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EFFECT OF SOME BIOLOGICAL AND MINERAL FERTILIZERS ON SOME GROWTH AND YIELD CHARACTERS OF TWO FLAX CULTIVARS

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ABSTRACT

Two field experiments were conducted in the Farm of Faculty of Agriculture, Al – Azhar University, Mostorod, through the successive seasons 2000 /2001 and 2001 /2002 , to study the effect of different sources of nitrogen fertilizers on two flax cultivars .

Two cultivars, *viz* . Sakha- 1 and Giza-7, three treatments of biofertilizer , *viz*., without biofertilizer (w.b) , Nitrobien and Phosphorien, as well as , three levels of nitrogen fertilizer , *viz*., 0.30 and 60kg N/fed were used.

The results could be summarized as follows : -

Sakha-1 cultivar surpassed significantly Giza -7 in total stem length , technical stem length straw yield / fed , seed yield / capsule , seed yield /plant and fiber as well as seed yield / fed , whereas Giza – 7 cultivar surpassed Sakha -1 in stem diameter, in both seasons .

In general, the inoculated seeds with Nitrobien or Phosphorien had a positive effect on the studied growth charcters; Phosphorien surpassed the other studied biofortilizer in the number of seeds / capsule and seed yield / plant and fed . Adding 60 kgN / fed was the optimum level, that gave the highest values for total stem length, technical stem length, straw yield / fed , no . of seeds / capsule, fiber yield / fed, and seed yield/ plant and fed . Most of the first and second order interactions, had

significant impact on growth , yield and yield components of flax plants.

1. INTRODUCTION

Flax *(Linum usitatissimum,* L. *)* is considered the second fiber crop in Egypt after cotton; its cultivated area is about 16.,345 feddan (Agric . Economy Dep . Minis . Agric ., 2005), In Egypt and some countries, flax is grown as a dual purpose crop *i.e* for its seed and fiber . The production of flax in Egypt is not enough to provide the local needs for oil, as well as the fibers . Several attempts were carried out to increase the productivity and improve fiber quality; this could be achieved by cultivating new high yielding genotypes and following the best cultural treatments .

Several investigators reported that, there are significant differences between the various flax cultivars in straw properties, yield and yield components. (Abou- Zaid ,1997 and El- Azouni,1998) . Flax plants show remarkable response to nitrogen fertilizers as stated by Gad and El- Farouk, (1978), Haniyat, *et al* . (1 97) , A bou- Zaid (1997) and El – Azouni (1998) . Inoculating flax seeds with some biofertilizers, *i. e.*, Nitrobien and Phosphorien plays an important role in helping N. fixation in the soil . In addition, the utilization of biofertilizer increases the availability and absorption of nitrogen and phosphorus. (Rai and Gour 1982) . Using of biofertilzers can minimize the total amount of the mineral fertilizer and its harmful effect on the environment . It is well known that nitrogen is an essential element for plant growth to build up protoplasm and proteins, which induce cell division and meristimic activity and furtherly increase flax growth and its yield . The aim of this work was to study the effect of biological and mineral fertilization on some growth characters, yield and yield components of two flax cutivars.

2. MATERIALS AND METHODS

Two field trials were performed at the experimental station of the Faculty of Agriculture , Al – Azhar University , Mostorod , Egypt , during 2000 /2001 and 2001 /2002 growing seasons to investigate the effect of mineral N fertilizer, two types of biofertilizers (Nitrobien & Phosphorien) on the growth, yield and yield components of two flax *(Linum usitatissimum)* cultivars . A split split plot design with three replications was used. The main plots were allotted to the two flax

cultivars (Sakha-1 and Giza -7) , whereas the sub plots were the two biofertilizers (Nitrobien and Phosphorien) and the control, (no biofertilization) while the sub sub plots were allotted to the three mineral nitrogen fertilizer levels (0,30 ,and 60 kg N/ fed) . The sub sub plot area was 3 × 2 m^2 (1 /700 feddan). The soil texture for this research site was almost clay loam .

