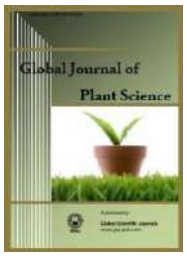
Global Journal of Plant Science 7 (2) 2022/ 35-42

Contents lists available at www.gsjpublications.com

Global Journal of Plant Science

journal homepage: www.gsjpublications.com/gjps



Effect of Organic and Phosphate Fertilizers on Yield Traits of Several Sesame Cultivars, *Sesamum Indicum* L.

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ARTICLE INFO

Received: 17 Aug 2022,
Revised: 19 Aug 2022,
Accepted: 29 Aug 2022,
Online: 25 Sep 2022,

Keywords:
Component; Formatting; Style; Styling; Insert

ABSTRACT

A field experiment was conducted in Al-Saqlawiyah district, Kasaiba region / Anbar province for the summer season 2021) to study the effect of organic and phosphate fertilizers on the growth traits of several sesame cultivars (Sumer, Al-Rafidain, Wadea, Had, Giza-32, Turkish, Malaysian black, local, Maghali -57 , Golmarmara , Batem) The first factor represents the cultivar, the second factor represents 0 without adding, phosphate fertilizer 100 kg.ha^{-1}, organic fertilizer 2 tons. ha^{-1}, the mixture is 100 kg. ha^{-1} phosphate fertilizer 2 tons. ha^{-1} and organic fertilizer.The experiment was conducted using a factorial experiment, in which the treatments were distributed according to a randomized complete block design (RCBD) with three replicates. The most important results of the study are: 1- Addition of the mixture (organic fertilizer 2 tons. ha-1 and phosphate fertilizer 100 kg. ha-1 gave a significant increase in the characteristics of the study represented by the number of capsules per plant (235 capsules. plant-1), Number of seeds in the capsule (75.16 seeds. capsule-1), the weight of 1000 seeds (3.86 g), total yield (3001.02 kg. ha-1) Compared with control treatment, which gave the lowest averages in the above traits. 2- The superiority of the local variety in most of the studied traits is represented in the number of capsules in the plant, the number of seeds in the capsule and the weight of 1000 seeds, The total seed yield with averages of (191.10 capsules. plant-1), (69.40 seeds. capsule-1), (3.46 g), (2776.12 kg. ha-1) respectively.

1. Introduction

The sesame crop (*Sesamum indicum* L.) belongs to the sesame family Pedaliaceae and is considered one of the ancient oil crops known to man and whose oil was used (Weiss, 1983). Sesame is grown mainly to obtain the oil. Its oil content ranges from (50-60%). It is considered one of the best types of oils because it contains the antioxidant sesamin, sesamolin, and sesamol, as its iodine number (103-116) and its saponification degree (188-193), and the refractive index at a temperature of 20 °C (0.922-0.924), (Tayfur and Rashid, 1996). The percentage of protein in it is (20-25%), carbohydrates (15%), and

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doi: 10.5281/gjps.2022.7110053

minerals (7-5%). As for its use as feed, sesame meal is rich in calcium, phosphorous, and vitamins such as vitamin B12 (Rizk and Abd Ali, 1982). Phosphorous plays an important role in forming energy-rich phosphate bonds, ADP, ATP, protein, and phospholipids, and is the main component of nucleic acids (RND and DNA) and nucleoproteins. Phosphorous is the most important nutrient for plants and is an essential element in preserving solar energy in chemical energy. The phosphorous in sesame improves the biological, physical, and chemical properties of the soil and obtains a high-quality production (Vora et al. (2018) The factors that highly affect the growth and activity of plants are the use of organic fertilizers, as adding organic fertilizers to the soil increases its ability to retain soil moisture and thus improves its biological properties, increasing the cationic exchange capacity of the soil, It also has a role in building organic compounds and increases the improvement of the path of vital activities in the plant (Zaghloul et al. 2011) and (Gairly et al. 2015). Climate clearly affects the genotype of sesame plants, as it affects the duration of flowering and low productivity. Pham et al. (2010). The genotypes differ in sesame regarding growth traits Laurentin et al. (2014). Due to the lack of sources on the subject of the study, this research aims to know the effect of organic and phosphate fertilizers on several genotypes of the sesame crop.

2. Materials and Methods

Preparing the Experimental Ground

The experiment was conducted in Kusaiba region x384161, y3731180 - Al-Saqlawiyah district - Anbar province to study the effect of organic and phosphate fertilizers on the growth traits of several sesame cultivars. As the experiment land was tillage by two vertical tillage by means of a disc and smoothed and modified, then random samples were taken from the experiment land at depths ranging from (0-30) cm to estimate some of the physical and chemical properties of the experiment soil, as shown in Table (1).

