EFFECT OF SEEDING RATES AND NITROGEN FERTILIZER LEVELS ON YIELD AND YIELD COMPONENTS OF TWO NEW FLAX CULTIVARS

Amal, M.A. El-Borhamy

Fiber Crops Res. Dep, Field Crop Res. Inst., ARC, Egypt

ABSTRACT

Two field experiments were carried out at the Experimental farm of Sakha Agricultural Research station during 2013/2014 and 2014/2015 seasons to study the effect of seeding rates and nitrogen fertilizer levels on two new flax cultivars. The experimental design was split-split plot with four replications. The three seeding rates (50, 60 and 70kg/fed) were distributed in main plot, three nitrogen levels (30, 45and 60kg fed)were allocated in sub plot and new flax cultivars(Giza11 and Giza12) were distributed in sub sub plots.

The results revealed significant differences among three seeding rates on straw yield and its components as well as fiber yield and its related characters. Increasing seeding rate from 50 to 70 kg /fed. increased technical length, straw yield/plant as well as per feddan, fiber length, fiber percentage and fiber yield/plant as well as per feddan. Increasing seeding rate decreased number of capsules/plant, number of seeds/plant, seed index, seed yield/plant as well as per feddan, whereas thee effect was insignificant in oil percentage. The seeding rate of 60 kg/fed.. gave higher seed yield and its component.

Increasing nitrogen level from 30 to 60 kg/fed significantly increased technical length, straw yield/plant, straw yield/fed, fiber length, fiber percentage, fiber yield/plant as well as per feddan. The differences between 45 and 60 kg N/fed did not reach the level of significant. Increasing nitrogen level from 30 to 60 kg N/fed significantly increased fruiting zone length, number of capsules/plant. Adding 45kg N/fed resulted in the highest values of seed yield and its components. The results revealed that Giza12 cv., was superior than Giza 11 cv., in technical length, straw yield /plant, straw yield/fed, fiber length, fiber percentage, fiber yield/plant and fiber yield/fed. While Giza 11 cv. was superior than Giza 11 cv., in fruiting zone length, number of capsules/plant, number of seeds /plant, seed yield/plant and seed index. The interaction between seeding rate x nitrogen level was significant in stem diameter, straw yield/fed, fruiting zone length, no of capsule/plant, seed index and fiber yield./plant.

The interaction between seeding rate and cultivar was significant in technical length, straw yield/fed., fruiting zone length, number of capsules/plant, seed yield/plant and seed index. Also, the interaction between nitrogen level and cultivars was significant in technical length, stem diameter, straw yield/plant as well as per feddan, fruiting zone length, number of capsules/plant, seed yield/plant and seed index.

The interaction between seeding rate x nitrogen level x cultivar was significant in technical length, straw yield/fed., fruiting zone length, no. of

capsules/plant, seed yield/fed seed yield/plant, fiber length and fiber yield/fed. From the results and under the conditions of this study, it could be concluded that for producing the highest straw and fiber yield, it can be recommended by using Giza 12 cv., at seeding rate of 60 kg seeds/fed, 45 kg N/fed while for high seed yield used Giza11cv, 60 kg seeds/fed. + 45 kg N /fed.

Key words: Flax, seeding rate, nitrogen fertilizer, cultivars, yield, yield components.

INTRODUCTION

In Egypt, flax (*Linum usitatissimum* L.) is an ancient crop, which is grown as dual purpose for its fiber and oil, flax ranks second to cotton, s fiber crop, where it plays an important role in the national economy due to local industry and contribute in increasing flax exports. The cultivated area in Egypt is very limited; therefore, increasing flax yield per unit area is very important. This could be achieved through improving the agronomic practices such as seeding rate, nitrogen fertilizer level and new cultivars highly yielding. Seeding rate is an important factor to enhance growth, yields and yield components.

