



ORIGINAL ARTICLE

## THE EFFECT OF SPRAYING WITH LIQUID UNIVERSITY FERTILIZER ON SOME GROWTH AND YIELD CHARACTERISTICS OF THREE VARIETIES OF SESAMUM

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**Abstract:** A field experiment was carried out to study the effect of spraying with Smad Al-jamah Al-sayl (liquid university fertilizer) on some growth and yield characteristics of three varieties of Sesamum used Randomized complete Block Design (R.C.B.D) by Global experience system with three replicates. The experiment included two factors, the first factor, the concentrations of spraying Smad Al-jamah Al-sayl (liquid university fertilizer) (5.0 and 10) ml. L<sup>-1</sup> and its symbols are (T1, T2, T3), while the second factor includes three categories (wdaa, Ishtar and Al-Mahali) and its symbols are (V1, V2, V3). The results showed that the wdaa variety (V1) was superior in plant height, with a weight of 1000 grains. It reached (159.46 cm and 3.93 g), while Al-Mahali variety (V3) outperformed some of the studied traits, including the number of branches.Plant<sup>-1</sup> after the first can.cm, the number of can.plant<sup>-1</sup>, the number of seeds.can<sup>-1</sup> gave the highest average (5.12 branch.Plant<sup>-1</sup>, 35.38 cm, 128.55 and 51.7 seed. can<sup>-1</sup>). The concentration exceeded 10 ml. L<sup>-1</sup> (T3) in all studied traits plant height. cm, number of branch. Plant<sup>-1</sup>, after the first can.cm, number of cans.Plant<sup>-1</sup>, the number of seeds.can and weighing 1000 grain (158.13 cm 4.37 branch.plant<sup>-1</sup> 34.87 cm, 128.55 can.plant<sup>-1</sup> 51.7 seed.Plant<sup>-1</sup> 3.93 g). The results of the double overlap between the cultivars and the concentrations (V, T) showed a significant effect in most of the traits, as the combination V3 and T3 outperformed the number of branches. Plant<sup>-1</sup>, number of can.plant<sup>-1</sup>, after the first can.cm and number of seeds.can<sup>-1</sup> (5.77 branch.plant<sup>-1</sup>, 133.83 can.Plant<sup>-1</sup>, 38.53 cm and 53.97 seed.can) and the combination V1, T3 gave the highest average in the trait. The weight of 1000 grain.g reached (4.13 g), while the combination V2, T3 gave the highest mean in the characteristic of plant height, cm was (161.50 cm).

**Key words:** Sesamum, Varieties, Foliar spray, Yield ingredients.

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### 1. Introduction

*Sesamum indicum* L. is one of the most important oil crops in the world and is cultivated for the purpose of obtaining its seeds that contain 60-50% oil, 20-18 protein, 18-16 carbohydrates and minerals such as calcium, phosphorous and vitamins such as vitamin E [Dasharath *et al.* (2007)]. The crop is mainly grown to obtain its seeds that are used in the production of some foodstuffs, being rich in oil, protein, calcium and phosphorous and Sesamum oil has great health benefits for humans. Sesamum oil is one of the finest oils, as it is distinguished by its light yellow color and contains a

high percentage of non-fatty acids. Saturated and its stability during storage without any change in color or taste due to its high content of antioxidant compounds Sisamin. As many studies have shown that Sesamum oil helps prevent high blood pressure and because it contains a high percentage of unsaturated fatty acids, it is very beneficial for heart health and blood vessel expansion and Sesamum oil in general serves the function of protecting the liver from damage and reducing the possibility of emergence. These are complete nutrients, plant and nutrients that have been completely ingested with nutrients that have been

modified by the nutrients modified by the roots. The leaves in the first class and other plant parts in the second degree are usually faster than through the special roots when the soil is suitable for the absorption of elements such as the pH or the contrast between the nutrients. For example, in Iraq, the local variety was introduced, for example, in the breeding and improvement program to generate mutations and the varieties (Rafidin, Ishtar, Babel) were obtained by means of Gamma rays [Annual Bulletin of Registered and Approved Varieties in Iraq (1992)]. It surpasses the original in many quantitative and qualitative characteristics and has been cultivated since 1993 and this is confirmed by Narimani *et al.* (2004), while the remaining percentage comes from good soil and crop management. Iraqi soli tends to be alkaline, so the readiness of all micronutrients (except for molybdenum) is reduced due to the nature of the reaction resulting from the presence of calcium carbonate and the conversion of these elements into low-soluble compounds that are not useful to the plant.

