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EFFECT OF NOFATRIN (N-BIOFERTILIZER) APPLICATION TIMES ON YIELD AND YIELD COMPONENTS OF SOMEFLAX VARIETIES

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ABSTRACT

This investigation was conducted at Ismailia Agric. Res. Station Agri. Res. Center during the two successive seasons 2003/04 and 2004/05 to study the effect of three Nofatrin application at 30, 60 and 90 days after planting in addition to the control treatment on yield and yield components of three flax varieties i.e., Sakha1, Sakha2 and Giza8. Moreover, to estimate correlation coefficient (r) between different characters.

Results obtained can be summarized as follow:

1- The flax variety Sakha1 surpass either Sakha2 or the lowest one Giza8 in total length, technical length, straw yield per plant as well as per faddan, fiber yield per plant as well as per faddan, fiber percentage and fiber length in both seasons and also in combined analysis over them.
2- The variety Sakha2 ranked first and superior the other two varieties Sakha1 and Giza8 in no. of fruiting branches, no. of capsules per plant, no. of seeds per capsule, 1000-seed weight, seed yield per plant as well as per faddan, oil percentage and oil yield per faddan in both seasons and combined analysis.
3- Nofatrin application times significantly differed and there are gradual increment in the mean values of each character from the control up to the largest time of application (at 90 days old). Moreover, the difference between the two treatment i.e., spray after 60 and 90 days from sowing did not reached the level of significance in most economical yield characters.
4- The estimates of correlation coefficient (r) were highly significant and positive between straw yield per faddan and each of straw yield per plant, technical length, fiber yield per faddan, fiber yield per plant, fiber length, seed yield per plant and no. of capsules per plant. On the other hand, the r values were not significant and positive between fiber yield per faddan and each of seed yield per faddan, seed yield per plant, no. of capsules per plant, 1000-seed weight, oil yield per faddan and oil percentage.

INTRODUCTION

Flax (*Linum usitatissimum* L.) is considered as the most important bast fiber crop in the Arab Republic of Egypt since several years ago. This crop is cultivate for two mainly products i.e., seeds and fiber. Nowadays, flax cultivated area did not enough to cover the great demands especially from linseed oil. In the same time, it is very difficult to increase the flax area in the valley lands due to the great competition with the other winter crops as wheat, clover and fababeen. For this reason, the only solution is to make an extension for cultivating flax in the new reclaimed lands. Moreover, great attention for using bio-fertilizers to minimize the production cost and environmental pollution in comparison with the chemical fertilization.

Many investigators found differences among flax genotypes concerning yield and its related characters such as El-Kady *et al.*, (1995), El-Shimy *et al.*, (1998), Mostafa *et al.*, (1998), El-Gazzar (2000), El-Shimy and Naglaa Ashry

(2003) and Nashy (2005). Regarding N-biofertilizer effect, El-Gazzar and El-Kady (2000) indicated that Nofatrin application as a foliar nutrition on flax plants increased straw and fiber yields per faddan and also El-Azzouni and El-banna (2002) reported that biofertain as a biofertilizer caused an increment in straw and seed yields for three flax genotypes.

The main objectives of the present investigation were to study the effect of four Nofatrin (N-biofertilizer) application treatments as foliar nutrition on the yield and yield components of three flax varieties in sandy soil.

MATERIALS AND METHODS

Two field experiments were carried out at Ismailia Agric. Res. Station Agri. Res. Center, Egypt during the two successive seasons of 2003/2004 and 2004/2005 to study the effect of Nofatrin application at three times in addition to the control treatment on yield and yield components of three flax varieties. The soil of the experimental site was sand in texture. Soil structure and chemical analysis of the experimental field are presented in Table (1). The chemical analysis of the experimental soil carried out according to the methods outlined by Piper (1950).

Table (1): Mechanical and chemical analysis of experimental soil (0-60, cm soil depth) in the two growing seasons.

