J. Agric. Sci. Mansoura Univ., 28(8): 5887 - 5902, 2003

EFFECT OF SEEDING RATE, POTASSIN FERTILIZER ON SOME GENOTYPES OF FLAX (*Limun usitatissimum* L.)

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ABSTRACT

Two field experiments were carried out at Tag El-Ezz Research Station Farm, Dakahlia Governorate, during two winter successive seasons, i.e., 2001/2002 and 2002/2003, to study the effect of two seeding rate i.e., 70 and 80 kg/fad. and spray fertilizer with potassin i.e. without spray and spray after 65 day from sowing on three genotypes of flax i.e. 2465/3, 402/12 and Sakha1. The experimental desigen was split-split plot in four replication.

The obtained results could be summarized as follows:

1. straw yield and its related characters

a. **Genotypes:** sakha1 flax variety has the superiority on strain 2465/3 in straw yield/faddan and all of related characters followed by Strain 2465/3 and the lowest yield was obtained from strain 402/12 in the two seasons.

b. **Spray with potassin:** Potassin increased significantly technical length, straw yield/plant / gm and fiber yield plant/gm characters comparison with untreated (control) treatment in the two seasons.

c. **Seeding rate:** seeding rate 80kg/fad increased significantly technical length and fiber yield per plant and per faddan characters comparison with 70 kg in the two seasons.

2. Seed yield and its related characters:

a. **Genotypes:** Sakha1 flax variety ranked first in seed yield/faddan kg and all of related characters followed by strain 2465/3 and 402/12 in the two seasons.

b. **Spray with potassin:** There are a significant increament in seed yield/fad and its related characters by using potassin treatment comparison with control treatment in the two seasons.

c. **Seeding rates:** seeding rate 70 kg/faddan significantly increased number of fruting branches / plant, number of capsules/plant and seed yield/faddan kg in the two seasons.

3. **Economical yield:** Sakha1 flax variety gave the highest significantly values in biological yield, economic yield and harvest index followed by strain 2465/3 and 402/12 in the two seasons. Also spray with potassin and 80 kg seeding rates gave the same trend with economic yield and harvest index meanwhile the differences did not reach the level of significance with harvest index by 80 kg seeding rate.

4. the values of correlation coefficient ® were highly significant and positive between fiber yield/ faddan and each of straw yield /fad., fiber yield/plant, straw yield/plant, plant height and technical stem length. Also the same trend was obtained between for seed yield/fad. correlated with each of seed yield/plant, number of frutting branches and number of capsules/plant. Meanwhile it was negative and significant correlated with fiber yield/plant, straw yield/plant, total plant height and technical stem length. On the other hand correlation coefficients were highly significant and positive between fiber yield/plant and each of straw yield/plant, plant height, technical stem length or between straw yield/plant and each of total plant height and technical stem length.

These results are of great interest to increase seed and fiber yield/fad. through selection of the yield characters that have sizable direct effect of treatments under study using these seeding rate, spray with potassin as well as the most important indirect effects through the characters that have sizable indirect in flax genotypes under study.

INTRODUCTION

Flax (*Linum usitatissimum* L.) had been cultivated by ancient Egyptian people since about 4000 years ago. Recently, flax ranks second after cotton, concerning the cultivated area and the amount of fiber produced annually. It could be emphasized that it plays a great role in Egyptian national economy.

Great efforts had done to increase flax yield and its quality by the way of evolve new flax varieties and different agriculture treatments to achieve highest yield and best quality. Therefore, the main target of this study is to determine the optimum seeding rate, spray with potassin fertilizer for flax genotypes 2465/3, 402/12 and Sakha1.

Yield of various genotypes of flax were study by many investigators and they noticed that flax genotypes different significantly from each other El-Farouk *et al.*(1982) Hella *et* al.,(1989), Momtaz *et. al.*, (1989), Gaafar et.al., (1990), Leilah, (1993) El-Kady *et al.*, (1995), El-Sweify and Mostafa (1996), El-Shimy *et al.*, (1997), Mostafa *et al.*, (1997), Mostafa and Ashmawy (1998), Moawed and Abd El-Hamid(1999) and Moawed,(2001).

Many researchers, also, indicated that spray with potassin for cultivating flax genotypes increased all characters under the study. Rodewald and Ulbricht (1963), Shekhawat *et al.*,(1971), Parakhevich and Bykov(1972), Kadry(1981), El-Shimy *et al.*,(1985), Moawed(2001), El-Zeiney *et al.*, (1994), Puri and Jaipurkar(1989), Ving Singir and Ramoar(1994), Abo-Zaied(1997), El-Azzouni(1998) and El-Shimy and Moawed (2000).

The effect of seeding rate was studyed by many investigator such as El-Hariri(1964), and (1968). Horodysk and Sokolowski(1964) Chi *et al.*,(1966), El-Farouk (1968), Rasbace (1969), El-Nkhlawy(1975) , Momtaz *et al.*(1989), El-Kady *et al.*,(1995) and El-Swiefy and Mostafa(1996)

The main targets of this research work were to find out the effect of spray with potassin fertilizer and seeding rate on some flax genotypes through fiber and seed yield as well as yield components during winter season of 2001/2002 and 2002/2003 at Tag El-Ezz, Research Station Dakahilia Governorate, Agricultural Research Center (A.R.C.) Egypt.

MATERIALS AND METHODS

Two field experiments were carried out at the experimental farm of Tag El-Ezz Res. Station, Dakahilia, Agric. Res. Center (A.R.C.), during the two winter seasons of 2001/2002 and 2002/2003.

Chemical analysis and physical properties of the experimental soil are presented in Table (1).