The design used and the studied factors and their levels:

In the implementation of the experiment, a randomized complete block design (RCBD) was used within the factorial experiment system and with three replicates. It included two factors:

The first factor:- Eleven cultivars (Sumer, Al-Rafidain, Wade, Had, Giza-32, Turkish, Malaysian black, local, Maghali -57 , Golmarmara , Batam)

Table (1) Some physical and chemical properties of the experimental soil for the season (2021).

Traits	values	units
pH	7.4	--
Electrical conduction (EC)	2.2	DSm^{-1}
available Nitrogen (N)	1.2	$g.kg^{-1}$
available phosphorous (P)	0.4	$mg.kg^{-1}$
dissolved potassium (K)	9.7	$mg.kg^{-1}$
Organic matter	9.83	$g.kg^{-1}$
the sand	713	$g.kg^{-1}$
silt	182	$g.kg^{-1}$
Clay	105	$g.kg^{-1}$
Texture	Sandy loam	--

The soil was analyzed in the laboratories of the Anbar Agriculture Directorate.

The experimental plot was divided into three replicates, with 44 experimental units for each replicate.

The fertilizer was added in the form of 80 kg urea.ha^{-1} Al-Janabi (2001) and in two batches, the first at planting and the second batch after 45 days of planting. Then add phosphate fertilizer on the formula P2O5 at an average of 100 kg. ha^{-1} and potassium fertilizer 20 kg. ha^{-1}.Potassium 20 kg was added. Acres (Asl, 2017 and Thaokar et al., 2019). Then the levels of the second factor (organic and phosphate fertilizers) were added during soil preparation.

Second work:- 0 without additives, phosphate fertilizer 100 kg. ha^{-1}, organic fertilizer 2 tons. ha^{-1}, the mixture is 100 kg. ha^{-1} and organic fertilizer 2 tons.ha^{-1}

The treatments were randomly distributed to the experimental units for each replicate. Then, the cultivar seeds were planted on May 1, 2021. The seeds were planted in lines, where the distance between one line and another was 40 cm, and the distance between one plant and another was 25 cm (Al-Prince, (1996), so the number of lines within the experimental unit was (7 lines). The number of plants in one line is 12, whereas the number of plants in the experimental unit is 84.Several seeds were placed for one crop at 2-3 cm depth. Then the experiment was narrated quietly to avoid the erosion of the seeds by the water stream.After germination, the grafting process was conducted for the non-growing pits, and then the process of thinning the plants was carried out by leaving one plant in the hole after the plant reached a height of 10 cm. As for the weeding process, it was counted whenever needed.

Harvesting was counted when the crop appeared to show signs of maturity.

10 plants were randomly taken from each experimental unit from the median lines and packaged in the form of a bundle so that the direction of the capsules was upwards and marked with indicative marks. Especially so that the direction of the capsules was upwards.After 7-10 days of drying, the packets of the crop were shaken off by turning them over the nylon pieces (waxed) to collect the yield for each packet, and then returned to drying again. This process was repeated several times until all the seeds were emptied from the capsules.

studied traits

Number of capsules per plant (capsule .plant^{-1})

It was calculated by taking ten plants from each experimental unit from the median lines, calculating the number of capsules for each plant, and then taking their average.

Number of seeds per capsule (seed. capsule^{-1})

It was calculated by randomly taking 50 capsules from each experimental unit and calculating the number of seeds for each capsule, and then taking their average

Weight of 1000 seeds (gm)

It was calculated after mixing the capsules seeds of the ten plants taken from the treatment's median lines and extracting an average of 1000 seeds.

Average total yield (kg.ha^{-1})

This trait was calculated by harvesting the experimental unit for each treatment with the addition of the yield of ten plants and then converted to kg. ha^{-1}

Statistical Analysis:

After collecting and tabulating the data, the data were statistically tested according to Duncan's polynomial test at the 5% test level. According to this test, the averages followed by the same alphabetic letters are not significantly different from each other. In contrast, the averages followed by different letters differ from each other significantly (Al-Rawi and Khalaf Allah, 1980).

3. Results and Discussion

Number of capsules per plant (capsule. plant^{-1})

The number of capsules in a plant is a genetic trait that is affected by environmental factors, especially those related to soil fertility and various field processes.

