J. Plant Production, Mansoura Univ., Vol. 6 (7): 1263-1275, 2015

RESPONSE OF SOME FLAX GENOTYPES TO LATE SOWING

Abd Eldaiem, M.A.M.
Fibers Crops Research Section, Field Crops Research Institute, Agricultural Research Center, Egypt.

ABSTRACT

In order to determine the response of some flax genotypes; Sakha 3, Giza 10, Strain 22, Imported and Sakha 1 under various sowing dates *i.e.* optimum sowing date (1^{st} November), late sowing (21^{st} November) and very late sowing (15^{th} December), two field experiments were carried out at the Experimental Farm of Gemmeiza Agriculture Research Station, Agricultural Research Center (ARC), Egypt, during 2012/2013 and 2013/2014 seasons. The experiments were carried out in a split-plot design with three replicates. The main-plots were assigned to sowing dates. While, the sub-plots were allocated to flax genotypes. The main obtained results of this study were sowing flax in the first of November produced the highest values of total plant height, technical length, stem diameter, biological yield/fed, straw yield/fed and long fiber yield/fed in both. Sowing flax in 21^{st} November resulted in the highest values of number of fruiting branches, number of capsules/plant, number of seeds/capsule, straw yield/plant, seed yield/plant and seed yield/fed in both seasons. Delay sowing date of flax until 15^{th} December registered the lowest values of total plant height, technical length, stem diameter, number of capsules/plant, straw yield/plant, seed yield/plant, biological yield/fed, straw yield/fed, seed yield/fed and long fiber yield/fed in both seasons. Giza 10 cultivar recorded the highest values of total plant height, technical length, straw yield/plant, biological yield/fed, straw yield/fed and long fiber yield/fed in the two growing seasons. Whereas, Strain 22 genotype produced the highest values of number of fruiting branches, seed yield/plant and seed yield/fed in the two growing seasons.

From obtained results, maximum straw yield and long fiber yield/fed and it`s components of flax could be achieved by optimum sowing of Giza 10 cultivar in the first of November. However, maximum seed yield/fed and it`s components resulted by late sowing Strain 22 genotype in 21^{st} November.

keywords: Flax, Sowing dates, Planting dates, Late sowing, Genotypes, Cultivars, Varieties, Yields.

INTRODUCTION

Flax (*Linum usitatissimum* L.) is one of the oldest cultivated crops, continues to be widely grown for oil, fiber and food (Oomah, 2001). Flax fibers are taken from the ste m of the plant and are two to three times as strong as those of cotton. Additionally, flax fibers are naturally smooth and straight. In Egypt, the gap between the production and local consumption increased because it is difficult to increase flax area on account other major winter crops due to great competition among them. However, this gap could be fairly minimized by increasing flax yield per unit area. It is well know that high productivity of any crop is the final goal of many factors and operations. In addition, the pronounced role of the agronomical processes such as sowing high yielding genotypes in the proper sowing date plays very important effect on increasing flax yields.

Sowing date means the effect of all environmental conditions in large scale on growth and yield of all crops, which differ widely from region to another. Moreover, sowing date is an important factor which affects the timing and duration of the vegetative and reproductive stages, since, environmental factors such as temperature and light differ with varying planting date. Sowing date also allows superposing the critical periods for oil yield and its components with the moment of the growth season where more environmental resources are available (Balalic *et al.*, 2012). So, it is very important to determine sowing date of flax that achieving the optimum limits for these factors in order to get higher yields. In this respect, Abd Eldaiem (2008) stated that early sowing of flax in 25th October favorably affected plant height, technical length, stem diameter, seed and long fiber yields per plant and per feddan. Whereas, highest number of apical brnches and number of capsules/plant were resulted from late sowing (24th November). Shaikh *et al.* (2009) reported that sowing date had a significant effect on seed yield and it`s components of flax. Al-Doori (2012) reported that sowing dates significantly affected flax yields and it`s component. Sowing flax in the first of November gave the highest number of capsules/plant, number of seeds/capsule and seed yield/ha. Ghanbari-odivi *et al.* (2013) showed that sowing dates had significant effect on plant height, number of capsules/plant and seed yield. Early sowing generally increased seed yield and it`s components. Wadan (2013) found that the early sowing in 15th November was superior they the other two dates in 30th November and 15th December on seed yield and yield components and straw, fiber yield and related traits. Gallardo *et al.* (2014) concluded that delayed sowing date had a negative effect on seed yield and it`s components. Rahimi (2014) stated that delaying flax sowing significantly reduced plant height, number of branches and capsules/plant, and seed and fiber yields. Saghayesh *et al.* (2014) showed that sowing dates had significant effect on all morphological characters. They added that an earlier sowing date (3rd March) led to better results.

