

EFFECT OF CULTIVAR AND SPRAYING BY MORINGA LEAVES EXTRACT AND ASPIRIN ON GROWTH AND YIELD OF OKRA *ABELMOSCHUS* *ESCULENTUS* L.

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1- Abstract

A factorial experiment was conducted with a one-time split-plot design to study the effect of spraying by Moringa leaves extract at concentrations of 0, 15, 30 g l⁻¹ and aspirin 0, 75, 150 mg l⁻¹ and their interactions on the growth of two local okra cultivars, Al-Khanisariya and Al-Hussainawiya. The results were analyzed using the analysis of variance, and the means were compared according to the Least Significant Differences (L.S.D) test at a probability level of 0.05. The most important results can be summarized as follows; Al-Khanisariya cultivar significantly outperformed the vegetative growth indicators (total leaves number. plant-1, lateral branches number. plant-1, fresh weight of shoot), average pod weight (6.05) g, pods number (64.56), yield per plant (130.75) g, and total productivity (1.412) tons per acre compared to the Hassnawiya cultivar. The plants sprayed with Moringa leaf extract excelled at a concentration of 30 g l⁻¹ was significant in plant height and lateral branches number. Plant-1, leaf area. plant-1, the total number of flowers. Plant-1, the percentage of fruit set, the yield of one plant (87.37) g, total productivity (943.6) kg per acre, and total number of pods. Plant-1 (63.67). The interaction between the two experimental factors significantly affected all the traits under study. The plants sprayed with Aspirin outperformed at a concentration of 150 mg l⁻¹ was significant in plant height; lateral branches number. Plant-1; leaf area. Plant-1; pod number. Plant-1 (72.17) pods; yield per plant (101.54) g, and total productivity (1096.7) tons per acre. The interaction between the experimental factors significantly affected all the traits under study.

Keywords: Okra; Cultivar; Moringa leaf extract; Aspirin; Growth; Yield

2- Introduction

Okra, *Abelmoschus esculentus* L., belongs to the family Malvaceae; it is an important summer vegetable crop worldwide. The okra production in Iraq in 2015 reached 58.42 tons, with a production rate of 5.586 tons. 1 Ac, for an area of 16,750 hectares. It is noted that there is a decrease in the productivity rate per unit area if compared to some countries such as Saudi Arabia, Jordan and Kuwait, where the productivity in each of them reached 14,763, 33.780 and 14,193 t ha⁻¹, respectively. One of the means that can be used to improve productivity, which is environmentally friendly, is spraying with extracts, including the extract of moringa leaves, Al-Akashi and Al-Sahaf (2017), indicated in a study conducted on three cultivars of okra (Petra, Patira, Al-hussainawiya) for two agricultural seasons, they noticed that the cultivar far exceeded the speed

of germination over the two cultivars, Petra and Al-Hussainawiya, for both seasons, as it reached 56.96 days. Adlan et al. (2016) found that when using three okra cultivars (Pusa Sawani, Clemson Spineless and Khrtoumeia), the cultivars differed in the vegetative growth indicators. Pusa sawani and khrtoumeia gave the highest number of branches. In contrast, the highest number of pods was given by Pusa sawani, and the highest total yield per hectare was recorded by both cultivars Pusa sawani and khrtoumeia.

The increased use of chemical fertilizers causes adverse environmental and pollution effects, reflected in the ecological balance and the reduction of plants' resistance to insect pests and diseases. One of the means that can be used to improve productivity, which is environmentally friendly, is spraying with extracts, including the extract of moringa leaves (Panayotov et al., 2010; Fawzy et al., 2012). There are modern and environmentally friendly techniques in agriculture that provide plants with appropriate amounts of nutrients, maintain soil quality and improve the quality and quantity of agricultural production (Russo et al. 2012) found by Maishanu et al. (2017) that spraying the extract as a plant hormone increased the yield of the cowpea plant due to its effect on all stages of growth and development of the cowpea plant. This increase in the total yield may be related to the increase in vegetative growth characteristics and the content of carbohydrates in the leaves. Fuglie (2008) found that foliar spraying with Moringa leaf extract increased cowpea yield by 25-30%, Nagar et al. (2006) indicated that Moringa leaf extract is rich in zeatin and natural cytokinin and a hormone that encourages plant growth, and this is in agreement with what was mentioned by Mvumi et al. (2013) on the bean and tomato and Fuglie (2000) who found an increase in the yield of cowpea plants sprayed with the extract compared to the control treatment.

This study aimed to know the appropriate cultivar for the productivity of okra, determine the response of the okra plant to spraying with Moringa leaf extract and its effect on increasing the yield, knowing the effect of the interaction between the cultivars and spraying with Moringa leaf extract and its effect on growth and yield.