Table (1): Some chemical and physical properties of the experimental soil at Tag ellez station (part19).

Seasons	E.C	T.S.S	pH	ESP %	O.M %	Available nutrients			Soil type
						N	P	K	
1st season	4.6	0.226	7.9	6.65	1.7	33	12	340	Saline
2nd season	4.1	0.219	7.9	5.60	1.9	38	12	370	Saline

Particle size distribution of experimental soil

Soil depth cm.	Coarse sand %	Fine Sand %	Silt %	Clay %	O.M %	$CaCO_3$ %	Texture
0-30	0.30	20.50	26.30	47.00	2.10	2.60	Clay

soils are very poor in available nutrients.

The objectives of this investigation are to study the effect of spray with potassin fertilizer, seeding rate on some flax genotypes in relation to some morphological characters, seed and fiber yields as well as the correlation coefficient among some characters.

Three flax genotypes were used, which included Sakha1 cultivar, in addition to two strains 2465/3 and 402/12.

Flax variety Sakha 1, promising strain 2465/3 and 402/12 were selected from cross between Bombay XI.1485, selection from Neelum(I.indian) and cross between Giza 4xI.235, respectively..

Spray with nutrient potassin(30%K_2O, and 8%nitrogen) were investigated including 1- without spray 2- spray with nutrient potassin after 65 days from sowing.

Two seeding rates were used 1- 70 kg/fad. 2- 80 kg/fad. A split-split plot design with four replicates was used in each experiment. Flax genotypes were randomly allotted in main plots, the sub-plots were assigned to the spray with nutrient fertilizer i.e. without spray and spray after 65 days from sowing and the two seeding rate i.e. 70 kg and 80 kg /fad. were confirmed to the sub sub-plots, which each plot area was (3x3.5)10.5m^2. Seeds were sown on November 17th in the first season and on 27th in the second one, seeds were obtained from the Fiber Res. Section, Agric. Res. Center (A.R.C.), Giza Egypt, level nutrient potassin fertilizer was obtained from Ministry of Agricultural G.O.A.E.F.

Weight of seeds for each treatment was equally drilled in 20 rows with 15 cm. apart.

Collected data:

At harvest time, ten guarded and competitive flax plants were taken randomly from each sub-plot to record the following characters:-

A-Single plant observation:

1- Plant height (cm.) was measured from soil surface to the highest point of plant.
2- Technical length (cm.) was determined from soil surface to the first branch.
3- Number of frutting branches/plant.
4- Number of capsules/plant.
5- Seed yield/plant (gm.)average mean of yield of 10plants.
6- Straw yield (gm.)average yield of 10 plants.

7- Fiber yield/plant (gm.) was estimated as an average of fiber extract from 10 plants.

B- Unit area observation:

From each plot, one square meter was harvested and the following characters were calculated:

8- Seed yield kg/fad.
9- Straw yield ton/fad.
10- Fiber yield kg/fad.

C- Economic characters:-

11- Biological yield /fad.(ton), calculated from the summation of straw and seed yield/fad. (W).
12- Economic yield (EY), the economic plant organ or more which the crop cultivated.
13- Harvest index (HI): the economic yield as percentage from the biological according to the following formula suggested by Wallaco *et al.*, (1972) and Kallo (1988)

H.I.= EY/W x 100 where: EY= Economic yield
W= Biological yield.

Statistical analysis:

All data were subjected to the analysis of variance according to the procedures outlined by Gomez and Gomoez (1984). Treatment means were compared by the Least significant difference test (L.S.D.) at the 5% and 1% levels of probability.

Correlation studies:

Interrelationships between different flax characters were calculated according to the following equation:

$$r = \frac{P_{xy}}{\sqrt{SS_{x\,ss}\, SS_{y.}}}$$

$$\text{Were: } SP_{xy} = \Sigma XY - \frac{\Sigma X \,.\, \Sigma Y}{N}$$

$$SS_x = \Sigma X^2 - (\Sigma X)^2 / n$$

$$SSy = \Sigma Y^2 - (\Sigma Y)^2 / n$$

The t. test was used to test the significance of (r) value.

RESULTS AND DISCUSSION

1.Straw yield and its related characters

Mean values of six straw characters i.e. plant height, technical length, straw yield/plant, straw yield/faddan, fiber yield/plant and fiber yield/faddan, as affected by flax genotypes (G), potassin spray (S), seeding rates ® and their interaction in the two successive seasons are presented in Table (2).

Table (2): Mean values of straw yield and related characters for some flax genotypes, spray with potassin, seeding rates and their interaction during winter seasons of 2001/2002 and 2002/2003.