Many workers study effect of seeding rate i.e. Abouldahab (2002) mentioned that increasing seeding rate increasing straw yield and its components. El-Borhamy (2003), found that plant density 1500 seeds/m^2 gave higher seed yield and its components, while 2100-2400 seeds/m^2 gave higher straw and fiber yields and its components. Abd El-Fatah and El-Essawy (2006), reported that increasing sowing density increased straw yield and its components, while, length of top capsule zone, seed yield were decreased. Wadan (2013), found that increasing seeding rate was decreased seed yield and its components in middle Egypt region conditions yield. Abou-Zied ***et al***. (2015), mentioned that seed rate increased technical length, seed yield and biological yields increased, whereas number of capsules/plant, seed index, fruiting zone length and seed yield per plant were decreased. . Eman and Dewdar (2015), reported that increasing seeding rate increase straw yield Nitrogen is often the most important nutrient, which influences the amount of protein and chlorophyll formed and increased cell size. Many researches have studied nitrogen level such as El-Gazzar and Kineber (2002) found that increasing nitrogen level from 30 to 60 kg/fed significantly increased seed yield per plant as well as per feddan. El-Nagdy ***et al***. (2010), reported that 45 kg N/fed have highest seed and straw yields. Geovan ***et al***. (2013), reported that nitrogen rates influenced some production components. Dervisevic ***et al***. (2014), and Dasminka ***et al***. (2014) reported that the optimal nitrogen rate for fiber flax to the obtained results was 30 kg N/ha. Abd El-Daiem and El-Borhamy (2015), reported that maximum straw and

seed yields and its components of flax could be achieved with fertilizer by75 kg N/fed on sandy soil. Sowing the suitable cultivars is an important factor to give higher yields. In this connections by many investigators indicating that there are significant differences due to flax genotypes in growth, yields. Hussein (2012), showed that flax crop genotypes significantly differed for all studied yield and its components. Gholamhosein ***et al***. (2013), found that flax genotypes in plant height, capsule number, seed yield and biological yield. El-Borhamy ***et al***. (2015), showed that significant differences among the flax genotypes in straw and seed yield and its components. Kineber ***et al***. (2015) found that new flax varieties Sakha 5 and Sakha 6 were significantly higher in straw, seed, fiber, and oil yields than the commercial check variety Sakha 2 and in fiber percentage and oil content.

The aim of this investigation was to study the effect of seeding rates and nitrogen fertilizer levels and their interactions on flax yield and its components of the two new flax cultivars Giza 11 and Giza 12.

MATERIALS AND METHODS

Two field experiments were carried out at the experimental farm of Sakha Agricultural Research Station during two successive winter seasons of 2013/2014 and 2014/2015 to study the effect of seeding rate and nitrogen level on yield and its components of two new flax cultivar Giza 11 and Giza 12. The soil of experiments field were clay in texture. The chemical analysis of the experimental soil is given in Table (1). The preceding crop was maize and sunflower in the first and second season, respectively. The experiments were carried out in a split-split plot design with four replications. The main plots were assigned to the three seeding rates i.e. 50, 60 and70 kg/fed. The sub plots were devoted to the three nitrogen levels i.e. 30, 45 and 60 kg N/fed. The sub sub plots were assigned to the flax cultivars i.e. Giza 11: dual purpose type selected from cross (Giza 8 x S.2419). Giza 12: dual purpose type selected from cross (S.2419 x S.148/6/1).

Table (1): Chemical analysis of experimental soil fields in the two growing seasons

Variable	Season	
	201/2014	2014/2015
pH	8.01	8.13
Organic matter	1.72	1.78
Available N (ppm)	19.45	18.10
Available P (ppm)	15.80	16.72
Available K (ppm)	245.12	246.01

Seed of the two flax cultivars were sown on Nov. 10th and 15th in 2013and 2014 respectively. Manual broadcast method was used at the seeding above mentioned. The sub-sub plot size was (2 x 3). Nitrogen fertilizer at the above mentioned level in the form of urea (46.5% N) was applied in two equal doses the first dose (50%) was applied before the first irrigation and the second dose (50%) before the second irrigation. The rest cultural practices were applied as recommended. At harvesting flax plant were pulled out manually, then seed and straw yields/fed. were estimated from central area of one square meter of each sub sub plot. Seed oil content was determined according to A.O.A.C. (1990). At harvesting time ten guarded plants were taken at random from each sub-sub plot to determine yield components.