There are broad variations among flax genotypes in their growth, yields and yield components. The local flax cultivars such as; Sakha 1 and Sakha 2 showed significant differences for almost yields and it`s components (Abd El-Mohsen *et al.*, 2013 and Wadan, 2013). Generally, flax genotypes significantly differed for all studied yields and it`s components (Al-Doori, 2012 ; Bakry *et al.*, 2012 and Bakry *et al.*, 2014). Many workers in Egypt and other countries confirmed this fact, among them, Abd Eldaiem (2004) found that Sakha 2 variety produced the highest seed yield, while the highest fiber yield was obtained from growing Escalina variety. Abd Eldaiem (2008) reported that Sakha 1 cultivar gave the highest straw and seed yields/fed. Whereas, Herma and Marlin cultivars recorded the highest fiber yield. Al-Doori (2012) showed that the highest number of capsules/plant, 1000-seed weight, seed and oil yield/ha were produced from strain genotype. Bakry *et al.* (2014) revealed that Letwania-9 and Evelen cultivars surpassed all other varieties in seed yield/fed. On the other hand, Blanka variety recorded the lowest values of straw yield/fed, while, Posna variety gave the lowest values of technical length. Gallardo *et al.* (2014) indicated that the best seed yields were obtained from Prointa Lucero and Carap´e INTA varieties. Bakry *et al.* (2015)

reported that Sakha-2 variety significantly surpassed Amon variety in plant height, technical length, seed yield/plant, straw yield/plant, seed yield/fed, straw yield/fed and fiber yield/fed. While, Amon variety surpassed Sakha-2 in fruiting zone length and number of capsules/plant.

Therefore, this investigation was established to determine the response of some flax genotypes to various sowing dates and their effect on straw, seed and long fiber yields and it`s components under the environmental conditions of Gemmeiza district, El-Gharbia Governorate.

MATERIALS AND METHODS

The field experiment was carried out at the Experimental Farm of Gemmeiza Agriculture Research Station, Agricultural Research Center (ARC), Egypt, during the winter growing seasons of 2012/2013 and 2013/2014 to determine the response of some flax genotypes to various sowing dates and their effect on straw, seed and long fiber yields and it`s components.

The experiments were carried out in a split-plot design with three replicates. The main-plots were assigned to these sowing dates; optimum sowing date (1st November), late sowing (21st November) and very late sowing (15th December).

The sub-plots were allocated to five flax genotypes *i.e.* Sakha 3, Giza 10, Strain 22, Imported and Sakha 1. The studied Egyptian flax genotypes were obtained from Fibers Research Section, FCRI, ARC, Giza, Egypt and its typ and pedigree were shown in Table 1.

Table 1: Pedigree of studied flax genotypes.

Genotype	Type	Pedigree
Sakha 3	Dual purpose	Belinka2E × I.2096
Giza 10	Dual purpose	S 420/140/5/10 × Bombay
Strain 22	Oil type	I.370 × I.2561
Agata	Fiber type	Imported
Sakha 1	Dual purpose	Bombay × Introduction/1485

Each experimental unit area was 2 × 3 m occupying an area of 6.0 m^2 *i.e.* 1/700 feddan. The preceding summer crop was maize (*Zea mays* L.) in both seasons. The soil samples were taken at random from the experimental field area at a depth of 0 - 30 cm from soil surface before the growing seasons to measure the physical and chemical soil properties as shown in Table 2.

Table 2: Some physical and chemical properties of the experimental site during 2012/2013 and 2013/2014 seasons.

Soil analysis		**2012/2013**	**2013/2014**
A: Mechanical analysis			
Clay (%)		36.74	37.19
Silt (%)		48.42	47.73
Sand (%)		14.84	15.08
Texture class		Silty clay loam	Silty clay loam
B: Chemical analysis			
pH		7.84	7.88
E.C. (mho/cm at 25 °C)		1.31	1.45
$CaCO_3$ (%)		3.65	3.59
Available nitrogen (ppm)		29.17	30.29
Available P (ppm)		10.76	9.99
Available K (ppm)		348.00	340.00
Cations (meq./100 g soil)	Ca^{++}	4.18	4.16
	Mg^{++}	4.25	4.31
	Na^{+}	4.63	5.01
	K^{+}	0.51	0.54
Anions (meq./100 g soil)	HCO_3^{-}	3.85	4.07
	Cl^{-}	6.51	6.52
	SO_4^{--}	3.19	3.54

Meteorological data (monthly temperature °C and relative humidity %) of Gemmeiza district, El-Gharbia Governorate, Egypt during the two growing seasons of 2012/2013 and 2013/2014 were shown in Table 3.

