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RESPONSE OF SOME FLAX GENOTYPES TO BIO, PHOSPHORUS FERTILIZATION AND SOME MICRONUTRIENTS APPLICATION

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ABSTRACT

Two field experiments were carried out at Gemmiza Res. Station, Gharbia Governorate, Agric. Res. Center during the two successive seasons of 2004/2005 and 2005/2006 to study the response of three flax genotypes namely Sakha 1 , Sakha 2 and S.2465/1 to six fertilizer treatments, i.e., 0 (control), calcium superphoshate (15.5% P_2O_5), Phosphorein (P-biofertilizer), Phosphorein + calcium superphoshate (15.5% P_2O_5), Coatingein (Zn + Fe + Mn chelates) + calcium superphoshate (15.5% P_2O_5) and Phosphorein + Coatingein + calcium superphoshate (15.5% P_2O_5). A Split plot design with four replications was used. The results of this investigation could be summarized as follow.

The flax variety Sakha 1 exhibited highest fiber yield/fed, highest value of the major unsaturated fatty acid Linolenic, refractive index, specific gravity, and recorded least peroxide value of oil. While, it ranked the second after Sakha 2 in straw yield/fed. and the lowest estimates in all straw characters obtained by S.2465/1. In the same time, the flax strain 2465/1 ranked the first and surpassed Sakha 1 and Sakha 2 in seed yield/plant as well as per feddan, number of capsules/plant, oil yield/fed and oil percentage.

Moreover, maximum straw and seed yields were obtained by using the mixture of fertilizer phosphorein + calcium superphoshate (15.5% P_2O_5)+ coatingein .

Phenotypic correlation coefficients among straw yield / plant exhibited significant positive correlations with each of plant height, technical length, seed yield / plant and number of capsules / plant. Also, seed yield exhibited significant positive correlations with each of number of capsules, number of apical branches, plant height , technical length and stem diameter. These results, supports the evidence for the possibility of isolating genotypes characterized with high straw yielding ability and simultaneous high seed potentialities.

In conclusion, Sakha 1 was the first one preferred for food and medicinal purposes followed by S. 2465/1. So, it could be recommended to plant of Sakha 1 genotype to produce high fiber yield with the high oil quality and S. 2465/1 to produce high yield of seed and oil with the addition of phosphorein + calcium superphoshate (15.5% P_2O_5) + coatingein.

INTROUDCTION

Flax (*Linum usitatissimum L.*) (Fam. Linaceae) is considered as an economical crop among about 150 ones, where it had been cultivated in the world as well as in Egypt since several thousand years ago. Many important industries depending on its two products, i.e., fiber and seeds. Fixed oil extracted from unheated seeds used for food purposes. Medicinally, crushed linseed is used in the form of a poultice and whole seeds are employed to demulcent preparations. The oil is used in liniments, and recent research

from Australia suggests that hydrolysed linseed oil has potentially useful antibacterial properties as a topical preparation in that it is effective against Staph: aureus strains resistant to antibiotics, Trease and Evans (1985).

Great numbers of workers found differences between flax genotypes regarding yield and yield components such as Momtaz *et al.*, (1990), Abou-Zaied (1991), El-Shimy *et al.*, (2002) and Zahana (2004).

It is also necessary to determine the suitable quantity and quality requirements from phosphorus, biofertilizer (phosphorein) and Zn, Fe and Mn (Coatingein).Concerning phosphorus, Jain *et al.*, (1989), Abd El-Dayem (1997), El-Deep (1998) and Mostafa *et al.*, (1998) revealed that added mineral phosphorus to flax plants caused an increment in straw yield, quality and fiber yield, seed yield and oil percentage.

Phosphorein is a biofertilizer that contains phosphate solubilizing bacteria is capable of converting tricalcium phosphate to monocalcium phosphate ready for plant nutrition (Abdalla *et al.*, 2001), in addition to El-Shimy *et al.*, (2001) and Ahmed *et al.*, (2005 a and b) who illustrated that fertilized flax with phosphorein as P-biofertilizer increased seed, oil and fiber yields.

The mixture of micronutrients Zn, Fe and Mn chelated are now produced under the commercial name of coatingein, seed coating with Zn + Fe + Mn was efficient for correcting the requirement and suitable balance between such nutrients in alluvial slightly alkaline soils for growth uptake and high yield production. Similar findings have been reported by Mostafa et al., (1998) and Ahmed et al., (2005 a and b) on flax.

The main objectives of the present investigation were to study the response of three flax genotypes Sakha 1, Sakha 2 and S. 2465/1 to mineral and bio-phosphorus (Phosphorein)in addition to coatingein (Zn + Fe + Mn chelates) . Nowadays, great attention occurs for using bio-fertilizer to minimize production costs and environmental pollution.