The research aims to know the effect of foliar feeding with liquid university fertilizer on growth, yield and components of Sesamum crop and to determine the best variety.

## 2. Materials and Methods

A field experiment was carried out during the 2019-2018 agricultural season in one of the farmers' fields located in the Abi Gharaq area 10 km west of Hilla, Babylon Governorate, to study the effect of spraying with Smad Al-jamah Al-sayl (liquid university fertilizer) on some growth characteristics and yield of three varieties of Sesamum. Randomized complete block design (R.C.B.D) was used with a global experimental system with three replicates [Al-Rawi and Khalaf Allah (2000)]. The experiment included two factors, the first factor, the concentrations of spraying Smad Al-jamah Al-sayl (liquid university fertilizer) (5.0 and 10) ml.L<sup>-1</sup> and its symbols are (T1, T2, T3), while the second factor included three varieties: (wdaa, Ishtar and Al-Mahali) and are denoted by the symbols (V1, V2, V3). The experiment land was plowed by two perpendicular plows, then it was graded and leveled in order to prepare a suitable place for the seed. The experiment field was divided into plots and the area of the secondary plot was 10.8 m<sup>2</sup> (3 m×3.6 m). One plot included 4 furrows, the distance between a furrow and another 90 cm and between hole and another 25 cm. In each hole there are 3 seeds, at a depth of 2-3 cm. The planting was

**Table 1:** Some physical and chemical characteristics of field soil.

Character	The value
<b>Soil components</b>	
Clay (g.Kg <sup>-1</sup> )	310
Silt (g.Kg <sup>-1</sup> )	570
Sand (g.Kg <sup>-1</sup> )	120
Soil texture	silt clay loam
Degree of soil reaction (pH)	7.72
Degree of electrical conductivity (Ec)	3.80
Nitrogen (mg.Kg <sup>-1</sup> )	82.5
Phosphorous (mg.Kg <sup>-1</sup> )	26.00
Potassium exchange (mg.Kg <sup>-1</sup> )	240.00

carried out on 5/11/2018, then the experiment was quietly irrigation to avoid the erosion of the seeds and after the germination, the patching process was carried out for the absent hole. After that, the individual planting process was carried out twice, in the first one leaving two plants and in the second one leave one plant in the hole. As for the cultivation, it was carried out three times during the growing season. Add phosphate fertilizer in the form of triple calcium superphosphate when preparing the ground at a rate of 80 kg P.ha<sup>-1</sup> and nitrogen fertilizer in the form of urea at a rate of 80 kg N.ha<sup>-1</sup> in two equal batches, the first when planting and the second 30 days after adding the first batch when the plant reaches height of 25 cm. The solution of potassium fertilizer was sprayed on the plant until complete wetness before sunset using a 15 liter hand sprayer and 20 Tween was added as a solution published with a concentration of 0.01%. Harvesting was conducted after 125 days, that is, after 90 days had passed since 75% flowering was determined [Al-Jubouri (1997)].

Ten plants were randomly selected from each plate and from the guarded midlines at harvest for the purpose of calculating plant height (cm), number of branches per plant, after the first plant can.cm, number of plant fruiting cans, number of seeds in cans and weight of 1000 seeds (g). After collecting and classifying the data for the studied characteristics, it was analyzed statistically according to the design used, adopting the Genstat program and the arithmetic averages of the parameters were compared using the lowest significant

**Table 2:** Components of liquid nutrient fertilizer.

The component	Percentage
Nitrogen	7%
Phosphorous	5%
Potassium	7%
Magnesium	0.5%
Potassium humate + micro elements	0.5%

difference test at the level of 0.05. And Smad Al-jamah Al-sayl (Liquid University Fertilizer) locally produced from the Agricultural Advisory Office of the College of Agriculture, University of Basra, Iraq.

