COMPARATIVE ANALYSIS OF YIELD AND ANATOMICAL MANIFESTATIONS OF SIX FLAX GENOTYPES

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Abstract

Two field experiments were conducted at Giza Agric. Res. Station Farm, Agric. Res. Center during the two successive seasons 2012/2013 and 2013/2014. The main objective of this study was to evaluate six flax genotypes for yield and its components, study also anatomical manifestation in the flax main stems at two regions (the middle and at the top of technical stem length) and the transverse sections in seeds. The obtained results can be summarize as follow: The flax variety Giza 10 achieved highest estimates in total plant height, technical stem length , upper branching zone length , straw yield/plant as well as per fad., fiber yield for either per plant or fad., fiber percentage , fiber length and fiber fineness. While, Sakha 3 ranked second in most economic straw traits, the two flax strains i.e., S.402/2 and S.22 were the latest in this case. The strain 22 occupied the first position and surpassed all the five genotypes in no. of capsules/plant , capsules set % , no. of seeds/plant , seed oil percentage , seed yield/fad. and oil yield/fad. The flax variety Giza 8 ranked second in most of seed characters , but the fewest one was Giza 10. Correlation coefficient (r) values were highly significant and positive between total plant height and each of technical stem length, straw yield/plant, fiber yield/plant, fiber percentage and fiber length. While r values were only positively significant with no. of basal branches, fiber fineness and seed yield/plant. Relation between no. of capsules/plant and each of capsules set % and seed yield/plant were highly significant and positive, but it was only significantly positive with no. of seeds/plant and seed oil percentage. Giza 10 variety achieved maximum fiber area/cross section and fiber index estimates (fiber per plant in volume) at either the middle or the top region of flax stem, while S.22 was the lowest in this respect. The majority of different tissues in the transverse section were greater in middle region of stems than in the top of technical length section, except with the cortex area for Sakha 1, Sakha 3 and Giza 10 which took the opposite direction. The flax strain 22 seeds performed highest cotyledons area % per the corresponding total cross section area, the descending arrangement in this case was Giza 8, Sakha 1, S.402/2 , Giza 10 and Sakha 3.

Key words: comparative analysis, yield, yield components, correlation, anatomy, flax.

INTRODUCTION

Flax belongs to genus *Linum*, where it consists about 200 species. Nowadays, *Linum usitatissimum* L. is the only member of the family Linaceae which

had grown for economic importance in the world to produce the bast fibers and seeds. It can be classified into three cultivated types *i.e* , fiber flax, Linseed and dual purpose according to the basis of their utility for fiber , seed or both fiber and seeds , respectively . The flax fiber differentiated and arise from pericyclic region for stems. Meanwhile, flax seeds initiated from a fertilized ovule, at maturity it consists of seed coat (testa) which derive from integument of the ovule, the seed oil stored mainly in the indosprm and in few amount in embryo cells.

Many investigators found differences among flax genotypes in yield and its components such as EL-Shimy and Moawed (2000), EL-Shimy *et al.*, (2002), Ghaniem (2004) and Abo-Kaied *et al.*, (2007). Many workers also studied interrelationships among different flax characters as EL-Shimy and Moawed (2000) EL-Shimy *et al.*,(2002), El-Refaie and Omar (2012) and Hussein (2012).

Concerning anatomical studies, Potocanac (1957) ,EL-Shimy (1975) , Sabh (1989), EL-Shimy *et al.*,(1993), Abo-Zaied (1997), EL-Azzouni (1998), Ghaniem (2004) and EL-Emary *et al.*, (2006) found anatomical differences in either tissues area of transverse sections in flax stems or diameters of seed cotyledon thickness.

The main target of this investigation was to make comparative study among six flax genotypes regarding yield, yield components and its relation to yield. Moreover, to study the anatomical manifestation of flax stems (at the middle region and the top of technical stem length) and transverse sections of seeds for each flax genotype.