Data collected included:

I. Straw yield and its components:

1. Technical length (cm)
2. Main stem diameter (mm).
3. Straw yield(g/plant).
4. Straw yield/fed. (tons).

II. Seed yield and its components:

1. Upper branching zone length (cm)
2. Number of capsules/plant.
3. Number of seeds/plant
4. Seeds yield (g/plant).
5. Seed yield/fed. (kg)
6. Seed index (g)
7. Oil content (%)

III. Fiber yield and its related characters:

1. Fiber length (cm)
2. Fiber percentage (%)
3. Fiber yield(g/plant).
4. Fiber yield/fed. (kg).

The analysis of variance was carried out according to Gomez and Gomez (1984) for all collected data. Treatment means were compared by Duncan's Multiple Range Test according Duncan (1955). All statistical analysis was performed using analysis of variance technique by means of "MSTATC" computer software package.

RESULTS AND DISCUSSION

1. Straw yield and its related characters:

1.1. Effect of seeding rates:

Data in Table (2) show that straw yield and its components were significantly affected by seeding rates in the two seasons. A gradual and significant increment in the mean value of technical length was obtained with increasing seeding rate from 50 up to 70

kg/fed,There was no significant between seeding rate 60 and 70 kg/fed. on the straw yield per plant as well as per feddan. This trend may be due to the low competition between plants at seeding rate 60 kg on nutrient, light and water. Moreover, higher seeding rate 70 kg/fed. produced thinner stem diameter. This may be due to high competition and consequently flax plants tended to elongate searching for light. Similar results were obtained by El-Borhamy (2003), Kineber (2003), Abd El-Fatah and El-Essawy (2006), Wadan (2013) and Eman and Dewedar (2015).

Table (2): Effect of seeding rate, nitrogen levels and flax cultivars on straw yield and its components during 2013/2014 and 2014/2015 seasons

Factor	Technical length (cm)		Stem diameter (mm)		Straw(g/plant)		Straw yield(t/fed)	
	2013/14	2014/15	2013/14	2014/15	2013/14	2014/15	2013/14	2014/15
A. Seeding rate (kg/fed.)								
50	85.36 b	88.01 b	2.02 a	2.03 a	1.09 b	1.91 b	3.890 ab	3.903 b
60	90.26 ab	92.37 b	1.99 ab	2.00 a	1.85 a	2.03 a	4.300 a	4.313 a
70	94.80 a	96.29 a	1.89 b	1.86 b	1.88 ab	2.02 a	4.300 a	4.323 a
F test	*	*	*	*	*	*	*	**
B. Nitrogen level								
30 kg/fed.	84.35 b	87.41 b	2.10 a	2.14 a	1.30 b	1.74 b	3.632 b	3.635 b
45 kg/fed	91.64 a	95.91 a	1.71 b	1.76 b	1.59 a	2.12 a	4.420 a	4.435 a
60 kg/fed.	94.43 a	93.35 a	2.11 a	2.12 a	1.32 b	2.10 a	4.400 a	4.440 a
F test	**	**	**	**	**	**	**	**
C. Cultivars								
Giza 11	86.71 b	88.54 b	2.08 a	2.12 a	1.22 b	1.87 b	4.000 b	4.094 b
Giza 12	93.75 a	95.89 a	1.86 b	1.89 b	1.23 a	2.11 a	4.285 a	4.299 a
F. test	**	**	**	**	**	**	**	**
D. Interactions								
AB	NS	NS	NS	*	NS	NS	*	*
AC	*	NS	NS	NS	NS	NS	NS	*
BC	**	*	*	*	NS	*	*	*
ABC	**	*	NS	NS	NS	NS	NS	*

**, * and NS indicate P< 0.05, 0.01 and not significant, respectively.
Means of each of factor designed by the same letter are not significantly different at 5% level according to Duncan's multiple range test

1.2. Effect of nitrogen levels:

Data in Table (2) show high significant effect of nitrogen level on technical length, stem diameter, straw yield per plant as well as per feddan.. Meanwhile, the differences between 45 and 60 kg N/fed. did not reach the level of significance in most cases. The results might be due to the fact that nitrogen hastens growth of flax plants and it is well known that nitrogen is an essential element for flax to build up protoplasm and proteins, which induce cell division and meristematic activity. Such effect resulted in an increase in cell number and size. The results are in acceptance with those obtained by Mostafa ***et al***. (2003), El-Nagdy (2010), and Abd El-Daiem and El-Borhamy, (2015).

