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Response of some Sesame Cultivars (*Sesamum indicum* L.) to Bio and Organic Fertilizers under Toshka Conditions

Hassaan, M. A. and A. M. Bughdady
Agron. Unit. Plant Production Dep; Desert Research Center, Matariya, Cairo, Egypt.

ABSTRACT

In order to study the effect of three Sesame cv. (Sohag1, Shandaweel 3 and Giza 32), two Bio-fertilizer inoculation (Azotobacter and biogein) and three rates of organic fertilizer (5 m^3, 10 m^3 and 20 m^3) compared with the control on seed yield and its components as well as Chlorophyll content growing during 2015 and 2016 seasons, so, two field experiments were carried out in the Desert Research Center (D.R.C.) Experiment Station at Toshka (Abu Simbel) Aswan Governorate, South Egypt. Obtained results showed that. Shandaweel 3 cultivar produced the maximum number of capsules/plant, number of seed/capsules and seed yield than all other cultivars. Increasing application of organic fertilizers from 5 up to 20 m^3 caused significant increament in chlorophyll content, plant height, number of seed/capsules, number of capsules/plant, 1000- seed weight; and seed yield compared with other organic fertilizer treatments. Application of Azotobacter as bio-fertilizer caused an increament concerning all characters studied. The interaction between cultivars and organic manures treatments showed a significant effect on chlorophyll content, plant height; number of capsules/plant and seed yield. Shandaweel 3 cultivar applied with 20 m^3 organic manures proved to have the best results. Moreover, all studied traits were significantly affected by the interaction between sesame cultivars and bio- fertilizer. Concerning, the interaction between organic manures and bio-fertilizers treatments, maximum seed yield were 524 and 478 (kg/fed.) during the two seasons respectively, recorded when organic manures application of 20 m^3 along with Azotobacter agent were applied. It could be concluded that sesame cultivar Shandaweel 3 cultivar fertilized with 20 m^3 organic fertilizers and Azotobacter as bio- fertilizers is recommended under semi-arid conditions of the Toshka, South Egypt

Keywords: Sesame cultivars, Bio fertilizer, Organic manure, Seed yield.

INTRODUCTION

Sesame (*Sesamum indicum* L.) is an important oilseed crop in the tropics and subtropics, however most of its cultivated area are grown in developing countries where usually grown by small holders. Sesame crop has important advantages, it could be grown under fairly high temperature, low water supply and low levels of other inputs (Ashri *et al*., 1989). Toshka region is one of the cultivated areas at south valley of Egypt. This area differs in its soil particle distribution, chemical analyses, its fertility as well as climatic conditions when compared with Delta and Nile valley areas. In addition, there is a dire need for increasing the production of oil plant due to over population, nowadays, a wide gap between productions of oils and its need reached 95%.

Many researchers studied the influence of cultivars, bio and organic fertilizer on sesame seed yield and its attributes as well as Chlorophyll content. El-Samanody *et al* (2010) they reported that sesame cv. Shandaweel 3 (V3) gave increament in seed yield during 2005 season by 34.90, 7.90 and 10.30 % as compared with Giza 32, Toshky 1 and Sohag1 respectively. However, during 2006 the respective increament in seed yield reached about 54.30, 5.60 and 5.90 %. Meanwhile, Abd El-Lattief (2015) found that Giza 32 cv. overcame significantly Toushki 3 cv. in plant height, fruiting zone length, number of fruiting branches/plant, number of capsules/plant, 1000-seed weight, seed weight/plant-1 and seed yield. Also, Hamza and Abd El-Salam, (2015) found that the Shandauil-3 cv. surpassed significantly Giza-32 and Sohag-1 cultivars in number of fruiting nodes/plant, number of capsules/plant, capsule length, number of seeds/ capsule, 1000-seed weight, seed weight/plant, seed and oil yields/ha, as well as, harvest index in both seasons.

Bio-fertilizers are important components of integrated nutrient management. These potential biological fertilizers would play key role in productivity and sustainability of soil and also protect the environment as eco-friendly and reduce input cost effective for the farmers. Kushwaha (2011) found that maximum organic carbon and available potassium applied with biofertilizers surpassed productivity viz. Phosphorous Solubilizing Bacteria (PSB) and Azotobacter respectively. Vessey (2003) defined bio - fertilizer as a substance which contains living microorganisms which applied to seeds , plants surfaces , or soil. Such at colonizes the rhizosphere promotes growth by increasing the supply or availability of primary nutrients to the host plant. In this respect, Ghosh and Mohiuddin (2000) found that bio-fertilizers induced significant increase in sesame plant height and yield components such as number of capsules/plant, number of seeds/capsule, 1000-seed weight and seed yield/plant when compared with the control. While, Ghosh (2000) reported that the use of biofertilizer did not influence significantly growth, yield attributes and seed yield of sesame over control.