MATERIALS AND METHODS

This study was carried out at Giza Agric. Res. Station Farm, Agric. Res. Center during the two successive seasons of 2012/2013 and 2013/2014, where sowing date was on Nov. 10^{th} of 2012 and on Nov. 12^{th} of 2013. The soil texture of experimental area was clay loam in both seasons. Trials were conducted in four replications using a Randomized Complete Block Design for the six flax genotypes i.e., Sakha 1, Sakha 3, Giza 10, S.402/2, S.22 and Giza 8 (classification and pedigree of these genotypes were described in Table 1). The plot size was 2x3 meters (6 m^2), each plot contains ten rows spaced 20 cm. apart. Sixty seeds were sown in each row at 5 cm. distance apart (60 seeds/row*10 row/plot = 600 seeds/plot). The normal agricultural practices for flax production as recommended were followed. At full maturity stage, ten guarded plants were taken at random from each plot to estimate flax yield components, in addition to two plants were chosen from each plot to study anatomical manifestations. Straw, fibers and seed yields/fad (fad.=4200 m^2) were calculated on plot area basis. Oil percentage was determined as a sample of seeds from the four

replication for each genotypes by using Soxhlet apparatus (A.O.A.C. 1995) The following characters were recorded:

A- Yield and yield components:

A-1- Straw yield and related characters:

Total plant height (cm), technical stem length (cm), upper branching zone length (cm), number of basal branches/plant, straw yield/plant (g), straw yield/faddan (ton), fiber yield/plant (g), fiber yield/faddan (kg), fiber percentage (%)calculated as a percentage between fiber yield/faddan and straw yield/faddan, fiber length (cm) and fiber fineness (Nm). Th last trait was determined according to the technique described by Radwan and Momtaz (1966).

A-2- Seed yield and related characters:

Number of apical branches/plant, number of capsules/plant, capsules set percentage (%) which determined from the ratio between number of full maturity capsules divided on no. of total apical branches/plant*100, no. of seeds/capsule, no. of seeds/plant, seed index mean of 1000 seeds weight in gram, seed yield/plant (g), seed oil percentage, seed yield/fad. (kg), oil yield/fad. (kg) calculated from the product of seed oil percentage and seed yield/fad.

Table 1. Pedigree and classification (dual type, D, oil type, O, and fiber type, F.) of sex flax genotypes.

No.	Genotypes	Pedigree	Classification
1	Sakha 1	I.1485 * Bombay	D
2	Sakha 3	I.2569 * Belinka	F
3	Giza 10	420/140/5/10 * Bombay	F
4	S.402/2	I.235 * Giza 5	D
5	S.22	I.370 * I.2561	O
6	Giza 8	Giza 6 * santa Catalina 6 (I.Argentina)	D

Statistical analysis:

Analysis of variance was carried out for each trait according to: Snedecor and Cochran (1980), differences between means were tested by using L.S.D. at the levels of 0.05 and 0.01 of probability. Also combined analysis was performed for all previously mentioned characters over the two seasons according to LeClerg *et al.*, (1966) after application of Bartlett's test of homogeneity.

B- Correlation coefficients (r) between either total plant height or number of capsules/plant and more economical characters for six flax genotypes in combined data for two seasons, were calculated according to Steel and Torrie (1980).

C- Anatomical studies

In the second season, at full maturity of flax plants and the plants were standing in the field, specimens had taken from the main stems at either the middle

region or at the top of technical stem length, in addition to flax seeds from the same plant for each genotype. After killing and fixing these samples for 36 hours by using Formalin, Acetic acid and Alcohol (F.A.A.) solution. Paraffin wax method was used for obtaining transverse sections. The two kinds of flax stems specimens microtomed at 25 microns by sliding, microtome, while the seed samples were microtomed at 20 microns by rotary microtome. The slides were smeared with small quantity of mayer albumen before mounting the ribbon of transverse sections, which stained in 0.5% safranin solution to make nucleus and lignified tissues with red colour, in addition to stain these sections with 1% light green dissolved in clove oil which gave the cytoplasm and cell wall green colour.

C-1- Stem (at the middle and the top of technical length) anatomical characters:

Total cross section area (mm^2), cortex area (mm^2), fiber area (mm^2) xylem area (mm^2) and pith area (mm^2) in addition to fiber index (cm^3) calculated from the product of fiber area (cm^2)/cross section x technical stem length (cm),this measurement represented the fiber which flax plant contain in volume.