It is noticed from Table (1) that there are significant differences between the cultivars and the organic and phosphate fertilizers, and the interaction between them in the character of the number of capsules (capsule. plant^{-1}). The addition of organic and phosphate fertilizers at a level of 2 tons. ha^{-1} is organic and 100 kg.ha^{-1} phosphate fertilizer gave the highest number of

capsules, which amounted to (235.25) capsules. Plant $^{-1}$Compared to the control treatment (without addition), which gave the lowest value, which was (108.19) capsules. Plant^{-1}. The reason for this may be due to the important effects of organic and phosphate fertilizers, whether singly or mixed with each other, in improving the plant's vegetative growth, which led to an increase in the number of capsules in the plant. Abd elramam and El-Mahdi (2008), seed Oloniruha et al. (2021) .The data in the same Table showed that the local cultivar excelled in the average number of capsules, which amounted to (191.10) capsules. Plant^{-1} compared to the Malaysian black cultivar, which was characterized by the lowest number of capsules, as it reached (165.17) capsules. Plant $^{-1}$ This may be due to the genetic characteristics of the cultivar , which led to its significantly excelled in traits of the number of capsules, which is consistent with Al-Janabi, 2001) and Golestani and Pakniyat (2015).As for the interaction between the cultivars and the fertilizer additions, the interaction between the local cultivar and the addition of the mixed fertilizer (2 tons.ha-1 organic and 100 kg.ha^{-1} phosphate fertilizer) was significantly excelled in all interactions, as it amounted to 243.66 capsules. Plant $^{-1}$ Whereas, the interaction between the black Malaysian cultivar and the control treatment (without adding fertilizer) was given as an average of (96.22) capsules. plant $^{-1}$

Table (1) Effect of organic and phosphate fertilizers and cultivars on the number of capsules per plant (capsule. plant^{-1}) of sesame crop

cultivars	fertilizer levels				average cultivars
	without adding (0)	Phosphate fertilizer 100 kg .ha^{-1}	Organic fertilizer 2 tons. ha^{-1}	Organic fertilizer 2 tons. ha^{-1}+ Phosphate fertilizer 100 kg. ha-1	
Sumer	t 125.5	l 186.68	f 208.5	a 243.66	a 191.1
	6		0		0
Al-Rafidain	u 121.42	m 180.71	f 205.71	ab 240.61	b 187.11
Wadea	u 118.94	n 175.97	fg 205.10	bc 237.62	c 184.41
Had	v 111.84	no 173.29	gh 201.62	a 242.67	d 182.35
Giza-32	v 109.65	op 170.96	hi 199.47	cd 234.62	e 178.67
Turkish	w 104.39	p 168.85	ij 196.05	cd 233.75	f 175.76
Malaysian black	wx 103.98	q 163.47	jk 193.91	d 232.85	g 173.55
local	xy 100.29	q 164.40	k 191.70	de 231.87	gh 172.07
Maghali-57	yz 99.31	qr 162.80	k 190.55	de 231.31	h 170.99
Golmar mara	yz 98.45	r 159.70	l 185.25	de 230.50	i 168.47
Batem	z 96.22	s 154.96	m 181.16	e 228.36	j 165.17
fertilizer averages	d 108.19	c 169.25	b 196.27	a 235.25	

The number of seeds in the capsule (seed. capsule^{-1})

Table (2) shows significant differences between cultivars and organic and phosphate fertilizers, and the interaction between them in the number of seeds in the capsule (seed. capsule^{-1}). The addition of organic and phosphate fertilizers at a level of 2 tons. ha^{-1} is organic and 100 kg. ha^{-1} Phosphate fertilizer gave the highest number of seeds in the capsule, amounting to (75.16) seeds. capsule^{-1}Compared with the control treatment (without addition), which gave the lowest value of (49.83) seeds. Capsule^{-1} This may be due to the important effects of organic and phosphate fertilizers, whether singly or mixed with each other, in improving the plant's vegetative growth, which led to an increase in the number of seeds in the capsule. The number of capsules is in Table (1). Shehu et al. (2010, Binh et al. (2016).The

data contained in the same Table showed that the local cultivar excelled in the average number of seeds in the capsule, which amounted to (69.40) seeds. Capsule^{-1} compared to the Malaysian black cultivar, which was characterized by the lowest number of seeds in the capsule, as it reached (61.41) seeds. capsule^{-1}This may be attributed to the genetic characteristics of the cultivar, which led to its significantly excelled in the number of seeds in capsules and its significance in the number of capsules, which was positively reflected in the number of seeds in the capsule, as well as the cultivar adaptation to local environmental conditions. This agrees with Al-Mohammadi (2001) and (Al-Maliki, 2015).As for the interaction between the cultivars and the fertilizer additions, the interaction between the local variety and the addition of the mixed fertilizer (2 tons.ha^{-1} organic and 100 kg.ha^{-1} phosphate fertilizer) was significantly excelled in all interactions, as it reached (79.56) seeds. capsule^{-1}Whereas, the interaction between the Malaysian black cultivar and the control treatment (without adding fertilizer) gave an average of 42.85 seeds. capsule^{-1}