MATERIALS AND METHODA

Two field experiments were carried out at Gemmiza Agric. Res. Station, Agric. Res. Center, Gharbia Governorate, Egypt, during the two successive seasons 2004/05 and 2005/06 to study yield, and yield components of three flax genotypes as affected by bio, phosphorus fertilizers and coatingein. The soil type was clay loam with organic matter of 2.18 and 2.23 %, available nitrogen 23.85% and 26.77%, available P 7.8 and 8.0 ppm $CaCO_3$ of 1.51 and 1.68% and pH value of 8.01 and 8.11 in the first and second seasons, respectively. A split-plot design with four replications was used. Flax genotypes Sakha 1, Sakha 2 and S.2465/1 were assigned in the main plots and six fertilizer treatments i.e., 0 (control), 50 kg/fed calcium superphoshate (15.5% P_2O_5), Phosphorein (P-biofertilizer), Phosphorein +50 kg/fed calcium superphoshate (15.5% P_2O_5), coatingein (Zn+Fe+Mn chelates) + 50 kg/fed calcium superphoshate (15.5% P_2O_5) and Phosphorein + coatingein (Zn+Fe+Mn chelates) + 50 kg/fed calcium superphoshate (15.5% P_2O_5) as sub-plots. In both seasons the sub-plot size was 2x3 meters (6 m^2) which represent 1/700 fed. The fertilizers was added at two equal dose, the first dose was applied at sowing, in addition to the second (last one), which was

applied after 45 days from sowing. Flax was sown on November 18th and 20 in the first and second seasons, respectively. Flax seeds were drilled in rows 20 cm apart at a rate of 60 kg / fed. Other cultural practices were followed as usual.

At full maturity ten guarded plants were taken at random from each plot to be used for recording yield components. Straw, fiber and seed yield / fed were calculated from the whole sub-plot area basis, the following data were recorded:

Yield and yield components:

A-Fiber yield and its related characters: Straw yield / plant (g), plant height (cm), technical length (cm), stem diameter (mm), straw yield / fed (ton) , fiber yield / fed (kg),fiber length(cm) and fiber fineness(Nm).

B- Seed yield and its related characters: Seed yield / plant (g), number of capsules/plant, number of seeds/capsule, number of apical branches. Seed yield(Kg / fed), fixed oil percentage and yield(Kg / fed) were also estimated.

Fixed seed oil were determined in the seed by the method described in the A.O.A.C (1990), using petroleum ether (40-60°c) in Soxhlet apparatus.

Oil analysis:

- Physical properties: (refractive index and specific gravity) Chemical properties: (acid value and peroxide value) of fixed oil were determined according to A.O.A.C. (1990).
- Determination preparation of fatty acids methyl ester according to Stahi (1965) then of fatty acid of three flax genotypes oil were analyzed by Gas Liquid Chromatographic technique (GLC).

Statistical analysis: Analysis of variance was computed according to Snedecor and Cochran (1982).

Correlation study: Estimates of correlation coefficients (r) among different flax characters were calculated according to (Svab 1973) as follow: $r_{xy}= Sp_{xy} / (SS_x . SS_y)^{0.5}$ where: Sp_{xy} is the phenotypic covariance between two traits, SS_x phenotypic standard deviation of the first character and SS_y phenotypic standard deviation of the second character.

RESULTS AND DISCUSSION

Yield and yield components:

A- Straw yield and its related characters:

Mean values of straw yield and its related characters of the three flax genotypes as affected by different fertilizers in the two seasons (2004/2005 and 2005/2006) are presented in Table (1). Statistical analysis revealed significant differences between either flax genotypes or among fertilizer treatment in all straw yield traits under study. The strain 2465/1 recorded the highest yield/plant (1.59 g and 1.84 g), tallest plant height (90.98 cm) and technical length (77.22 cm) in the first season only, and more thickness plant (2.48 and 2.69 mm) in both seasons. But this strain the was lowest in the two great important characters i.e., straw (4.194 and 4.879 t/fed) and fiber yields 461.3 and 494.8 kg/fed. The superiority of Sakha 1 in fiber yield/fed may be due to great fiber percentage in addition to contain less secondary xylem (woody part of the stem) in both seasons. Moreover, the flax variety Sakha 2 occupied the first site concerning straw yield/fed (4.462 and 5.122 ton) in both

seasons, the highest plant height and technical length in the second season only (102.22 and 88.91 cm) respectively and intermediate position in most of straw yield characters. The differences between flax in yield return to genetical make up for each one. These results are in harmony with Momtaz *et al.* (1990), Abou-Zaied (1991), El-Shimy *et al.* (2002) and Zahana (2004).