3- Materials and Methods

The experiment was carried out in the agricultural season 2021 and 2022 in one of the greenhouses of the Agricultural Research Station of the College of Agriculture - University of Basra and silty clay soil. Table (1) shows some of its chemical and physical properties that were analyzed in the laboratory of the Department of Soil and Water - College of Agriculture - University of Basra.

Table (1) some physical and chemical properties of field soil for the experimental seasons 2021 and 2022

Soil characteristics	Unit	Value
E.C	Ds m ⁻¹	4.09
pH	-	7.4
Total N	mg Kg ⁻¹	0.6
Total P		33.55
Total K		18.39

OM	g Kg ⁻¹	0.33
Soil Separators	%	
Sand		14.86
Silt		34.59
Clay		50.64
Soil texture	-	silty clay

The sample was analyzed in the laboratory of the College of Agriculture, Soil Department, Central Laboratory

The experiment included the effect of the cultivar and spraying with Moringa leaf extract on the growth and yield of okra.

The treatments were as follows:

1. Cultivars: The seeds of two local okra cultivars were planted, Al-Khanisariya and Al-Hussainawiya.
2. Spraying with Moringa leaf extract in three concentrations: 0, 15, 30 g l⁻¹.
Sprayed the plants four times, the interval between one spray and another two weeks; the spraying started a month after planting.

Table (2): Chemical analysis of irrigation water samples for the growing season 2022

characteristics	Unit	Irrigation Water
Ec	ds m ⁻¹	1.88
pH	-	7.3
SAR		2.10
Ca ⁺⁺	mml l ⁻¹	6.11
Mg ⁺⁺		10.0
Na ⁺		6.38
Cl ⁻		20.32
SO ₄ ^{- -}		3.2
HCO ₃ ⁻		0.4

A Complete Block Design Randomized (R.C.B.D.) design was used according to a split-plot design. The cultivars represented the main plots, while spraying with moringa leaf extract was considered the subplot. Two orthogonal plows plowed the land of the plastic house by the tip-over plow, during which the decomposed organic fertilizer was added at a rate of 10 tons. Then the soil was softened and divided into 6 lines, 45 m long, 40 cm wide, and 40 cm apart between one plant

and another. Triple superphosphate fertilizer (% P₂O₅ 45) was added to it at a rate of 35 kg ac⁻¹, and the soil was leveled. The groves were covered with a layer of field soil with a thickness of 10 cm, a layer of decomposed animal manure, and a layer of river sand with a thickness of 10 cm. The drip irrigation system was used to irrigate the plants, and it was connected to a water tank with a capacity of 5000 liters.

Greenhouse cultivation and agricultural service operations

Irrigation of the house was started by the irrigation system two days before planting the seeds to moisten the soil. The seeds for both types were planted in the experimental units on 01.12 so that 3 seeds were planted for each hole on both sides of the meadow, and in turn, it was reduced to one plant after germination. The length of the experimental unit was two meters, and the number of plants in the experimental unit was 20. The plants were irrigated with irrigation water and according to the treatments 10 days after germination.

All service operations and all treatments were carried out, such as recommendations for the production and fertilization of this crop. The neutral compound fertilizer 20-20-20 was added at a rate of 100 kg. 1 dun in two batches, the first when the weeding process was done and the second when flowering and a preventive program was followed to protect the field from insects and diseases during the two seasons of the experiment, as it was sprayed with Super Methrin 25% to control aphids. With the solution, a few drops of Tween 20 at a concentration of 0.1% were added as a diffuser. Experimental measurements were taken from four plants in each experimental unit at the end of the two growing seasons. They included the plant height (cm) and the total number of leaves Plant-1 and the number of lateral branches Plant-1, leaf area cm² Plant-1, total number of flowers plant-1, percentage of set pods (%), average weight of one pod (g) and number of pods Plant-1, yield per plant (kg) and yield per hectare (tons).

4- Results and discussion

4-1- plant height (cm)

Table (3) indicates the effect of the cultivar and spraying with Moringa leaf extract and Aspirin and their interactions, as it is noted that there is no significant difference between the two cultivars in the plant height characteristic. As for the effect of spraying with moringa leaf extract, the data in the same Table indicate a significant effect in this trait, as it was observed that the concentrations of 15 and 30 g l⁻¹ were significantly superior, as they gave the highest height of (132.2, 134.6) cm respectively compared to the comparison treatment that gave the lowest height reached 110.6 cm. The data in the same Table shows that spraying with Aspirin had a significant effect. It was superior to spraying with concentrations of 75 and 150 mg l⁻¹ and gave the highest height of 139.9, 128.7 cm compared with the lowest height of the comparison treatment was 108 cm.