Variables	Seasons	
	2003/04	2004/05
	Mechanical analysis	
Soil type	Sandy	Sandy
Coarse sand %	64.32	66.25
Fine sand %	35.85	27.40
Silt %	4.50	3.12
Clay%	7.64	4.36
	Chemical analysis	
PH value in 1: 2.5 suspension	7.52	7.75
EC (mhos/cm) dsm^{-1}	0.13	0.12
Organic matter %	0.061	0.050
Available N (ppm)	7.42	7.10
Available P (ppm)	1.50	1.43
Available K (ppm)	49.62	47.25

*Soil and water Lab., Ismailia Res. Station, El-Ismailia Governorate.

A split – plot design with four replications was used for each trait. The main plots were randomly assigned to the three flax varieties namely Sakha1, Sakha2 and Giza8, the sub-plots were the four foliar application treatments i.e., control (without Nofatrin), sprayed with Nofatrin after 30, 60 and 90 days from sowing. The rate of Nofatrin was one Liter solved in 200 liters water / faddan. Each sub-plot was 2 x 3 meters (1/700 faddan) with 10 rows, 20 cm apart. The experiments were preceded by sunflower crop in both seasons. The other agricultural practices were applied as recommended. Flax seeds were drilled in rows at the rate of 60 kg / faddan for each variety. The sowing dates were on November 6^{th} and November 14^{th} in the first and second seasons, respectively.

At maturity, ten guarded plants were pulled at random from each sub-plot to be used for recording yield components. Flax straw, fiber and seed yields/faddan were calculated from the sub-plot area basis. Data collected included the following characters:

A- Straw yield and its components: Total length (cm), technical length(cm), straw yield (g) / plant, straw yield (ton) / faddan,

B- Seed yield and its components: Number of fruiting branches, no. of capsules / plant, no. of seeds / capsule, 1000-seed weight (g), seed yield (g) / plant, seed yield (kg) / faddan, seed oil percentage and oil yield (kg) / faddan.

C- Fiber yield and its quality: fiber yield (g) / plant, fiber yield (ton) / faddan, fiber percentage and fiber length (cm).

Statistical Analysis

Analysis of variance was carried out according to Snedecor and Cochran (1982) and means were compared by least significant difference (L.S.D.) at the levels of 0.05 and 0.01. The combined analysis of variance over the two season was performed for each character (Le Clerg *et al.*,1966).

Correlation studies:

Estimates of correlation coefficient (r) between different flax characters were calculated according to Svab (1973) as follows:

$r_{xy} = SP_{XY}/(SS_X.SS_Y)^{0.5}$ where: SP_{XY} is the phenotypic covariance between the tow traits, SS_X phenotypic standard deviations of the first trait and SS_y phenotypic standard deviations of the second trait.

RESULTS AND DISCUSSION

Straw yield and its components :

Results in Table 2 showed significant differences between either flax or Nofatrin times application concerning the four traits studied i.e., total length, technical length, straw yield / plant and per faddan in both seasons as well as the combined analysis over them.

Regarding flax varieties, data illustrated that Sakha1 ranked first and surpass the other two ones Sakha2 and Giza8 in all characters under study among the two successive seasons and the combined analysis, the respective averages obtained in total length trait were 77.19, 72.87 and 66.67 cm. as obtained from combined analysis data for Sakha1, Sakha2 and Giza8, respectively. Moreover, the averages obtained from the combined analysis for technical length were 66.89, 62.94 and 59.76 cm for the same varieties which above mentioned arrangement. The respective means for straw yield / plant were 2.022, 1.788 and 1.276 g. Moreover, the averages for straw yield / faddan were 3.885, 3.261 and 2.795 ton, respectively. Many investigators found varietal differences in straw characters such as El-Kady *et al.*,(1995), Mostafa *et al.*,(1998) El-Gazzar (2000) El-Shimy *et al.*, (2001), El–Shimy and Naglaa Ashry (2003) and Nashy (2005).

Generally, the maximum mean values for the four characters previously mentioned were obtained by Sakha1 variety followed by Sakha2 and the lowest estimates obtained by Giza8, the differences between these flax varieties were mainly due to the genetically make up for each one.