Regarding fertilizers effect, results indicated gradual increment in all six straw yield characters from the untreated control (zero) towards the latest fertilizer treatment (Phosphorein + coatingein + 15.5 P_2O_5 kg/fed) which included the combination of all fertilizers i.e., phosphorein (Bio-biofertilizer) + Coatingein (Zn+Fe+Mn chelates)+ 15.5 kg P_2O_5/fed as a mineral phosphorus. By means this mixture considers as more suitable to cover flax plants their demands from elements. The averages of straw yield/plant ranged from 1.31 and 1.64 to 1.66 and 1.90 g in the first and second seasons, respectively, plant height ranged from 85.32 and 94.22 to 94.33 and 99.65 cm in both seasons, respectively, technical length ranged from 71.70 and 82.07 to 79.12 and 90.34cm, in both seasons, respectively stem diameter ranged from 2.24 and 2.37 to 2.60 and 2.86 mm, in both seasons, respectively, straw yield/fed ranged from 3.950 and 4.275 to 4.808 and 5.527 ton, in both seasons, respectively, fiber yield/fed ranged from 542.88 and 614.13 to 655.84 and742.47 kg , in both seasons, respectively, fiber percentage, fiber length and fiber fineness recorded the same trend for the untreated control (0) and treatment N0. 6 Phosphorein + 15.5 P2 O5 Kg/ fed + Coatingein (Zn+Fe+Mn chelates), respectively. The remain fertilizer treatments take the intermediate position in relation to their achievements in all studied characters. These results are in agreement with Jain *et al.* (1989), Abou-Zaied (1991), Abd El-Dayem (1997), El-Shimy *et al.* (2001), Zahana (2004) and Ahmed *et al.* (2005 b).

B - Seed yield and its related characters:

From Table (2), data illustrated in both seasons that the three tested flax genotypes significantly differed in seed yield/plant, number of capsules/plant and seed oil percentage. But number of seeds/capsule, number of apical branches, seed yield/fed and oil yield/fed did not reach the level of significance between studied genotypes. In the same time, the six fertilizer treatments significantly differed in their effects on seven seed yield traits.

The flax variety Sakha 1 recorded highest averages in number of seeds/capsule (5.70 and 5.59) in both seasons and number of apical branches (12.81 and 11.30) in both seasons, while it ranked third in number of capsules/plant, on the other hand it ranked second in the remain four seed characters. The flax variety Sakha 2 was the lowest in most of seed traits and ranked third among the three tested flax genotypes. Meanwhile, the flax strain 2465/1 achieved maximum estimates in seed yield/plant (0.51 and 0.40g) in both seasons, number of capsules/plant (9.17 and 8.80) in both seasons, seed yield/fed (730.16 and 712.98 kg) in both seasons, oil yield/fed (282.03 and 271.22 kg) in both seasons and finally oil percentage (38.58% and 38.61%) in both seasons . These results are agreed with that recorded by Momtaz *et al.* (1990), Abou-Zaied (1991), El-Shimy *et al.* (2002) and Zahana (2004).

Table (1): Averages of fiber yield and its related characters of the three tested flax genotypes as affected by different fertilizers during 2004/2005 and 2005/2006 seasons

Characteristic		Genotypes				Fertilizer							Interaction
		Sakha1	Sakha2	S.2465/1	Sig	1	2	3	4	5	6	Sig	
Straw yield/plant (gm)	2004/2005	1.39	1.41	1.59	*	1.31	1.38	1.46	1.45	1.53	1.66	*	Ns
	2005/2006	1.72	1.77	1.84	Ns	1.64	1.71	1.79	1.78	1.86	1.90	*	Ns
Plant height (cm)	2004/2005	89.40	89.78	90.98	*	85.32	88.38	89.60	90.93	91.76	94.33	*	Ns
	2005/2006	101.71	102.22	95.56	*	94.22	96.28	97.33	98.83	98.99	99.65	*	Ns
Technical length (cm)	2004/2005	75.45	76.10	77.22	*	71.70	74.50	75.97	76.91	77.50	79.12	**	*
	2005/2006	87.12	88.91	82.81	**	82.07	83.77	85.14	86.28	88.98	90.34	**	*
Stem diameter (mm)	2004/2005	2.41	2.43	2.48	Ns	2.24	2.39	2.42	2.50	2.51	2.60	*	Ns
	2005/2006	2.54	2.61	2.69	Ns	2.37	2.48	2.53	2.61	2.81	2.86	*	Ns
Straw yield/fed (ton)	2004/2005	4.386	4.462	4.194	*	3.950	4.085	4.271	4.422	4.551	4.808	**	*
	2005/2006	4.901	5.122	4.879	**	4.275	4.630	4.816	4.967	5.367	5.527	**	*
Fiber yield/fed (kg)	2004/2005	702.10	633.78	461.31	**	542.88	571.98	593.48	607.05	623.16	655.84	**	*
	2005/2006	819.50	720.61	494.83	**	614.13	643.23	664.73	678.30	726.94	742.47	**	*
Fiber percentage	2004/2005	18.3	17.5	16.1	*	15.6	16.4	16.8	17.3	18.7	19.0	*	Ns
	2005/2006	19.0	18.1	17.8	*	17.0	17.3	17.8	18.3	19.7	19.8	*	Ns
Fiber length (cm)	2004/2005	75.8	61.2	59.7	*	52.6	59.3	61.2	65.5	76.0	78.4	*	Ns
	2005/2006	81.4	75.6	65.3	*	55.3	69.6	72.2	74.1	80.5	81.0	*	Ns
Fiber fineness (M.n.)	2004/2005	306.3	276.0	268.5	**	253.3	260.8	271.4	283.6	313.9	318.6	*	Ns
	2005/2006	311.2	290.1	271.3	**	269.7	274.0	283.2	290.8	315.2	329.9	*	Ns

*, ** and Ns = significant, high significant and non-significant , respectively .

