

response of different flax varieties to population density and fertilization treatments

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In Egypt, flax is considered as a very important crop for its fiber and ranks second after cotton according to economic importance. The flax cultivated area decreased to about 40000 faddans in 1987/1988 season. In recent days the Egyptian government is planning to encourage flax growing and to improve the quality of flax fibers as well as to increase crop productivity. Flax crop grown in Egypt as a dual purpose type "fiber and seeds", and its yield and quality are affected by many factors such as varieties, nitrogen fertilizer levels and seeding rates. Therefore, this study was carried out to achieve some of these aims. Two field experiments were carried out at Sakha Agricultural Research Station (Kafr El-Sheikh Governorate) in 1985/1986 and 1986/1987 seasons to study the effect of different nitrogen levels and seeding rates on the three flax varieties "Giza 5, Giza 6 and Blanka" and the alternative effects on yield and yield components and quality of fiber and seeds. A split-split plot design with four replications was carried out in both seasons, the main plots were devoted for the three flax varieties Giza 5 (a), Giza 6 (b) and Blanka (c) representing the dual purpose and fiber types respectively. The sub-plots were assigned to the three nitrogen levels i.e., 30, 45 and 60 kg N/faddan and the sub-sub-plots for the five seeding rates i.e., 30, 40, 50, 60 and 70 kg seeds/faddan. All agricultural practices were applied as in the ordinary flax field. The main findings of the present investigation could be summarized as follows:

- A - Yield and yield components
- B - Straw yield and its related characters

1. Total plant height: Plants of Blanka variety had the highest mean values for total plant height as compared with Giza 5 and Giza 6 varieties under all treatments in both seasons. The mean values were (113.17 and 110.91 cms) for Blanka variety, followed by Giza 5 (107.10 and 102.56 cms) and the shortest plants were of Giza 6 (103.93 and 99.43 cms) in both seasons. Plant height significantly increased with each increase in nitrogen level up to 60 kg N/faddan. There was a gradual increment in plant height when the seeding rates increased from 30 to 70 kg seeds/faddan in both seasons. Applying 60 kg N/faddan combined with the rate of 70 kg seeds/faddan yielded the highest plants for the three varieties, while applying the combination of 30 kg N and 30 kg seeds/faddan produced the shortest plants of the three varieties in both seasons. The interaction between varieties x nitrogen fertilizer levels x plant density had significant effect in the two seasons. The maximum plant height was (122.65 and 129.64 cms) produced by Blanka supplied with 60 kg N/faddan and seeded by 70 kg/faddan in both seasons, while the shortest plants (91.48 and 88.48 cms) were produced by Giza 6 supplied with 30 kg N/faddan and seeded by 30 kg /faddan in both seasons.

2. Technical stem length: Blanka variety plants had the highest mean values for technical length as compared with Giza 5 and Giza 6 varieties under all treatments in both seasons. The mean values were (100.65 and 98.69 cms) for Blanka variety followed by Giza 5 (94.42 and 87.72 cms) and the shortest was Giza 6 (89.21 and 81.68 cms) in both seasons respectively. There was a significant increase in technical length with each increase in nitrogen level up to 60 kg N/faddan. There was a gradual increment in technical length when the seeding rates increased from 30 to 70 kg seeds/faddan. Applying 60 kg N/faddan combined with the rate of 70 kg seeds/faddan produced the highest mean values of technical length, on the other hand using the combination of 30 kg N and 30 kg seeds/faddan produced the lowest technical length of the three varieties in both seasons. The interaction between varieties x nitrogen fertilizer levels x plant density had significant effect in the