The bilateral and triple interaction had a significant effect on this trait, as the dual interaction between Hussainawiya cultivar and spraying with the extract at concentrations of 15 and 30 g l⁻¹ gave the highest height of 145.6, 141.8 cm, while the interaction between al-Khanisariya cultivar and concentration 0 g l⁻¹ gave the lowest height He reached 110.0 cm. As for the effect of the interaction between the cultivar and spraying with Aspirin, it has a significant impact, as Al-

Hussainawiya cultivar and spraying with Aspirin at a concentration of 75 mg l⁻¹ gave the highest height of 145.3 cm. In comparison, the treatment of Al-Khanisariya variety with a concentration of 0 mg l⁻¹ gave the lowest height of 96 cm.

The Table also shows that the interaction between spraying with Moringa leaf extract and Aspirin was significant, as the plants treated by spraying the extract at a concentration of 30 g l⁻¹ and Aspirin at a 75 mg l⁻¹ gave the highest height of 148.8 cm. In contrast, the untreated plants gave the lowest height of 96 cm. As for the triple interaction, the treatment of Al-Hussainawiya cultivar with a concentration of 15 g l⁻¹ extract and 150 mg l⁻¹ extract gave the highest height of 183.7 cm. In contrast, the plants of the Al-Khanisariya treated with a concentration of 0 gm l⁻¹ extract and 0 mg l⁻¹ extract gave less Aspirin. Plant height 82.7 cm (Table 3).

Table (3) Effect of cultivar, spraying with Moringa leaf extract and Aspirin, and their interactions on plant height (cm)

Cultivar	Extract concentration (g l ⁻¹)	Aspirin (gm l ⁻¹)			Cultivar + extract	Cultivar effect average
		0	75	150		
Al-Hussainawiya	0	82.7	123.3	124.0	110.0	118.7
	15	114.7	136.0	105.7	118.8	
	30	90.7	144.0	147.3	127.3	
Al-Khanisariya	0	123.0	127.0	83.7	111.2	132.9
	15	97.7	155.3	183.7	145.6	
	30	144.0	153.7	127.7	141.8	
L.S.D P ≤ 0.05		38.26			22.43	NS
average effect of Aspirin		108.8	139.9	128.7	Average extract effect	
L.S.D P ≤ 0.05		16.57				
Extract+ Aspirin	0	96.0	134.4	125.7	110.6	
	15	106.2	145.7	106.2	132.2	
	30	117.3	148.8	137.5	134.6	
L.S.D P ≤ 0.05		28.86			19.42	
Cultivar+ Aspirin	Al-Hussainawiy a	96.0	134.4	125.7		
	Al-Khanisariya	121.6	145.3	131.7		
L.S.D P ≤ 0.05		19.17				

4.2. Side branches number

Table (4) The effect of the cultivar and spraying with Moringa leaf extract and Aspirin and their interactions, as it is noted that there is a significant difference between the two cultivars in the character of the number of branches, where the Hussainawiya cultivar excelled in giving the largest number of branches reached 5.13 branches plant-1 compared with the lowest number given by the plants of the Khanisariya variety which amounted to 4.29 plant branch-1. As for the effect of spraying with moringa leaf extract, the data in the same Table indicate a significant effect in this trait, where the plants treated with a concentration of 30 g l-1 outperformed in giving the largest number of branches amounting to 5.07 plant branches-1 compared to the plants treated with the comparison treatment, which gave the lowest number of branches reached 4.47 plant branch-1, as the data of the same Table shows that spraying with Aspirin had a significant effect, it was superior to spraying with two concentrations 150 mg l-1 and gave the largest number of branches reached 5.98 plant branch-1 compared with the lowest number of branches of the comparison treatment amounted to 3.58.

The bilateral and triple interaction had a significant effect on this trait, as the dual interaction between Hussainawiya cultivar and spraying with the extract at a concentration of 30 gm l-1 gave the largest number of branches amounted to 5.68 branches plant-1, while the interaction between the cultivar Al-Khanisariya and the concentration 0 g l-1 gave the lowest number of branches It reached 4.19 plant branch-1. As for the effect of the interaction between the cultivar and Aspirin, as for the effect of the interaction between the extract and spraying with Aspirin, it has a significant impact, as the plants treated with Moringa leaf extract at a concentration of 30 g l-1 and with Aspirin at a concentration of 75 mg l-1 gave the highest number of branches of 6.26 plant branches-1, while the comparison treatment gave for each of the extract and Aspirin, the lowest number of branches was 3.26 plant -1. Concerning the triple interaction, the treatment of Al-Khanisariya cultivar with a concentration of 30 g l-1 extract and 150 mg l-1 aspirin was superior and gave the largest number of branches, reaching 6.940 branches plant-1, while the plants of the Hussainawiya cultivar and those treated with a concentration of 0 g l-1 extract and 0 mg l-1 extract Aspirin, the lowest number of branches was 3.25 branch plant-1.