Flax cultivars were planted on 15 th and 20 th of November, in the first and second seasons, respectively and the recommended cultural practices were used. Flax seeds of the cultivars were mixed with Nitrobien and Phosphorien in the presence of sand before sowing. N fertilizer used (ammonium sulphate) was divided into two equal doses, the first dose was applied before the first irrigation, and the second one was applied before the second irrigation as recommended . Ten guarded plants were taken at harvesting randomly from each plot to be used in the different measurements of straw yield, seed yield as well as their components and quality characters.

Characters studied

(A) Straw yield and its components

1- Total plant height in cm .
2- Technical length in cm .
3- Stem diameter in m . m .
4- Stem yield per feddan (ton) .

(B) Seed yield and its components

5-Seed yield per plant in gm , was calculated from the ten guarded plants .
6-No . of seeds / capsule , was calculated from the ten guarded plants.
7-Seed yield pef feddan in kg . by multiplying produced seeds from each plot by 700 .

(C) Fiber yield per feddan in kg .

All data collected were subjected to statistical analysis as described by Snedecor and Cochran . (1982) . Comparison among means of treatments were tested for significance against L . S. D values at 0.05 level of probability .

3. RESULTS AND DISCUSSION

3.1. Straw yield and its components

Tables 1.2.3 and 4 reveal that Sakha -1 cv. surpassed significantly Giza -7 cv. in total stem length and technical stem length /

Table (1): Effect of Nitrobien, Phosphorien and N. mineral fertilizers on the total stem length/plant (cm) of the flax cultivars during 2000/2001 and 2001/2002 seasons.

Bio-fertilizers (B) / Artificial N. Fertilizer (C) kg n	2000 /2001								2001 /2002							
	Cultivars (A)								Cultivars (A)							
	Sakha 1				Giza 7				Sakha 1				Giza 7			
	w.b *	Nitrobien	Phpsphorien	Mean	w.b	Nitrobien	Phpsphorien	Mean	w.b	Nitrobien	Phpsphorien	Mean	w.b	Nitrobien	Phpsphorien	Mean
0	108.40	111.80	111.00	110.40	105.90	108.40	106.07	106.79	104.07	109.53	106.53	106.71	99.80	100.20	101.20	100.4
30	112.20	113.90	113.77	113.29	108.03	109.63	110.33	109.33	105.53	108.27	108.73	107.51	104.40	108.60	106.67	106.5
60	114.40	114.90	114.90	114.73	109.07	111.63	111.13	110.61	107.60	110.93	111.27	109.93	105.80	109.07	110.60	108.4
Mean	111.67	113.53	113.22	112.81	107.67	109.89	109.18	108.91	105.73	109.58	108.84	108.05	103.33	105.96	106.16	105.1
Over all means of bio and mineral fertilizers.	w.b		Nitrobien		Phosphorien		Mean		w.b		Nitrobien		Phosphorien		Mean	
0	107.15		110.10		108.54		108.60		101.94		104.87		103.87		103.56	
30	110.12		111.77		112.05		111.31		104.97		108.44		107.70		107.04	
60	111.74		113.27		113.02		112.67		106.70		110.00		110.94		109.21	
Mean	109.67		111.71		111.20		110.86		104.54		107.77		10.50		106.60	
	L.S.D at 5% Level for :-								L.S.D at 5% Level for :-							
	Var. (A) = 2.5								2.75							
	Bio-fer. (B) = N S								Ns							
	M. fer. (C) = 1.30								2.10							
	Var × Bio-fer. (A × B) = 3.5								3.1							
	Var × M. fer. (A × C) = 4.00								1.3							
	Bio-fer × M. fer. (B × C) = N S								Ns							
	Var. × Bio-fer × M. fer. (A × B × C) = 3.2								Ns							

* w.b means without any addition of biofertilizer

Table (2): Effect of Nitrobien, Phosphorien and N. mineral fertilizers on the technical stem length/plant (cm) of the two flax cultivars during 2000/2001 and 2001/2002 seasons.