Table 3: Maximum and minimum monthly temperature (°C) and relative humidity (%)* at the experimental site during the two growing seasons.

Month	**Temperature (°C)**				**Relative humidity (%)**	
	2012/2013		**2013/2014**		**2012/2013**	**2013/2014**
	Max.	**Min.**	**Max.**	**Min.**	**Mean**	**Mean**
November	27.5	16.9	27.1	14.6	55.5	51.6
December	21.8	11.3	20.1	8.5	53.7	54.7
January	19.7	7.0	20.9	8.5	55.8	58.9
February	22.4	8.4	22.5	8.2	46.2	57.5
March	27.8	11.0	25.6	10.4	37.3	45.1
April	29.1	12.4	30.7	13.6	38.9	39.0

Fax genotypes were sown as the aforementioned sowing dates in the first and second seasons by using broadcasting method at the recommended rate of each genotype. The mineral phosphorus fertilizer in the form of calcium superphosphate (15.5% P_2O_5) at the recommended rate and mineral potassium fertilizer in the form of potassium sulphate (48.0% K_2O) at the recommended rate were added before sowing and during seed bed preparation (after ploughing and before division).The mineral nitrogen fertilizer in the form of ammonium nitrate (33.5 % N) at the recommended rate was applied in two equal doses at 30 and 45 days from sowing. The common agricultural practices for growing flax according to the recommendations of Ministry of Agriculture were followed, except the factors under study.

Studied characters:

At full maturity, ten guarded plants were taken at random from each sub- plot to be used in recording the flax yields components. Straw yield/fed, seed yield/fed and long fiber yield/fed were recorded on the whole sub-plot area basis.

1- Total plant height (cm). It was measured in cm from the soil surface up to the top of flax pant.
2- Technical length (cm). The length of main stem in cm from cotyledonary node to the lowest branching zone.
3- Stem diameter (mm). It was measured at the middle of technical length.
4- Number of fruiting branches.
5- Number of capsules/plant.
6- Number of seeds/capsule.
7- Straw yield/plant (g). As the total weight in grams of the air dried straw per plant after removing the capsules.
8- Seed yield/plant (g).
9- Biological yield (t/fed).
10- Straw yield/fed (ton). It was estimated from the rest area of each plot.
11- Seed yield/feddan (kg).
12- Long fiber yield/feddan (kg).

All obtained data were statistically analyzed according to the technique of analysis of variance (ANOVA) for the split– plot design as published by Gomez and Gomez (1984) by using MSTAT statistical package (MSTAT-C with MGRAPH version 2.10, Crop and Soil Sciences Department, Michigan State University, USA). Least significant difference (LSD) method was used to test the differences between treatment means at 5 % level of probability as described by Snedecor and Cochran (1980).

RESULTS AND DISCUSSION

1. Effect of Sowing dates:

Sowing dates of flax caused significant effects on total plant height, technical length, stem diameter, number of fruiting branches, number of seeds/capsule, straw yield/plant, seed yield/plant, biological yield/fed, straw yield/fed, seed yield/fed and long fiber yield/fed in both seasons, except stem diameter and number of fruiting branches in the second season only as shown from data presented in Tables 4 and 5. Sowing flax in the first of November significantly exceeded other studied sowing dates and produced the highest values of total plant height, technical length, stem diameter, biological yield/fed, straw yield/fed and long fiber yield/fed, followed by late sowing date (21st November) in both growing seasons of this study. However, late sowing date of flax (21st November) markedly resulted in the highest values of number of fruiting branches, number of capsules/plant, number of seeds/capsule, straw yield/plant, seed yield/plant and seed yield/fed as compared with other studied sowing dates in both seasons. On the other hand, very delay sowing date of flax until 15th December registered the lowest values of total plant height, technical length, stem diameter, number of capsules/plant, straw yield/plant, seed yield/plant, biological yield/fed, straw yield/fed, seed yield/fed and long fiber yield/fed. While, the lowest values of number of fruiting branches and number of seeds/capsule were resulted from optimum sowing date in the first of November on both seasons.