Main effects and interactions	Plant height (cm)		Technical length (cm)		Straw yield/plant (gm)		Straw yield /fad. (ton)		Fiber yield/plant (gm)		Fiber yield/fad. (kg)	
	2001/2002	2002/2003	2001/2002	2002/2003	2001/2002	2002/2003	2001/2002	2002/2003	2001/2002	2002/2003	2001/2002	2002/2003
Genotypes(G)												
2465/3	87.88	83.24	81 67	80.80	0 611	0.682	2.351	2.342	0.092	0.101	532.90	536.10
402/12	80.41	78.20	77.64	78.53	0.519	0 588	2.111	2.232	0.073	0.085	485.60	469.20
Sakha1	96.42	92.30	88.40	90.11	0.790	0.854	3.620	3.810	0.123	0.141	598.02	621.05
F. test	**	**	**	**	**	**	**	**	**	**	**	**
L.S.D	2.41	2.22	1.00	1.48	0.003	0.004	0.07	0.05	0.002	0.001	3.67	3.82
Spray (S)												
Without spray	86.30	85 10	80.40	78.90	0.643	0.628	3.420	3.320	0 082	0.093	586.32	588.30
Spray after 65 days	88.41	86.52	84.30	80.60	0.721	0.660	3.510	3.360	0.098	0.131	591.62	598.60
F. test	n.s	n.s	**	**	**	**	n.s	n.s	**	**	n.s	n.s
Seeding rates(R)												
70 kg/fad.	83.20	81 40	82.20	81.30	0.541	0.522	3.820	3.830	0.091	0.099	552.20	553.60
80 kg/fad.	91.88	86.95	84.50	84.00	0.699	0.721	3.860	3.910	0.111	0.121	599.41	632.10
F.test	n.s	n.s	*	**	n.s	n.s	N.s	n.s	**	**	n.s	**
Interaction												
G x S	**	**	**	**	**	**	**	**	**	**	**	**
G x R	n.s	n.s	**	**	n.s	n.s	n.s	n.s	**	**	n.s	n.s
S x R	n.s	n.s	**	**	n.s	n.s	n.s	n.s	n.s	n.s	n.s	n.s

Analysis of variance showed significant differences in all studied characters between the three flax genotypes i.e. strain 2465/3, 402/12 and Sakha1. Also plant height straw yield fad/ ton and fiber yield / fad(kg) reach the level of significance with potassin spray. Seeding rates effects were significantly only in technical length, fiber and yield/plant in both seasons and fiber yield/faddan in the second seasons only.

Straw yield / faddan

Regarding straw yield ton/faddan character, data showed that Sakha 1 flax variety ranked first with the mean values of 3.620 and 3.810 ton/faddan, followed by strain 2465/3 (2.351 and 2.342) and the lowest straw yield/fad was obtained by strain 402/12 (2.111 and 2.232) in the first and second seasons respectively. These findings are in harmony with those of Hella *et al.*, (1989), Momtaz *et al.*,(1989), Gaafar *et al.*,(1990), Leilah (1993), Mostafa and Ashmawy (1998) and Moawed and Abdel Hamid(1999).

Fiber yield/faddan kg

Regarding fiber yield /faddan character, data showed that seeding rate 80 kg per faddan ranked first with the mean values of 599.41 and 632.1 kg/faddan followed by 70 kg (552.20 and 553.60) in the first and second seasons, respectively. The increase in fiber yield with seeding rate 80 kg/faddan comparison with those of 70 kg could be attributed to the increase in fiber percentage where the plants become thiner with 80 kg than 70 kg. Similar results were obtained by Horodyski and Sokolowski (1964), Chi *et al.*,(1966), El-Nkhlawy (1975), Momtaz *et al.*, (1989), El-Kady *et al.*, (1995) and El Swiefy and Mostafa (1996).

II. Seed yield and its related characters:

Mean values of four seed characters i.e. number of frutting branches/plant, number of capsules/plant, seed yield/plant gm and seed yield/faddan kg as affected by flax genotypes, potassin spray, seeding rates and their interaction in the two successive seasons are presented in Table (3).

Analysis of variance revealed significant differences in all studied characters between the three flax genotypes i.e.strains 2465/3, 402/12 and Sakha 1.

A. Genotypes

In this respect data showed that Sakha1 flax variety ranked first with the mean values of 565.41 and 623.00 kg/faddan, followed by strain 2465/3 (334.65 and 367.22) and the lowest seed yield/faddan was obtained by strain 402/12 (275.11 and 289.35) in the first and second seasons, respectively. Similar results were obtained by Chi *et al.*, (1966), El-Farouk et al. (1982), Hella *et al.* (1989), Mostafa *et al.* (1997) and El-Shimy and Moawed (2000).

Table (3): Mean values of various seed characters for some flax genotypes, spray with potassin , seeding rates and their interaction during winter seasons of 2001/2002 and 2002/2003.

Main effects and interactions	Number of fruting branches/plant		Number of capsules/plant		Seed yield /plant (gm)		Seed yield /faddan (kg)	
	2001/2002	2002/2003	2001/2002	2002/2003	2001/2002	2002/2003	2001/2002	2002/2003
Genotypes(G)								
2465/3	5.8	6.9	6.21	5.9	0.207	0.212	334.65	367.22
402/12	5.4	5.5	4.30	4.8	0.181	0.183	275.11	289.35
Sakha1	8.9	9.6	7.90	6.2	0.267	0.311	565.41	623.00
F. test	**	**	**	**	**	**	**	**
L.S.D	1.02	1.40	1.67	0.76	0.004	0.003	12.31	13.89
Spray (S)								
Without spray	6.1	5.9	4.9	5.2	0.250	0.232	341.52	369.20
Spray after 65 days	6.2	7.6	6.0	6.5	0.292	0.270	367.43	382.60
F. test	**	**	**	**	**	**	**	**
Seeding rates(R)								
70 kg/fad.	7.9	10.4	8.2	8.9	0.243	0.525	388 41	381.90
80 kg/fad.	6.5	7.2	5.8	6.6	0.183	0.194	382.54	379.65
F.test	*	*	**	**	n.s	n.s	*	**
Interaction								
G x S	**	**	**	**	**	**	**	**
G x R	**	**	**	**	**	**	**	**
S x R	n.s	n.s	**	**	**	**	**	**

Seed yield/faddan kg

B-Spray with potassin

Mean values of using potassin on seed yield/faddan kg were (367.43 and 382.60), meanwhile it were (341.52 and 369.20) with control treatment in the first and second seasons, respectively. The increas in seed yield/fad. could be attributed to the increas in number of capsules/plant and seed yield/plant as a results of potassin applications comparison with those untreated. These findings are in a harmony with those of Shekhawat *et al.*(1971) Porokhnevich and Bykov (1972); Kadry (1981) and Moawed (2001).