Table (4) Effect of cultivar, spraying with Moringa leaf extract and Aspirin, and their interactions on side branches number

Cultivar	Extract concentration (g l ⁻¹)	Aspirin (gm l ⁻¹)			Cultivar + extract	Cultivar effect average
		0	75	150		
Al-Hussainawiya	0	3.280	5.027	5.960	4.198	5.132
	15	3.757	4.283	6.843	4.208	
	30	4.390	5.710	6.940	4.474	
Al-Khanisariya	0	3.257	4.043	5.293	4.756	4.293

	15	3.280	4.073	5.270	4.961	
	30	3.540	4.293	5.590	5.680	
L.S.D P_≤ 0.05		0.756			0.545	0.681
Average effect of Aspirin		3.584	4.572	5.983	Average extract effect	
L.S.D P_≤ 0.05		0.298				
Extract+ Aspirin	0	3.268	4.535	5.627	4.477	
	15	3.518	4.178	6.057	4.584	
	30	3.965	5.002	6.265	5.077	
L.S.D P_≤ 0.05		0.508			0.321	
Cultivar+ Aspirin	Al-Hussainawiy a	3.359	4.137	5.384		
	Al-Khanisariya	3.809	5.007	6.581		
L.S.D P_≤ 0.05		0.521				

4.3 Leaves number

Table (5) shows the effect of the cultivar and spraying with Moringa leaf extract and Aspirin and their interactions, as it is noted that there is a significant difference between the two cultivars in the characteristic of the total number of leaves per plant, where the Khanisariya cultivar outperformed, which gave the most number of leaves reached 56.7 leaves plant-1 compared with the Hussainawiya cultivar, which gave the lowest The number of papers reached 50.4 leaves. As for the effect of spraying with moringa leaf extract, the data in the same Table indicate a significant effect in this trait, as it was observed that the concentration of 30 g l-1 was significant, as it gave the largest number of leaves amounting to 57.9 leaves compared to the comparison treatment that gave the lowest number of leaves amounting to 49.8 leaves - 1 The data of the same Table showed that spraying with Aspirin had a significant effect, as it was superior to spraying with a concentration of 150 mg l-1 and gave the largest number of leaves amounted to 62.3 leaf-1. Compared with the lowest number of leaves for the comparison treatment amounted to 47.3 leaf-1. The bilateral and triple interaction had a significant effect on this trait, as the dual interaction between Hussainawiya cultivar and spraying with the extract at a concentration of 30 g l-1 gave the largest number of leaves, amounting to 64.7 leaves-1, while the interaction between the cultivar Al-Khanisariya and the concentration 0 g l-1 gave the lowest number Leaves amounted to 43.2 leaves -1.

As for the effect of the interaction between the cultivar and spraying with Aspirin, it has a significant impact, as the Al-Hussainawiya cultivar and spraying with Aspirin at a concentration of 150 mg l-1 gave the highest number of leaves that reached 53.2 leaves -1, while the treatment

of the cultivar Al-Khanisariya treated with a concentration of 0 mg l⁻¹ aspirin gave the number of leaves amounted to 45.6 leaves plant⁻¹. The Table also shows that the interaction between spraying with Moringa leaf extract and Aspirin was significant, as the plants treated with spraying the extract at a concentration of 30 g l⁻¹ and Aspirin at a concentration of 150 mg l⁻¹ gave the largest number of leaves amounting to 66.7 leaf⁻¹. In contrast, the untreated plants gave less The number of leaves was 41.00 leaf⁻¹; as for the triple interaction, the treated Al-Hussainawiya cultivar with a concentration of 15 g l⁻¹ extract and 150 mg l⁻¹ gave the largest number of leaves, which reached 72.7 leaves⁻¹. In comparison, the plants of the cultivar Al-Khanisariya and the laboratory showed a concentration of 0. 1 g l⁻¹ extract and 0 mg l⁻¹ aspirin; the lowest number of leaves was 31.2 leaves⁻¹ (Table).