1.3. Effect of cultivars:

Highly significant differences between the two flax cultivars i.e. Giza 11 and Giza 12 were obtained in technical length, stem diameter, straw yield/plant and straw yield/fed. Data in Table (2) show that the cultivar Giza 12 was superior in all straw yield and its components in both seasons compared with Giza 11 except stem diameter. These finding might be attributed to the differences in their genetical constitution. These results are in harmony with those obtained with Husssein (2012), Gholamhosein ***et al***. (2013), El-Borhamy ***et al***. (2015), Kineber ***et al***. (2015) and Abo-Kaied ***et al***. (2015).

1.4. Effect of interactions:

Data in Table (2) show that the interaction between seeding rate (A) and nitrogen level (B). was significant on straw yield/fed in both seasons while the interaction was significant on stem diameter only in the second season. Data presented in Table (3) show clearly that flax plants, which sow with 60 kg seeding rate and received 45kgN/fed.gave the highest values of stem diameter in the second season and straw yield /fed in both seasons.

Table (3): Highest values of flax straw yield and stem diameter as affected by the significant interaction between seeding rate and nitrogen level during 2013/2014 and 2014/2015 seasons

Characters	Highest values		Treatment
	2013/2014	2014/2015	
Stem diameter (mm)	-	1.75	60 kg seed x 45 kg N/fed.
Straw yield (t/fed.)	4.635	4.600	60 kg seed x 45 kg N/fed.

Data in Table (2) show significant interactions between seeding rate and cultivar, on the technical length in the first season, while the interaction was significant in both seasons on straw yield/fed. (Table 4).

The interaction between nitrogen levels fertilizer and cultivar was significant in most characters in both seasons.

Data in Table (5) indicate that the highest values for interaction between nitrogen levels and cultivars on straw yield and its components obtained by 45 kg N/fed. x Giza 12 cultivars. The interaction between seeding rate, nitrogen level and cultivars was significant on technical length(111.7, 113.3 cm) in both seasons respectively .While it was significant on straw yield/fed in second season only (4.686 ton).It obtained with Giza12 x 60kg seed/fed x 45 kg N/fed.

Table (4): Highest values of technical length and straw yield/fed as obtained by significant interaction (AC) in 2013/2014 and 2014/2015 seasons

Characters	Highest values		Treatment
	2013/2014	2014/2015	
Technical length (cm)	100.9	-	60 kg seed/fed x Giza 12
Straw yield (ton/fed)	4.481	4.438	60 kg seed/fed x Giza 12

Table (5): Highest values of straw yield (t/fed.) and its related characters as affected by the interaction between N-level and flax cultivar in 2013/2014 and 2014/2015 seasons

Characters	Highest values		Treatment
	2013/2014	2014/2015	
Technical length (cm)	100.1	102.3	45 kg N/fed x Giza 12
Stem diameter (mm)	1.80	1.75	45 kg N/fed x Giza 12
Straw yield/plant (g)	-	2.14	45 kg N/fed x Giza 12
Straw yield/fed. (ton)	4.441	4.383	45 kg N/fed x Giza 12

2. Seed yield and its related characters:

2.1. Effect of seeding rate:

There were significant differences between seeding rate in seed yield and its components. Seeding rate 60 kg/fed. gave the greatest values in fruiting zone length, number of capsules/plant, number of seeds/plant, seed yield/plant, seed index and seed yield/fed, while the effect of seeding rate on oil percentage was insignificant in both seasons (Table 6) While the lowest values for seed yield/plant as well as per feddan were obtained by using 70 kg/fed. This may be attributed to fact that high seeding rate created a high competition between plant for nutrients, moisture and light. The results are in harmony with those obtained **by El-Borhamy(2003), Kineber(2003), Abd-Fatah and El-Sssawy(2006), Rahimi *et al* (2011), Wadan(2013) and Abou-zeid *et al* (2015).**