1= control (zero). 2= 15.5 P_2O_5 Kg/ fed 3= Phosphorein (biofertilizer)

4= Phosphorein + 15.5 P_2O_5 Kg/ fed . 5= Coatingein (Zn+Fe+Mn chelates)

6= Phosphorein + 15.5 P_2O_5 Kg/ fed + Coatingein (Zn+Fe+Mn chelates) .

Table (2): Averages of oil yield and its related characters of the three tested flax genotypes as affected by different fertilizers during 2004/2005 and 2005/2006 seasons

Characteristic		Cultivars				Fertilizer							Interaction
		Sakha1	Sakha2	S.2465/1		1	2	3	4	5	6	Sig	
Seed yield/plant (gm)	2004/2005	0.47	0.45	0.51	**	0.41	0.44	0.46	0.48	0.49	0.56	**	Ns
	2005/2006	0.32	0.29	0.40	**	0.27	0.31	0.34	0.39	0.42	0.44	**	Ns
No. of capsules/ plant	2004/2005	8.00	8.78	9.17	**	8.22	8.62	8.66	9.04	9.35	10.00	**	Ns
	2005/2006	7.71	8.42	8.80	**	7.49	7.89	7.94	8.31	8.97	9.27	**	Ns
No. of seeds/ capsule	2004/2005	5.70	5.67	5.64	Ns	5.41	5.48	5.52	5.67	5.90	5.92	*	Ns
	2005/2006	5.59	5.50	5.53	Ns	5.30	5.34	5.40	5.54	5.78	5.88	*	Ns
No. of apical branches	2004/2005	12.81	12.69	12.65	Ns	11.52	11.90	12.40	12.74	13.32	14.41	**	*
	2005/2006	11.30	11.20	11.19	Ns	10.25	10.62	11.17	11.47	12.32	12.92	**	*
Seed yield /fed (Kg)	2004/2005	718.37	714.23	730.16	Ns	595.08	647.71	721.42	754.48	770.42	837.13	**	**
	2005/2006	700.11	702.32	712.98	Ns	565.74	628.37	712.06	725.14	764.99	834.54	**	**
Oil yield /fed (Kg)	2004/2005	274.86	274.55	282.03	Ns	217.04	245.07	266.68	294.10	303.99	336.84	**	**
	2005/2006	260.11	258.51	271.22	Ns	206.22	242.25	255.86	273.28	299.73	319.34	**	**
Oil percentage (%)	2004/2005	38.22	38.20	38.58	*	36.71	38.25	36.95	38.55	39.60	39.96	*	*
	2005/2006	38.20	38.21	38.61	*	36.80	38.29	36.94	38.60	39.61	39.90	*	*

*, ** and Ns = significant , high significant and non-significant , respectively .

1= control (zero). 2= 15.5 P_2O_5 Kg/ fed 3= Phosphorein (biofertilizer)

4= Phosphorein + 15.5 P_2O_5 Kg/ fed . 5= Coatingein (Zn+Fe+Mn chelates)

6= Phosphorein + 15.5 P_2O_5 Kg/ fed + Coatingein (Zn+Fe+Mn chelates) .

Concerning fertilizers effect. results revealed gradual increment in the mean values of all seven seed characters under study from the untreated control (0) up to the mixture (treatment No. 6) which represents the combination of all fertilizers in this study. Seed yield/plant ranged from 0.41 and 0.27 to 0.56 and 0.44g, number of capsules/plant ranged from 8.22 and 7.49 to 10.00 and 9.27. number of seeds/capsule ranged from 5.41 and 5.30 to 5.92 and 5.88, number of apical branches ranged from 11.52 and 10.25 to 14.41 and 12.92. seed yield/fed ranged from 595.08 and 565.74 to 837.13 and 834.54 kg. oil yield/fed ranged from 217.04 and 206.22 to 336.84 319.34 kg and oil percentage ranged from 36.71 and 36.80 to 39.96 and 39.90% in both seasons, respectively for the control and treatment No. 6 {Phosphorein + 15.5 P_2O_5 Kg/ fed + Coatingein (Zn+Fe+Mn chelates)}. The remain four fertilizer treatment performed intermediate mean values in general between the lowest averages obtained by the control and maximum estimates recorded by treatment No. 6. These results are in agreement partially with Jain *et al.* (1989), Abd El-Dayem (1997), El-Deep (1998), El-Shimy et al. (2001). Ahmed et al. (2005 a) on flax.