Table (2). Mean values of straw yield and two related characters for three flax varieties as affected by spraying Nofatrin fertilizer at three times In 2003/04, 2004/05 seasons and their combined analysis.

characters	Total length / plant (cm)			Technical length / plant (cm)			Straw yield / plant (g)			Straw yield / faddan (ton)		
Season / Treatment	1st	2nd	Comb.	1st	2nd	Comb.	1st	2nd	Comb.	1st	2nd	Comb.
A- varieties												
Sakha1	80.72	73.65	77.19	70.37	62.41	66.89	2.082	1.961	2.022	4.773	2.996	3.885
Sakha2	75.68	70.05	72.87	65.81	59.07	62.94	1.893	1.683	1.788	4.037	2.485	3.261
Giza8	70.95	62.39	66.67	64.38	55.13	59.76	1.369	1.182	1.276	3.636	1.954	2.795
F. test	**	**	**	*	*	**	**	**	**	**	**	**
LSD 0.05	2.68	4.61	1.63	3.76	5.26	1.98	0.327	0.111	0.106	0.604	0.629	0.266
0.01	3.27	5.62	2.37	-	-	2.87	0.399	0.135	0.154	0.736	0.767	0.387
B- time of Nofatrin foliar application												
Without spray (control)	67.83	56.36	62.10	53.78	42.81	49.80	1.306	0.777	1.042	3.437	2.001	2.719
Spray after 30 days	74.91	69.73	72.32	66.36	59.55	62.81	1.663	1.548	1.606	3.820	2.285	3.053
Spray after 60 days	78.00	72.09	75.05	70.73	63.70	67.21	1.962	2.004	1.983	4.600	2.747	3.674
Spray after 90 days	82.39	76.62	79.51	76.52	69.42	72.97	2.194	2.106	2.150	4.737	2.881	3.809
F. test	**	**	**	**	**	**	**	**	**	**	**	**
LSD 0.05	2.05	2.16	1.38	1.83	2.10	1.35	0.267	0.245	0.175	0.323	0.254	0.199
0.01	2.80	2.96	1.86	2.51	2.88	1.81	0.365	0.335	0.235	0.443	0.348	0.267

*,** Indicate only significant and highly significant, respectively.

Table (3). Mean values of fiber yield and two related characters for three flax varieties as affected by spraying Nofatrin fertilizer at three times In 2003/04, 2004/05 seasons and their combined analysis.

characters	Fiber yield / plant (g)			Fiber yield / faddan (ton)			Fiber percentage (%)			Fiber length (cm)		
Season / Treatment	1st	2nd	Comb.	1st	2nd	Comb.	1st	2nd	Comb.	1st	2nd	Comb.
A- varieties												
Sakha1	0.269	0.257	0.264	0.600	0.398	0.507	12.63	13.46	13.05	73.28	65.26	69.27
Sakha2	0.224	0.201	0.219	0.489	0.302	0.399	12.24	12.26	12.25	68.71	61.79	65.25
Giza8	0.163	0.136	0.153	0.438	0.229	0.328	12.10	11.82	11.96	64.89	55.99	60.44
F. test	**	**	**	**	**	**	-	*	*	**	**	**
LSD 0.05	0.025	0.020	0.010	0.084	0.095	0.039	-	1.08	0.85	2.65	4.24	1.68
0.01	0.031	0.025	0.014	0.102	0.116	0.061	-	-	-	3.23	5.90	2.45
B- time of Nofatrin foliar application												
Without spray (control) Spray after 30 days	0.166	0.109	0.121	0.446	0.280	0.315	12.94	13.85	11.57	59.85	46.82	53.34
	0.208	0.199	0.194	0.480	0.292	0.369	12.55	12.68	12.09	67.72	61.87	64.80
Spray after 60 days	0.234	0.241	0.250	0.555	0.333	0.404	12.14	12.03	12.62	71.59	65.13	68.36
Spray after 90 days	0.265	0.243	0.288	0.556	0.334	0.510	11.65	11.48	13.40	76.69	70.25	73.47
F. test	**	**	**	*	*	**	-	**	**	**	**	**
LSD 0.05	0.023	0.023	0.016	0.085	0.041	0.030	-	1.00	1.02	1.97	2.06	3.35
0.01	0.032	0.031	0.021	-	-	0.0400.	-	1.37	1.38	2.70	2.81	4.50

*,** Indicate only significant and highly significant, respectively.