The increases in flax yields and its component characters due to early or late sowing dates (1st to 21st November) might be attributed to the seasonable environmental conditions during this period such as temperature, day length and light intensity which allow rapid germination, establishment, vegetative growth, development and ripening, consequently increasing dry matter accumulation, yield components as well as straw, seed and long fiber yields per unit area. Al-Doori (2012), Ghanbari-odivi *et al.* (2013), Wadan (2013), Gallardo *et al.* (2014), Rahimi (2014) and Saghayesh *et al.* (2014) obtained similar results.

2. Genotypes performance:

Data presented in Tables 4 and 5 show significant differences among the five tested genotypes of flax for total plant height, technical length, number of fruiting branches, straw yield/plant, seed yield/plant, biological yield/fed, straw yield/fed, seed yield/fed and long fiber yield/fed in both seasons with exception number of fruiting branches in the second season only. The flax cultivar Giza 10 significantly surpassed other studied genotypes (Sakha 3, Strain 22, Imported and Sakha 1) and recorded the highest values of total plant height, technical length, straw yield/plant, biological yield/fed, straw yield/fed and long fiber yield/fed in the two growing seasons. Whereas, the flax genotype Strain 22 significantly exceeded other studied flax genotypes in number of fruiting branches, seed yield/plant and seed yield/fed in the two growing seasons. Under the environmental conditions of this study during both seasons, Sakha 1 cultivar considered as the second best cultivar concerning total plant height, technical length, number of fruiting branches, straw yield/plant, seed yield/plant, biological yield/fed, straw yield/fed, seed yield/fed and long fiber yield/fed. On the other side, the lowest values of all studied character were obtained from the Agata genotype during the two growing seasons on this research.

These findings might be attributed to the differences in genotypes genetical constitution and genetic factors makeup. Similar results were stated by Abd Eldaiem (2008), Al-Doori (2012), Bakry *et al.* (2014), Gallardo *et al.* (2014) and Bakry *et al.* (2015). The performance of Sakha 1 cultivar out yielded the other two cultivars and might be recommended.

T4

T5

3. Effect of the interaction:

The interaction between sowing dates and flax genotypes showed significant effect on total plant height, technical length, straw yield/plant, seed yield/plant and long fiber yield/fed in both seasons as well as straw yield/fed and seed yield/fed in the first season, vice versa concerning other traits as presented in Tables 4 and 5.

The highest values of total plant height, technical length, straw yield/fed and long fiber yield/fed (Fig. 1, 2, 5 and 7, respectively) were obtained from sowing Giza 10 cultivar in the first of November. This interaction treatments was followed by sowing Sakha 1 cultivar in the first of November, and then sowing Sakha 3 cultivar in the first of November.

Late sowing date (21st November) of Giza 10 cultivar produced the highest values of straw yield/plant as graphically illustrated in Fig. 3. The second best interaction treatment was sowing Sakha 3 cultivar in 21st November, and followed by sowing Sakha 1 cultivar on 21st November.

From obtained results graphically illustrated in Figs. 4 and 6, respectively show that the highest values of seed yield/plant and seed yield/fed were obtained from late sowing date (21st November) of Strain 22 genotype. Sowing Sakha 1 cultivar in 21st November ranked as second best interaction treatment.

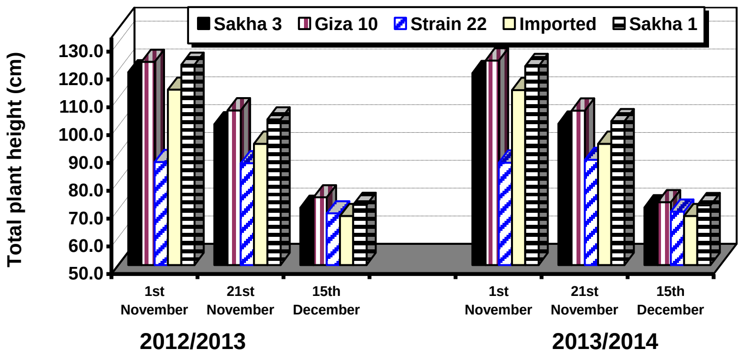

Fig. 1 : Total plant height (cm) as affected by the interaction between sowing dates and flax genotypes during 2012/2013 and 2013/2014 seasons.