2.2. Effect of nitrogen levels

Data presented in Tables 6 show clearly that seed yield and its components were significantly affected by nitrogen fertilizer levels except for oil percentage in both seasons. Increasing nitrogen level from 30 to 60 kg N/fed. significantly increased fruiting zone length, number of capsules/plant, number of seeds/plant, seed yield/plant, seed index and seed yield/fed. The differences between 45 and 60 kg N/fed did not reach the level of significant. Nitrogen application as it well known, enhance vegetative growth as well as all metabolism process in the plant, which caused an increase in dry matter accumulation. Also, that superiority in number of capsules, seed yield/plant and seed index. These findings are in harmony with those

of Mostafa ***et al***. (2003), El-Gazzar and Kineber (2002), El-Nagdy (2010), Huissein (2012), Geovan ***et al***. (2013) and Dervisevic ***et al***. (2014).

Table (6): Effect of seeding rate, nitrogen levels and flax cultivars on seed yield and its related components during 2013/2014 and 2014/2015 seasons

Factor	Fruiting zone length (cm)		Number of seeds/ plant		Number of capsules/ plant		Seed yield/plant (g)		Seed index (g)		Oil percentage (%)		Seed yield (kg/fed)	
	2013/14	2014/15	2013/14	2014/15	2013/14	2014/15	2013/14	2014/15	2013/14	2014/15	2013/14	2014/15	2013/14	2014/15
50	19.07^{a}	21.16^{a}	124.83^{a}	112.14^{c}	17.75^{b}	18.64^{b}	1.09^{c}	1.14^{b}	9.47^{b}	9.25^{b}	42.89	42.85	681.19^{b}	691.25^{b}
60	21.23^{a}	23.14^{a}	182.67^{a}	170.83^{a}	25.08^{a}	26.10^{a}	1.85^{a}	1.74^{a}	10.06^{a}	10.07^{a}	43.04	43.00	774.95^{a}	765.05^{a}
70	21.17^{a}	23.68^{a}	136.08^{b}	120.43^{b}	19.00^{ab}	20.01^{b}	1.28^{b}	0.94^{c}	8.73^{c}	8.75^{c}	42.78	42.75	612.65^{c}	683.34^{c}
F test	*	*	*	*	*	*	*	**	*	*	NS	NS	*	*
30 kg/fed.	18.53^{b}	20.52^{b}	142.50^{b}	130.00^{b}	19.92^{b}	20.85^{b}	1.30^{b}	1.13^{b}	8.86^{b}	8.87^{b}	43.44	43.49	615.10^{b}	638.92^{b}
45 kg/fed	21.40^{a}	23.34^{a}	160.83^{a}	154.13^{a}	23.42^{a}	24.24^{a}	1.59^{a}	1.52^{a}	9.99^{a}	9.99^{a}	43.33	43.30	731.20^{a}	755.75^{a}
60 kg/fed.	21.54^{a}	24.04^{a}	140.25^{b}	133.46^{b}	19.00^{c}	20.01^{c}	1.33^{b}	1.22^{b}	9.41^{a}	89.43^{a}	43.35	42.31	723.48^{a}	744.97^{a}
F test	**	**	**	*	**	*	*	**	**	*	NS	NS	*	*
Giza 11	23.01^{a}	24.40^{a}	159.50^{a}	150.01^{a}	23.05^{a}	25.11^{a}	1.59^{a}	1.50^{a}	10.01^{a}	10.06^{a}	42.75	41.89	738.28^{a}	761.41^{a}
Giza 12	17.96^{b}	20.86^{b}	136.22^{b}	130.36^{b}	18.50^{b}	17.36^{b}	1.22^{b}	1.07^{b}	8.78^{b}	89.80^{b}	42.30	41.80	640.28^{b}	665.02^{b}
F. test	**	**	**	*	**	**	**	**	**	**	NS	NS	*	*
AB	*	*	NS	NS	*	*	NS	*	*	*	NS	NS	NS	NS
AC	*	*	NS	NS	*	*	NS	NS	*	*	NS	NS	NS	NS
BC	*	*	NS	NS	*	*	*	NS	*	*	NS	NS	NS	NS
ABC	*	*	NS	NS	*	*	*	NS	*	*	NS	NS	*	*