C-2- Seed anatomical Characters:

At full formation of flax seeds for each genotype were chosen to carry out paraffin wax method as occurred on flax stem mentioned before. The economical seed tissues in cross section at the middle length of seeds were measured i.e., total cross section area (mm^2), testa area (mm^2), cotyledons area (mm^2) and the percentage between cotyledons area and the corresponding total cross section area.

RESULTS AND DISCUSSION

A- Yield and yield components:

A-1- Straw yield and related characters:

Mean values of straw yield and related traits for six flax genotypes (combined analysis for both seasons) are presented in Table (2). Data obtained revealed significant differences among flax genotypes in all straw characters except fiber percentage which appeared to be non-significant. The flax variety Giza 10 ranked first and achieved maximum estimates in total plant height (108.56 cm), technical stem length (85.25 cm.), upper branching zone length (23.31 cm),straw yield/plant (3.49 g.), straw yield/fad. (5.17 ton), fiber yield/plant (0.77 g.), fiber yield/fad. (790.50 kg.), fiber percentage (15.29%), fiber length (82.29 cm.), and fiber fineness (198.50 Nm). Meanwhile, the flax variety Sakha 3 occupied the second position in most economic straw yield traits such as total plant height (91.25 cm.), technical stem length (73.44 cm.), straw yield/fad.(4.76 ton), fiber yield/plant (0.63 g), fiber yield/fad.(724.25kg), fiber percentage (15.22%), fiber length (71.44 cm.) and fiber

fineness (189.00 Nm). On the other hand, the strain 402/2 was the latest in total plant height (86.03 cm.), technical stem length (63.68 cm.), fiber length (60.26 cm.) and fiber fineness (149.50 Nm.). In addition to S.22 was also lowest in straw yield/plant and fiber yield/plant, the remainder genotypes i.e., Sakha 1, Giza 8 and S.22 in remain characters ranked intermediate position between the highest genotype and the lowest one in this case. Coefficient of variability (C.V.) estimates exhibited relatively high values in all straw yield characters under study. Such variability among different flax genotypes in straw yield and its components was also reported by El- Shimy and Moawed (2000), Ghaniem (2004), Abo-Kaied et al., (2007), El-Shimy et al., (2008) and Hussein (2012).

A-2-Seed yield and its related characters:

Estimates of seed yield and related traits for six flax genotypes (combined analysis over both seasons) are presented in Table (3). Data illustrated that the six flax genotypes differed significantly in all seed characters, the strain 22 surpassed to all other flax genotypes in no. of capsules/plant (16.93) capsule set (67.84%), no. of seeds/plant (126.72), seed oil percentage (45.29%), seed yield/fad. (916.00 kg) and seed oil yield/fad. (414.92 kg). The flax variety Giza 8 ranked first concerning no. of apical branches/plant (26.56), seed index (9.40 g) and seed yield/plant (0.89 g). But it ranked second regarding no. of capsules/plant (15.50), capsule set (57.93%) and seed oil percentage (40.66%) also Giza 8 occupied the third situation in oil yield/fad. (267.51 kg) and lowest in no. of seeds/capsule (6.67). The other three flax genotypes i.e., Sakha 1, Sakha 3 and S.402/2 laid the intermediate position between highest and was lowest flax genotype (Giza 10) in relation to most economic seed characters. The respective C.V. estimates for the studied seed characters, which mentioned before were 12.34, 18.82, 9.26, 10.07, 19.45, 26.15, 10.59, 17.55, 25.83 and 36.46%, respectively. These results were in harmony with that reported by El-Shimy *et al.*, (2002), Ghaniem (2004), Abo-Kaiedet *et al.*,(2007) and El-Refaie and Omar (2012).

B-Correlation studies:

Correlation coefficient values (r) among either total plant height or number of capsules/plant and economical characters for six flax genotypes are presented in Table (4).

Interrelationships between total plant height and each of technical stem length, straw yield/plant, fiber yield/plant, fiber percentage and fiber length were highly significant and positively correlated, while r values were only significant and positive with no. of basal branches, fiber fineness and seed yield/plant. Meanwhile, no-significant positive r values had found with upper branching zone length, no. of apical branches and no. of capsules/plant. Correlation coefficient values between no. of capsules/plant and each of capsule set and seed yield/plant were highly significant

and positive, while r values were only significant and positive with no. of seeds/plant and oil percentage. These results were in agreement with those obtained by El-Shimy and Moawed (2000), El-Shimy *et al.*, (2002), El-Refaie and Omar (2012) and Hussein(2012). It can be concluded that correlation results in this investigation promote principal knowledge to flax breeder about the possibility for selection in flax genotypes which characterize by tallest plants (plant height) for high straw yield, fiber yield, fiber percentage and fiber fineness. Moreover, the great number of capsules/plant gave indication for higher seed production.