### 3. Results and Discussion

#### 3.1 Plant height (cm)

The results of Table 3 indicate the presence of significant differences between the varieties and the concentrations of spraying Smad Al-jamah Al-sayl (liquid university fertilizer) and the overlap between them in the characteristic of plant height. AL-Wadaa variety (V1) outperformed the two cultivars and gave an average of 159.46 cm, while Al-Mahali variety (V3) gave the lowest average of 154.26 cm. This is due to the genetic difference between the varieties. These results agreed with the findings of Narimani *et al.* (2004). It is noted from Table 3 a significant increase in plant height with an increase in the concentration of foliar fertilizer Smad Al-jamah Al-sayl (liquid university fertilizer), as the concentration T3 gave the highest average of 158.13 cm, while the control treatment T1 gave the lowest average of 154.96 cm. The reason is attributed to the role of the components of the fertilizer used, including the components of Iron and Zinc fertilizer, their role in the activity of meristematic cells, their division and the increase in the length of the internodes.

This result is consistent with the findings of Singravel *et al.* (2002) that there is a significant effect of spraying Iron and Zinc. Single or combined in height of Sesamum plant. The bilateral interference also had a significant effect (V, T) as the combination V2 and T3 outperformed the rest of the combinations by giving it the highest average of 161.50 cm, while the combination V2 and T1 gave the lowest average of 152.43 cm.

The results shown in Table 4 showed that there

**Table 3:** The effect of varieties, foliar fertilizer concentrations and the interaction between them on plant height characteristics (cm).

Varieties	Concentrations of Smad Al-jamah Al-sayl (liquid university fertilizer) mL.L <sup>-1</sup>			Average V
	T1	T2	T3	
V1	158.20	159.83	160.37	159.46
V2	152.43	156.57	161.50	156.83
V3	154.33	155.97	152.47	154.26
Average T	154.96	157.46	158.13	470.55
<b>L.S.D. 0.05</b>		<b>T = 1.45</b>	<b>V = 1.45</b>	<b>V×T = 2.51</b>
Number of branches (branch.Plant <sup>1</sup> )				

**Table 4:** The effect of varieties and concentrations of foliar fertilizer and the overlap between them on the variety of the number (branches. Plant<sup>-1</sup>).

Varieties	Concentrations of Smad Al-jamah Al-sayl (liquid university fertilizer) mL.L <sup>-1</sup>			Average V
	T1	T2	T3	
V1	3.13	3.27	3.40	3.26
V2	3.83	3.93	4.00	3.92
V3	4.77	4.87	5.73	5.12
Average T	3.91	4.02	4.37	12.3
<b>L.S.D. 0.05</b>		<b>T = 0.22</b>	<b>V = 0.22</b>	<b>V×T = 0.38</b>
After the first fruit can (cm)				

were significant differences between the varieties and concentrations of foliar application and the overlap between them in the characteristic of the number of branches.plant<sup>-1</sup>. The varieties differed among themselves in this characteristic and Al-Mahali variety gave the highest rate of 5.12 branches.Plant<sup>-1</sup>. While the variety AL-Wadaa gave the lowest number of branches in the plant was 3.26. This increase is due to the genetic nature of the two varieties, as the Al-Mahali variety has a greater leaf area, which increases the efficiency of light interception and converting it into dry matter and thus the positive effect on increasing growth and then the number of branches in the plant. This result agreed with both Sarkar and Anita (2005) who demonstrated the existence of genetic differences between varieties in this trait. It is also noticed from the data of the same table an increase in the number of branches with an increase in the concentration of foliar fertilizer used, as the concentration T3 gave the highest average of 4.37 branch.plant<sup>-1</sup> while the control treatment T1 gave the lowest average of 3.91 branch.Plant<sup>-1</sup>. This may be due to the positive role of these nutrients in the metabolic processes that take place within the plant and their importance in the formation and division of meristematic cells and

**Table 5:** The effect of varieties and concentrations of foliar fertilizer and the overlap between them on a characteristic after the first fruit can (cm).