second season only • The highest technical length was 119.63 cm obtained by Blanka seeded at 70 kg/faddan and supplied by 60 kg N/faddan , and the lowest length was 70.47 cm produced by Giza 6 seeded at 30 kg/ faddan) receiving 30 kg N/faddan •- 131 -3. Upper branching zone length..2. Plants of Giza 6 variety had the highest of upper branching zone as compared with Giza 5 and Blanka varieties under all treatments in both seasons •Statistical analysis revealed that the differences due to N levels did not reach the level of significance in both seasons , but there was a gradual increase with increasing nitrogen level from 30 up to 60 kg/faddan •There was a gradual decrement in upper branching zone length with increasing the seeding rates from 30 to 70 kg seeds/faddan in both seasons •Generally, applying 60 kg N/faddan combined with the rate of 30 kg seeds/faddan yielded the highest mean values of upper branching zone length , while using the combination of 30 kg Nand 70 kg seeds/faddan caused a great reduction in the length of the upper branching zone for the three varieties in both seasons •4. Main stem diameter:Blanka variety gave the 19west.measurement of main stem diameter inthe two seasons (1.86 and 1.79 mm.) while no significant differences were found between Giza 5 and Giza 6 •Main stem diameter increased significantly with increasing nitrogen doses from 30 up to 60 kg N/faddan in both seasons •Main stem diameter was decreased gradually with increasing plant density from the rate of 30 kg seeds to the rate of 70 kg seeds/ faddan •- 132 -- Applying 60 kg N/faddan combined with the rate of 30 kg seeds/faddan gave the highest measurement of main stem diameter , while usingthe combination of 30 kg Nand 70 kg seeds/faddan caused a great reduction in this character for the three varieties in bothseasons .5. Number of basal branches / plant:Giza 6 variety was the highest in mean values of number of basal branches/plant by means (2.12 and 1.43) , followed by Giza 5(1.97 and 1.26) and the lowest values were (1.53 and 1.06) obtained by Blanka variety •Basal branches/plant increased signi-icantly when the nitrogen level increased up to 60 kg N/faddan •Number of basal branches/plant showed gradual reduction when the seeding rates increased from 30 to 70 kg seeds/faddan at the twoseasons •Applying 60 kg N/faddan combined with the rate of 30 kg seeds/faddan produced the highest number of basal branches/plant , meanwhile using the combination of 30 kg Nand 70 kg seeds/faddan caused a great reduction in this character in both seasons for the three varieties •6. Straw yield/plant:Plants of Giza 5 variety were the highest in mean values of straw yield/plant without significant differences with Giza 6 variety, while the lowest values were of Blanka variety •- 133 -Applying nitrogen fertilizer at the levels ranging from 30 up to 60 kg N/faddan caused a significant increase in straw yield/plant in both seasons •The investigation indicated that plant density at a rate of 30 kg seeds/faddan produced the highest straw yield/plant and there was a gradual reduction in straw yield/plant with increasing plant density in both seasons •Data illustrated that applying 60 kg N/faddan combined with the rate of 30 kg seeds/faddan yielded the highest straw yield/plant, meanwhile , using the combination of 30 kg Nand 70 kg seeds/faddan caused a great reduction in straw yield/plant for the three varieties in both seasons •7. Straw yield / faddan:Giza 5 variety was the highest in mean values of straw yield/faddan(2.646 and 3.181 tons) as compared with Giza 6 (2.358 and 2.747 tons) and Blanka (2.349 and 2.614 tons) with no significant betweenGiza 6 and Blanka varieties .Straw yield/faddan was increased as the nitrogen level increasedfrom 30 up to 60 kg N/faddan •Results showed gradual increment in straw yield/faddan when the seeding rates increased from 30 to 70 kg seeds/faddan in bothseasons .- Applying 60 kg N/faddan combined with the rate of 70 kg seeds/faddan produced the highest straw yield/faddan , meanwhile using the- 134 -combination of 30 kg Nand 30 kg seeds/faddan caused a reductionin straw yield/faddan in both seasons for the three varieties •II - Seed yield and its related characters1. Number of capsules/plant:,, ...,Giza 6 variety was the highest in mean values , while the differencebetween Giza 6 and Giza 5 varieties did not reach the level ofsignificance in both seasons • The lowest number of capsules/plantwere produced by Blanka variety •Number of capsules/plant was increased significantly as the nitrogenlevel increased up to 60 N/faddan in both seasons •There was a gradual reduction in number of capsules/plant withincreasing plant density from 30 kg seeds up to 70 kg seeds/faddan •Applying 60 kg N/faddan combined with the rate of 30 kg seeds/faddanproduced highest number of capsules/plant for the three varietiesin both seasons •The interaction between varieties and plant density had significanteffect on this character in both seasons • The highest number ofcapsules/plant was 11.89 and 10.83 produced by the combination

of Giza 6 seeded at 30 kg/faddan, while the lowest number of capsules/plant was 6.03 and 6.18 resulting from Blanka seeded by 70 kg/faddan in both seasons.