C- Anatomical manifestations:

C-1- Anatomical structure of flax main stems at the middle region:

Mean values of different tissues area per cross section at the middle region of stems and fiber index estimates for six flax genotypes are presented in Table (5). The flax variety Giza 10 ranked first and achieved maximum fiber area and greatest fiber index which consider as more economic importance character, where it represent fiber quantity in volume per plant. It must be indicated here, that more fiber volume was also more fiber weight/plant. The descending regularity after Giza 10 in this case was Sakha 3, Sakha 1, S.402/2, Giza 8 and the lowest estimate obtained by the flax strain 22. Figs. (1,2 and 3) illustrated the highest, intermediate and lowest areas (mm^2) for either fiber or fiber index at the middle region of flax main stems. The differences among anatomical tissues in transverse sections for flax were confirmed by Potocanac (1957) El-Shimy (1975), Sabh (1989), El-Shimy *et al.*, (1993), Abo-Zaied (1997), El-Azzouni (1998), Ghaniem (2004) and El-Emary *et al.*,(2006).

C-2- Anatomical structure of flax main stem at the top region of technical length:

Mean values of different tissues area per cross sections at the top of technical stem length and fiber index estimates for six flax genotypes are presented in Table (6):

The new anatomical study regarding the top region of technical stem length which laid immediately before the apical branching zone, allows to make comparison with the corresponding anatomical manifestations in the middle stem region. Data in Table (6) revealed that the dual purpose and oil flax genotypes (Sakha 1, S.402/2, S.22 and Giza 8) showed higher total cross section and xylem areas, when compared with those obtained in the two flax varieties belonging to fiber type (Giza 10 and Sakha 3) which appeared to be lower in this respect. It can observed that fiber area per transverse sections, fiber index in addition to total cross section and xylem areas were in the same trend in both two anatomical stem regions by means at the middle and the top of technical length. Slight variation was found among the different tissues area/cross sections Figs. (4,5 and 6) exhibited the highest, intermediate and

lowest for either fiber area and fiber index estimates at the top of technical stem length. No literature are known to the authors for the anatomical study in this case.

Table (7) revealed the superiority ratios of different tissues area between the cross sections at the middle region of flax stems and the corresponding ones at the top of technical stem length.

It is clear that all tissues area for the transverse sections in middle region of flax stems surpassed to the respective ones made at the top of technical length except with the cotrex areas for Sakha 1, Sakha 3 and Giza 10 which appeared to be greater in their Cortex areas.

C-3- Estimates of economical seed tissues in cross sections at the middle region for six flax genotypes.

Data in Table (8) indicated that Giza 8 achieved maximum total cross section area (23.01mm^2) fallowed by Sakha 1 (22.46 mm^2), S.402/2 (21.10 mm^2), Sakha 3 (19.32 mm^2), Giza 10 (17.51 mm^2) and the lowest seed transverse section area was recorded for S.22 (15.93 mm^2). On the other hand, the flax strain 22 had smallest for either total cross section or testa area and relative higher in its cotyledans area (12.38 mm^2). Furthermore this flax strain ranked first in cotyledons area percentage per total cross section area (77.47%), followed by Giza 8 (70.45%), Sakha 1 (62.38%), S.402/2 (61.09%, Giza 10 (59.22%) and the lowest was Sakha 3 (56.37%). The descending regularity previously mentioned was in similar trend as shown in seed oil percentage (Table 3), in addition to S.22 performed highest seed oil yield/fad. which reported in the same table. The superiority of S.22 in oil yield/fad. production is due to the highest cotyledons %, seed oil percentage and greatest seed yield/fad. Figs. (7,8 and 9) exhibited the greatest, intermediate and lowest cotyledons percentages per their corresponding total cross sections area at the middle length of flax seeds at full maturity. The differences among the transverse sections of flax seed were recorded by El-Emary *et al*., (2006).

