.65 ab	241.40 a
	250 ppm	158.06 c	248.80 a-c	250.77 a-c	219.21 b	
	500 ppm	252.37 a-c	253.40 a-c	326.28 a	277.35 ab	
Hybrid × amino acid	Clarita	258.74 ab	236.23 ab	278.30 a	effect Salicylic acid	
	Crown	204.84 b	247.02 ab	272.35 a		
Salicylic acid × amino acid	0	216.20 b	243.75 ab	248.69 ab	236.21 b	
	250 ppm	212.44	213.09	264.91	230.15	

		b	b	ab	b
	500 ppm	266.73 ab	268.04 ab	312.38 a	282.38 a
effect amino acid		231.79 b	241.63 ab	275.32 a	

3- yield of plant (kg/plant).

The results of Table (3) show that the two factors of the study (hybrid and salicylic acid) did not have a significant effect on the yield of one plant. As for the effect of amino acid, the results indicate that spraying plants with a concentration of (3ml/L) gave the highest yield, while the treatment without spraying gave the lowest. yield per plant.

It is noted from the binary interaction with regard to the interaction of the hybrids with salicylic acid, where it was noted from the same table that the spraying treatment with a concentration of (500ppm) had the highest values in the hybrid Crown and differed significantly with the comparison treatment in the hybrid Clarita, which recorded the lowest yield per plant.

From the interaction of hybrids with amino acid, we find that the spraying treatment with a concentration of (3 ml/L) amino acid in the hybrid Crown obtained the highest yield per plant and did not differ significantly from the rest of the treatments except for the comparative treatment in the hybrid Clarita, which gave the lowest yield per plant.

The same applies to the interaction of salicylic acid with amino acid, where we notice in the same table the superiority of spraying treatment with salicylic acid at a concentration of (500ppm) and amino acid at a concentration of (3 ml/L) with the highest values, which recorded (2.6450 kg/plant) and it differed significantly with some treatments, while the treatment gave Without spraying, the lowest values were (1.8667) kg/plant.

From the observation of the results of the triple interaction between the studied factors, the results show that the hybrid crown with spraying with salicylic acid at a concentration of (500ppm) and amino acid at a concentration of (3 ml/L) gave the highest yield, which amounted to (2.8367 kg/plant), and it differed significantly with some treatments, while it gave Treatment without spraying in the hybrid Clarita decreased the yield of one plant, which gave (1.6867 kg/plant).

Table (3): Hybrids and spraying with amino acid and salicylic acid and the interaction between them in the yield of one plant (kg) for summer squash.

Hybrid	Salicylic acid	amino acid			Hybrid × Salicylic acid	Hybrid effect
		control	1.5 m/l	3 m/l		
Clarita	0	1.6867 b	1.7067 b	2.1467 ab	1.8467 b	2.0707 a
	250 ppm	1.9333 ab	2.1333 ab	2.1733 ab	2.0800 ab	
	500 ppm	2.0967 ab	2.3067 ab	2.4533 ab	2.2856 ab	
Crown	0	2.0467 ab	2.1967 ab	2.0667 ab	2.1033 ab	2.2741 a
	250 ppm	2.0667 ab	2.3033 ab	2.3100 ab	2.2267 ab	
	500 ppm	2.1967 ab	2.4433 ab	2.8367 a	2.4922 a	
Hybrid × amino acid	Clarita	1.9056 b	2.0489 ab	2.2578 ab	effect Salicylic acid	
	Crown	2.1033 ab	2.3144 ab	2.4044 a		
Salicylic acid × amino acid	0	1.8667 b	1.9517 b	2.1067 ab	1.9750 a	
	250 ppm	2.0000 b	2.2183 ab	2.2417 ab	2.1533 a	
	500 ppm	2.1467 ab	2.3750 ab	2.6450 a	2.3889 a	
effect amino acid		2.00444	2.18167	2.33111		

	b	ab	a
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4- Early yield (tons/ha).

Table (4) shows that the study factors (hybrid and amino acid) did not significantly affect the early yield of cultivated plants. As for the effect of salicylic acid, the results indicate that spraying plants with a concentration of (500ppm) salicylic acid gave the highest early yield, while the treatment without spraying gave the lowest. early yield of the plant. It is noted from the two interactions with regard to the interaction of hybrids with salicylic acid, where we find that the spray treatment with a concentration of (500ppm) salicylic acid gave the highest early yield, which reached (11.793) tons/ha in the hybrid Clarita, while the hybrid crown obtained with the spray treatment with a concentration of (250ppm) salicylic acid on The lowest values, which amounted to (8.535) tons / hectare.