• 2. Number of seeds/capsule: There were significant differences among the three flax varieties in both seasons, where Giza 6 variety was the highest in mean values, followed by Giza 5 variety and the lowest number was produced by Blanka variety.

• There was a gradual increase in number of seeds/capsule with increasing nitrogen level from 30 up to 60 kg/faddan, but with no significant differences in both seasons.

• Number of seeds/capsule was decreased gradually with increasing plant density from 30 kg seeds to 70 kg seeds/faddan.

• Applying 60 kg N/faddan combined with the rate of 30 kg seeds/faddan produced the highest seed number/capsule, while using the combination of 30 kg N and 70 kg seeds/faddan caused a great reduction in this character for the three flax varieties in both seasons.

• 3. Number of seeds/plant: Blanka variety gave the lowest value in both seasons, while Giza 6 produced the highest value followed by Giza 5 with significant differences among the three varieties in the second season.

• There was a gradual increase in number of seeds/plant with increasing nitrogen level from 30 up to 60 kg N/faddan, with no significant differences in both seasons.

• Number of seeds/plant was decreased gradually with increasing plant density from 30 kg seeds to 70 kg seeds/faddan.

• Applying 60 kg N/faddan combined with the rate of 30 kg seeds/faddan produced the highest mean values of number of seeds/plant, while applying the combination of 30 kg N and 70 kg seeds/faddan caused a great reduction in this character for the three flax varieties in both seasons.

• The three factors interaction (varieties x N levels x plant density) had significant effect on this character in the first season.

• The highest number of seeds/plant was 85.58 produced by Giza 6 seeded at 30 kg/faddan and supplied with 60 kg N/faddan while the lowest value was 32.30 of Blanka seeded by 70 kg/faddan and supplied with 30 kg N/faddan.

• 4. seed yield / plant: There were significant varietal differences among the three flax varieties in seed yield / plant.

• Giza 6 variety was the highest in mean values followed by Giza 5, while Blanka variety gave the lowest seed yield / plant in both seasons.

• There was a gradual increase in seed yield/plant with increasing nitrogen level from 30 up to 60 kg/faddan, but with no significant differences.

• seed yield/plant decreased gradually with increasing plant density from 30 kg seeds to 70 kg seeds/faddan.

• Generally, applying 60 kg N/faddan combined with the rate of 30 kg seeds/faddan gave the highest seed yield/plant, meanwhile using the combination of 30 kg N and 70 kg seeds/faddan caused a reduction in seed yield/plant for the three flax varieties in both seasons.

• 5. Seed yield / faddan: Giza 6 variety was significantly superior in seed yield/faddan compared with the two other varieties Giza 5 and Blanka in both seasons, where Giza 6 variety produced the highest yield (611.11 and 615.81 kg) followed by Giza 5 (542.60 and 554.22 kg) and the lowest yield was Blanka variety (359.17 and 354.98 kg) in both seasons.

• Seed yield/faddan increased significantly with the increase in N level up to 60 kg N/faddan in both seasons.

• Progressive significant increases in seed yield/faddan were obtained with the increase in seed rate up to 60 kg seeds/faddan in both seasons.

• Applying 60 kg N/faddan combined with the rate of 60 kg seeds/faddan produced the highest seed yield/faddan, while using the combination of 30 kg N and 30 kg seeds/faddan caused a great reduction in seed yield/faddan for the three flax varieties in both seasons.

• Blanka variety gave the lowest seed index in both seasons, while there was no significant difference in seed index between Giza 6 and Giza 5 in both seasons.

• There was a gradual increase in seed index with increasing nitrogen level from 30 up to 60 kg/faddan, but the differences were below the level of significance in both seasons.

• The differences in seed index due to the different seed rates did not reach the level of significance in both seasons but there was a gradual decrease with increasing seed rate from 30 to 70 kg seeds/faddan.

• Applying 60 kg N/faddan combined with the rate of 30 kg seeds/faddan produced the highest seed index, while using the combination of 30 kg N and 70 kg seeds/faddan caused a great reduction in seed index for the three flax varieties in both seasons.