**, * and NS indicate P< 0.05, 0.01 and not significant, respectively.
Means of each of factor designed by the same letter are not significantly different at 5% level according to Duncan's multiple range test

2.3. Effect of cultivars

Data presented in Table 6 show highly significant between cultivars on seed yield and its components except for oil percentage in both seasons, whereas Giza 11 cultivar superior than Giza 12 in seed yield and its components. These results may be due to genetical factors. These results are in agreement with those obtained by Hussein (2012), Gholamhosern ***et al***. (2013), Kieneber ***et al***. (2015) and Abou-Kaied ***et al***. (2015).

2.4. Effect of interactions:

The interaction between seeding rate and nitrogen fertilizer level was significant on fruiting zone length, number of capsules/plant and seed index in both seasons, while the interaction was significant on seed yield/plant in the second season only.

Data in Table 7 indicate that the highest values of fruiting zone length, number of capsule/plant and seed index were obtained by using 60 kg seed/fed. x 45 kg N/fed.

The interaction between seeding rate and cultivar was significant in fruiting zone length, number of capsules/plant, seed yield/plant, and seed index in both seasons (Table 8).

Table (7): Highest values for fruiting zone length, number of capsules/plant, seed index and seed yield/plant during 2013/2014 and 2014/2015 seasons

Characters	Highest values		Treatment
	2013/2014	2014/2015	
Fruiting zone length (cm)	23.37	25.52	60 kg seeds x 45 kg N/fed.
No. of capsules/plant	29.28	27.11	60 kg seeds x 45 kg N/fed.
Seed index (g)	10.88	10.72	60 kg seeds x 45 kg N/fed.
Seed yield/plant	-	2.13	60 kg seeds x 45 kg N/fed.

The interaction between nitrogen fertilizer level and cultivars was significant in fruiting zone length, number of capsules/plant, seed index and seed yield/fed, in both seasons, while it significant on the seed yield/plant in the first season, only (Table9).

Table (8): Highest values for fruiting zone length, number of capsules/plant and seed index as affected by interaction between seeding rate and cultivars

Characters	Highest values		Treatment
	2013/2014	2014/2015	
Fruiting zone length (cm)	24.56	26.28	60 kg seeds x Giza11cv..
No. of capsules/plant	29.33	27.80	60 kg seeds x Giza11cv..
Seed yield(g/plant)	2.01	2.12	60 kg seeds x Giza11cv.
Seed index (g)	10.87	10.69	60kgseeds/fed x GIza11cv.

Table (9): Highest values for fruiting zone length, number of capsules/plant, seed index and seed yield/plant as affected by interaction between nitrogen level and cultivar in2013/2014and 2014/2015

Characters	Highest values		Treatment
	2013/2014	2014/2015	
Fruiting zone length (cm)	24.56	26.28	45 kg N /fed x Giga11cv, .
No. of capsules/plant	29.33	26.58	45 kg N /fed Giza11cv.
Seed index (g)	10.84	10.69	45 kg N/fed x Giza11cv..
Seed yield (g/plant)	1.83	-	45 kg N/fed x Giza11cv.

Table (10): Highest values for fruiting zone length, number of capsules/plant, seed index and seed yield/plant as affected by interaction between seeding rateX nitrogen levelX cultivar during 2013/2014 and 2014/2015 seasons

Characters	Highest values		Treatment
	2013/2014	2014/2015	
Fruiting zone length (cm)	28.75	30.80	60 kg seeds x 45 kg N/fed x Giza 11 cv.
No. of capsules/plant	21.2	26.3	60 kg seeds x 45 kg N/fed. x Giza 11 cv.
Seed index (g)	11.88	11.85	60 kg seeds x 45 kg N/fed x Giza 11 cv.
Seed yield (g/plant)	1.75	--	60 kg seeds x 45 kg N/fed. x Giza 11 cv
Seed yield (kg/fed.)	823.13	837.19	60 kg seeds x 45 kg N/fed. x Giza 11 cv