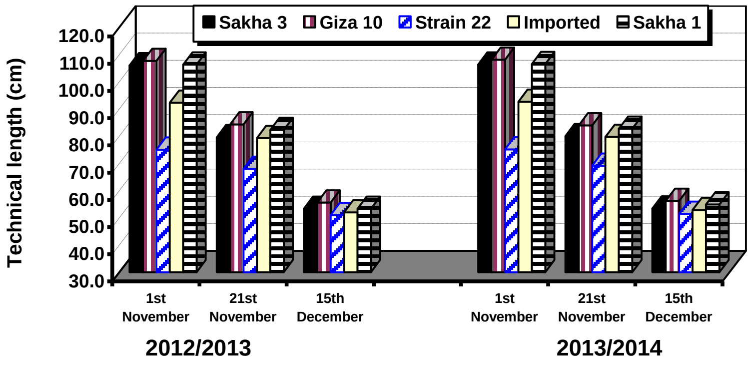

Fig. 2 :Technical length (cm) as affected by the interaction between sowing dates and flax genotypes during 2012/2013 and 2013/2014 seasons.

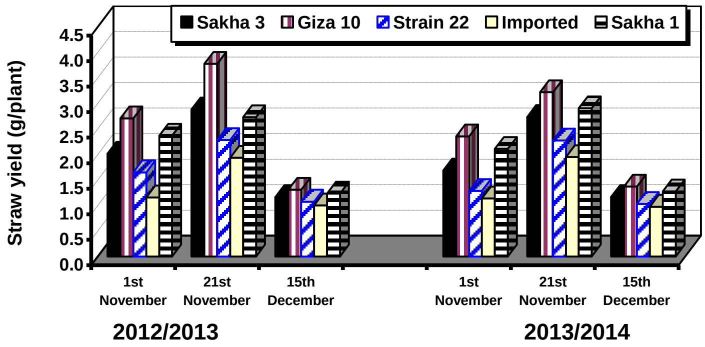

Fig. 3: Straw yield (g/plant) as affected by the interaction between sowing dates and flax genotypes during 2012/2013 and 2013/2014 seasons.

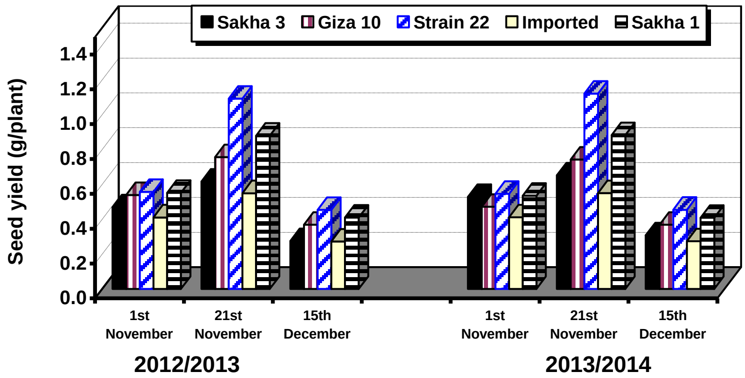

Fig. 4:Seed yield (g/plant) as affected by the interaction between sowing dates and flax genotypes during 2012/2013 and 2013/2014 seasons.

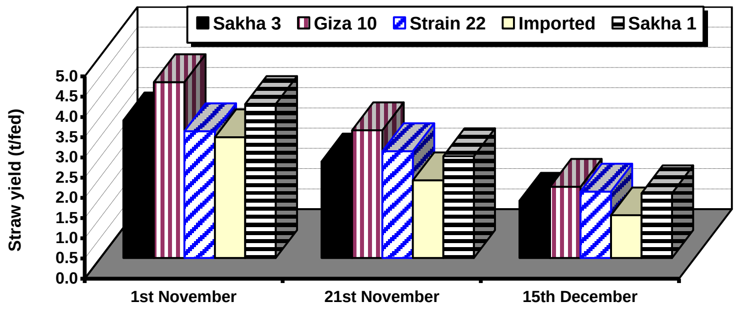

Fig. 5: Straw yield (t/fed) as affected by the interaction between sowing dates and flax genotypes during 2012/2013 season.

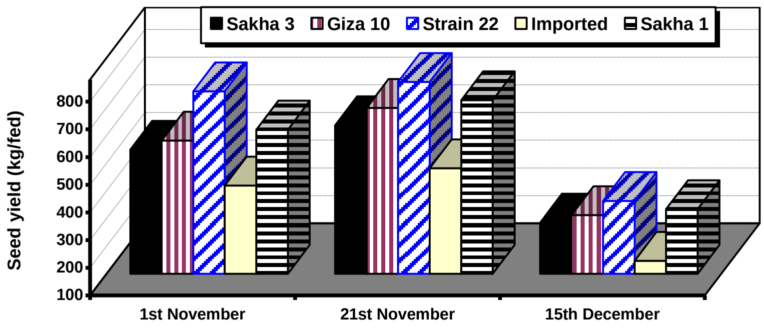

Fig. 6: Seed yield (kg/fed) as affected by the interaction between sowing dates and flax genotypes during 2012/2013 season.