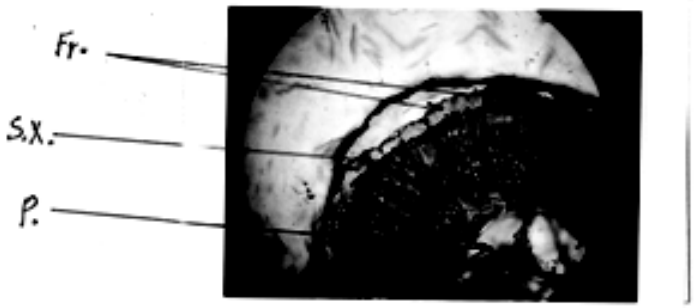

Fig. (1) Cross section of main stem for Giza 10 *cv.* in the middle region at full maturity, the greatest fiber production (fiber index).
fr: Fiber sx: Secondary xylem p: Pith

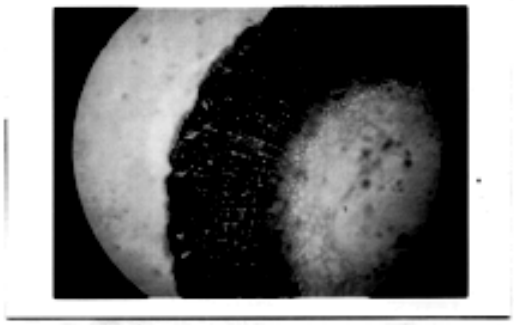

Fig. (2) Cross section of main stem for Sakha 1 *cv.* in the middle region at full maturity, the intermediate fiber production (fiber index).

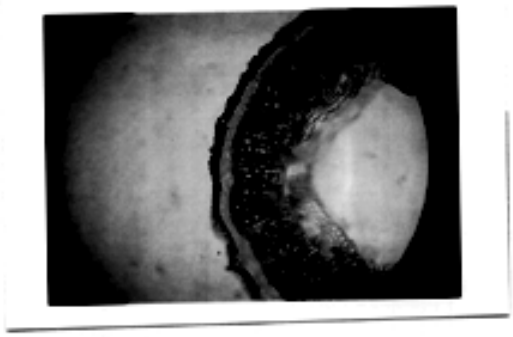

Fig. (3) Cross section of main stem for strain 22 in the middle region at full maturity, the lowest fiber production (fiber index).

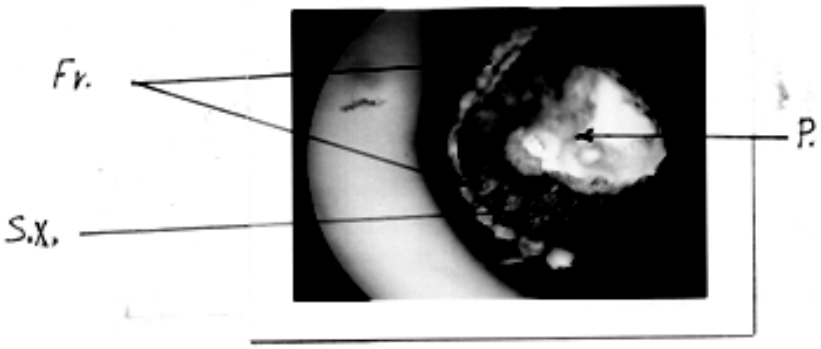

Fig. (4) Cross section for Giza 10 *cv.* in the top of technical stem length at full maturity, the greatest fiber area (mm^2).

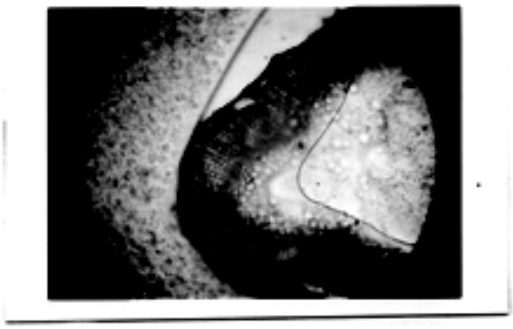

Fig. (5) Cross section for Sakha 1 *cv.* in the top of technical stem length at full maturity, the intermediate fiber area (mm^2).

Fig. (6) Cross section for strain 22 in the top of technical stem length at full maturity, the lowest fiber area (mm^2).