Organic manures is a key fertilizer in organic and sustainable soil management. It contains many of the elements that are needed for plant growth and development. Apart from increasing soil fertility, manure serve as soil amendment by adding organic matter to the soil. Organic manure has also been reported to greatly improve water holding capacity, soil aeration, soil structure, nutrient retention and microbial activity. On the other hand, the production of chemical fertilizers is a costly process. In addition, most of the energy for fertilizers production is provided by the consumption of non-renewable fossil fuels. Duhoon *et al* (2009) reported that organics play a major role in maintaining soil health due to buildup of soil organic matter, beneficial microbes and enzymes, besides improving soil physical and chemical properties. Suddhiyam *et al* (2009) reported that use three types for organic fertilizer (Sesbania sp. , EM compost and cow manure) improved pH from (5.7 to 6.0-6.5), organic matter from (1.39 to 2.24-2.55%), P, K, other minor elements and microbial biomass carbon. Therefore, this study aimed to improve productivity of sesame plants by bio- and organic fertilizer application and to reduce environmental pollution, minimize production costs and improving biological, physical and chemical properties of these poor sandy soils.

MATERIALS AND METHODS

Two field experiments were carried out at Experimental Farm Desert Research Center (D.R.C) well No. 85 during 2015 and 2016 seasons. Toshka area which located at 22 km north-west of Abu Simbel City, belong to Aswan Governorate, Western Desert (22°32′16″N, 31°30′40″E). The research field was located in a semi-arid region, where the summer is hot and dry. The meteorological data are recorded from sowing date to the harvest of each season (Table 1). The physical and chemical properties of the soil determined prior to sowing are presented in Table 2; the chemical analysis of the irrigation water is given in Table 3 a and b.

Table 1. Meteorological data of the two growing seasons (2015 and 2016) at Abu Simbel location 22°32′16″N, 31°30′40″E.

Months	2015				2016			
	Temperature		Relative Humidity (%)		Temperature		Relative Humidity (%)	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
April	40.0	10.4	58.6	2.6	44.9	13.2	41.4	9.7
May	45.6	16.7	74.3	1.9	47.1	17.0	40.0	8.1
June	45.5	19.2	73.2	4.0	46.9	20.0	37.3	9.2
July	44.3	21.0	39.2	9.2	45.5	21.1	40.2	8.9
August	47.5	24.5	37.0	10.1	45.3	21.0	41.1	10.3
September	44.1	22.1	38.0	11.2	43.4	19.5	42.6	10.8
October	42.7	14.7	48.2	14.3	41.2	16.1	49.2	16.2

Table 2. Average of some Physical and mechanical properties of a representative soil sample from experimental site for both seasons.

Soil depth (Cm)	Coarse sand (%)	fine sand (%)	Silt (%)	Clay (%)	Textural class
0-30	78.94	18.09	2.95	0.02	Sand
30-60	77.23	19.97	2.77	0.03	Sand

Chemical properties

Soil depth (Cm)	pH	EC (us/cm)	Soluble cations (mg/L)				Soluble anions (mg/L)				O.M. (%)	N ppm
			Ca++	Mg++	Na+	K+	Co_3^-	HCO_3^-	Cl^-	SO_4^-		
0-30	7.3	1638	120.7	14.1	200	24	0.00	73.2	199.6	460	0.09	59.5
30-60	7.6	1270	101.9	11.1	140	18	0.00	61.0	185.8	300	0.05	61.7

Table 3a. chemical analysis of irrigation water

well No	PH	EC (µS/cm)	TDS mg/l		Ca	Mg	Na	K	Cations	CO_3	HCO_3	SO_4	Cl	Anions
85	6.9	768	447.25	Ppm	81.32	11.29	50.00	2.00		3.00	111.15	151.25	87.98	
				Epm	4.06	0.93	2.18	0.05	7.21	0.10	1.82	3.15	2.48	7.55
				%	56.26	12.87	30.16	0.71	100.00	1.32	24.12	41.70	32.85	100.00

Table 3b. Micro-elements of irrigation water

well No	Ag	Al	B	Ba	Cd	Co	Cr	Cu	Fe	Mn	Mo	Ni	Pb	Si	Sr	V	Zn
85	0	0	0	0.05	0	0	0.15	0.02	0.25	0.002	0	0.014	0.003	4	0.35	0	0.008

The three sesame cultivars of Sohag-1, Shandaweel-3 and Giza-32 were obtained from Oil Crop Research Section, Field Crop Research Institute, Agriculture Research Center at Giza. Seeds were the sown on 10th and 8th April during 20015 and 2016 seasons, respectively.

The experiment was laid out in a split- split plot design with three replications. Sesame cultivars were arranged in the main plots. The sub plots included the organic fertilizer, and the Bio- fertilizer treatments assigned in the sub-sub plots. The normal agricultural practices for growing sesame were applied as recommended in the region. Calcium super phosphate (15.5% P_2O_5) and potassium sulphate (48% K_2O) at the rates of 32 kg P_2O_5/fed and 24 kg K_2O/fed, respectively and were added before planting. Nitrogen fertilizer at the rate of 45 kg N/fed as ammonium nitrate 33.5 % N was applied as one dose.

(A) Sesame cultivars:
(1) Sohag- 1 (V_1) (2) Shandaweel- 3 (V_2)
(3) Giza-32 (V_3)

(B) Organic fertilizer:
(1) Without organic. (2) 5 m^3/fed. (3) 10 m^3/fed.
(4) 20 m^3/fed organic manures of animal.