The interaction of the hybrids with the amino acid showed the superiority of the treatment of the hybrid Clarita with the spraying level (3 ml/L) with the highest early yield of the plant, while the hybrid Crown with the control treatment obtained the lowest early yield. Through the interaction between salicylic acid and amino acid, it appears that the treatment (500ppm) salicylic acid with a concentration of (3ml/L) of the amino acid got the most valuable values, while the treatment (250ppm) salicylic acid and without spraying with amino acid got the lowest values.

As for the triple interaction, the Clarita hybrid with the treatment (500ppm) salicylic acid and amino acid (3 ml / liter) outperformed the most expensive values, which amounted to (12.740 tons / hectare) and it differed significantly with some treatments, while the hybrid gave Crown with spraying at a concentration of (250ppm). Salicylic acid and without amino acid spraying at the lowest values.

Table (4): Hybrids and spraying with amino acid and salicylic acid and the interaction between them in the early yield (tons / hectare) of summer squash .

Hybrid	Salicylic acid	amino acid			Hybrid × Salicylic acid	Hybrid effect
		control	1.5 m/l	3 m/l		
Clarita	0	10.153 a-c	10.860 a-c	10.367 a-c	10.460 ab	10.8090 a
	250 ppm	9.987 a-c	9.241 a-c	11.293 a-c	10.174 ab	
	500 ppm	10.440 a-c	12.200 ab	12.740 a	11.793 a	
Crown	0	9.057 a-c	8.763 a-c	9.183 a-c	9.001 b	9.4924 b
	250 ppm	6.819 c	10.893 a-c	7.893 bc	8.535 b	
	500 ppm	8.473 a-c	12.120 ab	12.230 ab	10.941 ab	
Hybrid × amino acid	Clarita	10.193 ab	10.767 a	11.467 a	effect Salicylic acid	
	Crown	8.116 b	10.592 a	9.769 ab		
Salicylic acid × amino acid	0	9.605 ab	9.812 ab	9.775 ab	9.7306 b	
	250 ppm	8.403 b	10.067 ab	9.593 ab	9.3544 b	
	500 ppm	9.457 ab	12.160 a	12.485 a	11.3672 a	
effect amino acid		9.1548 a	10.6797 a	10.6178 a		

5- Total yield ton/ha.

The results in Table (5) show that there are no significant differences in both hybrids in the total yield. We note from the same table regarding the effect of salicylic acid. It was found that spraying with salicylic acid at a concentration of (500ppm) led to an increase in the total yield ton/ha, while the comparison treatment witnessed a decrease in The total yield, as well as for the effect of amino acid, where it was found that plants treated with amino acid at a concentration of (3 ml/L) were significantly superior to the treatment without spraying.

Through the binary interactions and with regard to the interaction of hybrids with salicylic acid, it is clear from the same table that spraying treatment with a concentration of ((500ppm) gave an increase in the total yield, which was recorded (62.298) in the crown hybrid, while the untreated plants gave the lowest total yield of fruits ton / hectare, which recorded (46.186) in the hybrid Clarita, while no significant differences were observed with regard to the interaction of the hybrids with the amino acid.

Through the interaction between salicylic acid and amino acid, it appears that the spray treatment with a concentration of (500ppm) salicylic acid and a concentration of (3 ml/liter) of amino acid recorded an increase in the total yield of fruits over the rest of the treatments, while the spray treatment got at a concentration of (250ppm) salicylic acid with no Spraying with amino acid on the lowest values.

As for the triple interactions, it is observed from the same table that the hybrid crown obtained with salicylic acid spraying with a concentration of ((500ppm) and amino acid at a concentration (3 ml/L) had the highest values, which amounted to 70.87)) tons/ha in the hybrid Crown and it differed significantly with regardless of the treatments in this The interaction, while treatment with a concentration of (250ppm) salicylic acid in the same hybrid gave a decrease in the total yield, which amounted to (37.44) tons/ha.

Table (5): Hybrids and spraying with amino acid and salicylic acid and the interaction between them in the total yield (tons/ha) of summer squash.