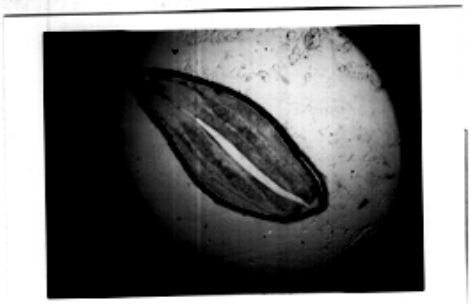

Fig. (7) Cross section for Strain 22 seed in the middle length at full maturity, the greatest cotyledons percentage per its total cross section.

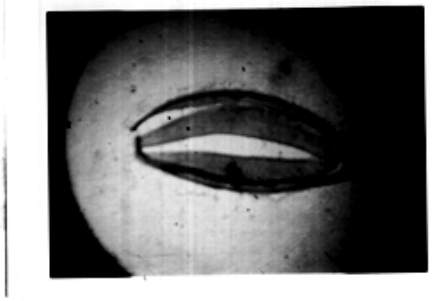

Fig. (8) Cross section for Sakha 1 seed in the middle length at full maturity, the intermediate cotyledons percentage per its total cross section.

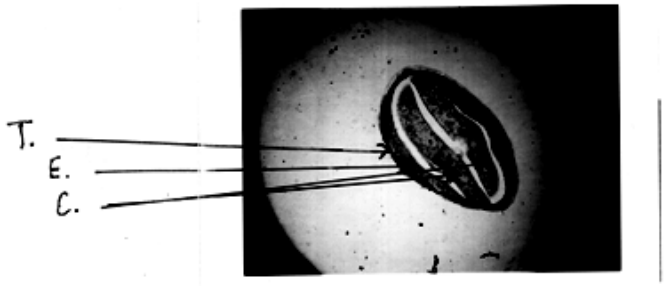

Fig. (9) Cross section for Sakha 3 seed in the middle length at full maturity, the lowest cotyledons percentage per its total cross section.

C: cotyledon E: endosperm T: testa

Table 2. Mean values of straw yield and its related characters for six flax genotypes (combined analysis over 2012/2013 and 2013/2014 seasons).

Genotype	Total plant height (cm)	Technical stem length (cm)	Upper branching zone length (cm)	Number of basal branches	Straw yield/plant (g)	Straw yield /fad. (ton)	Fiber yield/plant (g)	Fiber yield/fad. (kg)	Fiber%	Fiber length (cm)	Fiber fineness (Nm)
Sakha 1	86.41	70.80	15.61	1.67	2.72	4.50	0.48	672.25	14.94	67.59	159.25
Sakha 3	91.25	73.44	17.81	1.36	3.22	4.76	0.63	724.25	15.22	71.44	189.00
Giza 10	108.56	85.25	23.31	1.18	3.49	5.17	0.77	790.50	15.29	82.29	198.50
S.402/2	86.03	63.68	22.35	1.53	2.98	3.77	0.48	571.00	15.14	60.26	149.50
S.22	86.43	69.40	17.03	1.73	2.35	3.57	0.41	541.00	15.15	66.25	161.75
Giza 8	87.14	68.97	18.17	1.72	3.38	3.55	0.46	477.50	13.45	66.24	151.25
Grand mean	90.97	71.92	19.05	1.53	3.02	4.22	0.54	629.42	14.87	69.01	168.21
C.V.%	9.71	10.11	16.14	14.53	14.29	16.23	25.05	18.94	4.73	10.77	12.21
L.S.D. 0.01	4.51	3.95	5.86	0.50	0.91	0.66	0.17	59.13	ns	4.21	3.71
L.S.D. 0.05	3.26	2.86	4.24	0.36	0.66	0.48	0.12	31.92	ns	3.05	2.68

Table 3. Mean values of seed yield and its related characters for six flax genotypes (combined analysis over 2012/2013 and 2013/2014 seasons).