The interaction between flax genotypes and fertilizers

Table (3) showed significant effect on technical length, straw yield/fed , fiber yield/fed , number of apical branches, seed yield/fed, oil yield fed and oil percentage this means that these two factors done their effect dependently. The maximum estimates for technical length (80.30 and 92.63cm) , fiber yield/fed (749.39 and 866.79 kg) and seed yield/fed (853.50 and 835.23kg) were achieved by Sakha 1 combined with treatment N0. 6 in both seasons respectively. In addition to Sakha 2 recorded the maximum mean values for straw yield/fed and number of apical branches (4.917 and 5.537 ton) and (15.28 and13.79) when fertiled with treatment No. 6 in both seasons respectively. S.2465/1 recorded highest mean values for oil yield/fed (342.31 and 331.51kg) and oil percentage (40.19 and 40.22%) when fertiled with treatment No. 6 in both seasons respectively.

Correlation study:

Phenotypic correlation coefficients among seed, straw yields/plant of three flax genotypes under six fertilizer levels based on data of two seasons (2003/04 and 2004/05) are shown in Table 4. Regarding straw yield/plant exhibited significant positive correlations with each of plant height. technical length. seed yield/plant and No. of capsules/plant. Also, plant height/plant exhibited significant positive correlations with each of technical length, stem diameter, seed yield/plant and no. of capsules/plant, indicated that maximization of straw weight may be obtained via selection for these component variables. Moreover. the significant association between the two components, plant height and technical stem length. These results indicated that plant height and technical stem length are main components for straw weight/plant These results are agreement with those obtained by Abo El-Zahab *et al.*, (1994), Zahana (2004) and Abo-Kaied *et al.*, (2006). Regarding seed yield exhibited significant positive correlations with each of No.

Table 3: Averages of yield components of flax as affected by the interaction between genotypes and fertilizer treatments in 2004/2005 and 2005/2006 seasons

Characteristic	Genotypes (G)	2004/2005						2005/2006					
		1	2	3	4	5	6	1	2	3	4	5	6
Technical Length (cm)	Sakha 1	70.30	73.16	74.64	76.58	78.24	80.30	82.63	85.94	86.97	88.91	90.57	92.63
	Sakha 2	69.36	74.34	76.26	76.00	76.99	77.65	82.17	87.15	88.59	88.81	89.80	90.46
	S.2465/1	75.45	75.99	77.03	78.15	77.28	79.41	81.04	81.58	82.62	83.64	82.87	85.00
Straw yield/fed. (ton)	Sakha 1	4.052	4.237	4.374	4.450	4.521	4.680	4.576	4.752	4.898	4.975	5.040	5.203
	Sakha 2	4.106	4.082	4.311	4.623	4.732	4.917	4.726	4.702	4.931	5.243	5.352	5.537
	S.2465/1	3.693	3.935	4.128	4.193	4.399	4.815	4.378	4.620	4.813	4.878	5.084	5.500
Fiber yield/fed. (ton)	Sakha 1	647.76	678.00	701.70	712.64	723.14	749.39	675.16	7945.4	819.1	830.04	840.54	866.79
	Sakha 2	574.79	605.00	624.69	647.29	662.48	688.44	66h.62	691.83	711.52	734.12	749.31	775.27
	S.2465/1	406.09	432.94	454.04	461.24	483.88	529.69	439.61	466.46	487.56	494.76	517.40	563.21
No. of apical branches	Sakha 1	11.49	11.80	12.63	13.09	13.55	14.34	9.98	10.39	11.12	11.58	12.04	12.83
	Sakha 2	11.38	11.94	12.03	12.43	13.08	15.28	9.89	10.45	10.54	11.94	11.59	13.79
	S.2465/1	11.70	11.98	12.56	12.71	13.34	13.61	10.24	10.52	11.10	11.25	11.88	12.15
Seed yield/fed (kg)	Sakha 1	539.63	594.25	768.75	777.38	778.88	853.50	521.36	575.99	750.48	759.11	760.61	835.23
	Sakha 2	630.50	665.25	674.25	739.50	769.38	806.50	618.59	653.34	662.34	727.59	757.47	794.59
	S.2465/1	615.13	683.63	721.25	746.50	763.00	851.38	597.95	666.45	704.07	729.32	745.82	831.20
Oil yield/fed (kg)	Sakha 1	197.78	216.76	284.05	305.38	303.29	341.90	183.02	202.01	269.30	290.63	288.54	327.15
	Sakha 2	230.95	253.51	248.89	286.38	301.28	326.31	214.91	237.47	232.85	270.34	285.24	310.27
	S.2465/1	222.40	264.95	267.10	290.54	304.89	342.31	211.59	254.14	256.29	279.64	294.08	331.51
Oil percentage (%)	Sakha 1	36.63	37.93	36.91	38.11	39.73	40.04	36.61	37.91	36.89	38.09	39.71	40.02
	Sakha 2	36.76	38.08	36.90	38.69	39.11	39.65	36.77	38.09	36.91	38.70	39.12	39.66
	S.2465/1	36.75	38.74	37.03	38.85	39.95	40.19	36.78	38.77	37.06	38.88	39.98	40.22

1= control (zero). 2= 15.5 P_2O_5 Kg/ fed 3= Phosphorein (biofertilizer)

4= Phosphorein + 15.5 P_2O_5 Kg/ fed. 5= Coatingein (Zn+Fe+Mn chelates)

6= Phosphorein + 15.5 P_2O_5 Kg/ fed + Coatingein (Zn+Fe+Mn chelates).

of capsules, No. of apical branches, plant height , technical length and stem diameter. Moreover, the significant association among No. of capsules with each of plant height, technical length, stem diameter and seed yield/plant. In general, the above–mention results, supports the evidence for the possibility of isolating genotypes characterized with high straw yielding ability and simultaneous high seed potentialities. These results are in harmony with that reported by Abo El-Zahab *et al.*, (1994) and Abo-Kaied *et al.*, (2006).