Table (2) Effect of organic and phosphate fertilizers and cultivars on the number of seeds in the capsule (seed. capsule^{-1}) of the sesame crop

cultivars	fertilizer levels				average cultivars
	without adding (0)	Phosphate fertilizer 100 kg .ha^{-1}	Organic fertilizer 2 tons. ha^{-1}	Organic fertilizer 2 tons. ha^{-1}+ Phosphate fertilizer 100 kg. ha-1	
Sumer	s58.27	k-n 67.93	fh 71.85	a 79.56	a 69.40
Al-Rafidain	t 56.32	l-o 67.42	g-i 70.91	a 78.40	b 68.26
Wadea	u 54.63	l-o 67.340	hi 70.66	b 76.13	c 67.19
Had	v 52.50	m-o 67.10	hi 70.61	b 76.11	c 66.58
Giza-32	w 50.87	n-p 66.30	ij 69.83	bc 75.31	d 65.57
Turkish	x 48.43	n-p 66.15	i-k 69.72	b-d 74.46	e 64.69
Malaysian black	xy 47.81	o-p 65.93	i-k 69.65	c-e 73.91	ef 64.33
local	y 46.37	o-p 65.89	i-l 69.12	d-f 73.46	f 63.71
Maghali - 57	y 46.65	pq 65.03	i-m 68.76	c-e 74.09	f 63.63
Golmarmara	z 43.39	q 63.65	j-m68.70	d-f 72.75	g 62.12
Batem	z 42.85	r 61.87	j-m 68.33	e-g 72.57	g 61.41
fertilizer averages	D 49.83	c 65.87	b 69.8339	a 75.1615	

The 1000 seed weight (g)

Table (3) shows significant differences between cultivars and organic and phosphate fertilizers and their interaction in the trait of the weight of 1000 seeds (gm). The addition of organic and phosphate fertilizers at a level of 2 tons. ha^{-1} is organic and 100 kg. ha^{-1} Phosphate fertilizer gave the highest number of seeds in the capsule. It reached (3.86) gm. Compared to the control treatment (without addition), which gave the lowest value of (2.21) g. The reason for this may be due to the important effects of organic and phosphate fertilizers, whether singly or mixed with each other, in improving the plant's vegetative growth, which led to an increase in the weight of 1000 seeds.The excel of this level in the weight of 1000 seeds is also due to the excel in the number of capsules. The number of seeds in the capsule (Table 1, 2) Hafiz and (2012) El-Bramawy, Adepoju, et al. (2017)The data contained in the same Table showed that the local cultivar excelled in the average weight of 1000 seeds as it reached (3.46) g compared to the Malaysian black cultivar , which was characterized by the lowest weight of 1000 seeds as it reached (3.22) g. This may be due to the genetic characteristics of the cultivar, which led to its significantly excelled in the weight of 1000 seeds and its significance in the yield of dry matter, and this is reflected positively in the weight of 1000 seeds, as well as the cultivar adaptation to the local environmental conditions. This finding agrees with Hassoon and lehmood (2018) and (Abd ellateef et al., 2021).As for the interaction between the cultivars and the fertilizer additions, the interaction between the local cultivar and the addition of the

mixed fertilizer (2 tons.ha^{-1} organic and 100 kg.ha^{-1} phosphate fertilizer) was significantly excelled in all interactions as it reached (3.98) g, while the interaction between the Malaysian black cultivar and the treatment gave control(without adding fertilizer) averaged (1.99) gm. The gel showed promising Pandey and Polshettiwar (2011).