The interaction between seeding rate, nitrogen levels and cultivars was significant on fruiting zone length, number of capsules/plant, seed index and seed yield/fed in both seasons, while it significant on the seed yield/plant in the first season only(Table10)

3. Fiber yield and its components:

3.1. Effect of seeding rates:

Table 11 illustrate the mean values of fiber yield and its components as affected by seeding rates, nitrogen levels and cultivars in 2013/2014 and 2014/2015seasons.The differences between seeding rates were significant for all characters in both seasons, Increasing seeding rate from 50 up to 70 kg/fed. increased fiber yield and its components. The difference between 60and70 kg/fed. did not reach the level of significant. These results are in harmony with those obtained by Kieneber (2002), El-Borhamy (2003) and Eman and Dewedar (2015).

3.2. Effect of nitrogen levels:

Results presented in Table (11) revealed that nitrogen levels gave significant effect on fiber yield and its components in both seasons. The difference between 45 and 60 kg N/fed did not reach the level of significant. These results may be due to the favourable influence of nitrogen on the individual fiber units at the critical period of flax plant growth and in turn enhance fiber quality. These findings confirmed with those of El-Kady ***et al***. (1995), El-Gazzar and Kineber (2002), Hussein (2012) and Jasminka ***et al***. (2014).

3.3. Effect of cultivars:

Data were presented in Table (11) showed that the differences between flax cultivars were significant in fiber length, fiber percentage and fiber yield/plant in both seasons. Fiber yield /fed, was significant in the first season, while in the second season the differences was highly significant. Similar results were obtained by El-Borhamy (2011) and Abou-kaied *et al* (2015).

3.4. Effect of interactions:

The interaction seeding rate and nitrogen level was not significant in both seasons. Except in fiber yield/plant. in the second season, the interaction was significant. The highest value for fiber yield was 0.80(g). It recorded with 60kg seed /fed.*45kgN/fed. The interaction between seeding rate x cultivar had significant effect on the fiber length (92.3cm) in the first season only. The interaction between nitrogen fertilizer levels and cultivar was insignificant on fiber yield and its components in both seasons. On the other hand the interaction

among seeding rates, nitrogen fertilizer levels and cultivars were significant on fiber length, (92.5) and fiber yield/fed, (392.21)kg/fed, in the first season. It obtained by using 60 kg seed/fed. x 45kgN/fed. x Giza12 cultivar.

Table (11): Effect of seeding rates, nitrogen levels and flax cultivars on fiber length, fiber percentage, fiber yield/plant, and fiber yield/fed during 2013/2014 and 2014/2015 seasons

Factor	Fiber length (cm)		Fiber percentage (%)		Fiber yield (g/plant)		Fiber yield (kg/fed.)	
	2013/14	2014/15	2013/14	2014/15	2013/14	2014/15	2013/14	2014/15
A. Seeding rate (kg/fed.)								
50	81.11 b	84.64 b	16.02 b	15.83 b	0.680 b	0.685 b	333.69 b	329.08 b
60	87.47 a	89.48 a	17.24 a	17.06 a	0.179 a	0.740 a	368.88 a	370.03 a
70	90.12 a	91.99 a	17.25 a	17.15 a	0.735 a	0.735 a	369.12 a	367.57 a
F test	**	*	*	*	*	*	**	*
B. Nitrogen level								
30 kg/fed.	82.42 b	84.56 b	15.58 b	13.48 b	0.666 b	0.642 b	311.60 b	311.81 b
45 kg/fed	87.46 a	90.95 a	17.46 a	17.31 a	0.727 a	0.754 a	380.22 a	379.73 a
60 kg/fed.	90.12 a	90.56 a	17.47 a	17.29 a	0.742 a	0.768 a	379.88 a	375.15 a
F test	**	**	**	*	*	*	**	*
C. Cultivars								
Giza 11	87.68 b	85.81 b	16.08 b	15.42 b	0.706 b	0.712 b	346.88 b	342.29 b
Giza 12	89.29 a	91.60 a	17.59 a	17.42 a	0.714 a	0.726 a	367.59 a	368.84 a
F. test	*	**	*	*	*	*	*	**
D. Interactions								
AB	NS	NS	NS	NS	NS	*	NS	NS
AC	*	NS	NS	NS	NS	NS	NS	NS
BC	NS	NS	NS	NS	NS	NS	NS	NS
ABC	*	NS	NS	NS	NS	NS	*	NS

