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EFFECT OF SOWING DATES, FOLIAR X AS BALANCED COMPOUND FERTILIZER ON YIELD AND ITS COMPONENTS OF SOME FLAX VARIETIES IN SANDY SOIL

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ABSTRACT

Two field experiments were conducted at Ismailia Agric. Res. Station Farm, Ismailia Governorate, A.R.C. Egypt, during winter seasons of 2004/2005 and 2005/2006 to study the performance of three flax genotypes namely Sakha 3, Sakha 4 and Giza 10 under three sowing dates i.e. 1th November, 10 November and 20 November, also Foliar X as balance compound fertilizer using split-split plot design.

Results showed that Giza 10 surpassed all other tested varieties in plant height, technical length, seed yield / plant and per faddan, straw yield / fad., fiber yield plant and per faddan and number of capsules/ plant when sown at 1 November and using Foliar X. Sakha 3 flax variety take the second rank for straw yield and its related characters, meanwhile Sakha 4 for seed yield and its related characters. The greatest yield of straw, fiber and seed per faddan were achieved when sowing flax plants in 1 November with Foliar X as mixture of nutrients.

There was highly significant and positively correlation between straw yield / fad. and each of fiber yield / plant, fiber yield / fad., straw yield / plant and plant height. Seed yield / fad. appeared to be more related with seed yield / plant, number of capsules / plant and technical length. Also fiber yield / fad. was significantly correlated with each of fiber yield / plant, straw yield / fad., straw yield/ plant and plant height.

Path coefficient analysis revealed that fiber yield / plant, plant height and straw yield / fad. has the most prominent direct effects on fiber yield / fad as first important factor with relative importance of 30.4%, 18.4% and 16.5%, respectively of the total variation of fiber yield / fad. The second path coefficient analysis showed that seed yield / plant, number of capsules / plant and technical length had the most prominent direct effect on seed yield / fad with relative importance of 30.2%, 28.9% and 26.3% respectively of the total variation of seed yield / faddan.

INTRODUCTION

Flax (*Linum usitatissimum*, L.) is still the main source of bast fiber production in Egypt. However ,grown as dual purpose type to extract fiber from straw and obtained oil from seeds. Recently, flax acreage in Egypt about 12000 faddan*. Therefore, a greet gap occured between the production and consumption especially in seed yield. This gap could be minimized by increasing flax yield per unit area through involving new varieties characterized by high yielding ability and improvement of Agricultural practices.

Many investigators such as Momtaz *et al* (1989), Werma and Pathak (1993), El-Farouk *et al* (2003), Zedan (2004), Nashy (2005), Abo Zaied and Mousa (2007) and Moawed *et al*. (2008), who mentioned that there were

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varietal differences regarding flax yield and its components. Furthermore, flax plants were significantly affected by sowing dates such as Kwon *et al* (1988), who reported that the early sowing dates achieved highest straw, fiber and seed yields and its related characters, Ramui and Bondopadhyay(1992), Salama (1996), Aly and Awaad (1997), El-Kassaby *et al* (1999) and Abd El-Dayem (2007) came to the same results. Foliar X as abalanced compound fertilizer improve fiber and seed quantity. Hella *et al* (1988), Abd El-Rasoul and El Azzonii (2002), El-Shemy *et al* (2002) and El-Azzouni *et al* (2003) found that N.P.K and magnesium increased and improved straw and seed yield of flax. Moreover, El-Azzouni *et al* (2003), Zahana *et al* (2004), and El-Shemy *et al* (2006) found that spraying flax plants with foliar application of nutrients and N. biofertilizer in soil significantly increased all the character of yield, yield components of flax. Finally Salem *et al* (2006), Hussien and Zeden *et al* (2008) and Moawed *et al* (2008) reported that yield and yield components of flax increased by adding nutrients to soil.