Hybrid	Salicylic acid	amino acid			Hybrid × Salicylic acid	Hybrid effect
		control	1.5 m/l	3 m/l		
Clarita	0	42.19 b	42.67 b	53.69 ab	46.186 b	50.541 a
	250 ppm	48.39 ab	42.24 b	54.36 ab	48.330 ab	
	500 ppm	52.34 ab	57.64 ab	61.34 ab	57.109 ab	
Crown	0	51.19 ab	54.95 ab	51.71 ab	52.617 ab	55.278 a
	250 ppm	37.44 b	57.62 ab	57.70 ab	50.919 ab	
	500 ppm	54.97 ab	61.56 ab	70.87 a	62.298 a	
Hybrid × amino acid	Clarita	47.641 a	47.518 a	56.466 a	effect Salicylic acid	
	Crown	47.863 a	57.876 a	60.094 a		
Salicylic acid × amino acid	0	46.690 b	48.812 ab	52.702 ab	49.401 b	
	250 ppm	42.912 b	49.928 ab	56.033 ab	49.624 b	
	500 ppm	53.655 ab	59.350 ab	66.105 a	59.703 a	
effect amino acid		47.752 b	52.697 ab	58.280 a		

6- Marketing yield (tons/ha).

The results of Table (6) show that there are no significant differences for both hybrids (Crown and Clarita) in the marketing yield of the fruits. It is noted from the same table that there are no significant differences in relation to the treatment with

salicylic acid on the marketing yield, while the treatment with a concentration of (3 ml / liter) led to an increase in The marketing quotient of the fruits, while the comparison treatment gave the lowest marketing quotient.

In the binary interactions and as for the interaction of hybrids with salicylic acid, we notice the superiority of the spraying treatment with a concentration of (500ppm) in the hybrid Crown, recording an increase in the marketing yield of the fruits in the hybrid Crown, which amounted to (59.186) tons/ha, while the comparison treatment in the hybrid Clarita obtained the lowest marketing yield, which (44.087 tons/ha), while we did not notice significant differences regarding the interaction of the hybrids with the amino acid.

As for the interaction of salicylic acid with amino acid, where we notice in the same table the superiority of spraying treatment with salicylic acid at a concentration of (500ppm) and amino acid at a concentration (3 ml/L) with the highest values, which recorded ((62.397 tons/ha), while the spray treatment gave a concentration of (250ppm). The lowest values, which were recorded (40.201) tons / hectare.

Among the results of the triple interactions, it is noted in the same table that the plants treated with high concentrations of both salicylic acid and amino acid in the hybrid Crown had the highest marketing yield, which amounted to (67.25) tons/ha, while the plants in the same hybrid and treated with a concentration of (250ppm) gave salicylic acid without spraying with acid Al-Amini has the lowest marketing yield, which recorded (34.78) tons/ha.

Table (6): Hybrids and spraying with amino acid and salicylic acid and the interaction between them in the marketing yield (tons/ha) for summer squash.

Hybrid	Salicylic acid	amino acid			Hybrid × Salicylic acid	Hybrid effect
		control	1.5 m/l	3 m/l		
Clarita	0	39.72 b	41.13 ab	51.40 ab	44.087 b	47.729 a
	250 ppm	45.62 ab	38.16 b	51.90 ab	45.229 ab	
	500 ppm	49.67 ab	54.41 ab	57.54 ab	53.874 ab	
Crown	0	49.41 ab	52.45 ab	50.30 ab	50.718 ab	52.863 a
	250 ppm	34.78 b	55.93 ab	55.34 ab	48.685 Ab	
	500 ppm	52.80 ab	57.51 ab	67.25 a	59.186 a	
Hybrid × amino acid	Clarita	45.007 a	44.566 a	53.616 a	effect Salicylic acid	
	Crown	45.662 a	55.296 a	57.631 a		
Salicylic acid × amino acid	0	44.565 ab	46.787 ab	50.852 ab	47.401 a	
	250 ppm	40.201 b	47.048 ab	53.622 ab	46.957 a	
	500 ppm	51.237 ab	55.957 ab	62.397 a	56.530 a	
effect amino acid		45.334 b	49.931 ab	55.623 a		

7- Non-marketing yield ton/ha.