Table (3) Effect of organic and phosphate fertilizers and cultivar on the weight of 1000 seeds (gm) of the sesame crop

cultivars	fertilizer levels				average cultivars
	without adding (0)	Phosphate fertilizer 100 kg .ha^{-1}	Organic fertilizer 2 tons. ha^{-1}	Organic fertilizer 2 tons. ha^{-1}+ Phosphate fertilizer 100 kg. ha-1	
Sumer	u 2.40	mn 3.65	h 3.81	a 3.98	a 3.46
Al-Rafidain	v 2.35	mn3.64	j 3.75	b 3.96	b 3.42
Wadea	w 2.32	no 3.63	j 3.75	c 3.94	c 3.41
Had	w 2.31	op 3.61	k 3.73	d 3.92	d 3.39
Giza-32	x 2.27	pg 3.60	l 3.70	e 3.89	e 3.36
Turkish	y 2.25	ar 3.58	l 3.69	f 3.87	f 3.34
Malaysian black	z 2.21	rs 3.57	m 3.66	g 3.83	g 3.31
local	a 2.17	rs 3.56	mn 3.65	h 3.81	h 3.29
Maghali - 57	b 2.11	s 3.56	mn3.64	i 3.78	i 3.27
Golmarmara	c 2.01	t 3.52	o 3.62	j 3.76	j 3.22
Batem	c 1.99	t 3.52	op 3.61	j 3.75	j 3.22
fertilizer averages	d 2.21	c 3.58	b 3.69	a 3.86	

Total seed yield (kg. ha^{-1})

Table (4) shows significant differences between the cultivars and the organic and phosphate fertilizers and the interaction between them in plant yield (kg.ha^{-1}) that the addition of organic and phosphate fertilizers at a level of 2 tons. ha^{-1} Organic and 100 kg. ha^{-1} phosphate fertilizer, which gave the plant the highest yield, reached (3001.71) kg. ha^{-1}Compared with the control treatment (without addition), which gave the lowest value of (1857.23) kg. ha^{-1} The reason for this may be due to the important effects of organic and phosphate fertilizers, whether singly or mixed with some, in improving the plant's vegetative growth, which led to an increase in the yield of the plant. The excel of this level in the yield of the plant is also attributed to the excel in the number of capsules, the number of seeds in the capsule, and the weight of 1000 seeds (Table 1, 2, 3), and this was reflected in the yield of the plant Pagal et al. (2017)The data contained in the same Table showed that the local cultivar excelled in the average yield of the plant, as it reached (2776.12) kg. ha^{-1} compared to the Malaysian black cultivar, which was characterized by the lowest yield of the plant, as it reached (2472.71) kg. ha^{-1}This may be due to the genetic characteristics of the cultivar, which led to its excelled in the trait of the yield of the plant and its excelled in the weight of 1000 seeds, and this reflected positively on the yield of the plant as well as the adaptation of the variety to the environmental conditions. This is consistent with Vijayakumari and Hiranmai (2021).

As for the interaction between the cultivars and the fertilizer additions, the interaction between the local cultivar and the addition of the mixed fertilizer (2 tons.ha^{-1} organic and 100 kg.ha^{-1} phosphate fertilizer) was significantly excelled in all interactions, as it amounted to (3187.83) kg. ha^{-1} While the interaction between the Malaysian black cultivar and the control treatment (without adding fertilizer) gave an average of (1744.86) kg. ha^{-1}

Table (4) Effect of organic and phosphate fertilizers and cultivars on the total seed yield (kg. ha-1) of the sesame crop

cultivars	fertilizer levels				average cultivars
	without adding (0)	Phosphate fertilizer 100 kg .ha^{-1}	Organic fertilizer 2 tons. ha^{-1}	Organic fertilizer 2 tons. ha^{-1}+ Phosphate fertilizer 100 kg. ha-1	

Sumer	z 1919.70	gh 2988.36	e 3008.60	a 3187.83	a 2776.12
Al-Rafidain	z 1915.50	gh 2983.43	ef 3001.40	b 3153.53	b 2763.46
Wadea	za 1909.70	ij 2967.76	gh 2988.20	c 3125.66	c 2747.83
Had	a 1902.80	m 2889.46	jk 2963.83	d 3112.03	d 2717.03
Giza-32	b 1886.46	n 2863.76	l 2931.03	ef 3001.26	e 2670.63
Turkish	c 1862.30	p 2825.86	n 2855.46	fg 2990.93	f 2633.64
Malaysian black	d 1842.40	q 2798.16	y 2779.66	hi 2976.90	g 2599.28
local	de 1833.03	s 2767.83	s 2756.56	k 2955..16	h 2578.15
Maghali-57	e 1824.03	u 2729.10	t 2742.66	o2841.90	i 2534.42
Golmarmara	f 1788.76	x 2656.33	v 2691.93	op 2835.46	j 2493.12
Batem	g 1744.86	y 2643.13	w 2672.26	op 2830.60	k 2472.71
fertilizer averages	d 1857.23	c 2828.47	b 2853.78	a 3001.02	

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