Genotype	Number of apical branches per plant	Number of capsules/plant	Capsules set %	Number of seeds/capsule	Number of seeds/plant	Seed index (1000 seed weight) (g)	Oil percentage %	Seed yield/plant (g)	Seed yield/fad. (kg)	Oil yield/fad. (kg)
Sakha 1	21.37	12.03	56.38	6.88	82.70	8.99	40.19	0.70	758.00	304.67
Sakha 3	23.64	12.98	55.69	8.28	107.99	4.94	34.00	0.61	501.25	170.45
Giza 10	18.76	10.66	56.82	8.21	87.60	5.13	34.93	0.53	472.75	165.15
S.402/2	21.55	11.23	51.89	6.68	75.50	8.15	39.04	0.71	584.75	225.25
S.22	25.00	16.93	67.84	7.45	126.72	7.22	45.29	0.72	916.00	414.92
Giza 8	26.56	15.50	57.93	6.67	101.85	9.40	40.66	0.89	658.00	267.51
Grand mean	22.81	13.22	57.76	7.36	97.06	7.31	39.02	0.69	648.46	257.99
C.V.%	12.34	18.82	9.26	10.07	19.45	26.15	10.59	17.55	25.83	36.46
L.S.D. 0.01	7.78	5.36	10.93	0.98	38.85	1.33	0.97	0.31	37.49	18.71
L.S.D. 0.05	5.63	3.88	7.90	0.71	28.10	0.96	0.70	0.22	27.11	13.54

Table 4. Correlation coefficient values (r) between either total plant height or number of capsules/plant and the most ecomical characters for six flax genotypes (combined analysis of 2012/13 and 2013/14 seasons).

Characters	Total plant height
Technical stem length	0.949 **
Upper branching zone length	0.637
Number of basal branches	0.864 *
Straw yield/plant	0.897**
Fiber yield/plant	0.927 **
Fiber percentage	0.896 **
Fiber length	0.935 **
Fiber Fineness	0.876 *
No. of apical branches	0.640
No. of capsules/plant	0.505
Seed yield/plant	0.829 *

Characters	Number of capsules/plant
Capsule set percentage	0.966 **
No. of seeds/plant	0.878 *
Seed yield/plant	0.941 **
Oil percentage	0.784 *

Table 5. Mean values of different tissue areas per cross section (C.S.) at the middle region of stems and fiber index estimates for six flax genotypes.

Genotype	Total cross section area (mm^2)	Cortex area (mm^2)	Fiber area (mm^2)	Xylem area (mm^2)	Pith area (mm^2)	Fiber index (cm^3)
Sakha 1	44.67	3.05	5.25	25.87	10.50	3.72
Sakha 3	32.75	1.72	5.96	18.19	6.88	4.38
Giza 10	41.75	1.52	6.88	18.91	14.44	5.75
S.402/2	66.12	5.96	4.92	43.01	12.23	3.68
S.22	69.57	3.60	4.20	49.90	11.87	2.91
Giza 8	80.23	4.63	4.66	51.73	19.21	3.52
Grand mean	55.85	3.41	5.31	34.60	12.52	3.99
C.V.%	0.33	0.50	0.18	0.45	0.33	0.25

Table 6. Mean values of different tissue areas per cross section (C.S.) at the top region of technical stem length and fiber index estimates for six flax genotypes.

Genotype	Total cross section area (mm^2)	Cortex area (mm^2)	Fiber area (mm^2)	Xylem area (mm^2)	Pith area (mm^2)	Fiber index (cm^3)
Sakha 1	35.32	3.55	3.02	18.75	10.00	2.14
Sakha 3	21.48	3.36	3.40	9.52	5.20	2.50
Giza 10	26.57	1.95	3.96	10.97	9.69	3.38
S.402/2	35.14	2.39	2.86	20.10	9.79	1.82
S.22	34.97	2.30	2.45	22.47	7.75	1.70
Giza 8	32.50	1.24	2.75	19.86	8.65	1.90
Grand mean	31.00	2.47	3.07	16.95	8.51	2.24
C.V.%	0.18	0.35	0.17	0.32	0.22	0.28

Table 7. Superiority ratios of different tissues between the cross sections at the middle region of flax stems and the crresponding ones at the top of technical stem length.