C- Seeding rates:-

Concerning seed yield/fad.kg character, data showed that 70kg/fad ranked first with the mean values of 388.41 and 381.9 kg/faddan comparison with 80 kg/faddan 382.54 and 379.65 in the first and second season, respectively.

The increased in seed yield /faddan with seeding rates 70kg/faddan than 80kg could be attributed to the increased in number of fruting branches/plant and number of capsules/plant. These results were in agreement with those obtained by Rodewald and Ulbricht(1963); El-Hariri(1964); Horodyski and Sokolowski (1964); El-Nkhlawy (1975); El-Shimy *et al.* (1985); El-Swiefy and Mostafa(1996) and Moawed(2001).

III. Economical flax characters:

1. Biological yield

According to biological yield character data in Table 4 show that Sakha1 flax variety ranked first with the mean values of 2.92 and 2.96 ton/faddan, followed by strains 402/12 and 2465/3 (2.27,2.88) and (2.66,

2.41(ton)in the first and second seasons, respectively. This may be attributed to the increas in seed and straw yields/fad. this result agree with those obtained by Moawed(2001).

2. Economic yield (ton/faddan):

Sakha1 flax variety show superiority the two genotypes 402/12 and 2465/3 in the first and second seasons. Mean values were 996.60 and 984.80 for Sakha1, meanwhile it was (759.30, 885.11) and (762.24, 971.40) for strains 402/12 and 2465/3, respectively. Similar results were obtained by El-Swiefy and Mostafa (1996) and El-Shimy *et al.*(2001).

B- Spray with potassin:

Analysis of variance in Table(4) show significant differences in economic yield ton/faddan in the two seasons. Mean values of this character were (853.61, 822.60) and (762.30, 781.60) for spray with potassin and control treatment in the fist and second seasons, respectively.

Table (4): Estimates of economic flax characters as affected by genotypes, spray with potassin, seeding rates and their interaction during winter seasons of 2001/2002 and 2002/2003.

Main effects and Interactions	Biological yield (ton)		Economic yield (ton)		Harvest index %	
	2001/2002	2002/2003	2001/2002	2002/2003	2001/2002	2002/2003
Genotypes(G)						
2465/3	2.66	2.41	762.24	971.40	0.30	0.32
402/12	2.27	2.88	759.30	885.11	0.26	0.28
Sakha1	2.92	2.96	996.60	984.80	0.30	0.33
F. test	**	**	**	**	**	**
L.S.D	0.021	0.032	6.87	9.14	0.003	0.006
Spray (S)						
Without spray	2.50	2.67	762.30	781.60	0.28	0.29
Spray after 65 days	2.63	2.81.	853.61	822.60	0.30	0.31
F. test	n.s	n.s	**	**	*	*
Seeding rates(R)						
70 kg/fad.	2.50	2.41	742.90	965.11	0.25	0.26
80 kg/fad.	2.56	2.65	824.30	985.60	0.26	0.28
F.test	n.s	n.s	**	*	n.s	n.s
Interaction						
G x S	**	**	**	**	n.s	n.s
G x R	n.s	n.s	**	**	n.s	n.s
S x R	n.s	n.s	**	**	n.s	n.s

The increment in this character could be attributed to the role of potassin on growth of flax plants, and its effects on straw and seed yield and its related characters. Where K_2O in potassin found in great concentration in meristematic plant tissues and growth regions According to results-obtained by . Ving Singir and Ramoar(1994),; El-Swiefy and Mostafa(1996); Abo-Zaied (1997); El-Azzouni (1998) and El-Shimy and Moawed(2000).

C-Seeding rates

Concerning the effect of seeding rates, data show that the 80kg/faddan gave the highest values of economic yield ton 824.30 and 985.60 comparison to 70kg/faddan 742.90 and 965.11 in the first and second seasons, respectively. This finding is in agreement with those obtained by El-Farouk(1968) and Kallo(1988).

3- Harvest index

In Table (4) the effect of genotypes and spray with potassin were significant, meanwhile the differences didn't reach the level of significant with seeding rate. Similar results were obtained by Puri and Jaipukar(1989); El-Zeiney et al(1994); El-Kady *et al.*(1995) and Moawed (2001).

IV- Interaction effects:

Statistical analysis of the data in Table (5) revealed that the interaction combination had significant effect on plant height, technical stem length, number of capsules/plant, number of frutting branches, seed yield/plant, straw yield/plant, fiber yield/plant, seed and straw yield/faddan, fiber yield/faddan, economic yield and biological yield with the interaction between genotypes (G) x potassin (S) in the two seasons.

Concerning Table (6) and its related characters i.e. technical stem length, number of capsules/plant, number of frutting branches, seed yield/plant, fiber yield/plant, seed yield/ faddan and economic yield, they had significant effect with the interaction between flax genotypes x seeding rate in the two seasons.

In Table (7) there are significant effect in technical stem length, number of capsules/plant, seed yield/faddan and economic yield with the interaction between S x R in the two seasons. Generally, when interaction was insignificant (independent) it means that each one of factors (G, S and R) are acted separately. Meanwhile, when it was significant, it mean that each one of factors under study depend on the other in its effect .

V – Correlation study:

Data in table (8) showed correlation coefficiens between ten flax characters. Fiber yield/fad. was positively and significantly correlated with each of straw yield/fad., straw yield/plant, total plant height and technical stem length with r values of 0.890, 0.988, 0.969 and 0.888, respectively, while the *r* values were negatively and significantly correlated with seed yield/fad. (-0.362), seed yield/plant (-0.241), no. of fruting branches/plant (-0.696) and no. of capsules/plant (-0.965).