**, * and NS indicate P< 0.05, 0.01 and not significant, respectively.
Means of each of factor designed by the same letter are not significantly different at 5% level according to Duncan's multiple range test

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الملخص العربى

تأثير معدلات التقاوي ومستويات السماد النيتروجيني على المحصول ومكوناتهٍ لصفين جديدين من الكتان

أمل محمد عوض البرهامى.

قسم بحوث الا لياف – معهد بحوث المحاصيل الحقلية – مركز البحوث الزراعية – مصر

أجريت تجربتان حقليتان بالمزرعة البحثية بمحطة البحوث الزراعية بسخا كفر الشيخ خلال موسمي 2013/ 2014, 2015/2014 لدراسة تأثير ثلاث معدلات تقاوي هي (50 – 60- 70 كجم / فدان)و ثلاث مستويات من السماد النتروجيني وهي (30 – 45 – 60 كجم نتروجين للفدان) على صنفين جديدين من الكتان هما جيزه 11 وجيزة12 استخدام تصميم القطع المنشقة مرتين فى اربعة مكررات بحيث وزعت معدلات التقاوي في القطع الرئيسية ومعدلات السماد النتروجيني في القطع الشقية الأولى أما الاصناف فقد وزعت في القطع الشقيه الثانية وكانت النتائج المتحصل عليها كما يلي:-

وجود إختلافات معنوية بين معدلات التقاوي على كل من محصول القش ومكوناته ومحصول الالياف ومكوناته.

زياده معدلات التفاوي من 50 – 70 كجم / فدان زاد كل من الطول الفعال ، محصول القش للنبات ، محصول القش للفدان ، نسبه الالياف ،طول الالياف ،محصول الالياف للنبات وللفدان.

زياده معدل التقاوي أدي إلى نقص في عدد كبسولات النبات ، وزن 1000 بذره ، محصول البذور للنبات ومحصول البذور للفدان. معدل التقاوى لم يكن له تاثير معنوى على نسبة الزيت.

زيادة معدلات السماد النتروجين من 30 – 60 كجم نتروجين للفدان زاد كل من الطول الفعال ، محصول القش للنبات ، ومحصول القش للفدان, طول الالياف ، نسبه الالياف، محصول الالياف للنبات ومصول الالياف للفدان . الاختلافات بين معدلات السماد النتروجين 45كجم للفدان و60 كجم للفدان لم تكن معنوية.

زياده مستويات السماد النتروجينى من 30 – 60 كجم نتروجين للفدان زاد كل من طول المنطقه الثمرية ، عدد كبسولات النبات ،وان إضافه 45 كجم نتروجين للفدان اعطي أعلى القيم لمحصول البذور ومكوناته .

التفاعل بين معدلات التفادي ومستويات السماد النتروجين كان معنوي في كل من قطر الساق محصول القش للفدان ، طول المنطقة الثمريه ، عدد كبسولات النبات ، محصول البذور للنبات ووزن 1000 بذرة.

الاختلاف بين الاصناف كانت عاليه المعنوية حيث تفوق الصنف جيزة 12 مقارنه بالصنف جيزة 11 في كل من الطول الفعال ، محصول القش لنبات ، محصول القش للفدان ، طول الالياف ، نسبه الالياف ، محصول الالياف للنبات وللفدان بينما تفوق الصنف جيزة 11 في كل من طول المنطقة الثمريه ، عدد كبسولات النبات ، عدد بذور النبات ، وزن 1000 بذره ومحصول البذور للنبات والفدان .

التفاعل بين معدلات التقاوى ومعدلات السماد النتروجينى كانت معنوية فى كل من قطر الساق ومحصول القش للفدان وطول المنطقة الثمرية وعدد كبسولات النبات وزن الالف بذرة.