Concerning Nofatrin application times effect, data revealed that the four traits studied differed significantly within each character in both seasons and also in combined analysis over them. Moreover, the means of these characters increased with increasing the days old of flax plants. The averages obtained from the combined analysis for total length were 62.10, 72.32, 75.05 and 79.51 cm, while they were 49.80, 62.81, 67.21 and 72.97 cm for technical length, straw yield / plant recorded 1.042, 1.606, 1.983 and 2.150 g, in addition to straw yield / faddan which recorded 2.719, 3.053, 3.674 and 3.809 ton for control (without Nofatrin), spraying with Nofatrin at 30, 60 and 90 days from sowing date, respectively. At 60 or 90 days old, flax plants were in full leaves formation which made plants to able more benefit from Nofatrin fertilizer. It can be concluded that nitrogen is an essential element for flax growth to build up protoplasm and proteins which induce cell division and meristematic activity, consequently more plant cells in number and size with an overall increase in plant growth. It must be mentioned here, that all estimates recorded in the first season were higher than obtained from the second one, this behavior may be due to the earliness in sowing date, the suitable environmental conditions and more available N, P and K / ppm in the first season.

Results illustrated the In Table 3 reveal that the varieties significantly differed in all fiber characters studied with an exception for fiber percentage in the first season which did not reached the level of significance. Moreover, similar case had observed for Nofatrin application times in relation to the significance among four Nofatrin treatments. With respect to varietal differences, the flax variety Sakha1 ranked first and recorded highest mean values in all the four fiber traits, followed by Sakha2 and the lowest one Giza8 in both seasons and the combined analysis for each character. The averages as shown from the combined analysis were 0.264, 0.219 and 0.153 g for fiber yield / plant, while they were 0.507, 0.399 and 0.328 ton for fiber yield / faddan, the estimates of fiber percentages were 13.05, 12.25 and 11.96% and fiber length recorded were 69.27, 65.25 and 60.44 cm for Sakha1, Sakha2 and Giza8, respectively.

Owing to the Nofatrin treatments, data indicated gradual increase in mean values of the four fiber traits with increasing the days from sowing. In this connection, the difference among spraying Nofatrin at 60 and 90 days old did not reached the level of significance in fiber yield / faddan and fiber percentage. From the combined analysis, the estimates for fiber yield / plant were 0.121, 0.194, 0.250 and 0.288 g, for fiber yield / faddan they were 0.315, 0.369, 0.464 and 0.510 ton the fiber percentage recorded 11.57, 12.09, 12.62 and 13.40%, while the fiber length means were 53.34, 64.80, 68.36 and 73.47 cm for the control, spraying Nofatrin at 30, 60 and 90 days after planting, respectively. It must be noticed that the data collected from the first season were higher than those obtained from the second one. Many investigators reported that N-biofertilizer application caused an increment in straw yield and related characters such as El-Gazzar and El-Kady (2000), El-Azzouni and El- Banna (2002) and El- Gawish (2005)

Seed yield and its Components:

Mean values of the four characters related to seed yield for three flax varieties as affected by spraying Nofatrin fertilizer at three times in 2003/04, 2004/05 seasons and their combined analysis are presented in Table (4). Statistical analysis showed significant differences between either flax varieties or Nofatrin application times in the four traits studied i.e., number of fruiting branches / plant, no. of capsules / plant, no. of seeds / capsule and 1000-seed weight in both seasons as well as the combined analysis over them. It could be noticed that Sakha2 surpassed either Sakha1 or Giza8 in all characters under study among the two successive seasons and the combined analysis. The respective averages obtained for no. of fruiting branches / plant were 8.52, 7.88 and 7.14 as shown for the combined analysis data for Sakha2, Sakha1 and Giza8, respectively. Moreover, the average obtained from the combined analysis in no. of capsules / plant were 7.94, 7.18 and 6.65 for the same varieties which above mentioned arrangement, the respective means for no. of seeds / capsule were 7.53, 6.73 and 6.33 while, for 1000-seed weight they were 9.60, 9.07 and 8.75 g, respectively.