Varieties	Concentrations of Smad Al-jamah Al-sayl (liquid university fertilizer) mL.L <sup>-1</sup>			Average V
	T1	T2	T3	
V1	29.80	30.73	32.07	30.86
V2	30.87	32.67	34.03	32.52
V3	33.13	34.50	38.53	35.38
Average T	31.26	32.63	34.87	98.76
<b>L.S.D. 0.05</b>		<b>T = 0.87</b>	<b>V = 0.87</b>	<b>V×T = 1.51</b>
Number of cans.plant <sup>1</sup>				

stimulating buds to develop and form branches [Singravel *et al.* (2002)].

The results of the bilateral interaction between varieties and concentrations (V, T) showed a significant effect, as the combination V3, T3 gave the highest rate of 5.73 branch.Plant<sup>-1</sup> while the combination, V1 and T1, gave the lowest mean of 3.13 branch.Plant<sup>-1</sup>.

The proximity of the fruit capsules to the surface of the ground is an important and desirable characteristic because it indicates early flowering and can formation. The results of Table 5 show that there was a significant effect of the variety and variety and Smad Al-jamah Al-sayl (the liquid university fertilizer) in this characteristic. The varieties differed significantly in this characteristic and it was found that Al-Mahali variety gave a higher dimension to the first fruit can from the surface of the earth, which reached 35.38 cm, while the Wadaa variety recorded less the first fruit capsules than the soil surface is 30.86 cm. The differences between the varieties are due to the genetic nature of the variety in proximity and distance to the can from the ground. These results are consistent with Salem (2007). The results of Table 5 confirm that the lowest dimension of the first fruit can appear at the concentration T1 reached 31.26 cm, while Panama was higher after it was at the concentration T3 reached 34.87 cm. The reason for this may be attributed to the stimulation and availability of growth regulators, such as auxin and cytokinine, each of which has a role in cell division and the rapid growth of meristematic tissue. The bilateral interference had a significant effect, as the combination V3, T3 gave the highest mean rate of 38.53 cm, while the combination V1, T1 gave the lowest average of 29.80 cm.

The varieties differed among themselves in the average number of fruit can.plant<sup>-1</sup>. The data in Table 6 indicated the superiority of Al-Mahali variety (V3), which gave the highest rate of 128.55 can.plant<sup>-1</sup>, while the variety Wadaa (V1) gave the lowest average of 22.13 can.plant<sup>-1</sup>. The reason for the difference between the varieties is due to the nature and viability of these varieties to the production of genetically enriched boxes, with reference to the role of fertilizer components used, including the potassium element, in increasing the vital role of enzymes and biological activities within the plant that played in creating compared to non-fertilization. The results agreed with the findings of Kalaiselvan *et al.* (2002). Table 6 shows

**Table 6:** The effect of varieties and concentrations of foliar fertilizer and the overlap between them on the characteristic (number of cans. Plant<sup>-1</sup>).

Varieties	Concentrations of Smad Al-jamah Al-sayl (liquid university fertilizer) mL.L <sup>-1</sup>			Average V
	T1	T2	T3	
V1	121.60	121.77	123.03	122.13
V2	123.67	124.33	124.80	124.26
V3	124.37	127.47	133.83	128.55
Average T	123.21	124.52	127.22	374.94
<b>L.S.D. 0.05</b>		<b>T = 1.38</b>	<b>V = 1.38</b>	<b>V×T = 2.39</b>
Number of seeds. For the can				

that there is an increase in the number of cans when increasing the concentration, as the concentration T3 gave the highest average of 127.22 can.plant<sup>-1</sup> while the control treatment gave the lowest average of 123.21 can.Plant<sup>-1</sup>. The increase in plant fruit cans may be explained by the increase in the number of branches of the plant, Table 4 as well as to the role of foliar nutrient with Smad Al-jamah Al-sayl ( liquid university fertilizer), including the elements of zinc and iron and their role in the activity of reproductive cells and since the Sesamum plant is self-pollinating, adding these nutrients will lead to the activity of the pollen tube and from Then the number of fertile flowers increased and as a result, more fruit cans were formed. The results of the bilateral interaction between V and T showed a significant effect on this trait, as the combination V3, T3 gave the highest average of 133.83 can.plant<sup>-1</sup> Vegetable while the combination, V1 and T1, gave the lowest average of 121.60 can.Plant<sup>-1</sup>.