(C) Bio- fertilizer treatments:
(1) Without bio-fertilizer (control)
(2) Azotobacter (nitrogen fixing bacteria)
(3) Biogein (nitrogen fixing bacteria)

Azotobacter and Biogein were obtained from General Organization for Agriculture Equalization Fund (GOAEF), Ministry of Agriculture, Egypt. The used bio-fertilizers added as inoculated the seeds and sowing.

Chlorophyll content (Chl.) was determined quantitatively in the most upper leaves developed on the main stem at the age of 75 days from sowing date and measured using a self-calibrating SPAD chlorophyll meter (Model 502, Spectrum Technologies, Plainfield, IL). At maturity, ten random plants from each plot were harvested

where the fallowing characteristics were determined; plant height (cm), Number of capsules/plant, Number of seed/capsules, weight of 1000-Seed (g). Moreover, seed yields (kg/fad) for each replicate were determined.

Statistical analysis:

All the obtained data were subjected in a split- split plot design in randomized complete blocks design with three replications to analysis of variance according to the method described by Gomez and Gomez (1985). The least significant difference (LSD) at 5% level of significance was used.

RESULTS AND DISCUSSION

A- Effect of cultivar on chlorophyll content, seed yield and yield components:

Data presented in Table (4,5 and 6) showed differences between the three cultivars of Sohag 1, Shandawel 3 and Giza 32 on chlorophyll content, plant height (cm), number of capsules/plant, number of seed/capsules, weight of 1000-seed (g).and seed yields during the two studied seasons. Where the result illustrate a significant differences among the three cultivars in all the above mentioned characters While, no significant differences between Sohag 1 and Shandawel 3 cultivar for 1000-seed weight during 1st and 2nd seasons. Meanwhile, Shandawel 3 surpassed in number of capsules/plant and number of seed/capsules. Also, the Shandawel 3 cultivar was superior in seed yield during two seasons compared with Giza32 and Sohag1 respectively. However, during two seasons respective increament in seed yield reached about 17.8, 15.45 and 12.91, 8.67 % for Giza32 and Sohag1 cultivars during both seasons respectively. While Sohag-1 cultivar surpassed in plant height during both seasons. But Giza 32 variety surpassed in Chlorophyll content. Generally, this superiority may be due to the increase in number of capsules/plant, number of seed/ capsules. Shandawel 3 cultivar may produce more sufficient photosynthates located in economic seed yield. El-Samanody *et al* (2010) who found that the Shandaweel 3 was superior in seed yield during two seasons compared with Giza32, Toshky1 and Sohag1 respectively. However, during 1st and 2nd seasons the increament in seed yield reached about 54.3, 5.6 and 5.9 % for same cultivars respectively. These results agreed with those obtained by Subrahmaniyan *et al.*(1999), El Karamany *et al*.,(2000), El Naim *et al.*,(2010), Abd El-Lattief (2015) and Fakhry (2016).

B- Effect of organic fertilizer on chlorophyll content, seed yield and yield components:

Application of organic fertilizer significantly increased on chlorophyll content plant height (cm), number of capsules/ plant, number of seed/capsules, weight of 1000-seed (g) and seeds yield as a respond to increasing organic level from zero to m^3/fed. Application of 20 m^3/fed organic fertilizer produced maximum chlorophyll content, seed yield and yield components of sesame plants (Tables 4, 5 and 6) as compared with the other organic fertilizer during 2015 and 2016 seasons. The increasing of organic manures level from 0 to 20 m3/fed increased seeds yield kg/fed by 25.59 and 24.08 % in the first and second seasons, respectively. Contrary, the lowest recorded values were achieved with the control i.e. no organic fertilizers. Maximum seed yield and yield components were recorded when maximum amount from application of organic fertilizers was applied a consequence of greater amount of nutrients uptake by sesame plants. Application of organic fertilizers increased the supply of easily assimilated macro as well as micronutrients to plant, besides mobilizing unavailable nutrients into available form. Such nutrient is needed mostly by young, fast growing tissue and performs a number of functions related to growth, development, photosynthesis and utilization of carbohydrates. These all processes favorably improved with application of organic manure. Therefore improvement in growth characters that favorable modified the yield attributes and consequently showed significant positive correction with seed yield. Organic manures can provide the essential plant nutrients and enhance crop productivity, but also leave a beneficial residual effect on succeeding crops, whereas. Nurhayati *et al* (2016) reported that a positive effect of manure application on growth parameters, yield components and oil content when cow manure at rate of 30 ton/ha was applied. The role of manure was seen in physical improvement of the soil, such as soil aggregation and permeability towards air circulation, granulation, fixing power hold nutrients and water, plant roots easily penetrate deeper and wider so that the plants more robustly able to absorb nutrients and water, while in chemical function, it can increase soil CEC and the absorption of some nutrients, whereas in biological function, manure as organic matter is a major source of energy for activity of soil microorganisms, which serves in binding some plant nutrients and is beneficial to plant growth. These results are substantiated with the studies conducted by Haruna and Abimiku (2012)., Ahmed *et al* (2015), Anguria *et al.* (2017)., and Takar *et al.* (2017).