Straw yield/fad was significant and positive associated with fiber yield/plant (0.875), straw yield/plant (0.942), total plant height(0.856) and technical stem length (0.910). on the other hand it was negatively and significantly correlated with seed yield/fad (-0.821), seed yield/plant (-0.890), no. of fruting branches/plant (-0.752) and no. of capsules/plant (-0.264).

Seed yield/fad was positively and significantly correlated with seed yield/plant (0.965), no. of fruting branches/plant(0.932) and no. of capsules/plant (0.941). while it was negative and significant correlated with fiber yield/plant (-0.882), straw yield/plant (-0.913), total plant height (-0.944) and technical stem length (-0.524).

Table (5): Interaction between flax genotypes (G) and spray fertilizer (S) for some characters during 2001/2002 and 2002/2003 seasons.

Interaction		Plant height (cm)		Technical stem length (cm)		No. of capsules/plant		No. of frutting branches		Seed yield /plant (g)		Straw yield /plant (g)	
		2001/2002	2002/2003	2001/2002	2002/2003	2001/2002	2002/2003	2001/2002	2002/2003	2001/2002	2002/2003	2001/2002	2002/2003
G1	S 1	76.50	77.80	73.60	74.80	5.40	5.60	5.40	5.60	0.221	0.223	0.679	0.712
	S 2	79.90	81.30	76.40	79.20	5.80	5.90	7.80	7.90	0.246	0.252	0.719	0.701
L.S.D		1.03	1.210	0.891	0.762	0.01	0.02	0.31	0.24	0.010	0.010	0.003	0.020
G 2	S1	72.05	73.40	68.50	69.30	5.90	5.60	5.20	5.40	0.176	0.183	0.579	0.627
	S2	85.40	89.20	81.30	84.20	4.30	4.40	6.30	6.40	0.165	0.164	0.619	0.621
L.S.D		0.856	0.923	0.760	1.420	0.65	0.341	0.312	0.203	0.022	0.021	0.054	0.60
G 3	S1	83.10	86.60	82.00	85.30	6.70	6.80	7.90	8.80	0.255	0.267	0.729	0.778
	S2	92.30	96.40	90.00	91.00	6.80	5.90	8.00	9.20	0.274	0.285	0.899	0.899
L.S.D		1.60	1.20	2.10	2.00	0.64	0.58	0.23	0.25	0.010	0.020	0.246	0.254

Table (5): cont.

Interaction		Fiber yield/plant (g)		Seed yield/fad. Kg		Straw yield /fad Ton		fiber yield /fad. Kg		Economic yield Kg		Biological yield ton	
		2001/2002	2002/2003	2001/2002	2002/2003	2001/2002	2002/2003	2001/2002	2002/2003	2001/2002	2002/2003	2001/2002	2002/2003
G1	S 1	0.101	0.110	283.66	299.55	2.684	2.822	523.16	449.20	742.368	806.530	2.931	2.652
	S 2	0.112	0.113	462.22	409.29	2.531	2.543	589.46	601.23	972.160	980.451	3.091	3.121
L.S.D		0.001	0.001	22.35	16.75	0.021	0.011	2.320	3.650	14.58	18.75	0.134	0.214
G 2	S1	0.097	0.099	285.39	291.88	2.141	2.256	499.40	454.32	693.71	711.25	2.626	2.452
	S2	0.087	0.079	315.64	317.07	2.362	2.711	531.94	511.92	795.29	787.10	3.100	2.890
L.S.D		0.002	0.001	3.410	2.820	0.141	0.101	3.660	12.56	11.420	12.510	0.241	0.100
G 3	S1	0.151	0.147	439.34	425.32	3.252	3.398	679.67	623.44	942.41	996.62	3.570	3.440
	S2	0.122	0.151	571.71	587.00	3.890	3.740	629.30	677.32	1182.14	1160.92	4.100	3.880
L.S.D		0.001	0.001	6.21	6.43	0.510	0.260	7.82	11.41	12.36	24.35	0.410	0.360

G1 strain 2465/3 G2 402/12 G3 Sakha 1
S1 spray with potassin S2 without spray.

Table (6): Interaction between flax genotypes (G) and seeding rates (R) for some characters during 2001/2002 and 2002/2003 seasons.

Interaction		Technical stem length (cm)		No. of capsules /plant		No. of frutting branches		Seed yield /plant (gm)		Fiber yield/plant (gm)		Seed yield/fad. (kg)		Economic yield (ton)	
		2001/2002	2002/2003	2001/2002	2002/2003	2001/2002	2002/2003	2001/2002	2002/2003	2001/2002	2002/2003	2001/2002	2002/2003	2001/2002	2002/2003
G1	R 1	78.8	79.60	5.40	5.80	6.80	7.10	0.233	0.246	0.099	0.113	307.66	312.08	852.37	854.88
	R 2	82.6	88.40	4.30	4.60	5.30	5.90	0.202	0.213	0.092	0.097	314.54	362.22	948.36	959.28
L.S.D		1.22	2.31	0.31	0.36	0.49	0.44	0.005	0.004	0.002	0.005	2.160	11.10	18.63	20.21
G 2	R1	71.90	73.80	4.60	4.90	5.50	6.30	0.178	0.179	0.078	0.083	326.22	334.11	699.19	712.41
	R2	77.40	79.30	3.40	3.80	4.10	4.30	0.152	0.143	0.054	0.063	314.52	328.49	733.54	747.49
L.S.D		1.83	1.98	0.410	0.326	0.442	0.575	0.090	0.012	0.008	0.006	3.65	2.26	9.650	17.66
G 3	R1	83.80	84.60	8.20	8.60	7.80	7.90	0.292	0.310	0.122	0.133	485.36	479.82	965.34	985.67
	R2	89.70	89.90	5.80	6.30	6.90	6.60	0.231	0.262	0.113	0.123	418.26	436.29	1101.00	1112.53
L.S.D		3.62	2.40	1.20	0.91	0.62	0.88	0.021	0.040	0.001	0.001	9.46	4.91	14.25	11.12

G1 Strain 2465/3 G2 402/12 G3 Sakha 1 R1 seeding rate 70 kg/fad R2 80kg/fad.