Table (5) Effect of cultivar, spraying with Moringa leaf extract and Aspirin, and their interactions on leaves number (leaves plant⁻¹)

Cultivar	Extract concentration (g l ⁻¹)	Aspirin (gm l ⁻¹)			Cultivar + extract	Cultivar effect average
		0	75	150		
Al-Hussainawiya	0	31.7	42.3	55.7	43.2	50.4
	15	64.3	48.3	57.3	56.7	
	30	40.7	52.3	60.7	51.2	
Al-Khanisariya	0	50.3	47.7	71.0	48.1	56.4
	15	35.7	52.0	56.7	56.3	
	30	61.3	60.0	72.7	64.7	
L.S.D P≤ 0.05		16.42			7.88	5.20
Average effect of Aspirin		47.3	50.4	62.3	Average extract effect	
L.S.D P≤ 0.05		7.48				
Extract+ Aspirin	0	41.0	45.0	63.3	49.8	
	15	50.0	50.2	57.0	52.4	
	30	51.0	56.2	66.7	57.9	
L.S.D P≤ 0.05		11.85			6.35	
Cultivar+ Aspirin	Al-Hussainawiy a	45.6	47.7	57.9		
	Al-Khanisariya	49.1	53.2	53.2		
L.S.D P≤ 0.05		9.19				

Tables (4 and 5) show the superiority of the Khanisariya variety in the two characteristics (number of lateral branches and number of leaves) over Hussainawiya variety. This may be attributed to the genetic difference of the variety and the extent to which it is affected by environmental conditions and weather factors. The result agreed with (Zidane and Shehab, 2010).

As for the effect of moringa leaf extract, the superiority of spraying in vegetative characteristics (the height of the plant, the number of branches and leaves) is due to its containing nitrogen, which works on cell division, which leads to increased root growth. The elements and their accumulation within the plant tissues, or the reason for the increase in this, maybe because a large part of the growth regulators present in the extract help to increase the absorption of nutrients by the plant, which leads to an increase in cell division, or the reason for the increase in vegetative growth indicators when spraying plants with an extract Moringa leaves may be due to the presence of antioxidants and cytokinins, especially zeatin, auxin, and gibberellins important in cell division and cell elongation Hanafy (2017).

The increase in vegetative growth indicators when spraying okra with Moringa leaf extract agreed with what was found by Maishanu et al. (2017) that spraying cowpea plant increased the yield of the plant due to its effect on all stages of growth and development of a plant. This increase in the total yield may be related to the increase in vegetative growth characteristics and carbohydrate content of leaves. A non-enzymatic oxidant that protects tissues from free radicals that build up as a result of stress by inactivating or scavenging them.

4.4. Pod weight

Table (6) shows the effect of the cultivar and spraying with Moringa leaf extract and Aspirin and their interactions, as it is noted that there is a significant difference between the two cultivars in the characteristic of okra pod weight. As for the effect of spraying with moringa leaf extract, the data in the same Table indicate a significant effect in this trait, as it was observed that the concentrations of 30 and 15 g l⁻¹ were significantly superior, as it gave the largest average weight of the pod amounting to (5.50 and 5.34) g compared with the control treatment that gave the lowest The weight of the pod was 4.51 g, and the concentration of 15 g l⁻¹ was superior to that of 30 g l⁻¹, as the data in the same Table showed that spraying with Aspirin had a significant effect, as the spraying with concentrations of 75 and 150 mg l⁻¹ gave the most average weight of the pod (5.09 and 5.59) g, respectively, compared with the lowest weight of the pod for the control treatment was 4.71 g.

The bilateral and triple interaction had a significant effect on this trait, as the dual interaction between Al-Khanisari cultivar and spraying with the extract at a concentration of 30 g l⁻¹ gave the most weight to the pod amounted to (6.54) g, while the interaction between the Husseinawiyah cultivar and the concentration 0 g l⁻¹ gave the lowest weight of pod It was 3.70 gm. As for the interaction effect between the cultivar and spraying with Aspirin, it has a significant impact, as the two cultivars of Al-Khanisariya and sprayed with Aspirin at a concentration of 150 mg l⁻¹ gave the most weight of the pod amounted to 6.41 g, while the treatment of Al-Hussainawiya cultivar at a concentration of 0 mg l⁻¹ gave the lowest weight of the pod amounted to 3.61 g The Table

also shows that the interaction between spraying with Moringa leaf extract and Aspirin was significant, as the plants treated by spraying the extract with a concentration of 15 g l⁻¹ and Aspirin at a concentration of 150 mg l⁻¹ gave the most weight of the pod amounted to 6.00 g, while the untreated plants gave the lowest pod weight of 4.19 g As for the triple interaction, the treatment of Al-Khanisariya cultivar with a concentration of 30 g l⁻¹ extract and 150 mg l⁻¹ extract and gave the highest maximum weight of the pod amounted to 6.94 g, while the plants of the Al-Hussainawiya cultivar and the treated plants gave a concentration of 30 g l⁻¹ extract and 0 mg l⁻¹ aspirin, the weight of the pod was 3.27 g.