Bio-fertilizers (B) / Artificial N. Fertilizer (C)	2000 /2001								2001 /2002							
	Cultivars (A)								Cultivars (A)							
	Sakha 1				Giza 7				Sakha 1				Giza 7			
	w.b	Nitrobien	Phpsphorien	Mean	w.b	Nitrobien	Phpsphorien	Mean	w.b	Nitrobien	Phpsphorien	Mean	w.b	Nitrobien	Phpsphorien	Mean
0	94.53	95.70	95.47	95.23	91.93	94.03	93.07	93.01	83.00	92.50	87.00	87.50	77.00	87.80	81.07	81.96
30	97.20	99.73	98.53	98.49	93.33	96.13	92.90	93.82	87.03	97.63	91.00	91.89	82.31	92.95	91.50	88.92
60	99.07	102.93	100.60	100.87	97.33	98.43	96.00	97.25	93.70	100.90	96.80	97.13	86.50	97.50	93.67	92.56
Mean	96.93	99.45	98.20	98.20	94.20	96.20	93.69	94.69	87.91	97.01	91.60	92.17	81.94	92.75	88.75	87.81

Over all means of bio and mineral fertilizers.	2000 /2001				2001 /2002			
	w.b	Nitrobien	Phosphorien	Mean	w.b	Nitrobien	Phosphorien	Mean
0	93.23	94.87	94.27	94.12	80.00	90.10	84.04	84.73
30	95.27	97.93	95.27	96.16	84.67	95.29	91.25	90.41
60	98.20	100.68	98.30	99.06	90.10	99.20	95.24	94.85
Mean	95.57	97.83	95.95	96.45	84.92	94.88	90.18	90.00

	2000 /2001	2001 /2002
L.S.D at 5% Level for :-		
Var.	(A) = 3.25	2.03
Bio. fer.	(B) = 1.48	1.85
M. fer.	(C) = 2.02	2.50
Var × Bio-fer.	(A × B) = 2.80	4.00
Var × M. fer.	(A × C) = 1.24	3.25
Bio-fer × M. fer.	(B × C) = 2.30	3.50
Var. × Bio-fer × M. fer.	(A × B × C) 3.20	3.10

Table (3): Effect of Nitrobien, Phosphorien and N. mineral fertilizers on stem diameter (m.m) of the two flax cultivars during 2000/2001 and 2001/2002 seasons.

Bio-fertilizers (B) / Artificial N. Fertilizer (C)	2000 /2001								2001 /2002							
	Cultivars (A)								Cultivars (A)							
	Sakha 1				Giza 7				Sakha 1				Giza 7			
	w.b	Nitrobien	Phpsphorien	Mean	w.b	Nitrobien	Phpsphorien	Mean	w.b	Nitrobien	Phpsphorien	Mean	w.b	Nitrobien	Phpsphorien	Mean
0	1.31	1.45	1.39	1.38	1.88	1.80	1.83	1.81	1.20	1.23	1.20	1.21	1.63	1.67	1.67	1.66
30	1.41	1.57	1.58	1.52	1.90	2.00	1.97	1.96	1.27	1.27	1.30	1.28	1.63	1.64	1.70	1.66
60	1.45	1.50	1.50	1.48	1.91	1.97	1.92	1.93	1.23	1.27	1.20	1.23	1.73	1.67	1.67	1.69
Mean	1.39	1.51	1.49	1.46	1.87	1.92	1.91	1.90	1.23	1.26	1.23	1.24	1.66	1.66	1.65	1.67
Over all means of bio and mineral fertilizers.	w.b		Nitrobien		Phosphorien		Mean		w.b		Nitrobien		Phosphorien		Mean	
0	1.56		1.63		1.61		1.60		1.42		1.45		1.44		1.44	
30	1.66		1.79		1.78		1.74		1.45		1.46		1.49		1.47	
60	1.68		1.74		1.71		1.71		1.48		1.47		1.44		1.46	
Mean	1.63		1.72		1.70		1.68		1.45		1.46		1.46		1.46	
	L.S.D at 5% Level for :-								L.S.D at 5% Level for :-							
	Var. (A) = 0.40								0.38							
	Bio-fer. (B) = N S								Ns							
	M. fer. (C) = N S								Ns							
	Var × Bio-fer. (A × B) = N S								Ns							
	Var × M. fer. (A × C) = N S								Ns							
	Bio-fer × M. fer. (B × C) = N S								Ns							
	Var. × Bio-fer × M. fer. (A × B × C) = N S								Ns							

Table (4): Effect of Nitrobien, Phosphorien and N. mineral fertilizers on the straw yield/fed (ton), of the two flax cultivars during 2000/2001 and 2001/2002 seasons.