Generally, the maximum mean values for the four characters previously mentioned obtained by Sakha2 variety followed by Sakha1 and the lowest estimates obtained by Giza8.

Regarding Nofatrin application, data indicated that the traits studied differed significantly within each character in both seasons and also in combined analysis over them. Moreover, the means of these characters increased with increasing the days old of flax plants sprayed with Nofatrin. The averages obtained from the combined analysis for no. of fruiting branches / plant were 6.16, 7.51, 9.76 and 9.96 while, no. of capsules / plant were 5.71, 6.88, 8.17 and 8.28 no. of seeds / capsule recorded 5.63, 6.72, 7.47 and 7.63 while, the mean values of 1000-seed weight were 8.48, 8.93, 9.43 and 9.71 g for control, spraying Nofatrin at 30, 60 and 90 days from sawing date, respectively. The difference between spray Nofatrin after the two application times at 60 and 90 days old did not reached the level of significance in no. of fruiting branches, no. of capsules / plant and no. of seeds / capsule. In addition to , that the averages obtained from the first season were higher than those obtained from the second one.

Results recorded in Table 5 reveal that either the varieties or among the Nofatrin treatments significantly differed in all seed characters studied in both season and combined analysis.

With respect to varietal differences, the flax variety Sakha2 ranked first and recorded highest mean values in all seeds traits, followed by Sakha1 and the lowest one Giza8 in both seasons and also the combined analysis for each character. The averages as shown from the combined analysis were 0.650, 0.467 and 0.418 g for seed yield / plant, while they were 562.81, 502.73 and 449.87 kg for seed yield / faddan, in the same time they were 39.79, 38.91 and 38.52% of seed oil percentage and finally oil yield / faddan recorded 224.16, 195.82 and 173.27 kg for Sakha2, Sakha1 and Giza8, respectively.

Table (4). Mean values of four characters related to seed yield for three flax varieties as affected by spraying Nofatrin fertilizer at three times In 2003/04, 2004/05 seasons and their combined analysis.

Characters	No. of fruiting branches/plant			No. of capsules/plant			No. of seeds/capsule			1000-seed weight (g)		
Season / Treatment	1st	2nd	Comb.	1st	2nd	Comb.	1st	2nd	Comb.	1st	2nd	Comb.
A- varieties												
Sakha1	8.56	7.19	7.88	7.77	6.58	7.18	7.12	6.33	6.73	9.30	8.83	9.07
Sakha2	9.08	7.95	8.52	8.46	7.42	7.94	7.73	7.33	7.53	9.82	9.37	9.60
Giza8	7.95	6.33	7.14	7.35	5.94	6.65	6.68	5.98	6.33	8.95	8.55	8.75
F. test	**	**	**	*	*	**	**	**	**	**	**	**
LSD 0.05	0.422	0.77	0.27	0.96	1.14	0.45	0.47	0.38	0.20	0.41	0.36	0.17
0.01	0.515	0.94	0.39	-	-	0.66	0.58	0.46	0.29	0.50	0.44	0.24
B- time of Nofatrin foliar application												
Without spray (control)	6.47	5.84	6.16	5.83	5.58	5.71	5.68	5.58	5.63	8.78	8.17	8.48
Spray after 30 days	8.31	6.71	7.51	7.56	6.19	6.88	7.02	6.41	6.72	9.22	8.64	8.93
Spray after 60 days	9.61	7.90	9.76	8.99	7.34	8.17	7.97	6.97	7.47	9.65	9.20	9.43
Spray after 90 days	9.72	8.19	9.96	9.06	7.49	8.28	8.04	7.22	7.63	9.77	9.64	9.71
F. test	**	**	**	**	**	**	**	**	**	**	**	**
LSD 0.05	0.528	0.30	0.29	0.69	0.47	0.40	0.44	0.53	0.39	0.09	0.26	0.21
0.01	0.723	0.41	0.39	0.94	0.64	0.54	0.60	0.73	0.52	0.12	0.35	0.28

*,** Indicate only significant and highly significant, respectively.