MATERIALS AND METHODS

Two field experiments were conducted at Ismailia Agric. Res. Station (sandy soil) Egypt during the two successive seasons of 2004/05 and 2005/06 to study the effect of sowing date, Foliar X as balanced compound fertilizer on three flax varieties, i.e. Sakha 3, Sakha 4 and Giza 10 as a new flax variety and double purpose type. Flax seed were drilled in rows. Three sowing dates were studied first of November (A), 10 November (B) and 20 November (C). varieties were randomly allotted in main plots., the sub-plots were assigned to sowing dates, while soil spray with (Foliar X) in sub-sub plots. The sources of Folier X as balanced compound fertilizer and locally produced by El Nasr Co. for pesticides and chemicals. It used at the rate of 0.25% (2.5 g/L) which sprayed under the growing plants after one month from sowing will the soil was still wet at the rate of 1000 L/ feddan. Folier X contains 10% N, 7% P, 8% K, 2500 ppm of each of chelated Fe and Zn, and 300 ppm of chelated Mn in addition to traces of Mg, S, B and Cu. Plot size was 2×3 m which equal 1/200 faddan. Sprinkler irrigation system was used. All agricultural practices were carried out as recommended in this district. Chemical analysis and physical properties of the experimental soil are presented in Table (1).

Collected data:

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

A- Single plant observation: (Average of 10 plants)

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 capsules / plant.
4- Seed yield / plant (gm.).
5- Straw yield /plant (gm.).

6- Fiber yield / plant (gm.):

B- Unit area observation

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

7- Seed yield(kg/ fad.)
8- Straw yield (ton/ fad.)
9- Fiber yield (kg/ fad.)

Table (1): Physical and chemical analysis of the soil before the sowing

1- Mechanical analysis	
Coarse sand (%)	68.52
Fine sand (%)	35.71
Silt (%)	3.5
Clay (%)	2.41
Textural class	Sandy
2- Chemical analysis:	
pH	7.63
E.C (mm hos Cm^{-1} (1:5)	0.099
Organic Matter (%)	0.061
Available N (ppm)	7.13
Available P (ppm)	1.30
Available K (ppm)	49.80

Statistical analysis:

The collected data were statistically analyzed according to Snedecor and Cochran (1982) and treatments means were compared using least significant differentce (L.S.D) at 5% level of probability with evaluating some statistical procedures such as:

1-Analysis of variance Basic statistical: arithmetic means, stander deviation, standard error and simple correlation coefficient were computed between plant yield and its components according to the method described by (Sendecor and Cochran, 1982). Correlation coefficient were calculated to determine how strong is the relation between flax and its attributes.

2-Path coefficient analysis: As applied by Durate and Adams (1972) was used. A path coefficient is simply a standardized partial regression coefficient as it measures the direct influence of one variable upon another and permits the separation of the correlation coefficient into components of direct and indirect effects.

RESULTS AND DISCUSSION

Mean values of plant height, technical length, straw yield / plant (gm.) and seed yield / plant (gm.) for three flax varieties as affected by sowing dates, Foliar X (nutrients mixture) and their interaction in the two successive seasons are presented in Table (2). Analysis of variance showed significant differences in all studied traits for the three varieties except with the average of straw yield / plant and seed yield / plant in both seasons, which did not reach the level of significance.

1- Plant height (cm):

Regarding plant height character(Table 2), data revealed that Giza 10 flax variety ranked first with the mean values of 68.44 and 63.22 followed by Sakha 3 which recorded (67.83 and 61.52 cm) and the shortest plant height was obtained by Sakha 4 which recorded (65.5 and 60.01 cm) in the first and second seasons, respectively. This may be due to the growth habit Giza 10 and Sakha 3 as fiber type, Meanwhile Sakha 4 which recorded the lowest values of this character as oil type. These varietal difference are in agreement with those obtained by Momtaz *et al* (1989), Zedan (2004) and Abou Zaied and Mousa(2007).

Also data showed significant differences in plant height at different sowing dates. Sowing date at 1 November produced taller plants with the mean value of 76.37 and 66.18 cm followed by 10 November which recorded (63.73 and 60.14 cm) and the shortest plant height was obtained by 20 November as sowing date which recorded (61.75 and 56.42 cm) in the first and second seasons, respectively. The increasing in plant height could be attributed to the long of growth period in the first sowing date under suitable conditions of weather and before plant blooming. These results are in agreement with those obtained by Ramui and Bondopadhyay (1992), Aly and Awaad (1997) and Abd El-Dayem (2007).

Foliar X as mixture of nutrients affected in plant height. The tallest plant was obtained when adding Foliar X (67.42 and 62.17 cm) in both seasons, respectively. Meanwhile, the shortest plant heights were obtained under control (without Foliar X) 63.15 and 60.99 cm in both seasons, respectively. This findings are in line with those of Hella *et al* (1988), Abd El-Rasoul and El Azzonii (2002), El-Azzouni *et al* (2003) and Hussein and Zedan (2008).