Genotype	Total cross section area %	Cortex area%	Fiber area %	Xylem area %	Pith area %
Sakha 1	26.47	-16.39	73.84	37.97	5.00
Sakha 3	52.47	-95.35	75.29	91.07	32.31
Giza 10	57.13	-28.29	73.74	72.38	49.02
S.402/2	88.16	149.37	72.03	113.98	24.92
S.22	98.94	56.52	71.43	122.07	53.16
Giza 8	146.86	273.39	69.45	160.47	122.08

Table 8. Estemates of economical seed tissues in cross sections at the middle region for seeds of six flax genotypes.

Genotype	Total cross section area (mm^2)	Testa area (mm^2)	Cotyledons area (mm^2)	Cotyledons % per total cross section area
Sakha 1	22.46	8.45	14.01	62.38
Sakha 3	19.32	8.43	10.89	56.37
Giza 10	17.51	7.14	10.37	59.22
S.402/2	21.10	8.21	12.89	61.09
S.22	15.98	3.60	12.38	77.47
Giza 8	23.01	6.80	16.21	70.45
Grand mean	19.90	7.11	12.79	64.50
C.V.%	0.14	0.26	0.17	0.12

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تحليل مقارن للمحصول والمظاهر التشريحية لستة تراكيب وراثية من الكتان

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أقيمت تجربتان حقليتان في محطة البحوث الزراعية بالجيزة خلال الموسمين المتعاقبين ١٣/٢٠١٢ ، ١٤/٢٠١٣ وذلك للمقارنة بين ست تراكيب وراثية من الكتان من حيث المحصول والارتباط بين أهم الصفات الاقتصادية وكذلك دراسة المظاهر التشريحية في منتصف الساق الرئيسي وأيضا في المنطقة ألقميه للطول الفعال بالإضافة للقطاعات العرضية في البذور .

ويمكن تلخيص النتائج المتحصل عليها كما يلي :-

تفوق الصنف جيزة ١٠ في صفات الطول الكلى ، الطول الفعال ، طول منطقة التفريع القمي ، محصول القش / نبات وللفدان ، محصول الألياف / نبات و للفدان ، النسبة المئوية للألياف ، طول الألياف ، نعومة الألياف – وقد احتل صنف الكتان سخا ٣ المكانة الثانية في معظم الصفات الاقتصادية بينما احتلت السلالة ٢/٤٠٢ والسلالة ٢٢ المركزين الأخيرين في هذه الحالة .

احتلت السلالة ٢٢ المرتبة الأولى في عدد الكبسولات / نبات، النسبة المئوية للعقد، عدد بذور النبات، النسبة المئوية للزيت، محصول البذور / فدان، محصول الزيت / فدان. ويليها الصنف جيزة ٨ في معظم صفات البذرة – بينما أحتل الصنف جيزة ١٠ المكانة الأخيرة .

كانت قيم معامل الارتباط الظاهري عاليه المعنوية وموجبه بين الطول الكلى وكل من الطول الفعال ، محصول القش / نبات ، محصول الألياف / نبات ، النسبة المئوية للألياف ، طول الألياف – بينما كانت قيم معامل الارتباط معنوية فقط وموجبه مع عدد الفروع ألقاعدية ، نعومة الألياف ، ومحصول البذرة / نبات . كان معامل الارتباط عالي المعنوية وموجب بين عدد الكبسولات / نبات وكل من النسبة المئوية للعقد ، محصول البذرة / نبات ومعنوية فقط وموجبه مع عدد البذور / نبات ، النسبة المئوية للزيت .

حقق صنف الكتان جيزة ١٠ أعلى مساحة للألياف / القطاع العرضي وكذلك دليل الألياف (حجم الألياف للنبات) في كل من المنطقة الوسطية للساق أو أعلى الطول الفعال وسحلت السلالة ٢٢ أقل التقديرات في هذه الصفات – هذا وقد كانت مساحة الأنسجة المختلفة في القطاعات العرضية وكذلك دليل الألياف بالنسبة للتراكيب الوراثية تحت الدراسة اكبر في قطاعات منتصف الساق عن مثيلتها عند قمة الطول الفعال .

سجلت بذور السلالة ٢٢ أعلى قيمة للنسبة المئوية للفلقتين بالنسبة للمساحة الكلية في القطاع العرضي للبذور وكان الترتيب التنازلي بعد ذلك وفي هذه الحالة هو الصنف جيزة ٨ ، سخا ١ ، س ٢/٤٠٢ ، جيزة ١٠ وأخيرا سخا ٣ .