Table (5). Mean values of seed yield and two related characters for three flax varieties as affected by spraying Nofatrin fertilizer at three times In 2003/04, 2004/05 seasons and their combined analysis.

Characters	Seed yield / plant (g)			Seed yield / faddan (kg)			Seed oil percentage (%)			Oil yield / faddan (kg)		
Season / Treatment	1st	2nd	Comb.	1st	2nd	Comb.	1st	2nd	Comb.	1st	2nd	Comb.
A- varieties												
Sakha1	0.497	0.436	0.467	505.73	499.72	502.73	39.29	38.52	38.91	196.67	194.97	195.82
Sakha2	0.700	0.599	0.650	572.50	553.12	562.81	40.08	39.50	39.79	221.91	226.41	224.16
Giza8	0.449	0.386	0.418	468.43	431.30	449.87	38.74	38.30	38.52	167.34	179.20	173.27
F. test	**	**	**	**	**	**	**	**	**	**	**	**
LSD 0.05	0.028	0.132	0.041	31.74	18.24	19.18	0.43	0.54	0.21	7.89	13.67	4.82
0.01	0.034	0.161	0.061	38.70	22.23	16.26	0.52	0.66	0.31	9.62	16.67	7.01
B- time of Nofatrin foliar application												
Without spray (control)	0.382d	0.288	0.335	462.62	438.47	450.55	38.29	37.96	38.13	175.75	168.13	171.94
Spray after 30 days	0.520	0.420	0.471	509.33	486.16	497.75	39.12	38.44	38.78	195.87	190.46	193.17
Spray after 60 days	0.617	0.564	0.591	540.18	522.71	531.45	39.93	39.25	39.59	212.16	209.08	210.62
Spray after 90 days	0.674	0.622	0.648	550.09	531.50	540.80	40.15	39.44	39.80	216.98	213.56	215.27
F. test	**	**	**	**	**	**	**	*	**	**	**	**
LSD 0.05	0.056	0.047	0.035	26.99	20.82	16.47	0.47	0.49	0.33	11.25	8.98	6.95
0.01	0.077	0.064	0.047	36.98	28.52	22.10	0.64	-	0.44	15.41	12.30	9.33

*,** Indicate only significant and highly significant, respectively.

The differences between flax genotypes concerning seed yield and related characters had been observed by El-Gazzar (2000), El-Shimy and Naglaa Ashry (2003) and Nashy (2005).

Owing to Nofatrin spraying date,, data indicated gradual increase in mean values with each increase up to 90 days from planting of the four seed traits than the untreated control. In this connection, the difference between spraying Nofatrin at 60 and 90 days old did not reached the level of significance in seed yield / faddan and oil yield / faddan as shown in the combined analysis. The estimates for seed yield / plant were 0.335, 0.471, 0.591 and 0.648 g they were 450.55, 497.75, 531.45 and 540.80 kg for seed yield / faddan. While, the seed oil percentage recorded 38.13, 38.78, 39.59 and 39.80% moreover, the means of oil yield / faddan were 171.94, 193.17, 210.62, and 215.27 kg for the control, spraying Nofatrin at 30, 60 and 90 days from planting, respectively. It must be noticed that the data collected from the first season were higher than those obtained from the second one in all characters studied. Improvement of flax seed productivity and quality as resulted of N-biofertilizer application which occurred in this study had reported too by El-Azzouni and El-Banna (2002) and El-Gawish (2005)

Generally, it can be concluded that the flax variety Sakha1 achieved maximum estimates for straw yield and its related characters, followed by Sakha2 and the lowest one Giza8. In the same time, Sakha2 ranked first and surpass Saka1 and Giza8 which ranked the third concerning seed yield and related traits. Regarding Nofatrin application times data showed gradual increment in each character studied beginning from the lowest mean obtained by control towards to the highest one occurred by Nofatrin application at 90 days after planting. Moreover, that no significant differences had found between the two treatment i.e., 60 and 90 days in most economic flax characters.