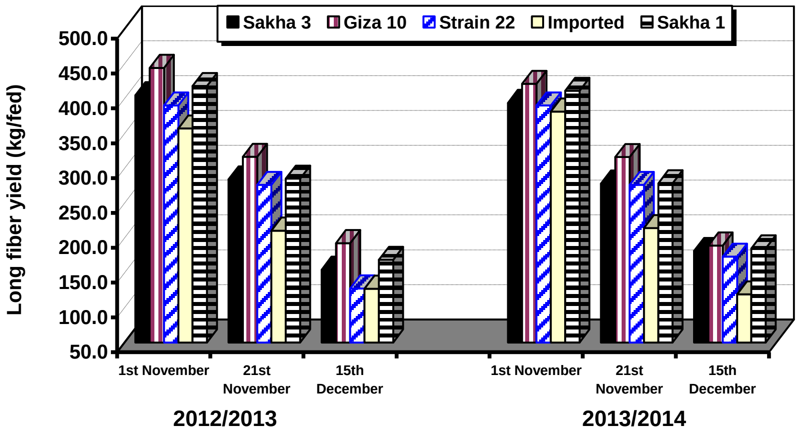

Fig. 7: Long fiber yield (kg/fed) as affected by the interaction between sowing dates and flax genotypes during 2012/2013 and 2013/2014 seasons.

CONCLUSION

From obtained results, maximum straw yield and long fiber yield/fed and its components of flax could be achieved from optimum sowing Giza 10 cultivar in the first of November. However, maximum seed yield/fed and its components resulted from sowing Strain 22 genotype on 21st November.

REFERENCES

Abd Eldaiem, M.A. (2004). Evaluation of some flax genotypes under different plant densities. M. Sc. Thesis, Fac. of Agric. Al-Azhar Univ.

Abd Eldaiem, M.A. (2008). Response of some flax genotypes to sowing dates and micro elements fertilization. Ph. D. Thesis, Fac. of Agric. Al-Azhar Univ.

Abd El-Mohsen, A.A. ; Amany M. Abdallah and Gamalat O. Mahmoud (2013). Optimizing and describing the influence of planting dates and seeding rates on flax cultivars under Middle Egypt region conditions. World Essays J., 1 (4): 142-152.

Al-Doori, S.A.M. (2012). Influence of sowing dates on growth, yield and quality of some flax genotypes (*Linum usitatissimum* L.). College of Basic Education Res. J., 12(1): 733-746.

Bakry, B. ; O. Ibrahim ; Elewa T. El-Fattah and M. El-Karamany (2014). Performance assessment of some flax (*Linum usitatissimum* L.) varieties using cluster analysis under sandy soil conditions. Agric. Sci., 5, 677-686. doi: 10.4236/as.2014.58071.

Bakry, B.A. ; M.M. Tawfik ; B.B. Mekki and M.S. Zeidan (2012). Yield and yield components of three flax cultivars (*Linum usitatissimum* L.) in response to foliar application with Zn, Mn and Fe under newly reclaimed sandy soil conditions. American-Eurasian J. Agric. & Environ. Sci., 12 (8): 1075-1080.

Bakry, B.A. ; O.A. Nofal ; M.S. Zeidan and M. Hozayn (2015). Potassium and zinc in relation to improve flax varieties yield and yield components as grown under sandy soil conditions. Agric. Sci., 6: 152-158.

Balalic, I. ; M. Zoric ; G. Brankovic ; S. Terzic and J. Crnobarac (2012). Interpretation of hybrid × sowing date interaction for oil content and oil yield in sunflower. Field Crops Res., 137: 70-77.

Gallardo, M.A. ; H. JoséMilisich ; S.R. Drago and R.J. González (2014). Effect of cultivars and planting date on yield, oil content, and fatty acid profile of flax varieties (*Linum usitatissimum* L.). International J. of Agron., Vol. 2014: 1-7.

Ghanbari-odivi, A. ; A. Safari ; B.K. Tahmasebi ; M. Farrokhi and B. Bahrampour (2013). Effect of delaying in sowing date on growth, yield, yield components and oil content of two genotypes of flaxseed (*linum usitatissimum* L.). Adv. in Environ. Biol., 7(6): 1014-1018.