Table (6) Effect of cultivar, spraying with Moringa leaf extract and Aspirin, and their interactions on Pod weight (g)

Cultivar	Extract concentration (g l ⁻¹)	Aspirin (gm l ⁻¹)			Cultivar + extract	Cultivar effect average
		0	75	150		
Al-Hussainawiya	0	3.45	3.78	3.87	3.70	4.21
	15	4.09	4.51	5.56	4.72	
	30	3.27	4.47	4.88	4.21	
Al-Khanisariya	0	4.92	5.21	5.84	5.32	6.05
	15	6.13	6.26	6.45	6.28	
	30	6.38	6.29	6.94	6.54	
L.S.D P ≤ 0.05		0.34			0.13	0.14
Average effect of Aspirin		4.71	5.09	5.59	Average extract effect	
L.S.D P ≤ 0.05		0.16				
Extract+ Aspirin	0	4.19	4.50	4.86	4.51	
	15	5.11	5.38	6.00	5.50	
	30	4.83	5.38	5.91	5.38	
L.S.D P ≤ 0.05		0.24			0.10	
Cultivar+ Aspirin	Al-Hussainawiy a	3.61	4.25	4.77		
	Al-Khanisariya	5.81	5.92	6.41		
L.S.D P ≤ 0.05		0.19				

4.5. Pods number

Table (7) indicates the effect of the cultivar and spraying with Moringa leaf extract and Aspirin and their interactions, as it is noted that there is a significant difference between the two cultivars in the number of pods, where the Khanisariya cultivar significantly died over the Hussainawiya cultivar. As for the effect of spraying with moringa leaf extract, the data in the same Table indicate a significant effect in this trait, as it was observed that the concentration of 30 g l-1 was significantly superior, as it gave the largest number of pods reached 63.67 pods plant-1 compared with the comparison treatment that gave the lowest number of pods amounted to 61.22 Pod-1. The same table's data also showed that spraying with Aspirin had a significant effect. It was superior to spraying with a concentration of 150 mg l-1 and gave the largest number of pods, which amounted to 72.17 pods-1, compared with the lowest number of pods for the comparison treatment, 52.94 pods-1.

The bilateral and triple interaction had a significant effect on this trait, as the dual interaction between Al-Khanisariya cultivar and spraying with the extract at a concentration of 30 g l-1 gave the largest number of pods reached 65.44 pods-1, while the interaction between Hussainawiya cultivar and a concentration of 0 g l-1 gave the lowest number. The pods were 59.22 pods-1, but the effect of the interaction between the cultivar and spraying with Aspirin has a significant impact, as the interaction between the cultivar Al-Khanisariya and spraying with Aspirin at a concentration of 150 mg l-1 gave the largest number of pods amounted to 74.78 pods-1, while the treatment of Al-Hussainawiya cultivar at a concentration of 0 mg l-1 gave 1- The lowest number of pods was 50.56 pods-1, as the Table shows that the interaction between spraying with moringa leaf extract and Aspirin was significant, as the plants treated by spraying the extract with Turkish extract 30 g l-1 and Aspirin at a concentration of 150 mg l-1 gave the largest number of pods reached 73.50 pods -1, while the non-treated plants gave the lowest pod diameter of 52.00 pods-1, as for the triple interaction, the treatment of the treated cultivar Khanisariya with a concentration of 30 g l-1 extract and 150 mg l-1 aspirin gave the largest number of pods 75.33 pods l-1, while the plants of the Hussainawiya cultivar and those treated with a concentration of 0 g l-1 extract and 0 mg l-1 aspirin gave the lowest number of pods which was 49.67 pods-1.

Table (7) Effect of cultivar, spraying with Moringa leaf extract and Aspirin, and their interactions on Pods number -1

Cultivar	Extract concentration (g l ⁻¹)	Aspirin (gm l ⁻¹)			Cultivar + extract	Cultivar effect average
		0	75	150		
Al-Hussainawiya	0	49.67	60.33	67.67	59.22	60.48
	15	50.00	61.67	69.33	60.33	
	30	52.00	62.00	71.67	61.89	
Al-Khanisariya	0	54.33	62.00	73.33	63.22	64.56
	15	55.33	64.00	75.67	65.00	

	30	56.33	64.67	75.33	65.44	
L.S.D P\leq 0.05		3.202			0.786	0.969
Average effect of Aspirin		52.94	62.44	72.17	Average extract effect	
L.S.D P\leq 0.05		1.571				
Extract+ Aspirin	0	52.00	61.17	70.50	61.22	
	15	52.67	62.83	72.50	62.67	
	30	54.17	63.33	73.50	63.67	
L.S.D P\leq 0.05		2.256			0.491	
Cultivar+ Aspirin	Al-Hussainawiy a	50.56	61.33	69.56		
	Al-Khanisariya	55.33	63.56	74.78		
L.S.D P\leq 0.05		1.865				