The interaction:

The interaction between two studied factors i.e., flax varieties (V) and Nofatrin application times (N) concerning straw yield and seed yields (Table 6) had significant effect on the four characters plant length, technical length, fiber length and seed yield / plant. This means that these two factors done their effect dependently. Moreover, that the maximum estimates of the three straw characters were achieved by the variety Sakha1 combined with Nofatrin application at 90 days from sowing. Meanwhile, seed yield /plant was achieved by Sakha2 combined with Nofatrin application at 90 days from sowing. On the other hand, the residual traits under study were not significant.

Correlation studied:

Table (7), showed positive and highly significant correlation coefficient were obtained between straw yield / faddan and each of straw yield / plant, technical length, fiber yield / faddan, fiber yield / plant, fiber length, seed yield / plant and no. of capsules / plant, while only significant and positive in seed yield / faddan, 1000-seed weight, oil yield / faddan and oil percentage.

Table (6). Interaction values between flax varieties and Nofatrin application times for plant length, technical length, fiber length and seed yield /plant from the combined analysis over the two experimental seasons.

Flax varieties	Nofatrin application times per days				Flax varieties	Nofatrin application times per days			
	control	30	60	90		control	30	60	90
	Plant length (cm)					Technical length (cm)			
Sakha1	70.75	76.75	78.80	82.23	Sakha1	55.51	66.68	69.97	75.01
Sakha2	62.08	72.52	76.24	80.64	Sakha2	49.26	61.85	67.52	73.14
Giza8	53.47	67.46	70.11	75.66	Giza8	44.23	59.89	64.13	70.77
LSD 0.05	2.40				LSD 0.05	2.33			
0.01	3.22				0.01	3.42			
	Fiber length (cm)					Seed yield / plant (g)			
Sakha1	60.56	69.06	71.61	75.85	Sakha1	0.319	0.429	0.552	0.567
Sakha2	53.36	64.42	69.11	74.12	Sakha2	0.407	0.580	0.755	0.857
Giza8	46.08	60.41	64.35	70.45	Giza8	0.280	0.404	0.465	0.522
LSD 0.05	2.39				LSD 0.05	0.06			
	4.50				0.01	0.09			

Ns, *,** Indicate non-significant, significant and highly significant, respectively.

Table (7). Simple correlation coefficient among straw and seed yields as well as other related characters from the combined analysis over the two experimental seasons.

	Characters	2	3	4	5	6	7	8	9	10	11	12
1	Straw yield / faddan (ton)	0.933**	0.825**	0.951**	0.952**	0.859**	0.636*	0.571	0.722**	0.674*	0.639*	0.627*
2	Straw yield / plant (g)	-	0.918**	0.825**	0.978**	0.941**	0.783**	0.745**	0.863**	0.821**	0.788**	0.792**
3	Technical length (cm)		-	0.655*	0.857**	0.991**	0.657*	0.722**	0.849**	0.791**	0.670*	0.745**
4	Fiber yield / faddan (kg)			-	0.904**	0.718**	0.507	0.359	0.515	0.477	0.497	0.437
5	Fiber yield /plant (g)				-	0.897**	0.716**	0.623*	0.762**	0.717**	0.713**	0.684*
6	Fiber length (cm)					-	0.694*	0.721**	0.838**	0.795**	0.702*	0.748**
7	Seed yield/faddan (Kg)						-	0.910**	0.911**	0.933**	0.998**	0.940**
8	Seed yield / plant (g)							-	0.924**	0.978**	0.930**	0.973**
9	No. of capsules/plant								-	0.966**	0.909**	0.960**
10	1000-seed weight (g)									-	0.951**	0.988**
11	Oil yield / faddan (kg)										-	0.959**
12	Oil percentage (%)											-

*,** Indicate significant and highly significant, respectively.