The interaction between sowing dates and Foliar X (SXF) had insignificant effect on plant height in both seasons, but the interaction between varieties and sowing date (VXS), varieties and Foliar X (VXF) and (VXSXF) had significant effect in both seasons.

2- Technical length:

Concerning technical length character, date obtained indicated similar trend with plant height behaviour, by means that Giza 10 variety recorded heighest technical length 58.76 and 54.79 cm, followed by Sakha 3 which recorded length 57.49 and 54.19 cm, while the shortest were obtained by Sakha 4 which mean values were 55.06 and 52.23 cm in both seasons, respectively. Similar results where recorded by Werma and Pathak (1993), El-Farouk *et al* (2003) and Maowed *et al* (2008).

Early sowing date (1 November) encourage technical length with average 66.99 and 61.47 cm when compared with the late sowing date 20 November which recorded 49.14 and 46.61 cm, while sowing date 10 November recorded medium 55.15 and 53.01 cm in both seasons, respectively. These results are similar with those obtained by Salama (1996), EL-Kassaby *et al* (1999) and Abd El-Dayem (2007).

Nutrients mixture (Foliar X) affected significantly in technical length. Adding Foliar X gave tallest technical length 59.11 and 55.73 cm, meanwhile

the shortest technical length 55.10 and 51.73 cm were obtained under control in both seasons, respectively. These results are in agreement with those obtained by El-Shemy *et al* (2002), Zahana Afaf *et al* (2004) and Moawed *et al* (2008).

The interaction between varieties and sowing dates (VXS), varieties and Foliar X (VXF), (SXF) and (VXSXF) had significant effect on technical length in both seasons.

3- Straw Yield / Plant:

Regarding straw yield plant(g), data revealed that Sakha 3 flax variety, Sakha 4 and Giza 10 recorded approximately equal values by means 1.26 and 1.20, 1.11(g) and 1.07 and 1.13 and 1.09(g) in both seasons, respectively. This results similar with those obtained by Momtaz *et al* (1989), Nashy (2005) and Moawed *et al* (2008).

Sowing date 1 November gave the highest straw yield gm/ plant 1.50 and 1.30 gm followed by 10 November (1.07 and 1.10 gm) and the lowest straw yields / plant were obtained by sowing date 20 November which recorded 0.91 and 0.96 gm in the first and second seasons, respectively. This finding are in agreement with those obtained by Kwon *et al* (1988), Werma and Pathak(1993) and Abd El-Dayem (2007).

Analysis of variance showed increased in this trait by using Foliar X as nutrients mixture, which highest straw yield / plant 1.26 and 1.34 (g), while the control gave lowest 1.05 and 0.90 (g) in the first and second seasons, respectively. Similar results were obtained by Hella *et al* (1988), El-Shimy *et al* (2006) an Moawed *et al* (2008).

All the interaction had nosignificant effect on straw yield / plant (g) in both seasons. Demonstrating that each studied factor act independently on straw yield/ plant.

4- Seed yield / Plant (g):

Results reveled that Giza 10 gave the highest seed yield / plant with the mean values of 0.257 and 0.249 gm followed by Sakha 4 (0.254 and 0.243 (g)) while, the lowest ones were obtained by Sakha 3 (0.247 and 0.230 gm) in both seasons, respectively. These results agreed with those found by El-Farouk *et al* (2003), Abou Zaied and Mousa (2007) and Moawed *et al* (2008).

First sowing date 1 November produced the heaviest seed yield / plant (0.316 and 0.272(g)) followed by 10 November (0.244 and 0.230) while, the lowest ones were obtained by third sowing date 20 November (0.199 and 0.220 gm) in both seasons, respectively. This findings are in line with those of Salma (1996), El-Kassaby *et al* (1999) and Abd El-Dayem (2007).

Results revealed that Foliar X as nutrients mixture gave the highest seed yield / plant(g) (0.285 and 0.266(g)). Meanwhile, the lowest seed yield was obtained by control with mean values of 0.220 and 0.215(g) in both seasons, respectively. This results are in agreement with those obtained by Hella *et al* (1988), Salem *et al* (2006) and Moawed *et al* (2008).