Table (7): Interaction between spray fertilizer (S) and seeding rates (R) for some characters during 2001/2002 and 2002/2003 seasons.

Interaction		Technical stem length (cm)		No. of capsules /plant		Seed yield /plant (gm)		Seed yield/fad. (kg)		Economic yield (ton)	
		2001/2002	2002/2003	2001/2002	2002/2003	2001/2002	2002/2003	2001/2002	2002/2003	2001/2002	2002/2003
S1	R 1	76.34	72.41	5.89	4.74	0.224	0.232	336.24	338.25	876.35	884.56
	R 2	81.68	83.40	4.86	5.24	0.148	0.156	314.20	302.60	828.32	8.24.65
L.S.D		1.56	2.25	0.416	0.254	0.019	0.020	6.54	9.95	20.74	13.25
S2	R1	82.51	80.42	5.47	5.26	0.214	0.220	456.41	489.23	985.64	988.70
	R2	88.14	89.53	6.82	6.01	0.164	0.145	498.31	499.62	939.39	999.89
L.S.D		2.94	1.68	0.064	0.085	0.006	0.009	6.75	7.82	11.10	8.75

S1 spray with potassin S2 without spray R1 70 kg seeding rate R2 80 kg seeding rate

Table (8): simple correlation coefficients between the different flax recorded characters for some genotypes of flax under various seeding rate and spray with potassin fertilizer of two winter growing seasons 2001/2002 and 2002/2003.

	2	3	4	5	6	7	8	9	10
Fiber yield/fad.(kg)	0.890**	-0.362*	-0.985**	0.988**	-0.241*	0.969**	0.888**	-0.696*	-0.965**
Straw yield/fad.(ton)	--	-0.821**	0.875**	0.945**	-0.890**	0.856**	0.910**	-0.752**	-0.264*
Seed yield/fad.(kg)	--	--	-0.882**	-0.913**	0.965**	-0.944**	- 0.524*	0.932**	0.941**
Fiber yield/plant (gm)	--	--	--	0.853**	-0.810**	0.894**	0.831**	-0.361*	-0.610*
Straw yield/plant(gm)	--	--	--	--	-0.654*	0.884**	0.733**	-0.110*	-0.894**
Seed yield/plant (gm)	--	--	--	--	--	-0.821**	-0.891**	0.941**	0.965**
Total plant height(cm)	--	--	--	--	--	--	0.936**	-0.616*	-0.341*
Technical stem length(cm)	--	--	--	--	--	--	--	-0.792**	-0.310*
No. of frutting/plant	--	--	--	--	--	--	--	--	0.965**
No. of capsul/plant	--	--	--	--	--	--	--	--	--

Fiber yield /plant positively and significantly correlated with straw yield/plant (0.853), total plant height (0.894) and technical stem length(0.831). On the other hand it was negatively and significantly correlated with seed yield /plant (-0.810), no. of fruting branches/plant (-0.361) and no. of capsules /plant(-0.610).

Straw yield/plant recorded positively and significantly correlation coefficients with total plant height (0.884) and technical stem length (0.733). but it was negatively and significantly correlated with seed yield/plant (-0.654), no. of fruting branches /plant (-0.110) and no. of capsules/plant (-0.894).

Seed yield/plant was positive and significant correlated with no. of fruting branches /plant (0.941) and no. of capsules/plant (0.965). Meanwhile, it was negatively correlated with total plant height (-0.821) and technical stem length (-0.891).

Total plant height was positively and significantly correlated with only technical stem length (0.936) but it was negative and significant correlated with no. of fruting branches/plant (-0.616) and no. of capsules/plant (-0.341).

The technical stem length showed negative and significant correlation with no. of fruting branches/plant (-0.792) and no. of capsules /plant (-0.310).

Number of fruting branches/plant was positively and significantly correlated with no. capsules/plant (0.965). Generally, correlation was positive (r+), it means that the increase in straw character parallel with increasing in fiber yield / fad. /kg, total plant height and technical stem length . On the other hand correlated negatively (r-), it mean that straw character did not parallel with increasing in seed yield, No. of fruting / plant and No. of capsules / plant . These results are in agreement with those obtained by El-Shimy *et al.*(1997) and Moawed (1999 and 2001).

REFFERENCES

Abo-Zaied, T.A. (1997). Comparative study of yield and technological character of some flax varieties. pH.D.Thesis Fac. of Agric. El-Mansoura Univ.

Chi , C.Y.; K.H.Tsai; C.C.Tai and H.T.Chiu (1966). Study on sowing rate and sowing method with different varieties of flax. J.Agric.Ass.China, 49:25-31.(c.f. Field Crop Abst. 1966,19,412.

Duncan, D.B. (1955). Multiple Range and Multiple F-test. Biometris, 11: 1-42

El-Azzouni, A.M.A. (1998). Comparative study of yield and thechnological properties of flax under new reclaimed lands conditions. Ph.D.Thesis,Fac. Agric., Al-Azhar Univ.