The results of Table 7 indicate the superiority of Al-Mahali variety (V3), with the highest rate of 51.7 seeds.can<sup>-1</sup> While the variety gave Wadaa (V1) the lowest rate was 47.85 seeds.can<sup>-1</sup>. The number of seeds in the capsules varies according to the varieties,

**Table 7:** The effect of varieties and foliar fertilizer concentrations and the interaction between them on the characteristics of the number of seeds.

Varieties	Concentrations of Smad Al-jamah Al-sayl (liquid university fertilizer) mL.L <sup>-1</sup>			Average V
	T1	T2	T3	
V1	46.77	47.87	48.93	47.85
V2	47.67	48.70	50.07	48.81
V3	48.50	49.63	53.97	51.7
Average T	47.64	48.73	50.99	147.36
<b>L.S.D. 0.05</b>		<b>T = 0.31</b>	<b>V = 0.31</b>	<b>V×T = 0.5</b>
Weight of 1000 grain.g				

as the ratio of the size and length of the fruit is related to the number of seeds and fertility advantage if we know that cross pollination by insects can increase the number of seeds in the fruit. The increase in the concentrations of spraying the used fertilizer (liquid university fertilizer) led to an increase in the number of seeds per fruiting cans, as the T3 concentration gave the highest average of 50.99 seeds.can<sup>-1</sup> while the control treatment T1 gave the lowest average of one seed.can<sup>-1</sup>. The characteristic of the number of seeds in the fruiting can is one of the most important components of the yield and represents the number of fertilized eggs that succeeded in producing the seeds. The reason for the increase is due to the role of the components of the fertilizer used, including the potassium element and its effect on increasing the activity of the biological processes of plants, which helps in increasing the number of fertile florets turned into seeds. These results agreed with the findings of Al-Naqib (2003) reached similar results and found that increased levels of potassium fertilization led to an increase in the number of seeds per can. The interaction between V and T also had a significant effect on this characteristic, as the combination V3, T3 gave the highest rate of 53.97 seeds.can<sup>-1</sup>, while the combination V1, T1 gave the lowest rate of 46.77 seeds.can<sup>-1</sup>.

The results of Table 8 indicate the superiority of the variety V1 and it gave the highest mean mean for the trait of 3.93 g, while the variety V3 gave the lowest average for this trait, which was 3.1 gm. It may be attributed to the nature of the genetic varieties that were reflected in their response in showing superiority compared to the local variety, in addition to the small number of fruiting cans for the extracted varieties, which was reflected in the increase in seed weight.

The foliar fertilizer spray concentrations (liquid university fertilizer) showed that there was no

**Table 8:** The effect of varieties and foliar fertilizer concentrations and the interaction between them on the weight of 1000 grain.g.

Varieties	Concentrations of Smad Al-jamah Al-sayl (liquid university fertilizer) ml.L <sup>-1</sup>			Average V
	T1	T2	T3	
V1	4.00	3.67	4.13	3.93
V2	3.47	3.60	3.00	3.35
V3	2.70	3.20	3.40	3.1
Average T	3.39	3.49	3.51	10.38
<b>L.S.D. 0.05</b>		<b>T = 0.32</b>	<b>V = N.S</b>	<b>V×T = 0.56</b>

significant effect in this feature. The results of Table 8 showed that there was a significant effect of the bilateral interaction between the varieties and the concentrations (V, T), as the combination V1 and T3 outperformed the rest of the combinations by giving it the highest average of 4.13 g.

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