The interactions between (VXS), (VXF) and (VXSXF) had insignificant effect on seed yield / plant gm. in both seasons, on the other hand, the interaction between (SXF) had significant effect on seed yield / plant (gm) in both seasons.

Mean values of number of capsules / plant, straw yield / fad (ton), seed yield / fad (kg), fiber yield / plant and fiber yield / fad (kg.) for three flax varieties as affected by sowing dates, Foliar X as nutrients mixture and their interactions in the two successive seasons are presented in Table (3).

Analysis of variance showed significant differences in all studied traits for the three factors in both seasons.

5- Number of capsules / Plant:

Date in Table (3) show that Giza 10 flax variety recorded the highest value of number of capsules / plant by means values of 4.99 and 4.71 followed by Sakha 4 (4.46 and 4.27). Meanwhile, the lowest number of capsules / plant wasobtained by Sakha 3 (4.19 and 4.05) in both seasons, respectively. These results agreed with those found by Werma and Pathak (1993), Abou Zaied and Mousa (2007) and Moawed *et al* (2008).

Also date show significant differences in number of capsules / plant at different sowing dates. Sowing date at 1 November produced highest number of capsules / plant with the mean values of 5.79 and 4.92 followed by 10 November which recorded (4.62 and (4.15) and the lowest number of capsules / plant was obtained by 20 November as sowing date which recorded (3.23 and 3.96) in both seasons, respectively. This results are similar with those obtained by Salama (1996), Aly and Awaad (1997) and Abd El-Dayem *et al* (2007).

Regarding effect of Foliar X as nutrients mixture Table (3) date reveled that used Foliar X gave highest values of number of capsules/ plant (4.69 and 4.59) comparing with control which recorded (4.40 and 4.10) in the first and second seasons, respectively. These results are in agreement with those reported by El-Azzouni *et al* (2003), Salem *et al* (2006) and Hussein and Zedan (2008).

The interaction between (SXF) had significant effect on number of capsules / plant in both seasons. Meanwhile, the other interaction did not reach the level of significance in both seasons.

6- Straw yield (ton / Fad):

Results in Table (3) showd that Giza 10 recorded the highest straw yield / fad (ton) with the mean values of 4.228 and 4.077 followed by Sakha 3 (4.067 and 3.981 ton) while, the lowest straw yield was obtained by Sakha 4 (3.935 and 3.516 ton) in both seasons, respectively. These results may be due to the differences in genetic creation between the three flax varieties. These varietal differences were in accordance with those obtained by Momtaz *et al* (1989), Zedan (2004) and Moawed *et al* (2008).

Sowing date 1 November created the highest straw yield ton/ fad 4.919 and 4.101 tone. followed by 10 November (4.070 and 3.971 ton) and the lowest straw yield / fad. Was obtained by sowing date 20 November which recorded 3.239 and 3.502 ton in the first and second seasons, respectively. This finding are in agreement with those obtained by Ramie and Bondpadhyay (1992), El-Kassaby *et al* (1999) and Abd El-Dayem (2007).

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Analysis of variance showed an increase in straw yield ton/ fad by using Foliar X as nutrients mixture, which highest values of straw yield / fad 4.429 and 4.105 ton, while the control (without Foliar X) gave lowest by means 3.724 and 3.611 ton in the first and second seasons, respectively. Similar results were obtained by Hella *et al* (1988), El-Shemy *et al* (2006) and Moawed (2008).

The interaction between (SXF) has significant effect on straw yield / fad ton in both seasons. Meanwhile, the other interactions did not reach the level of significant in both seasons.

7- Seed yield / fad (kg):

Giza 10 flax variety gave the highest seed yield / fad kg with the mean values of 412.64 and 399.18 kg followed by Sakha 4 (396.60 and 371.56 kg) while, the lowest values were obtained by Sakha 3 (348.20 and 322.16) in both seasons, respectively. The superiority of Giza 10 variety in seed yield / fad kg may be attributed to the increase in seed yield components. Similar results (Varietal differences) were obtained by Momtaz *et al* (1988), Abou Zaied and Mousa (2007) and Moawed *et al* (2008).