Gomez, K.N. and A.A. Gomez (1984). Statistical procedures for agricultural research. John Wiley and Sons, New York, 2nd Ed., 68 P.

Oomah, B.D. (2001). Flaxseed as a functional food source. J. of the Sci. of Food and Agric., 81: 889–894.
Rahimi, M.M. (2014). Effect of sowing date and nitrogen on yield and yield components of medicinal flax. Intern. J. of Biosci., 5(12): 160-165.
Saghayesh, S.P. ; M.Moghaddam and L. Mehdizadeh (2014). Effect of sowing dates on the morphological characteristics, oil yield and composition of fatty acids in flax (*Linum usitatissimum* L.). Intl. J. Agric. Crop Sci., 7 (11): 915-922.
Shaikh, F.G. ; D.N. Gokhale ; B.S. Rokade ; and P.J. Jadhav (2009). Effect of sowing date on some growth characters in linseed. J. Agrometeorolo., 11(2): 203-205.
Snedecor, G.W. and W.G. Cochran (1980). "Statistical Methods" 7th Ed. The Iowa State Univ. Press, Iowa, USA.
Wadan, A. (2013). Optimizing and describing the influence of planting dates and seeding rates on flax cultivars under Middle Egypt region conditions. J. of Sci. Res. and Rev., 1(2): 28-39.

إستجابة بعض التراكيب الوراثية المختلفة من الكتان للزراعة المتأخرة

محمدعبدالسميع محمدعبد الدايم
قسم بحوث محاصيل الألياف – معهد بحوث المحاصيل الحقلية –- مركز البحوث الزراعية – مصر.

لتحديد مدى استجابة بعض التراكيب الوراثية للكتان (الصنف التجارى سخا ٣، الصنف التجارى جيزة ١٠، السلالة ٢٢، صنف أجاتا "مستورد" و الصنف التجارى سخا ١)) لمواعيد الزراعة المختلفة (الأول من نوفمبر "زراعة مثلى، ٢١ نوفمبر "زراعة متأخرة و١٥ ديسمبر "زراعة متأخرة جداً")، أجريت تجربتان حقليتان في المزرعة البحثية لمحطة الجميزة للبحوث الزراعية، مركز البحوث الزراعية، مصر، خلال موسمى ٢٠١٣/٢٠١٢ و٢٠١٤/٢٠١٣. أجريت التجارب في تصميم القطع المنشقة مرة واحدة في ثلاث مكررات. تم تعيين القطع الرئيسية لمواعيد الزراعة. في حين تم تخصيص القطع الشقية للتراكيب الوراثية للكتان. تشير النتائج أن الزراعة المثلى للكتان في الأول من نوفمبر أدت للحصول على أعلى القيم لصفات طول النبات، الطول الفعال ، قطر الساق، المحصول البيولوجي/ فدان، محصول القش/فدان ومحصول الألياف الطويلة/فدان في كلا الموسمين. في حين أدت الزراعة المتأخرة للكتان في ٢١ نوفمبر للحصول على أعلى القيم لعدد الفروع الثمرية، عدد الكبسولات/نبات، عدد البذور/كبسولة ومحصول القش/نبات، محصول البذور/نبات ومحصول البذور/فدان في كلا الموسمين. في حين أدت الزراعة المتأخرة جداً للكتان في ١٥ ديسمبر للحصول على أقل القيم لطول النبات، الطول الفعال، قطر الساق، عدد الكبسولات/نبات، محصول القش/نبات، محصول البذور/نبات، المحصول البيولوجى/فدان، محصول القش/فدان، ومحصول البذور/فدان ومحصول الألياف الطويلة/فدان في كلا الموسمين. سجل الصنف التجارى جيزة ١٠ صنف أعلى القيم لطول النبات، الطول الفعال، محصول القش/نبات، المحصول البيولوجى/فدان، محصول القش/فدان ومحصول الألياف الطويلة/فدان في كلا الموسمين. في حين، أنتجت السلالة ٢٢ أعلى القيم لعدد الفروع الثمرية، محصول البذور/نبات ومحصول البذور/فدان في كلا الموسمين.

من النتائج التي تم الحصول عليها، كانت أعلى القيم لمحصول القش والألياف الطويلة للفدان ومكوناتهما من الكتان من الزراعة المثلى للصنف التجارى جيزة ١٠ صنف في الأول من نوفمبر. بينما نتجت أعلى القيم لمحصول البذور للفدان من الزراعة المتأخرة (٢١ نوفمبر) للسلالة ٢٢ تحت الظروف البيئية لمنطقة الجميزة، محافظة الغربية.