C- Effect of bio-fertilizer on chlorophyll content, seed yield and yield components:

Concerning, the response of seeds yield and yield attributes of sesame plants to different biofetilization treatments showed a significant difference during both seasons. Addition of Azotobacter recorded maximum chlorophyll content, plant height (cm), number of capsules/plant, number of seed/capsules, weight of 1000-seed (g).and seeds yield (Kg/fed) as presented in tables 4, 5 and 6. Seed yield (Kg/fed) was increased by about 9.72 and 5.88 % for Azotobacter as bio-fertilizer compared to control (no bio-fertilizer) during 1st and 2nd seasons, respectively. Contrary, the lowest recorded values of the previous characters were achieved when no bio-fertilizers (control) was used during first and second seasons. The results of (Ghosh and Mohiuddin 2000) revealed that use of biofertilizer had a significant improvement on sesame plant height and number of branches/plant. Bio-fertilizer increased yield components such as number of capsules/plant, number of seeds/capsule, 1000–seed weight and seed yield when compared with control. While, (Ghosh 2000) reported that the use of biofertilizer did not influence significantly growth, yield attributes and seed yield of sesame. Asl (2017) found that a significant effect of nitrogen and phosphate as biofertilizer, on plant height, No. of branches/plant, No. of capsules/plant, seed in capsules, oil percent, seed yield and harvest index. Similar

results were reported by Boghdady *et al.* (2012),Babajide and Fagbola (2014), and Gayatri *et al.* (2017).

D-1 Effect of the interaction between cultivar and organic fertilizer on chlorophyll content, seed yield and yield components:

The results presented in tables (5, 6 and 7), showed the interaction between sesame cultivars and organic fertilizers and significantly affected chlorophyll content, plant height (cm), number capsules/plant, and seeds yield during both seasons. On the other hand, the effect of this interaction was not significant on 1000-seed weight during the two studied seasons. Interaction effect among sesame cultivars and organic fertilizers on number of seeds/capsule was significant during the second season only. The interaction among sesame cultivars and organic manures maximized number capsules/plant, number of seed/ capsules and seed yield were obtained from plants attributed to Shandaweel-3 cultivar and received 20 m^3 of organic fertilizers during two seasons. Maximum chlorophyll content, plant height and 1000-seed weight were obtained for Sohag 1 cultivar received to 20 m^3/fed organic manures. Giza 32 cv. which received no organic fertilizers application recorded the minimum values during both season. These results are in harmony with the results obtained by Aghili *et al* (2015).

D-2 Effect of the interaction between cultivar and bio-fertilizer on chlorophyll content, seed yield and yield components:

Regarding to the effect of interaction between cultivars and bio-fertilizers the results presented in tables 5, 6 and 7 affected revealed that all above traits of seed yield and its components were significantly by the interaction between sesame cultivars and application of Azotobacter as bio- fertilizer during both seasons. Results showed that, the maximum number capsules/plant, number of seed/capsule and seed yield were obtained by Shandaweel-3 cultivar with addition of Azotobacter as bio-fertilizer followed by the same cultivars with biogein bio- fertilizer during both seasons. Also, maximum values of plants highest and 1000-seeds weight were achieved by Sohag 1 when using Azotobacter as biofertilizer during the both seasons. Moreover the highest mean value of Chlorophyll content was achieved by Giza 32 with Azotobacter type biofertilizer during 2015 and 2016 seasons. The lowest values were achieved by the interaction of Giza sown 32 cultivar with control (without bio-fertilizers) during the two seasons. Result of Mahrous *et al*,(2015) showed that the interaction between sesame varieties and fertilizer treatments had a significant effect on seed weight/plant during both seasons. The application of 100% NPK+ biofertilizers (BM, BC, BP) with shandawel-3 gave maximum seed weight $plant^{-1}$ during both seasons (169 and 139g) respectively. On the other hand, Toushka-1 received no fertilizers or received 50% NPK mineral fertilizer (30 kg N, 15 kg P_2 O_5 and 25 kg K_2O/fed) recorded the lowest seed weight/plant in the first season. On the other hand Shandawel-3 with control treatment or Toushka-1 with 100% NPK+ Biological fertilization (BM, BC, BP) recorded low values of seed weight per plant in the second growing season. These findings are in close conformity with the results of El Habbasha *et al.* (2007), Kushwaha (2011), Hasanpour *et al*,(2012), Ahmed *et al.* (2015) and Fakhry (2016).

D-3 Effect of interaction between organic manures and bio-fertilizer on chlorophyll content, seed yield and yield components:

Effect of the interaction between organic manures x bio-fertilizers indicated that chlorophyll content, plant height (cm), number capsules/ plant, number of seed/capsule1000 seed weight and seeds yield during both seasons were significant affected as presented in (tables 4, 5 and 6). Adding (20 m^3) organic manure and Azotobacter as bio-fertilizer maximized seed yield (524 and 478 kg/fed) during the two seasons, respectively. While, the difference between bio and organic manures was insignificant in terms of number of capsules/plant and seed yield during second season only. Contrary, the interaction effect among bio- and organic fertilizers on number of seeds/capsule was no significant during the first season only. The highest level of organic manures (20 m^3/fed) with Azotobacter as bio-fertilizer produced maximum of the most studied traits. Whereas, the lowest values of above Sesame plant characters were obtained from the treatment receive no bio and organic manures during both seasons. El Kramany *et al.* (2000), and Nurhayati, *et al* (2016) reported that such increment was due to the application of bio-fertilizer and poultry manure singly or in combination compared with control.