Regarding seed yield / fad (kg), data in Table (3) revealed that sowing date 1 November gave highest values of seed yield / fad kg (470.74 and 401.26 kg) followed by 10 November (384.83 and 370.12 kg) while, the lowest estimate was obtained by 20 November (301.94 and 321.52 kg) in the first and second seasons, respectively. This results are in agreement with those reported by Kwon *et al* (1988), Werma and Pathak (1993) and Abd El-Dayem (2007).

Foliar X nutrients mixture increased seed yield / fad kg by mean values of 406.66 and 388.5 kg comparing with control treatment which recorded (365.01 and 340.10 kg) in both seasons, respectively. These result agreed with those found by Hella *et al* (1988), El-Shimy *et al* (2002), Abd El-Rasoul and Azzonii(2002) and Moawed *et al* (2008).

The all interactions had significant effect on seed yield / fad kg in both seasons. The maximum values of seed yield / fad were obtained by Giza 10 flax variety, sowing date 1 November and using Foliar X as nutrients mixture.

8- Fiber yield / plant(g):

Fiber yield / plant (gm) varied significantly due to varieties, sowing dates and Foliar X as nutrients mixture (Table 3). The highest fiber yield / plant 0.286 and 0.268 was obtained by Giza 10 flax variety followed by Sakha 3 by means (0.261 and 0.249 gm) while, the lowest fiber yield (0.259 and 0.232 gm) was obtained by Sakha 4 flax variety in both seasons, respectively. Similar results were obtained by Momtaz *et al* (1989), El-Farouk *et al* (2003) and Abou Zaied ands Mousa (2007).

1 November as sowing date gave highest fiber yield / plant (0.324 and 0.302) followed by 10 November (0.261 and 0.250 gm) and the lowest fiber yield / plant was obtained by sowing date 20 November which recorded 0.219 and 0.197 gm in the first and second seasons, respectively. This findings are in agreement with those obtained by Salama (1996) and Abd El-Dayem (2007).

Analysis of variance showed an increase in fiber yield / plant with the control recorded the using Foliar X as nutrients mixture, which highest values 0.287 and 0.260 gm, while the control (without Foliar X) gave lowest 0.249 and 0.239 gm in both seasons, respectively. Similar results were obtained by Hella *et al* (1988), Zahana *et al* (2004) and Maowed *et al* (2008).

The interaction between (VXS), (VXF) and (VXSXF) had significant effect on fiber yield gm/ plant. meanwhile, the interaction between (SXF) did not reach the level of significance in both seasons.

9- Fiber yield / fad (kg):

Results in Table (3) reveled that Giza 10 flax variety recorded highest fiber yield / fad kg with the men values of 581.04 and 547.10 kg followed by Sakha 3 (569.47 and 532.27 kg) while, the lowest fiber yield was obtained by Sakha 4 (550.99 and 510.75 kg) in both seasons, respectively. This may be due to the differences in genetic creation between the three studied varieties, which growth habit of Giza 10 and Sakha 3 are fiber type, meanwhile Sakha 4 is oil type. These varietal differences were in accordance with those obtained by Momtaz *et al* (1989), Zedan (2004) and Moawed *et al* (2008).

First sowing date 1 November produced the heaviest fiber yield kg/ fad (677.93 and 552.21 kg) followed by 10 November (569.90 and 520.30 kg) while, the lowest was obtained by third sowing date 20 November (453.62 and 517.61 kg) in both season, respectively. This findings are in line with those of El-Kassaby *et al* (1999) and Abd El-Dayem (2007).

Results revealed that Foliar X as nutrients mixture gave the highest fiber yield / fad (620.21 and 548.68 kg). Meanwhile, the lowest fiber yield / fad was obtained by control with the mean values of 514.13 and 511.40 kg in both seasons, respectively. These results might be due to the favorable effect of Foliar X in enhanced growth of flax plants and increase also the secondary wall in fiber cells which cause more fibers. This findings are in accordance with those obtained by El-Shimy *et al* (2002), El-Azzouni *et al* (2003), Hussein *et al* (2007) and Moawed *et al* (2008).

The interaction between (VXS), (VXF) and (VXSXF) had significant effect on fiber yield / fad kg in both seasons, it mean that each one of factors under study depend on the other in its effect. On the other hand the interaction between (SXF) did not reach the level of significance in both seasons (independent), it means that each of factors (, Sand F) are acted separately.