El-Farouk, M.M.A.(1968). Effect of plant density, nitrogenous fertilizer and irrigation on yield and fiber quality of flax (*Linum usitatissimum* L.). M.Sc. Thesis, Fac. Agric. Cairo Univ.

El-Farouk, M.M.A.; E.A.Mohamed and M.Samia Hassan (1982). Growth, yield and fiber quality of two flax cultivars as affected by row spacing and nitrogen levels. Res. Bull. 785. Fac.of Agric. Zagazig Univ. Egypt.

El-Hariri, D.M.(1964): Effect of light intensity and plant density on growth fiber development and yield of flax. M.Sc. Thesis Agric., Ain-Shams Univ. Egypt.

El-Hariri, D.M. (1968). Factors affecting quality of flax yield. PH.D. Thesis, Fac. Agric., Ain –Shams Univ. Egypt.

El-Kady, E. F.; S. E.Shafshak; F. L. Gaballah and M. E. A. Kineber (1995). Effect of seeding rates on yield and its components of six promising flax genotypes under saline condition. J. Agric. Sci, Mansoura Univ. , 20(2):593-602.

El-Nkhlawy, F.S.(1975). Effect of some cultural practices on flax. M.Sc.Thesis, Fac. Agric. Alexandria Univ., Egypt.

El- Shimy, G.H. and E.A.Moawed (2000). Effect of different potassium and nitrogen fertilizer levels on Giza8 and Viking flax varieties. Egypt J.Agric. Sci. Mansoura Univ., 25(10):5993-6007.

El- Shimy, G.H.; T.Nasser El-Din and A. M. A. Hella (1985). Effect of seeding rates and microelements on the yield of some flax varieties. J.Agric. Res.Tanta Univ., 12(3): 708-720.

El- Shimy, G.H.; S.H.A.Mostafa and E.A. Moawed (2001). Effect of mineral and biophosphorus fertilization on productivity and quality of Sakha1 and Giza 8 flax varieties. Egypt J.Appl. Sci.16(8):101-117.

El- Shimy, G.H.; S.H.A.Mostafa and S.Z. Zidan (1997). Studies on yield-yield components, quality and variability in some flax genotyps. Egypt J. Agric.Res., 75(3): 697-715.

El-Swiefy, A. H.H. and S.H.A. Mostafa (1996). Growth yield and quality of flax as affected by genotypes, potassium fertilizer and plant densities. Egypt J. Appl. Sci., 11(7):116-133.

El-Zeiney, H.A.; M.M.Hussein and Kortam (1994). Effect of potassium fertilizer on yield of flax (*Linum usitatissimum* L.) grown under different conditions of water supply Agric. Res. J. Tanta Univ., 10(3): 880-890.

Gaafar, S.M.; G.H.El-Shimy and A.M. Hella (1990). Evaluation of some flax cultivars (*Linum usitatissimum* L.) Egypt J. Appl. Sci., 5(1): 514-526.

Gomez, K.A. and A.A. Gomez (1984). Statistical procedures for Agricultural researches John Willy and son. Lnc. New York.

Hella, A.M.; N.K.M. Mourad and E.A.El-Kady (1989). Comparative study on some flax cultivers. Moshtohor Ann. Agric. Sci., 27(4): 2105-2120.

Horodyski, A. and J. Sokolowski (1964). Effect of the spacing and amount of seed/ha on the seed yield of flax.(Pol.) (Pam. Putowski, 1964, 15:123-131, bibl.8 C.F.Field Crop Abst.,1966, 19,429).

kadry, W.(1981). Effect of some nutrients and methods of application of the yield and quality of flax (*Linum usitatissimum* L.) Ph.D. Thesis, fac. of Agric. Moshtohor, Zagazig Univ. Egypt.

Kallo,(1988). Vegetable breeding. Vol.111. CRC,Pr., Inc. Baco Ration, Florida. 174P.

Leilah, A. A. (1993). Evaluation of yield and its components of some flax cultivars under different nitrogen fertilization levels. J.Agric. Sci. Mansoura Univ., 18(2): 313-321.

Moawed, E. A. (2001). Effect of microelements and row distances on the yield of some flax (*Linum usitatissimum* L.) varieties. Egypt J. Appl. Sci., 16(6): 157-172.

Moawed, E. A.; S. Z. Abd El-Hamid (1999). Response of some local and introduced flax (Linum usitatissimum L.) cultivars to various nitrogen fertilization levels. Egypt J. Appl. Sci.,14(12): 518-540.

Momtaz, A.; M. El-Farouk; N. K. M. Mourad; T. Nassr El-Din; E. A. F. El-Kady and A. M. A. Hella (1989). New flax varieties Giza7 and Giza8. Agric. Res. Rev., 68(7):1461-1475.

Mostafa, S. H. A. and F. Ashmawy (1998). Performance and yield stability of some flax genotypes. Annals Agric. Sci. Ain Shams Univ. Cairo, 43(2):403-417.

Mostafa, S. H. A.; S. Z. Zidan and M. E. Kineber (1997). Association studies between quantative traits in some flax genotypes. Egypt J. Appl. Sci., 13(7):93-108.

Porokhnevich, N. V. and A. E. Bykov (1972). Effect of zinc and copper on formation of the photosynthetic apparatus and yield in fiber flax in the 1st generation. Agrokhimiya, 2: 103-111 (C.F.Field Crop Abst.26(1):5106).

Puri, G. and S. A. Jaipurkar (1989). Potassic fertilization of linssed (*Linum usitatissimum* L.) utilization of soil potassium in verisol. .J. of Potassium Res., 5(1):26-34.