D-4 Effect of the interaction between cultivar, organic and bio-fertilizer on chlorophyll content, seed yield and yield components:

The interaction effect between three factors of organic fertilization application, biofetilization and three sesame cultivars were significant for Chlorophyll content and plant height characteristics of sesame during both seasons (tables 4, 5 and 6). Maximum number capsules/plant, number of seed/capsule and seeds yield were obtained from plants of Shandawel 3 cultivar supplied with 20 m^3 organic manures and Azotobacter as biofetilization treatment during two seasons. The maximum values of chlorophyll content and plant height were achieved from Sohag-1 and Giza 32 cultivars with the same 20 m^3 organic manures and Azotobacter as biofertilizer during 2015 and 2016 seasons. While, the minimum values of chlorophyll were obtained from Sohag-1 cultivar with the control treatments organic and bio fertilizer during the two seasons. Whereas, the shorts plant were obtained from sown Shandawel 3 cultivars with treatment receive no biofertilizer and organic manures during both seasons. Also, Sohag-1 and no bio and organic recorded the lowest number capsules/plant and number of seed/capsule in the first and second growing seasons. These results are supported by the findings obtained by El-Habbasha *et al.* (2007).

Table 4. Chlorophyll and Plant height as affected by sesame cultivars, organic fertilizers, bio-fertilizers and their interaction during 2015 -2016 seasons.

Bio- (V) organic		Chlorophyll content							
		2015				2016			
		bio.1	Bio.2	Bio.3	Mean	bio.1	Bio.2	Bio.3	Mean
V1	Con.	33.54	38.80	38.41	36.92	33.31	38.49	38.35	36.72
	5m^3	34.81	43.56	42.85	40.54	34.74	43.09	42.98	40.27
	10m^3	41.05	45.93	45.90	44.29	40.36	45.26	45.24	43.62
	20m^3	45.51	47.41	47.27	46.73	44.67	47.22	46.89	46.26
Mean		38.73	44.02	43.61	42.12	38.27	43.51	43.37	41.72
V2	Con.	33.57	34.71	34.81	34.36	33.53	35.98	36.01	35.18
	5m^3	35.71	37.25	38.22	37.06	35.65	37.20	37.03	36.62
	10m^3	38.22	41.18	40.72	40.04	38.15	41.13	40.98	40.09
	20m^3	40.70	44.41	42.38	42.50	40.53	44.21	44.02	42.92
Mean		37.05	39.39	39.03	38.49	36.97	39.63	39.51	38.70
V3	Con.	34.37	43.25	42.05	39.89	34.30	41.11	41.00	38.81
	5m^3	38.92	44.37	44.19	42.49	38.01	43.92	43.83	41.92
	10m^3	41.21	45.71	45.19	44.04	40.31	44.91	44.90	43.38
	20m^3	44.64	47.13	47.05	46.27	43.53	46.11	45.96	45.20
Mean		39.79	45.12	44.62	43.17	39.04	44.01	43.93	42.33
O×b	Con.	33.83	38.92	38.42	37.06	33.72	38.53	38.46	36.90
	5m^3	36.48	41.86	41.75	40.03	36.13	41.40	41.28	39.61
	10m^3	40.16	44.27	43.94	42.79	39.60	43.77	43.71	42.36
	20m^3	43.62	46.32	45.57	45.17	42.91	45.85	45.62	44.79
Bio-		38.52	42.84	42.42		38.09	42.39	42.27	
L.S.D.5% cultivar			0.42				0.18		
Organic			0.38				0.24		
Bio-			0.30				0.16		
VxO			0.65				0.41		
V.xbio.			0.52				0.28		
O.xbio.			0.60				0.32		
V.xO.xbio.			1.04				0.56		