Simple correlation analysis (r)

Simple correlation coefficients (r), among studied characters over the two seasons are given in Table (4). Positive and significant correlation was recorded between straw yield / fad. and each of fiber yield / plant, fiber yield / fad., straw yield / plant and plant height. Seed yield / fad. appeared to be more related with seed yield / plant number of capsules / plant and technical length. Also fiber yield / fad was significantly correlated with each of fiber yield / plant, straw yield / fad, straw yield / plant and plant height. These results are in agreement with those obtained by Momtaz *et al* (1997) and Moawed *et al* (2008).

Table (4): Simple correlation coefficients between different studied characters (Combined data over two seasons).

Characters	1	2	3	4	5	6	7	8	9
1- Plant height cm.	-	** 0.891	** 0.922	** 0.981	** 0.852	** 0.901	0.301	** 0.652	0.412
2- Technical length cm.		-	-0.310	-0.161	-0.360	** -0.651	** 0.812	** 0.910	** 0.792
3- Straw yield gm/ plant.			-	** 0.962	** 0.890	** 0.951	** -0.622	- 0.361	** -0.861
4- Straw yield ton./ fad.				-	** 0.722	** 0.811	-0.410	-0.592	-0.162
5- Fiber yield gm./ plant.					-	** 0.692	-0.212	-0.171	** -0.791
6- Fiber yield kg./ fad.						-	** - 0.621	* -0.561	** -0.672
7- Number of capsules/ plant.							-	** 0.961	** 0.981
8- Seed yield gm./ plant.								-	** 0.972
9- Seed yield kg./ fad.									-

*** Significant at 0.05 levels Significant.**
**** Significant at 0.01 levels Significant.**

Path coefficient analysis:

Direct, indirect effect and total contribution of fiber and seed yield / fad are presented in Tables (5) and (6). The results can be summarized as follows; plant height straw yield / plant, straw yield / fad and fiber yield / plant. The first importance of these factors in varience of fiber yield / fad. Table (5). The total contribution of these character was 0.754. the contribution of characters studied were 0.184, 0.101, 0.165 and 0.304 for plant height, straw yield / plant, straw yield / fad and fiber yield / plant, respectively.

Table (5): Direct and indirect effects due to fiber yield/ fad factor of flax over both seasons.

Components	Direct effect	Indirect effect	Total contribution	Direct (%)
Plant height cm.	0.062	0.122	0.184	0.337
Straw yield gm/ plant.	0.018	0.083	0.101	0.178
Straw yield ton./ fad.	0.040	0.125	0.165	0.242
Fiber yield gm./ plant.	0.191	0.113	0.304	0.628
R_2%			0.754	
Residual			0.246	

Table (6): Direct and indirect effects due to seed yield/ fad factor of flax over both seasons.

Components	Direct effect	Indirect effect	Total contribution	Direct (%)
Technical length cm.	0.082	0.181	0.263	0.312
Number of capsules/ plant	0.201	0.088	0.289	0.695
Seed yield gm./ plant	0.211	0.091	0.302	0.698
R_2%			0.854	
Residual			0.146	

The residual effect due to other factors was 0.246. Also the second importance of these factors in varience of seed yield / fad. Table (6). The total contribution of these character was 0.854. the contribution of characters studied were 0.263, 0.289 and 0.302 for technical length, number of capsules / plant and seed yield / plant, respectively. The residual effect due to other factors was 0.146.

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تـأثير ميعـاد الزراعـة والسـماد المتـوازن المركـب (فوليـار x) علـى المحصـول ومكوناته في بعض أصناف الكتان بالأرض الرملية

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أجريـت تجربتـان حقليتـان خـلال الموسـمين الـزراعيين ٢٠٠٤/٢٠٠٥ و ٢٠٠٥/٢٠٠٦م بـأرض رملية بمحطـة البحـوث الزراعيـة بالإسماعيلية لدراسـة تـأثير ثلاثـة مواعيد للزراعـة هـي ١ نوفمبر، ١٠ نوفمبر، ٢٠ نـوفمبر مـع إضـافة السماد المركـب المتوازن فوليـار x) وذلـك علـى ثلاثـة أصنـاف من الكتان هي سخا ٣، سخا ٤ وجيزة ١٠ (كطرز ثنائية الغرض).