Bio-fertilizers (B) / Artificial N. Fertilizer (C)	2000 /2001								2001 /2002							
	Varieties (A)								Varieties (A)							
	Sakha 1				Giza 7				Sakha 1				Giza 7			
	w.b	Nitrobien	Phosphorien	Mean	w.b	Nitrobien	Phosphorien	Mean	w.b	Nitrobien	Phosphorien	Mean	w.b	Nitrobien	Phosphorien	Mean
0	5.00	5.20	5.10	5.10	4.80	4.20	4.10	4.10	3.91	5.01	3.95	4.29	2.92	3.80	3.45	3.39
30	5.15	5.50	5.25	5.30	4.10	4.40	4.25	4.25	4.59	5.18	4.89	4.89	3.20	4.00	3.50	3.57
60	5.42	6.00	5.75	5.72	4.25	5.00	4.55	4.60	4.83	5.72	5.14	5.23	3.75	4.60	3.89	4.08
Mean	5.19	5.57	5.37	5.37	4.12	4.53	4.30	4.32	4.44	5.30	4.66	4.80	3.29	4.13	3.61	3.68
Over all means of bio and mineral fertilizers.	w.b		Nitrobien		Phosphorien		Mean		w.b		Nitrobien		Phosphorien		Mean	
0	4.50		4.70		4.60		4.60		3.42		4.41		3.70		3.84	
30	4.63		4.95		4.75		4.78		3.90		4.59		4.20		4.23	
60	4.84		5.50		5.15		5.16		4.29		5.16		4.52		4.66	
Mean	4.66		5.05		4.83		4.85		3.87		4.72		4.14		4.24	
	L.S.D at 5% Level for :-								L.S.D at 5% Level for :-							
	Var. (A) = 1.00								1.20							
	Bio. fer. (B) = 0.15								0.40							
	M. fer. (C) = 0.20								0.30							
	Var × Bio-fer. (A × B) = N S								Ns							
	Var × M. fer. (A × C) = N S								Ns							
	Bio. fer × M. fer. (B × C) = N S								Ns							
	Var. × Bio. fer × M. fer. (A × B × C) = N S								Ns							

plant (cm) in both seasons, whereas this trend was significant , for straw yield / fed , in the first season only . These results may be due to the difference in genetic background between the studied cultivars, as reported by Amna *et al.*, (1997) and El – Gazzar (2000). On the contrary , Giza -7 cv . surpassed Sakha -1 . by high significant values for stem diameter (1.90 and 1.67 m .m) in the first and second seasons, respectively . El – farouk *et al*, (2003) confirmed the previous result .

Total stem length and stem diameter were not significantly affected by the application of biofertilizers , in both seasons . Whereas inoculated flax seeds with Nitrobien or Phosphorien showed significant increase in the technical stem length, compared with the untreated seeds. These results are in agreement with those reported by El – Gazzar (2000) . Bashan and Levanony (1990) proposed several possible modes of action of biofertilizer on plant growth ; N_2 fixation , which contributes N to the plant hormonal effects, which alter plant metabolism and growth , general improvement in the growth of the entire root system, resulting in enhanced mineral and water uptake . In both successive seasons, Nitrobien surpassed Phosphorien in straw yield / fed. by 4.36 and 12.28 % ,in the first and second season, respectively . It is worthy to mention that, total stem length, technical stem length (cm) and straw yield / fed (kg) were increased significantly by the application of 60 kg N / fed as compared with 0.0 kg N / fed (untreated)plants were the shortest and lowest ones . These results could be explained by the increasing vegetative growth and increasing translocation of metabolites from source to sink, due to nitrogen application (Mohamed , 2003) . Most of the studied interactions were significant for the total and technical stem length as revealed in Tables 1 and 2 , in both seasons . Inoculated seeds with Nitrobien or Phosphorin gave the tallest flax plants as compared with untreated plants , either for Sakha -1 or Giza -7 cultivars . In general , for total stem length, Sakha-1 surpassed Giza 7 under either inoculation with biofertilizer or not . Inoculation Sakha -1 cv. seeds with Nitrobien in the presence of 60 kg N / fed recorded the highest technical stem length , whereas the lowest values were obtained from Giza -7 cv . without any fertilization treatment (control).