Table 4: Flax total plant height, technical length, stem diameter, number of fruiting branches, number of capsules/plant and number of seeds/capsule as affected by sowing dates of five flax genotypes and their interaction during 2012/2013 and 2013/2014 seasons.

Characters / Treatments	Total plant height (cm)		Technical length (cm)		Stem diameter (mm)		Number of fruiting branches		Number of capsules /plant		Number of seeds/capsule	
Seasons	2012/2013	2013/2014	2012/2013	2013/2014	2012/2013	2013/2014	2012/2013	2013/2014	2012/2013	2013/2014	2012/2013	2013/2014
Sowing dates (S):												
1st November	112.86	112.76	97.46	97.76	2.22	2.23	3.69	3.74	10.59	10.80	7.27	7.24
21st November	97.80	97.89	78.73	79.12	2.18	2.19	4.38	4.72	13.82	14.08	7.71	7.72
15th December	70.60	70.36	53.06	53.82	1.77	1.80	3.96	3.98	10.44	10.50	7.52	7.50
LSD at 5 %	2.53	1.42	3.90	4.56	0.13	NS	0.31	NS	NS	NS	0.13	0.15
Genotypes (G):												
Sakha 3	95.77	95.61	78.88	79.30	1.97	1.98	3.92	4.27	11.55	11.80	7.76	7.75
Giza 10	99.55	98.95	82.55	82.80	2.24	2.23	3.80	3.84	10.80	10.95	7.66	7.70
Strain 22	95.11	95.12	76.00	76.77	2.06	2.12	4.47	4.47	14.43	14.71	7.73	7.73
Agata	80.77	81.28	65.00	65.74	1.96	1.97	3.70	3.95	10.40	10.28	7.15	7.10
Sakha 1	97.55	97.38	79.66	79.87	2.04	2.05	4.16	4.18	10.91	11.23	7.20	7.15
LSD at 5 %	2.95	2.00	6.53	6.38	NS	NS	0.28	NS	NS	NS	NS	NS
C- Interaction: S×G (F. test)	*	*	*	*	NS	NS	NS	NS	NS	NS	NS	NS

Table 5: Flax straw yield/plant, seed yield/plant, biological yield/fed, straw yield/fed, seed yield/fed and long fiber yield/fed as affected by sowing dates of five flax genotypes and their interaction during 2012/2013 and 2013/2014 seasons.

Characters / Treatments / Seasons	Straw yield (g/plant)		Seed yield (g/plant)		Biological yield (t/fed)		Straw yield (t/fed)		Seed yield (kg/fed)		Long fiber yield (kg/fed)	
	2012/2013	2013/2014	2012/2013	2013/2014	2012/2013	2013/2014	2012/2013	2013/2014	2012/2013	2013/2014	2012/2013	2013/2014
Sowing dates (S):												
1st November	2.014	2.013	0.465	0.476	4.609	4.579	3.530	3.501	592.4	654.3	402.7	399.4
21st November	2.156	2.290	0.766	0.764	4.101	4.034	2.521	2.519	660.7	663.5	274.3	272.4
15th December	1.680	1.182	0.411	0.412	2.515	2.375	1.492	1.459	288.2	276.2	154.0	169.8
LSD at 5 %	0.282	0.360	0.086	0.094	0.111	0.134	0.147	0.157	43.9	56.9	12.5	15.8
Genotypes (G):												
Sakha 3	1.867	1.762	0.515	0.516	3.748	3.770	2.397	2.430	520.0	534.8	267.0	287.3
Giza 10	2.569	2.181	0.560	0.557	4.266	4.193	3.031	2.975	530.2	532.2	295.5	299.2
Strain 22	1.702	1.688	0.638	0.647	3.729	3.705	2.229	2.256	531.0	622.4	269.5	258.8
Agata	1.581	1.596	0.455	0.468	2.979	2.851	2.225	2.211	349.3	339.4	266.8	262.4
Sakha 1	2.031	1.915	0.568	0.565	3.987	3.794	2.690	2.594	638.4	627.8	286.1	295.0
LSD at 5 %	0.339	0.441	0.119	0.131	0.174	0.186	0.173	0.197	30.6	31.7	9.5	13.4
C- Interaction: S×G (F. test)	*	*	*	*	NS	NS	*	NS	*	NS	*	*

Agala Agala

Agala

Agala

Agala

Agala

Agala

Agala