It is noted from Table (7) that no significant differences were recorded between the two hybrids (Crown and Clarita) in the non-marketing yield of the fruits. From the same table, we note that the spraying treatment with a concentration of (500ppm) gave an increase in the non-marketing yield, which amounted to (3.1744 tons / hectare), while the treatment without spraying

obtained the lowest values, which amounted to ((2.0011 tons / hectare), while no significant differences were recorded for the treatment with acid. The amino in the non-marketing quotient.

In the binary interactions and for the interaction of the hybrids with salicylic acid, it was found that the treatment with a concentration of (500ppm) salicylic acid in the hybrid Clarita gave a significant superiority over most of the treatments of this interaction, while the lowest non-marketing yield I got was in the treatment of spraying with a concentration of (250ppm) salicylic acid in the hybrid Crown While no significant differences were observed in the interaction coefficients of the hybrids with the amino acid.

And by observing the interaction of salicylic acid with amino acid, where it was found in the same table that the spray treatment with a concentration of (500ppm) salicylic acid and (3 ml/L) amino acid was superior, recording an increase in the unmarketed yield, which was recorded (3.7100 tons/ha, while the treatment was recorded with a concentration of (3 ml / liter) of amino acid, the lowest non-marketable yield, which amounted to (1.8533) tons / hectare.

As for the triple interactions of the studied treatments, the crown hybrid was superior with the use of a spray level of (500ppm) salicylic acid and (3 ml/liter) amino acid, recording an increase in the marketing yield, which recorded (3.8033) tons / hectare in the hybrid Clarita, while the treatment was recorded without spraying The lowest non-market yield, which reached (1.4200) tons / hectare in the hybrid crown.

Table (7): Hybrids and spraying with amino acid and salicylic acid and the interaction between them in the non-market yield (tons/ha) of summer squash.

Hybrid	Salicylic acid	amino acid			Hybrid × Salicylic acid	Hybrid effect
		control	1.5 m/l	3 m/l		
Clarita	0	2.4700 a-d	1.5467 cd	2.2867 a-d	2.1011 b	2.6470 a
	250 ppm	2.7600 a-d	2.5867 a-d	2.4667 a-d	2.6044 ab	
	500 ppm	2.6700 a-d	3.2333 a-d	3.8033 a	3.2356 a	
Crown	0	1.7800 a-d	2.5033 a-d	1.4200 d	1.9011 b	2.2974 a
	250 ppm	1.5867 b-d	1.6833 b-d	2.3633 a-d	1.8778 b	
	500 ppm	2.1667 a-d	3.5567 a-c	3.6167 ab	3.1133 a	
Hybrid × amino acid	Clarita	2.6333 a	2.4556 a	2.8522 a	effect Salicylic acid	
	Crown	1.8444 a	2.5811 a	2.4667 a		
Salicylic acid × amino acid	0	2.1250 bc	2.0250 c	1.8533 c	2.0011 b	
	250 ppm	2.1733 bc	2.1350 bc	2.4150 bc	2.2411 b	
	500 ppm	2.4183 bc	3.3950 ab	3.7100 a	3.1744 a	
effect amino acid		2.2389 a	2.5183 a	2.6594 a		

Impact of amino acids and salicylic acid in the yield characteristics of two squash hybrids (*Cucurbita Pepo L.*) .

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Abstract .

The experiment was carried out in the vegetable field of the Department of Horticulture and Landscape Engineering / College of Agriculture and Forestry / University of Mosul for the spring season 2021 to study the effect of amino acids and salicylic acid on the growth characteristics and yield of two squash hybrids. The experiment included three factors, represented

by hybrids (Clarita and Crown), which were placed in the main plots of the experiment, while the second factor was amino acids and salicylic acid, with three concentrations of each (zero, 1.5 ml / l, 3 ml / l) and (zero, 250 ppm, 500 ppm) respectively which are placed in the secondary plots. The results showed the superiority of the hybrid Crown over the hybrid Clarita in the number of fruits per plant, while the hybrid Clarita outperformed the hybrid Crown in the early yield. The plants grown under the high level of salicylic acid excelled in the characteristics of the number of fruits, fruit weight, early yield, total and non-market yield compared with no spraying with acid. Plants grown under high levels of amino acid in the characteristics of plant yield, total yield and marketing yield in comparison with plants not treated with acid. The paper is retrieved from a master's thesis of the first researcher.

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