3 . 2 . Seed yield and its components

Sakha -1cv. showed significant superiority over Giza-7 *cv.* for the number of seeds / capsule , seed yield / plant (gm) and seed yield /

Table (5): Effect of Nitrobien, Phosphorien and N. mineral fertilizers on seed yield/plant (gm) of the two flax cultivars during 2000/2001 and 2001/2002 seasons.

Bio-fertilizers (B) / Artificial N. Fertilizer (C)	2000 /2001								2001 /2002							
	Cultivars (A)								Cultivars (A)							
	Sakha 1				Giza 7				Sakha 1				Giza 7			
	w.b	Nitrobien	Phpsphorien	Mean	w.b	Nitrobien	Phpsphorien	Mean	w.b	Nitrobien	Phpsphorien	Mean	w.b	Nitrobien	Phpsphorien	Mean
0	40	55	60	52	37	50	52	46	20	25	30	25	20	21	22	21
30	52	60	65	59	41	49	55	48	25	30	38	31	22	23	24	23
60	58	68	71	66	42	52	60	51	27	35	48	34	24	26	30	27
Mean	50	61	65	59	40	50	56	48	24	30	36	30.	22	23	25	24
Over all means of bio and mineral fertilizers.	w.b		Nitrobien		Phosphorien		Mean		w.b		Nitrobien		Phosphorien		Mean	
0	39		53		56		49		20		23		26		23	
30	47		55		60		54		24		27		31		27	
60	50		60		66		59		26		31		35		31	
Mean	45		56		61		54		23		27		31		27	
	L.S.D at 5% Level for :-								L.S.D at 5% Level for :-							
	Var. (A) 9.0								5.0							
	Bio. fer. (B) 3.0								4.0							
	M. fer. (C) 5.0								4.0							
	Var × Bio-fer. (A × B) = 8.0								10.0							
	Var × M. fer. (A × C) = 10.0								7.0							
	Bio. fer × M. fer. (B × C) = 5.0								4.0							
	Var. × Bio. fer × M. fer. (A × B × C) = 9.0								8.0							

Table (6): Effect of Nitrobien, Phosphorien and N. mineral fertilizers on number of seeds/capsule for the two flax cultivars during 2000/2001 and 2001/2002 seasons.

Bio-fertilizers (B) / Artificial N. Fertilizer (C)	2000 /2001 cultivars (A)								2001 /2002 cultivars (A)							
	Sakha 1				Giza 7				Sakha 1				Giza 7			
	w.b	Nitrobien	Phpsphorien	Mean	w.b	Nitrobien	Phpsphorien	Mean	w.b	Nitrobien	Phpsphorien	Mean	w.b	Nitrobien	Phpsphorien	Mean
0	6.10	6.43	6.47	6.33	5.00	5.33	6.56	5.63	5.73	6.40	6.33	6.15	4.70	4.93	5.93	5.19
30	6.80	6.70	7.33	6.94	5.60	5.50	5.90	5.67	6.20	6.13	6.63	6.32	5.63	6.33	5.74	5.90
60	7.67	6.87	7.63	7.39	5.93	6.30	6.00	6.08	6.57	6.50	6.83	6.63	6.27	6.13	6.43	6.28
Mean	6.86	6.67	7.14	6.89	5.51	5.71	6.15	5.79	6.17	6.34	6.60	6.37	5.53	5.80	6.03	5.79
Over all means of bio and mineral fertilizers.	w.b		Nitrobien		Phosphorien		Mean		w.b		Nitrobien		Phosphorien		Mean	
0	5.55		5.88		6.52		5.98		5.22		5.67		6.13		5.67	
30	6.20		6.10		6.62		6.31		5.92		6.23		6.19		6.11	
60	6.80		6.59		6.82		6.74		6.42		6.32		6.63		6.46	
Mean	6.18		6.19		6.65		6.34		5.85		6.07		6.32		6.08	
	L.S.D at 5% Level for :-								L.S.D at 5% Level for :-							
	Var. (A) = 0.45								0.44							
	Bio. fer. (B) = 0.30								0.20							
	M. fer. (C) = 0.35								0.30							
	Var × Bio-fer. (A × B) = N S								0.31							
	Var × M. fer. (A × C) = 0.42								0.34							
	Bio. fer × M. fer. (B × C) = N S								Ns							
	Var. × Bio. fer × M. fer. (A × B × C) = N S								Ns							

Table (7): Effect of Nitrobien, Phosphorien and N. mineral fertilizers on seed yield/fed (Kg) for the two flax cultivars during 2000/2001 and 2001/2002 seasons.