Bio- (V) organic		Plant height (cm)							
		bio.1	bio.2	bio.3	mean	bio.1	bio.2	bio.3	mean
V1	Con.	135.33	141.33	139.00	138.56	133.67	140.00	138.33	137.33
	5m^3	143.33	158.00	159.67	153.67	142.33	157.00	156.00	151.78
	10m^3	152.00	173.33	170.33	165.22	149.67	171.00	169.00	163.22
	20m^3	169.00	191.00	187.00	182.33	165.67	188.00	185.00	179.56
Mean		149.92	165.92	164.00	159.94	147.83	164.00	162.08	157.97
V2	Con.	126.00	130.66	131.67	129.44	125.00	130.00	129.67	128.22
	5m^3	133.67	143.33	141.67	139.56	132.00	141.67	141.00	138.22
	10m^3	142.00	151.67	149.67	147.78	141.00	149.33	148.67	146.33
	20m^3	155.00	163.00	160.33	159.44	153.33	162.00	159.00	158.11
Mean		139.17	147.17	145.83	144.06	137.83	145.75	144.58	142.72
V3	Con.	136.33	142.33	142.33	140.33	133.67	141.00	140.33	138.33
	5m^3	143.00	157.67	155.67	152.11	141.67	156.00	155.00	150.89
	10m^3	152.00	167.67	167.33	162.33	150.56	166.33	165.00	160.67
	20m^3	162.00	177.00	173.33	170.78	159.00	175.00	173.00	169.00
Mean		148.33	161.17	156.39	156.39	146.25	159.58	158.33	154.72
Mean	Con.	132.56	138.11	137.67	136.11	130.78	137.00	136.11	134.63
	5m^3	140.00	153.00	152.33	148.44	138.67	151.56	150.67	146.96
	10m^3	148.67	164.22	162.44	158.44	147.11	162.22	160.89	156.74
	20m^3	162.00	177.00	173.56	170.85	159.33	175.00	172.33	168.89
Mean		70.70	76.79	82.92		143.97	156.44	155.00	
L.S.D.5% cultivar			1.14				0.89		
Organic			0.88				1.20		
Bio-			0.90				0.89		
VxO			1.52				2.08		
V.xbio.			0.55				1.54		
O.xbio.			0.64				1.78		
V.xO.xbio.			1.10				3.08		

***Cultivars (V) Sohag- 1 (V_1) (2) Shandaweel- 3 (V_2) (3) Giza-32 *Organic manures (O) Control , 5m^3/fed, 10m^3/fed and 20m^3/fed**
*** Bio-fertilizers (1) Control (bio.1) (2) Azotobacter (bio.2) (3) Biogein (bio.3)**

Table 5. Number of capsules/plant and number of seeds/capsule as affected by sesame cultivars, organic fertilizers, bio-fertilizers and their interaction during 2015 -2016 seasons.

Bio- (V) organic		Number of capsules/ plant							
		2015				2016			
		bio.1	Bio.2	Bio.3	Mean	bio.1	Bio.2	Bio.3	Mean
V1	Con.	117.67	132.67	132.67	127.67	123.67	126.67	125.00	125.11
	5m^3	128.67	142.00	139.67	136.78	127.33	139.00	137.03	134.56
	10m^3	138.00	149.00	146.67	144.56	134.00	148.00	144.00	142.00
	20m^3	147.67	159.33	153.67	153.56	146.67	159.00	157.00	154.22
Mean		133.00	145.00	143.17	140.64	132.92	143.17	140.83	138.97
V2	Con.	141.33	157.00	156.00	151.44	140.67	153.00	150.13	148.00
	5m^3	158.00	171.33	170.00	166.44	153.67	166.00	164.33	161.33
	10m^3	172.33	178.67	176.67	175.89	172.33	175.33	172.67	173.44
	20m^3	182.33	197.00	191.00	190.11	180.33	194.00	186.33	186.89
Mean		163.50	176.00	173.42	170.97	161.75	172.08	168.42	167.42
V3	Con.	131.00	150.00	146.67	142.56	126.67	142.00	132.67	133.78
	5m^3	147.00	156.67	156.67	153.22	141.00	156.67	153.67	150.44
	10m^3	157.00	165.33	161.33	161.22	155.00	160.00	157.33	157.44
	20m^3	161.00	176.33	170.67	168.00	158.67	167.00	166.33	164.00
Mean		149.00	160.92	158.83	156.25	145.33	156.42	152.50	151.42
Mean	Con.	130.00	146.56	145.11	140.56	130.33	140.56	136.00	135.63
	5m^3	144.56	156.44	155.44	152.15	140.67	153.89	151.78	148.78
	10m^3	155.78	164.33	161.56	160.56	153.78	161.11	158.00	157.63
	20m^3	163.67	170.22	171.78	170.56	161.89	173.33	169.89	168.37
Mean		148.50	160.89	158.47		146.67	157.22	153.92	
L.S.D.5% cultivar				1.18				3.75	
Organic				1.25				2.59	
Bio-				1.15				1.93	
VxO				2.67				4.59	
V.xbio.				N.S.				N.S.	
O.xbio.				2.29				N.S.	
V.xO.xbio.				N.S.				N.S.	
Bio-		Number of seeds/capsule							
(V) organic		bio.1	bio.2	bio.3	mean	bio.1	bio.2	bio.3	mean
V1	Con.	39.60	40.27	39.47	39.78	38.60	40.80	40.60	40.00
	5m^3	41.20	41.53	41.33	41.36	41.07	41.80	41.53	41.47
	10m^3	42.20	42.73	42.47	42.47	41.60	42.60	42.27	42.16
	20m^3	42.60	43.27	43.00	42.96	43.27	43.40	42.87	42.84
Mean		41.40	41.95	41.57	41.64	40.88	42.15	41.82	41.62
V2	Con.	44.53	46.27	46.07	45.62	43.27	45.53	44.87	44.56
	5m^3	45.67	46.53	46.60	46.27	43.93	46.80	46.53	45.76
	10m^3	46.47	47.13	46.93	46.84	45.67	46.87	47.13	46.56
	20m^3	46.80	47.40	47.13	47.11	46.80	47.60	47.33	47.24
Mean		45.87	46.83	46.68	46.46	44.92	46.70	46.47	46.03
V3	Con.	44.47	45.73	44.87	45.02	42.47	43.93	43.80	43.40
	5m^3	45.47	46.60	46.53	46.20	44.13	44.60	44.53	44.42
	10m^3	46.20	46.73	46.93	46.62	45.53	45.53	45.20	45.42
	20m^3	46.53	47.40	46.80	46.91	45.60	46.27	45.93	45.93
Mean		45.67	46.62	46.28	46.19	44.43	45.08	44.87	44.79
Mean	Con.	42.87	44.09	43.47	43.47	41.44	43.42	43.09	42.65
	5m^3	44.11	44.89	44.82	44.61	43.04	44.40	44.20	43.88
	10m^3	44.96	45.53	45.44	45.31	44.27	45.00	44.87	44.71
	20m^3	45.31	46.02	45.64	45.66	44.89	45.76	45.38	45.34
Mean		44.31	45.13	44.84		43.41	44.64	44.38	
L.S.D.5% cultivar				0.32				0.43	
Organic				0.21				0.36	
Bio-				0.17				0.28	
VxO				0.36				N.S.	
V.xbio.				0.30				0.48	
O.xbio.				N.S.				0.56.	
V.xO.xbio.				N.S.				N.S.	