وتم تصميم التجربة في قطع منشقة مرتين في ثلاث مكررات خـلال الموسمين. وتتلخص أهم النتائج المتحصل عليها فيما يلي:

تفوق صنف الكتان جيزة ١٠ على باقي الأصناف في صفات الطول الكلي، الطـول الفعـال محصـول البذور / نبات، محصـول البذور / فدان، محصـول القش / فدان، محصـول الألياف / نبـات، محصـول الألياف / فدان وعدد كبسولات النبات في كلا الموسمين وجاء الصنف سخا ٣ في المركز الثاني بعد الصنف جيزة ١٠ وذلك في محصول القش والصفات المرتبطة به بينما احتل الصنف سخا ٤ المركز الثاني بعد جيزة ١٠ في محصول البذور والصفات المرتبطة به.

أدى التبكير في الزراعة في ميعـاد ١ نـوفمبر إلـى زيـادة معنويـة فـي جميـع الصـفات تحـت الدراسـة والخاصـة بـالقش والبـذور والألياف والصـفات المرتبطـة بهـا مقارنـة بالتـأخير فـي كـلا الموسمين.

وجد أن إضافة السماد المعدني المركب فوليار x رشا علي التربة تحت النباتـات بعد شـهر مـن الزراعـة أدى إلـى زيـادة معنويـة فـي جميـع الصـفات تحـت الدراسـة مقارنـة بعـدم الـرش بكـلا الموسمين

كـان للتفاعـل الثلاثـي مـا بـين الأصـناف وميعـاد الزراعـة وإضـافة السماد المركـب تـأثير معنوي واضح على محصول الألياف / فدان ومحصول البذور / فدان حيث تم الحصـول علـى أعلـى محصول ألياف وبذور / فدان باستخدام الصنف جيزة ١٠ والزراعة في ١ نوفمبر مع إضـافة السماد المركب في كلا الموسمين ويمكن التوصية بذلك في الظروف البيئة المشابهة.

وجد ارتباط موجب ومعنوي بين محصول القش للفدان وكل من محصول الألياف للنبـات، محصول الألياف/ فدان، محصول القش / نبات والطول الكلي للنبات وأيضـا بين محصـول البذور للفدان وكل من محصول البذور / نبات، عدد كبسولات النبات والطول الفعال وبالنسبة لمحصـول الألياف للفدان وجد ارتبـاط موجب ومعنـوي بـين المحصـول وكـل مـن محصـول الألياف/ نبـات، محصول القش/ فدان، محصول القش للنبات والطول الكلي.

أوضح تحليل معامل المرور أن صفات محصول الألياف للنبات، الطول الكلـي ومحصـول القش للفدان أعطت أعلى تأثير مباشر في محصـول الألياف للفدان فـي محصـول الكتـان حيث كانـت المسـاهمة الكليـة لهـذه الصـفات فـي المحصـول ٣٠,٤%، ١٨,٤%، ١٦,٥% علـى الترتيـب وعلـى الجانب الآخر بالنسبة للمكون الثاني للمحصـول وهو البذور فإن صفات محصـول البذور / نبـات، وعدد كبسولات النبات والطول الفعال أعطت أعلى تأثير مباشر في محصول البذور للفدان بمسـاهمة كلية لهذه الصفات في المحصول ٣٠,٢%، ٢٨,٩%، ٢٦,٣% علـى الترتيـب. وعمومـا يجـب علـى المربي أن يضع في اعتباره ببرامج التربية هذه الصفات والأكثر مسـاهمة فـي المحصـول والانتخـاب لتحسين إنتاجية محصول الكتان.

Table (2): Mean values of plant height (cm), technical length(cm)., straw yield/ plant (g). and seed yield (g)/ plant as affected by diversity varieties, sowing dates, foliar x as nutrients mixture and their interactions in 2004/05 and 2005/06 seasons.