4.6. Yield plant of one plant⁻¹

Table (8) shows the effect of the cultivar and spraying with Moringa leaf extract and Aspirin and their interactions, as it is noted that there is a significant difference between the two cultivars in the yield of one plant in okra, where the Al-Khanisariya cultivar outperformed and gave the highest rate of yield per plant of 98.25 g compared to the Hussainawiya cultivar which showed the lowest yield per plant of 64.65 g. As for the effect of spraying with moringa leaf extract, the data in the same Table indicate a significant effect in this class, where the concentration exceeded 30 g l-1 and gave the largest yield of 87.37 g compared to the comparison treatment, where it gave the lowest yield of an average of 70.06 g, The data of the same Table also showed that spraying with Aspirin had a significant effect, as the spraying with concentrations of 75 and 150 l-1 was superior. They gave the highest yield of the plant to the okra crop amounted to (101.54,79.75) g, respectively, compared to the treatment of the treatment with a concentration of 0 mg l-1, which gave 63.05 g, and the concentration was superior. 150 mg l-1 at a concentration of 75 mg l-1, and the binary and triple interaction had a significant effect in this trait, as the bilateral interaction between Al-Khanisariya cultivar and spraying with the extract at two concentrations of 15.30 g l-1 and gave the largest amount per plant reached (107.49,102.33)gm, while the comparison treatment gave the lowest germination yield of Al-Hussainawiya cultivar reached 55.20 g, and Al-Khanisariya cultivar with a concentration of 30 g l-1 was superior to a concentration of 15 g l-1. As for the effect of the interaction between the cultivar and spraying with Aspirin, it has a significant impact, as the Al-Khanisariya cultivar and spraying with Aspirin at two concentrations of 75,150 mg l-1, gave the greatest weight for the single plant crop amounted to (119.95, 94.23) g compared with the Hussainawiya cultivar. The comparison treatment gave the lowest yield per plant, 45.54 g. The concentration of 150 mg l-1 was superior to that of 75 mg l-1, as the Table

shows that the interaction between spraying with moringa leaf extract and Aspirin was significant, as the plants treated by spraying with the extract at a concentration of 30 g l⁻¹ and Aspirin at a concentration of 150 mg l⁻¹ gave the largest amount of the yield. One plant of the okra crop reached 109.21 g, while the plants treated by spraying with an extract at a concentration of 0 g l⁻¹ and Aspirin at a concentration of 0 mg l⁻¹ gave the lowest yield per plant, amounted to 54.93 g. And Aspirin 150 mg l⁻¹ gave the largest yield per plant in this triple interaction, which was 130.75 g, while plants of the Hussainawiya cultivar treated with a concentration of 0 g l⁻¹ extract and 0 mg l⁻¹ aspirin gave the lowest yield per plant at 43.09 g.

Table (8) Effect of cultivar, spraying with Moringa leaf extract and Aspirin, and their interactions on yield plant of one plant (g)

Cultivar	Extract concentration (g l ⁻¹)	Aspirin (gm l ⁻¹)			Cultivar + extract	Cultivar effect average
		0	75	150		
Al-Hussainawiya	0	43.02	57.03	65.56	55.20	64.65
	15	51.26	69.54	96.41	72.40	
	30	42.35	69.21	87.43	66.33	
Al-Khanisariya	0	66.85	80.81	107.11	84.92	98.25
	15	84.81	100.19	122.00	102.33	
	30	90.03	101.69	130.75	107.49	
L.S.D P ≤ 0.05		5.06			2.57	2.11
Average effect of Aspirin		63.05	79.75	101.54	Average extract effect	
L.S.D P ≤ 0.05		2.27				
Extract+ Aspirin	0	54.93	68.92	86.33	70.06	
	15	68.04	84.86	109.21	86.91	
	30	66.19	85.45	109.09	87.37	
L.S.D P ≤ 0.05		3.67			2.09	
Cultivar+ Aspirin	Al-Hussainawiy a	45.54	65.26	83.13		
	Al-Khanisariya	80.57	94.23	119.95		
L.S.D P ≤ 0.05		2.80				