The r values were highly significant and positive between straw yield / plant and each of technical length, fiber yield / faddan, fiber yield / plant, fiber length, seed yield / faddan, seed yield / plant, no of. Capsules / plant, 1000-seed weight, oil yield / faddan and oil percentage. The correlation coefficient values were highly significant and positive between technical length and each of fiber yield / plant, fiber length, seed yield / plant, no. of capsules / plant, 1000-seeds weight and oil percentage, while they were only significant and positive in fiber yield / faddan, seed yield / faddan and oil yield / faddan. The r estimates were highly significant and positive between fiber yield / faddan and only significant in the two characters fiber yield / plant and fiber length, but not significant and positive in the other six traits. The relationship between fiber yield / plant and each of fiber length, seed yield / faddan, no. of capsules / plant, 1000-seed weight and oil yield / faddan showed highly significant and positive while, seed yield / plant and oil percentage were only significant and positive correlated. The r values between fiber length and each of seed yield / plant, no. of capsules / plant, 1000-seed weight and oil percentage were positively and highly significant and only significant positive with seed yield / faddan and oil yield / faddan. The following r values were highly significant and positive between seed yield / faddan and each of seed yield / plant, no. of capsules / plant, 1000-seed weight, oil yield / faddan and oil percentage, between seed yield / plant and each of no. of capsules / plant, 1000-seed weight, oil yield / faddan and oil percentage, between no. of capsules / plant and each of 1000-seed weight, oil yield / faddan and oil percentage, between 1000-seed weight and each of oil yield / faddan and oil percentage, finally, between oil yield / faddan and oil percentage. These results were in agreement with those obtained by Afaf Zahana (1999), El-Shimy *et al.*, (2001), Abo-Kaied (2003) and El-Hariri *et al.*, (2004).

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تأثير مواعيد إضافة النوفاترين (نتروجين حيوي) علـى المحصـول ومكوناتـه لبعض أصناف الكتان

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أجري هذا البحث بمحطة البحوث الزراعية بالاسـماعيلية خـلال موسـمي ٢٠٠٣/٢٠٠٤ ، ٢٠٠٤/٢٠٠٥ وذلك لدراسة تأثير مواعيد إضافة النوفاترين (عند عمر ٣٠، ٦٠ ، ٩٠ يوم من الزراعة) على المحصول ومكونات المحصول لثلاثة أصناف من الكتان هم سخا١ ، سخا٢ ، جيزة ٨. وكذلك لتقدير قيمة معامل الارتباط) بين الصفات المختلفة .

وفيما يلي أهم النتائج المتحصل عليها :

١- تفوق صنف الكتان سخا١ على سخا٢ وكذلك على الصنف الأقل جيزة ٨ فى الطول الكلـى ، الطـول الفعال ، محصول القش / نبات وكذلك للفدان ، محصول الألياف/ نبات وكذلك للفدان ، النسبة المئويـة للألياف ، طول الألياف فى كلا الموسمين وكذلك فى التحليل التجميعي ليما .

٢- أحتل الصنف سخا٢ المكانة الأولى وتفوق على الصنفين سخا١ وجيزة ٨ فى عدد الفروع الثمريـة ، عدد الكبسولات / نبات ، عدد البذور / كبسولة ، وزن الألف بذرة ، محصول البذور / نبـات وكـذلك للفدان ، النسبة المئوية للزيت ، محصول الزيت / فدان فى كلا الموسمين والتحليل التجميعي ليما . .

٣- كان هناك فرق معنوي بين مواعيد إضافة النوفاترين وكذلك كان هنـاك زيـادة متدرجـة فـى قـيم المتوسطات لكل صفه حتي عمر ٩٠ يوم من الزراعة بينما لم يصل الفرق بين معاملتي الرش عند ٦٠، ٩٠ يوم من الزراعه الى مستوى المعنوية فى معظم الصفات الاقتصادية للمحصول .

٤- كانت قيم معامل الارتباط (ر) معنوية جدا وموجبة بين محصول القش / فدان وكل من محصول القش / نبات ، الطول الفعال ، محصول الألياف / فدان ، محصول ألالياف / نبات ، طول الألياف ، محصول البذرة / نبات ، عدد الكبسولات / نبات - وعلى الجانب الأخر كانت قيم (ر) غير معنوية وموجبة بين محصول الألياف/ فدان وكل من محصول البذرة / فدان، محصول البذرة / نبات ، عـدد الكبسـولات / نبات ، وزن الألف بذرة ، محصول الزيت / فدان ، النسبة المئوية للزيت