Table 4: Simple correlation coefficient between eight flax characters (over the two seasons)

Characters	1	2	3	4	5	6	7
1-Straw yield/plant(gm)							
2-Plant height(cm)	0.814 *						
3-Technical length(cm)	0.791 *	0.957 **					
4-Stem diameter(mm)	0.771 *	0.948**	0.912**				
5-Seed yield plant(gm)	0.922 **	0.957**	0.813*	0.841**			
6-No. of capsules/plant	0.802 *	0.887**	0.846**	0.853**	0.897**		
7-No. of seeds/capsule	0.506	0.691	0.598	0.735*	0.675	0.703	
8-No. of apical branches	0.669	0.87 **	0.755*	0805*	0.81**	0.919**	0.75*

*** ,** significant at 0.05 and 0.01 levels of probability, respectively.**

Physiochemical properties of fixed oil:

The obtained data in Table (5) indicated that Sakha1 Var. recorded highest values of refractive index and specific gravity, while it recorded the least peroxide value comparing to Sakha 2 Var. and S. 2465/1. the least peroxide value may be due to the composition of antioxidant in Sakha 1 Var. oil. there fore oxidation of oil decreased. On the other hand, the lowest acid value obtained by S. 2465/1. The best quality of oil was obtained by Sakha 1 genotype

While S. 2465/1 came in the second place and sakha 2 genotype came last .

Maximum value of refractive index (1.4786) was obtained by using phosphorein but when combined it with phosphorus and coatingein (treatment No. 6) decreased refractive index and specific gravity of Sakha 2 and S. 2465/1.Data , also in Table (5) show that all treatments decreased peroxide value of 3 flax varieties comparing to untreated control , the value of refractive index , spaceific gravity , acid value and peroxide value ranged between (1.4735 and 1.4786) , (.9250 and .9379) , (.85 and 1.45) and (1.92 and 4.00), respectively. Same findings were given by Abou – El Hawa *et al* , (1982) , EL- Kady (1995) and Seniha (1997) which found that refractive index ranged between 1.4730 and 1.4786 and specific gravity ranged between (.9244 and .9382) In addion to El – Nakhlawy (1987) obtained that the acid value ranged from 0.3 to 3.0 while the peroxide value ranged from 1.0 to 8.0 for thirty flax varieties.

Table (5): Averages of physiochemical properties of fixed oil of the three tested flax genotypes as affected by phosphorus, phosphorein and coatingein.

Treatments		Refractive index	Specific gravity	Acid value	Peroxide value
Sakha1	1	1.4779	0.9377	1.30	2.84
	2	1.4781	0.9379	1.32	2.96
	3	1.4786	0.9364	1.18	2.70
	4	1.4780	0.9365	1.16	2.02
	5	1.4781	0.9370	1.14	1.92
	6	1.4784	0.9370	1.36	1.92
Means		1.4781	0.9370	1.26	2.39
Sakha 2	1	1.4770	0.9266	1.11	4.00
	2	1.4768	0.9269	0.85	3.77
	3	1.4770	0.9266	1.12	2.81
	4	1.4762	0.9263	1.22	3.70
	5	1.4765	0.9270	1.32	3.76
	6	1.4760	0.9260	1.45	2.84
Means		1.4765	0.9265	1.17	3.48
S.2465/1	1	1.4748	0.9290	1.06	3.84
	2	1.4748	0.9290	1.16	2.94
	3	1.4743	0.9285	0.98	1.92
	4	1.4740	0.9280	1.06	2.77
	5	1.4737	0.9254	0.87	2.00
	6	1.4735	0.9250	1.18	1.92
Means		1.4741	0.9274	1.05	2.56

1= control (zero). 2= 15.5 P_2O_5 Kg/ fed
3= Phosphorein (biofertilizer) 4= Phosphorein + 15.5 P_2O_5 Kg/ fed .
5= Coatingein (Zn+Fe+Mn chelates)
6= Phosphorein + 15.5 P_2O_5 Kg/ fed + Coatingein (Zn+Fe+Mn chelates) .

Fatty acid composition of 3 falx var. oil:

Separation of oil samples by GLC revealed five identified constituents; Palmitic, Stearic, Oleic, Linoleic and Linolenic (Table 6 and Fig1,2 and 3). These oil components constituted 90.57%, 90.37% and 83.50% of the oil from Sakha 1, Sakha 2 and S. 2465/1 var., respectively. Linolenic was the major constituent of the oil of flax. The highest percentage of Linolenic was in oil from Sakha 1 var. followed by S. 2465/1, while the lowest was in the case of the sakha 2 oil. These results means that the first one preferred for food and medicinal purposes was Sakha1 oil var. followed by S. 2465/1 oil.