4.7. Total yield (t ac⁻¹)

Table (9) indicates the effect of the cultivar and spraying with Moringa leaf extract and Aspirin and their interactions, as it is noted that there is a significant difference between the two cultivars in the characteristics of the total yield t ac⁻¹, where the Al-Khanisariya cultivar excelled and gave the highest total germination yield of 1061.1 kg ac⁻¹ compared with Al-Hussainawiya cultivar, which gave the lowest total yield It reached 698.2 kg ac⁻¹. As for the effect of spraying with Moringa leaf extract, the data in the same Table indicate a significant effect in this trait, as it was noticed that the two concentrations were significantly superior to 15.30 g l⁻¹, as it gave the most total yield of 943.6, 938.6 kg ac⁻¹. Compared with the treatment of 0 g l⁻¹, which gave the lowest total yield of 756.7 kg ac⁻¹, the data of the same Table showed that spraying with Aspirin had a significant effect, as spraying with two concentrations of 75,150 mg l⁻¹ and gave a total yield amounted to (1096.7, 861.3) kg ac⁻¹ compared with the lowest yield of the control treatment was 681.0 kg ac⁻¹. The concentration of 150 mg l⁻¹ was superior to the concentration of 75 mg l⁻¹. The bilateral and triple interaction had a significant effect on this trait, as the dual interaction between Al-Khanisariya cultivar and spraying with the extract at two concentrations of 15.30 g l⁻¹ and gave total yield per ac amounted to (1160.9'1105.2) kg ac⁻¹, compared with the comparison treatment for Al-Hussainawiya cultivar where It gave the lowest total yield of 596.2 kg ac⁻¹. The concentration of 30 g l⁻¹ was superior to that of 15 g l⁻¹. As for the effect of the interaction between the cultivar and spraying with Aspirin has a significant impact. For an ac, it amounted to (1295.2, 1105.2,) kg ac⁻¹ compared with the Hussainawiya cultivar for the comparison treatment, which gave the lowest total yield of 491.9 kg ac⁻¹. The Table also shows that the interaction between spraying with Moringa leaf extract and Aspirin was significant, as the plants treated by spraying with the extract gave At a concentration of 30 g l⁻¹ and Aspirin at a concentration of 150 mg l⁻¹, the highest total yield was 922.9 kg ac⁻¹, while the untreated plants gave the lowest total yield of 593.3 kg ac⁻¹. As for the triple interaction, the treatment of the treated cultivar Al-Khanisariya at a concentration of 30 g l⁻¹ extract and 150 mg l⁻¹ gave the highest total yield of 1412.1 kg ac⁻¹, while the plants of the Hussainawiya cultivar and treated with a concentration of 30 g l⁻¹ extract and 0 mg l⁻¹ aspirin gave the lowest total yield of 457.4 kg ac⁻¹.

Table (9) Effect of cultivar, spraying with Moringa leaf extract and Aspirin, and their interactions on Total yield (t ac⁻¹)

Cultivar	Extract concentration (g l ⁻¹)	Aspirin (gm l ⁻¹)			Cultivar + extract	Cultivar effect average
		0	75	150		
Al-Hussainawiya	0	464.6	464.6	708.0	596.2	698.2
	15	553.6	553.6	1041.2	781.9	
	30	457.4	457.4	944.2	716.4	

Al-Khanisariya	0	722.0	722.0	1156.7	917.2	1061.1
	15	916.0	916.0	1317.6	1105.2	
	30	972.4	972.4	1412.1	1160.9	
L.S.D P\leq 0.05		54.7			27.7	22.8
Average effect of Aspirin		681.0	861.3	1096.7	Average extract effect	
L.S.D P\leq 0.05		24.6				
Extract+ Aspirin	0	593.3	744.4	932.4	756.7	
	15	734.8	916.5	1179.4	938.6	
	30	714.9	922.9	1178.2	943.6	
L.S.D P\leq 0.05		39.6			22.5	
Cultivar+ Aspirin	Al-Hussainawiy a	491.9	704.8	897.8		
	Al-Khanisariya	870.1	1017.7	1295.5		
L.S.D P\leq 0.05		30.3				

The results of the tables (6, 7, 8 and 9) show the superiority of the Khanisariya variety over the Hussainawiya variety in yield traits (number of pods, pod weight, yield of one plant, total yield). It may be inherited under genetic control. This result agrees with (Yahya, 2004). As for the interpretation of the effect of moringa leaf extract on these traits, it may be attributed to the increase in the leaves' carbohydrate content when treated by spraying on the leaves to its role in increasing its content of chlorophyll, the results of the current study, as well as an increase the leaf area in the plant, and this, in turn, is reflected positively on the efficiency of the photosynthesis process, as well as the increase of manufactured materials in the leaves and thus to an increase in the number of carbohydrates in the leaves and the accumulation of soluble solids in the fruits. The results agree with Khidir (2001).

The reason may be attributed to the extract's role in increasing the accumulation of nutrients in the pods. The increase in the number of pods when treated with the extract may be due to an increase in the number of flowers and an increase in the set rate. The positive role of treatment with the extract in increasing the vegetative growth at an early age compared with the untreated plants encouraged the formation of a good yield. Nagar et al. (2006) stated that Moringa leaf extract is rich in zeatin and natural cytokinin and a hormone that encourages plant growth, and this is in agreement with what was mentioned by Mvumi et al. (2013) on the bean and tomato and Fuglie (2000) who found an increase in the yield of cowpea plants sprayed with the extract compared to the control treatment.

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