Main effects and interactions	plant height(cm).			technical length(cm.)			Straw yield/ plant (g)			seed yield./ plant (g)		
	2004/05	2005/06	combined	2004/05	2005/06	combined	2004/05	2005/06	combined	2004/05	2005/06	combined
Varieties (V)												
Sakha 3	67.83	61.52	64.67	57.49	54.19	56.06	1.26	1.2	1.23	0.247	0.230	0.238
Sakha 4	65.52	60.01	62.76	55.06	52.23	53.64	1.11	1.07	1.09	0.254	0.243	0.248
Giza 10	68.44	63.22	65.83	58.76	54.79	56.77	1.13	1.09	1.11	0.257	0.249	0.253
F. Test	*	*	*	*	*	*	N.S	N.S	N.S	N.S	N.S	N.S
L. S. D	0.910	0.510	0.714	0.662	0.415	0.531						
Sowing dates (S)												
1 November	76.37	66.18	71.27	66.99	61.47	64.23	1.50	1.30	1.44	0.316	0.272	0.294
10 November	63.73	60.14	61.93	55.15	53.01	54.07	1.07	1.10	1.08	0.244	0.23	0.237
20 November	61.75	56.42	60.08	49.14	46.61	47.87	0.91	0.96	0.93	0.199	0.22	0.209
F. Test	*	*	*	*	*	*	*	*	*	*	*	*
L. S. D	1.832	2.101	1.941	2.61	2.582	2.593	0.200	0.141	0.172	0.081	0.07	0.077
Foliar X (F)												
Foliarx	67.42	62.17	64.79	59.11	55.73	57.42	1.26	1.34	1.30	0.285	0.266	0.217
control	63.15	60.99	62.06	55.10	51.73	53.41	1.05	0.90	0.97	0.220	0.215	0.275
Interactions												
V X S	*	*	*	*	*	*	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
V X F	*	*	*	*	*	*	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
S X F	N.S.	N.S.	N.S.	*	*	*	N.S.	N.S.	N.S.	*	*	*
V X S X F	*	*	*	*	*	*	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

Table (3): Mean values of number of capsules/ plant, straw yield ton/ fad, seed yield kg/ fad., fiber yield gm/ plant. and fiber yield kg/ fad. as affected by diversity varieties, sowing dates, foliar x as nutrients mixture and their interactions in 2004/05 and 2005/06 seasons.

Maim effects and interactions	Number of capsules / plant			Straw yield ton. / fad.			Seed yield kg. / fad.			Fiber yield gm. / plant			Fiber yield kg/ Fad.		
	2004/05	2005/06	combined	2004/05	2005/06	combined	2004/05	2005/06	combined	2004/05	2005/06	combined	2004/05	2005/06	combined
Varieties (V)															
sakha 3	4.19	4.05	4.09	4.067	3.981	4.024	348.2	322.16	335.18	0.261	0.249	0.255	569.47	532.27	550.87
sakha 4	4.46	4.27	4.36	3.935	3.516	3.726	396.60	371.56	384.08	0.259	0.232	0.245	550.99	510.75	530.87
Giza 10	4.99	4.71	4.85	4.228	4.077	4.153	412.64	399.18	405.91	0.286	0.268	0.277	581.04	547.10	564.07
F. Test	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
L. S. D	0.410	0.210	0.232	0.213	0.302	0.252	8.516	9.910	8.991	0.031	0.027	0.029	3.825	3.161	3.491
Sowing dates (S)															
1 November	5.79	4.92	5.35	4.919	4.101	4.510	470.74	401.26	436	0.324	0.302	0.313	677.93	552.21	615.06
10 November	4.63	4.15	4.38	4.070	3.971	4.020	384.83	370.12	377.47	0.261	0.250	0.255	569.90	520.30	545.09
20 November	3.23	3.96	3.39	3.239	3.502	3.370	301.94	321.52	311.73	0.219	0.197	0.208	453.61	517.61	485.61
F. Test	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
L. S. D	0.611	0.506	0.572	0.410	0.320	0.365	12.150	11.882	11.993	0.060	0.053	0.059	11.160	9.501	10.272
Foliar X (F)															
Foliarx	4.69	4.59	4.63	4.429	4.105	4.267	406.66	388.50	397.58	0.249	0.239	0.244	620.207	548.68	584.44
Control	4.40	4.10	4.25	3.724	3.611	3.667	365.01	340.10	352.55	0.287	0.260	0.273	514.13	511.40	512.76
Interactions															
V X S	N.S.	N.S.	N.S.	N.S.	N.S.	N.S	*	*	*	*	*	*	*	*	*
V X F	N.S.	N.S.	N.S.	N.S.	N.S.	N.S	*	*	*	*	*	*	*	*	*
S X F	*	*	*	*	*	*	*	*	*	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
V X S X F	N.S.	N.S.	N.S.	N.S.	N.S.	N.S	*	*	*	*	*	*	*	*	*