***Cultivars (V) Sohag- 1 (V_1) (2) Shandaweel- 3 (V_2) (3) Giza-32 *Organic manures (O) Control , 5m^3/fed, 10m^3/fed and 20m^3/fed**
*** Bio-fertilizers (1) Control (bio.1) (2) Azotobacter (bio.2) (3) Biogein (bio.3)**

Table 6. 1000-seed weight and seeds yield as affected by sesame cultivars, organic fertilizers, bio-fertilizers and their interaction during 2015 -2016 seasons.

Bio-(V) organic		1000-seeds weight (g)							
		2015				2016			
		bio.1	Bio.2	Bio.3	Mean	bio.1	Bio.2	Bio.3	Mean
V1	Con.	3.83	3.96	3.93	3.91	3.73	3.90	3.87	3.83
	5m³	4.05	4.47	4.17	4.17	3.95	4.16	4.11	4.07
	10m³	4.18	4.46	4.42	4.36	4.14	4.32	4.25	4.24
	20m³	4.37	4.48	4.63	4.56	4.26	4.58	4.50	4.45
Mean		4.11	4.34	4.29	4.25	4.02	4.24	4.18	4.15
V2	Con.	3.84	3.92	3.91	3.89	3.80	3.80	3.77	3.79
	5m³	4.04	4.27	4.23	4.18	3.98	4.17	4.13	4.09
	10m³	4.13	4.47	4.41	4.34	4.08	4.36	4.33	4.26
	20m³	4.28	4.63	4.60	4.50	4.19	4.53	4.45	4.39
Mein		4.07	4.32	4.29	4.23	4.01	4.22	4.17	4.13
V3	Con.	3.71	3.78	3.74	3.74	3.66	3.72	3.65	3.68
	5m³	3.92	3.97	3.95	3.95	3.80	3.94	3.88	3.87
	10m³	4.07	4.16	4.13	4.12	3.91	4.11	4.06	4.02
	20m³	4.19	4.23	4.17	4.20	4.02	4.19	4.13	4.11
Mean		3.97	4.03	4.00	4.00	3.85	3.99	3.93	3.92
Mean	Con.	3.79	3.89	3.86	3.85	3.73	3.81	3.76	3.77
	5m³	4.00	4.17	4.12	4.10	3.91	4.09	4.04	4.01
	10m³	4.12	4.36	4.32	4.27	4.04	4.26	4.21	4.17
	20m³	4.28	4.51	4.47	4.42	4.16	4.43	4.36	4.32
Mean		4.05	4.23	4.13		3.96	415	4.09	
L.S.D.5% cultivar				0.17				0.10	
Organic				0.13				0.09	
Bio-				0.11				0.08	
VxO				N.S.				N.S.	
V.xbio.				N.S.				N.S.	
O.xbio.				N.S.				N.S.	
V.xO.xbio.				N.S.				N.S.	