Table (6): Percentages of identified fatty acids of 3 flax genotypes oil

Fatty acids %	Genotypes		
	Sakha 1	Sakha 2	S. 2465/1
Palmitic (16:0)	3.45	4.37	3.56
Stearic (18:0)	2.69	4.54	3.68
Oleic (18:1)	19.61	21.26	18.91
Linoleic (18:2)	18.40	20.47	16.31
Linolenic (18:3)	46.42	39.73	41.04
Total identified	**90.57**	**90.37**	**83.5**

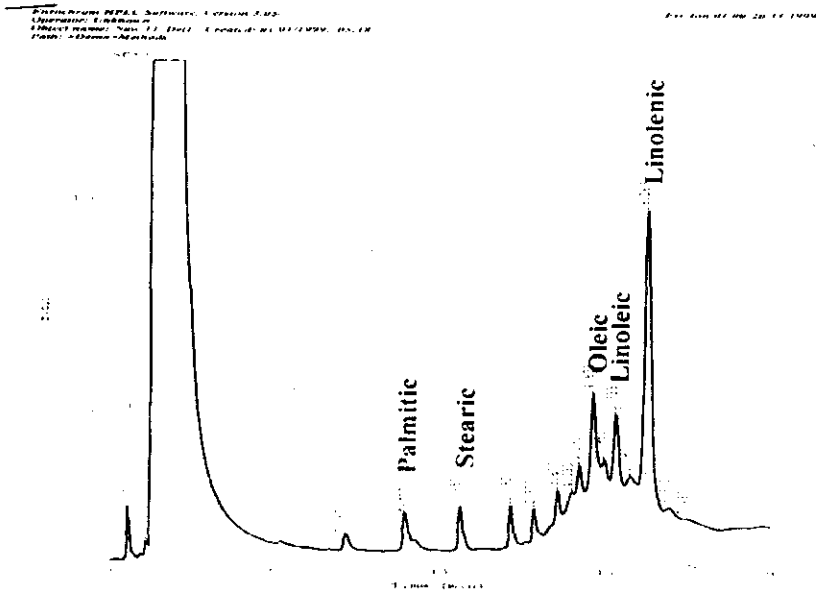

Fig (1): Main fatty acids of Sakha 1 var. oil.

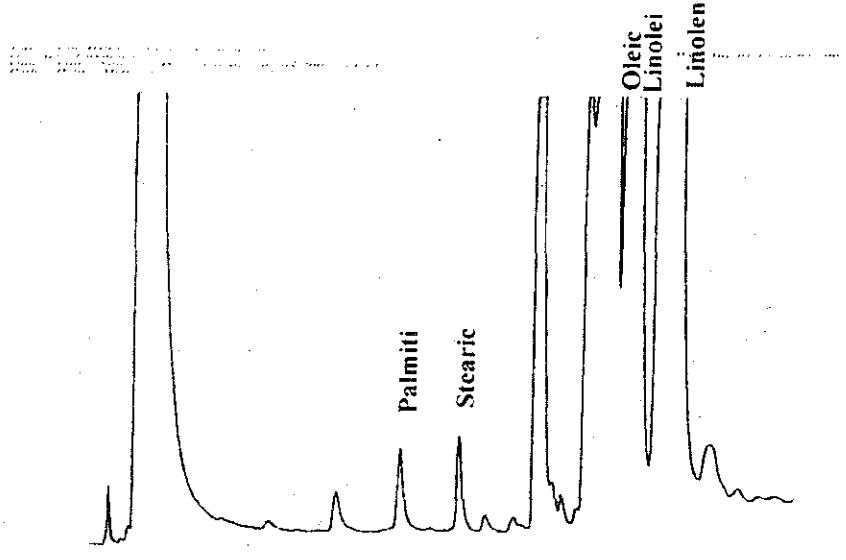

Fig (2): Main fatty acids of Sakha 2 var. oil.