Rodewold, W. and H. Ulbricht (1963). Growth flax Dtsch.Handw. 14:186-188 (C.F.Field Crop Abst. 16,1977).

Shekhawat, G. S.; M. M. Jain and D. C. Sharma (1971). Response of linseed (*Linum usitatissimum* L.) to micronutrients under varying fertility levels in barani (rain-fed) condition. Indian J. of Agronomy., 16(1): 64-66.

Ving Singir and S.S. Ramoar (1994). Effect of applied potassium and sulphur on yield, oil content and their uptake by linseed. J. of Potassium Res., 10(4):407-410.

Wallaco, D. H.; J. I. Ozbun and H. M. Munger (1972). Physiological genetics of crop yield. Adv. Agron., 24:97-146.

تأثيرمعدلات التقاوى والرش بمركب البوتاسين على بعض أصناف الكتان.

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** المعمل المركزى لبحوث التصميم والتحليل الاحصائى

تم اجراء تجربتان حقليتان بمحطة البحوث الزراعية بتاج العز- محافظة الدقهلية والتابعة لمركز البحوث الزراعية خلال الموسمين الزراعيين ٢٠٠١/٢٠٠٢ ، ٢٠٠٢/٢٠٠٣م لدراسة تأثير معدلى التقاوى ٧٠، ٨٠ كجم/فدان والرش بمركب البوتاسين على سلالات الكتان ٣/٢٤٦٥، ١٢/٤٠٢ والصنف التجارى سخا(١) ولمعرفة تأثير ذلك على المحصول ومكوناتة مقارنة بعدم الرش.

وتتلخص أهم نتائج البحث فيما يلى:-

أولا: محصول القش والصفات المرتبطة بة

١- تفوق صنف الكتان التجارى سخا(١) على السلالات المستخدمة فى محصول القش للفدان وكذلك جميع الصفات الاخرى المتعلقة بالقش وتبعة فى ذلك السلالة ٣/٢٤٦٥ وكان أقل محصول للسلالة ١٢/٤٠٢ وذلك فىكلا الموسمين.

٢-أظهر مركب البوتاسين زيادة معنوية فى صفات الطول الفعال، محصول القش للنبات وللفدان مقارنة بالكنترول(الغير معامل بالبوتاسين) وذلك فى كلا الموسمين.

٣-أثر معدل التقاوى ٨٠كجم/فدان معنويا فى زيادة كل من الطول الفعال ومحصول الالياف للنبات وللفدان وذلك مقارنة بالمعدل ٧٠ كجم/فدان فى كلا الموسمين

ثانيا: محصول البذرة والصفات المرتبطة بة

٤-تم الحصول على أعلى محصول بذرة للفدان وكذلك فى الصفات المرتبطة بها من الصنف التجارى سخا(١) وتبعة فى ذلك السلالة ٣/٢٤٦٥ ثم السلالة ١٢/٤٠٢ وذلك فى كلا الموسمين.

٥-وجدت زيادة معنوية للرش بالبوتاسين بمحصول البذرة وكذلك بجميع الصفات المرتبطة بة مقارنة بالكنترول(الغير معامل) فى كلا الموسمين

٦-كان لمعدل التقاوى ٧٠ كجم/فدان تأثيرا معنويا فى زيادة كل من عدد الافرع الثمرية للنبات، عدد كبسولات النبات ومحصول البذرة فى كلا الموسمين .

ثالثا:-

٧- ززاد المحصول الاقتصادى ودليل المحصول معنويا باستخدام البوتاسين رشا على النباتات وكذلك معدل التقاوى ٨٠كجم/فدان كما وأن الصنف التجارى للكتان سخا (١) أعطى أعلى القيم فى كل من المحصول البيولوجى والاقتصادى ودليل الحصاد فى كلا الموسمين.

رابعا:-

٨-كان لمعامل الارتباط الظاهرى تأثيرا معنويا واضحا وموجبا بين محصول الالياف للفدان وكل من محصول القش للفدان ، محصول الالياف للنبات، محصول القش للنبات والطول الكلى والفعال للنبات وكذلك العلاقة بين محصول البذرة للفدان وكل من محصول البذرة للنبات، وعدد الافرع الثمرية/للنبات وعدد كبسولات النبات بينما كان هذا التأثير سالبا بين محصول البذرة للفدان وكل من محصول الالياف للنبات ومحصول القش للنبات والطول الكلي والطول الفعال للنبات. كما وأن قيم معامل الارتباط كانت مرتفعة جدا بين محصول الالياف للنبات وكل من محصول القش للنبات وارتفاع النبات والطول الفعال وبين محصول القش للنبات وكل من ارتفاع النبات والطول الكلى.

التفاعل :

التفاعل ما بين الاصناف والرش بالبوتاسين كان معنويا وعدد كبسولات النبات ومحصول القش للنبات ومحصول الالياف للنبات. كما أظهرت التفاعلات الثنائية ما بين الاصناف والبوتاسين، الاصناف ومعدلات التقاوى وكذلك معدلات التقاوى والرش بمركب البوتاسين تأثيرا معنويا على معظم صفات القش والبذرة والصفات المرتبطة بهما والمحصول البيولوجى والاقتصادى.

وتوصى الدراسة بأهمية الرش بمركب البوتاسين للصنف التجاري سخا١ مع معدل تقاوي ٨٠كجم / للفدان لزيادة إنتاجية محصول القش ومعدل تقاوي ٧٠ كجم / للفدان لزيادة محصول البذرة تحت ظروف مشابهة لظروف الزراعة.