Bio-fertilizers (B) / Artificial N. Fertilizer (C) kg n	2000 /2001 Cultivars (A)								2001 /2002 Cultivars (A)							
	Sakha 1				Giza 7				Sakha 1				Giza 7			
	w.b	Nitrobien	Phpsphorien	Mean	w.b	Nitrobien	Phpsphorien	Mean	w.b	Nitrobien	Phpsphorien	Mean	w.b	Nitrobien	Phpsphorien	Mean
0	640	740	840	740	500	600	650	583	500	600	700	600	450	530	600	527
30	740	840	890	823	600	650	700	650	620	700	800	707	520	600	700	607
60	790	890	990	890	650	700	750	700	690	800	900	797	570	650	780	667
Mean	733	823	907	818	583	650	700	644	603	700	800	701	513	593	693	600
Over all means of bio and mineral fertilizers.	w.b		Nitrobien		Phosphorien		Mean		w.b		Nitrobien		Phosphorien		Mean	
0	570		670		745		662		475		565		650		563	
30	670		745		795		737		570		650		750		657	
60	720		795		870		795		630		725		840		732	
Mean	653		737		803		731		558		647		747		651	
	L.S.D at 5% Level for :-								L.S.D at 5% Level for :-							
	Var. (A) = 150								99							
	Bio-fer. (B) = 62								82							
	M. fer. (C) = 55								71							
	Var × Bio-fer. (A × B) = 94								80							
	Var × M. fer. (A × C) = 45								100							
	Bio-fer × M. fer. (B × C) = 72								70							
	Var. × Bio-fer × M. fer. (A × B × C) = NS								Ns							

* w.b means without any addition of biofertilizer

Table (8): Effect of Nitrobien, Phosphorien and N. mineral fertilizers on Fiber yield/fed (kg). of the two flax cultivars during 2000/2001 and 2001/2002 seasons

Bio-fertilizers (B) / Artificial N. Fertilizer (C) kgm	2000 /2001 Cultivars (A)								2001 /2002 Cultivars (A)							
	Sakha 1				Giza 7				Sakha 1				Giza 7			
	w.b	Nitrobien	Phpsphorien	Mean	w.b	Nitrobien	Phpsphorien	Mean	w.b	Nitrobien	Phpsphorien	Mean	w.b	Nitrobien	Phpsphorien	Mean
0	925	988	946	953	617	683	656	652	712	977	766	818	441	618	552	537
30	960	1077	981	1006	656	724	697	692	893	1049	957	966	512	658	569	580
60	1019	1184	1093	1097	701	862	762	775	956	1173	1028	1052	619	784	652	685
Mean	968	1083	1007	1019	658	756	705	706	854	1069	917	945	524	685	951	601

Over all means of bio and mineral fertilizers.	2000 /2001 w.b	Nitrobien	Phosphorien	Mean	2001 /2002 w.b	Nitrobien	Phosphorien	Mean
0	771	836	801	803	577	798	659	678
30	808	901	839	849	703	854	763	773
60	860	1023	928	936	788	979	840	869
Mean	813	920	856	863	689	877	754	773

	2000 /2001	2001 /2002
L.S.D at 5% Level for :-		
Var. (A)	= 300	308
Bio-fer. (B)	= 50	100
M. fer. (C)	= 45	70
Var × Bio-fer. (A × B)	= 100	170
Var × M. fer. (A × C)	= 150	150
Bio-fer × M. fer. (B × C)	= N S	Ns
Var. × Bio-fer × M. fer. (A × B × C)	= NS	Ns