Bio-(V) organic		Seeds yield kg/fed.							
		bio.1	bio.2	bio.3	mean	bio.1	bio.2	bio.3	mean
V1	Con.	349.33	398.00	395.33	380.89	327.67	392.33	382.33	367.44
	5m³	392.00	429.33	425.67	415.67	374.33	412.33	401.00	395.89
	10m³	420.33	472.00	466.33	452.89	404.67	443.67	431.33	426.56
	20m³	442.67	507.67	486.67	479.00	424.00	488.00	482.00	464.67
Mean		401.08	451.75	443.50	432.11	382.67	434.08	424.17	413.64
V2	Con.	411.67	451.33	445.00	463.00	390.67	423.00	407.67	407.11
	5m³	439.00	474.00	466.33	459.78	419.67	439.33	428.00	429.00
	10m³	465.67	536.33	528.67	510.22	447.00	494.33	474.33	471.89
	20m³	487.67	580.67	569.00	545.00	469.00	510.67	490.33	490.00
Mean		451.00	510.58	502.25	487.94	431.58	466.83	450.08	449.50
V3	Con.	343.33	379.00	383.33	368.56	325.00	353.33	339.33	339.22
	5m³	379.00	383.33	389.67	398.78	366.33	397.00	384.00	382.44
	10m³	408.33	434.67	434.00	425.56	399.67	419.00	406.67	408.44
	20m³	429.67	499.67	462.67	464.00	422.33	436.00	423.67	427.33
Mean		392.67	430.42	419.58	414.22	378.33	401.33	388.36	389.35
Mean	Con.	368.11	409.44	407.89	395.15	347.78	389.56	376.44	371.26
	5m³	406.89	437.22	430.11	424.74	386.78	416.22	404.33	402.44
	10m³	431.33	481.33	476.33	462.89	417.11	452.33	437.44	435.63
	20m³	453.33	529.33	506.11	496.26	438.44	478.22	465.33	460.66
Mean		414.92	464.25	455.11		397.53	434.08	420.89	
L.S.D.5% cultivar				9.12				8.36	
Organic				5.99				5.41	
Bio-				5.15				4.47	
VxO				10.27				9.37	
V.xbio.				8.93				7.74	
O.xbio.				10.31				N.S.	
V.xO.xbio.				N.S.				N.S.	

***Cultivars (V) Sohag- 1 (V_1) (2) Shandaweel- 3 (V_2) (3) Giza-32 *Organic manures (O) Control , 5m³ /fed, 10m³ /fed and 20m³ /fed**
*** Bio-fertilizers (1) Control (bio.1) (2) Azotobacter (bio.2) (3) Biogein (bio.3)**

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استجابة بعض اصناف السمسم للتسميد الحيوى والعضوى تحت ظروف توشكى

محمدعبدالحميد حسان وعلاء محمد محمود بغدادى

وحدة المحاصيل - قسم الانتاج النباتى – مركز بحوث الصحراء – المطرية - القاهرة

أقيمت تجربتان حقليتان بمحطه بحوث توشكى بابوسمبل التابعة لمركز بحوث الصحراء بمحافظة اسوان خلال موسمي 2015 و 2016 وتهدف هذة الدراسه لدراسة تأثير التسميد العضوى بمعدلات (صفر , 5م^3 و 10م^3 و 20م^3/ فدان) و التسميد الحيوي بمعدلات (بدون, مخصب حيوى ازوتوباكتر , وبيوجين) على المحصول ومكوناته لثلاث أصناف من السمسم (سوهاج 1, وشندويل 3 وجيزة 32) المنزرعة تحت ظروف منطقة توشكى جنوب مصر. وفيما يلي ملخص لاهم النتائج: 1- أظهرت النتائج المتحصل عليها بتفوق الصنف شندويل 3 فى كلا من عدد الكبسولات/نبات ، وعدد البذور/كبسوله ومحصول البذور مقارنه بالصنفين (سوهاج 1 وجيزة 32). 2- اشارة النتائج بأن زيادة استخدام الأسمدة العضوية من 5 إلى 20 م ^{3} الي زيادة معنويه فى كل الصفات تحت الدراسه (الكلوروفيل ، ارتفاع النبات؛ عدد البذور/الكبسولات ، عدد الكبسولات/نباتات و وزن 100بذره ؛ ومحصول البذور للفدان. 3- اوضحت النتائج بأن اضافة المخصب الحيوي ازوتوباكتر الى زيادة معنويه فى كل الصفات التى شملتها الدراسه. 4- سجل التفاعل بين الأصناف ومعاملات الأسمدة العضوية له تأثير معنوى على الكلوروفيل ، ارتفاع النبات ؛ عدد الكبسولات /نبات ومحصول البذور واعطى التفاعل الصنف شندويل 3 مع اضافة السماد العضوي 20 م ^{3} أفضل النتائج . 5- لقد سجل التفاعل الثنائي بين الاصناف والمخصب الحيوي الى وجود فروق معنويه فى كل صفات تحت الدراسه في كلا الموسمين باستثناء عدد الكبسولات / نبات ووزن 1000 بذرة لم تسجل معنويه في كلا الموسمين. 6- سجل التفاعل بين الأسمدة العضوية 20 م^3 والسماد الحيوى ازوتوباكتر أعلى القيم من محصول البذور 524 و 478 كجم /فدان في كلا الموسمين على التوالي. 7- التفاعل الثلاثي بين الاصناف والسماد الحيوى والعضوى لم يسجل اى فروق معنويه الا فى صفات الكلورفيل و ارتفاع النبات. توصى الدراسه: بزراعه صنف السمسم شندويل 3 مع اضافه 20 متر مكعب من السماد البلدى العضوي والمخصب الحيوى أزوتوباكتر تحت ظروف المناطق الشبه الجافه (توشكي) - جنوب مصر.