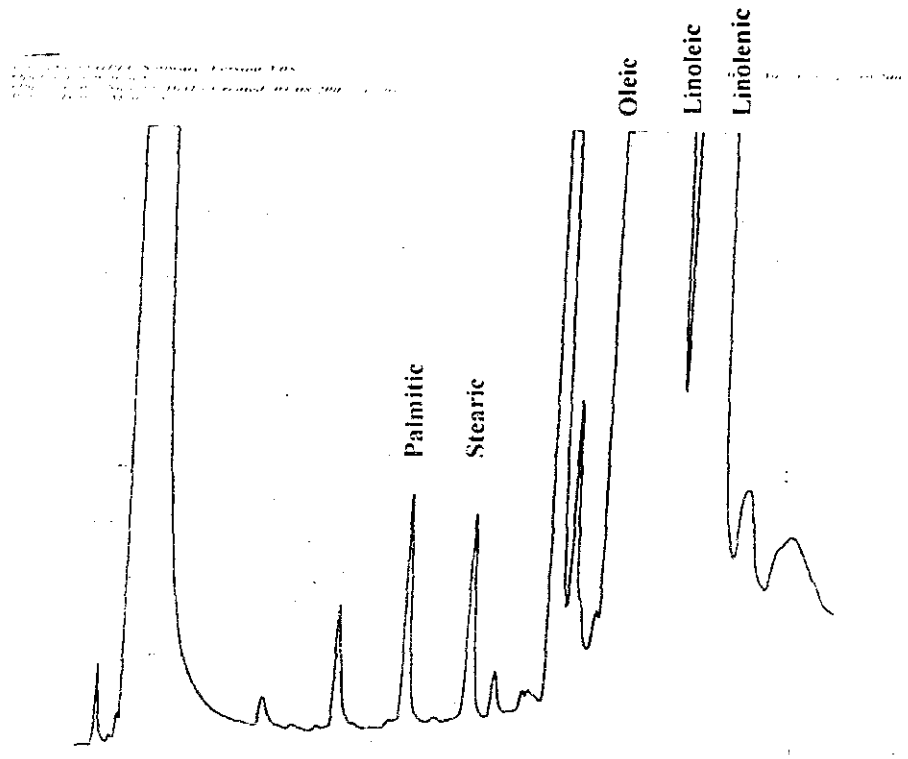

Fig (3): Main fatty acids of S. 2465/1 var. oil.

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استجابة بعض التراكيب الوراثية من الكتان للتسميد الفوسفاتي الحيوي والمعدني وبعض العناصر الصغرى

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أقيمت تجربتان حقليتان بمحطة البحوث الزراعية بالجميزة -محافظة الغربية- مركز البحوث الزراعية خلال الموسمين ٢٠٠٤/٢٠٠٥ و ٢٠٠٥/٢٠٠٦ وذلك لدراسة استجابة ثلاثة تراكيب وراثية من الكتان (سخا ١ ، سخا ٢، وسلالة ١/٢٤٦٥) للمعاملات السمادية الاتية ١- صفر (كنترول) ، ٢- ٥٠ كجم/للفدان سوبر فوسفات الكالسيوم (فو٢أ ١٥,٥%) ، ٣- فوسفورين (سماد حيوي) ، ٤- فوسفورين + ٥٠ كجم/للفدان سوبر فوسفات الكالسيوم (فو٢أ ١٥,٥%)، ٥- كوتنجين (حديد + منجنيز + زنك في صوره مخلبيه) ، ٦- فوسفورين + كوتنجين + ٥٠ كجم/للفدان سوبر فوسفات الكالسيوم (فو٢أ ١٥,٥%)

و يمكن تلخيص أهم النتائج المتحصل عليها كما يلي :-

تفوق الصنف سخا١ في محصول الألياف للفدان وأعطى اعلى نسبة للحمض الدهني الرئيسي الغير مشبع لينولينك وأعلى معامل انكسار وأعلى كثافة للزيت مع أقل رقم بيروكسيد للزيت، بينما احتل الصنف سخا٢ المركز الثاني في محصول القش للفدان . و سجلت للسلالة 2465/1 أقل التقديرات في باقي صفات القش في نفس الوقت، احتلت السلالة 2465/1 المكانة الأولى وتفوقت على الصنفين سخا١ و سخا٢ بالنسبة لمحصول البذرة للنبات وللفدان، عدد الكبسولات للنبات ، محصول الزيت للفدان وكذلك النسبة المئوية للزيت. تم الحصول على أعلى محصول للقش والبذور ومكوناتهما بإضافة مخلوط سماد فوسفورين + كوتنجن + ٥٠ كجم/للفدان سوبر فوسفات الكالسيوم (فو٢أ ١٥,٥%). أظهرت النتائج أن محصول القش للنبات ارتبط موجبا ومعنويا مع كل من الطول الكلي للنبات، والطول الفعال ، ومحصول البذور للنبات ، وعدد الكبسولات للنبات . أيضا أظهرت النتائج أن محصول البذور للنبات ارتباطا موجبا ومعنويا مع كل من عدد الكبسولات ، وعدد الافرع الفعلية ، والطول الكلي ، والطول الفعال ، وسمك الساق ، وهذه النتائج تدل على امكانية الحصول على تركيب وراثي يتصف بالقدرة المحصولية العالية لكل من محصولي القش والبذور . وبناء على ما سبق يمكن اختيار وتفضيل الزيت الناتج من صنف سخا ١ في الأغراض الغذائية والدوائية. بينما يأتي في المرتبة الثانية الزيت الناتج من السلالة 2465/1 . وللحصول على أعلى محصول للألياف مع أعلى جودة للزيت ينصح بزراعة الصنف سخا ١. وللحصول على أعلى محصول من البذور والزيت ينصح بزراعة السلالة 2465/1 مع استخدام الفوسفورين + ١٥,٥ كيلو جرام فوسفور معدني للفدان + الكوتنجين (حديد+ منجنيز + زنك في صورة مخلبيه) في كلا الحالتين.