* w.b means without any addition of biofertilizer

fed (kg) , as tabulated in Tables (5 ,6 , and 7) in both growing seasons. As for biofertilizer impact, Phosphorien ranked first in the number of seeds / capsule , seed yield / plant (gm) and per fed (kg) , their values were increased significantly as compared with Nitrobien treatment, that ranked the second or untreated plants that ranked the third. In general, in both seasons, inoculation of the seeds with biofertilizers enhanced significantly seed yield and its components . Tables 4,5,6 and 7 show that 60 kg N / fed surpassed significantly 30 kg N / fed in both seasons, as for the number of seed / capsule , seed yield / plant (gm) and seed yield / fed . These results are supported by kineber *et al,* (1991) , who reported that nitrogen applications enhance vegetative growth as well as the metabolism process in the plant and cause an increase in dry matter accumulation.

All the second order interactions (A × B× C) in both seasons had no significant effect on the number of seeds / capsule , and seed yield / fed , while seed yield / plant (gm) was significantly affected by the previous interactions . Inoculated Sakha -1 cv . seeds with Phosphosien or Nitrobien, in the presence of 60 Kg N / fed gave the highest seed yield / plant (gm) while the lowest values were obtained from both studied cultivars without any fertilization treatments . These results are in harmony with those obtained by Kravchenko *et al.*, (1994) , who stated that flax seed treatments with bacteria or fungi increased seed yield .

3.3. Fiber yield / fed (Kg)

From Table (8) , it is obvious that Sakha-1 cv showed the highest fiber yield / fed , as compared with the other cv. (Giza -7) . On the other hand, treating flax seeds with Nitrobien or Phosphorien increased significantly fiber yield / fed . as compared with the control (0.0 biofertilizer) . The application of 60 kg N / fed enhanced significantly fiber yield / fed , as compared with unfertilized plants ,in both seasons. Eventually , in both seasons , fiber yield / fed was significantly affected by first (A×B and A ×C) order interactions only . For example , the maximum values of fiber yield / fed . were associated with Sakha -1 cv. when inoculated with Nitrobien, whereas the minimum averages belonged to Giza -7 cv . without any biofertilizer inoculation .

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تأثير بعض الأسمدة الحيوية والمعدنية على صفات النمو والمحصول لصنفين من الكتان .

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ملخص

أجريت تجربتان بمزرعة كلية الزراعة بجامعة الأزهر بمنطقة مسطرد فى موسمي ٢٠٠٠ /٢٠٠١ و ٢٠٠١ /٢٠٠٢ وذلك لدراسة تأثير التسميد الحيوي والنيتروجيني على صنفين من الكتان . وكانت المعاملات على النحو التالي :

أولا : الاصناف المستخدمة : سخا ١ ، جيزة ٧

ثانيا : معاملات التسميد الحيوي : بدون تسميد ، التسميد بالنتروبين والتسميد بالفوسفورين

ثالثا : مستويات التسميد الأزوتي : صفر ، ٣٠ ، ٦٠ كجم ازوت / فدان

وكانت أهم النتائج على النحو التالي :

١- تفوق الصنف سخا ١ معنويا فى الطول الكلي والطول الفعال ومحصول القش / فدان ومحصول البذور بالكبسولة ومحصول البذور بالنبات ومحصول الألياف والبذور بالفدان .

٢- بينما تفوق صنف جيزة ٧ فى سمك الساق فى كلا الموسمين .

٣- بصفة عامة اتمت البذور الملقحة بالسماد الحيوي النتروبين أو الفسفورين زيادة معنوية على صفات النمو تحت الدراسة .

٤- تفوق التسميد بالفوسفورين على النتروبين فى عدد البذور بالكبسولة ومحصول البذور فى النبات وبالفدان .

٥- أدى التسميد بمعدل ٦٠ كجم / فدان أعلى القيم بالنسبة لصفة الطول الكلي

والطول الفعال ومحصول القش / للفدان وعدد البدور / الكبسولة ومحصول الألياف / الفدان ومحصول البذور فى النبات والفدان .

٦- أعطت معظم تفاعلات الدرجة الأولى والدرجة الثانية زيادة معنوية فى صـــفات النمو والمحصول ومكوناته فى نباتات الكتان .

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