EFFECT OF PLANT DENSITY AND NITROGEN FERTILIZER RATES ON QUANTITY, QUALITY AND ANATOMICAL CHARACTERISTICS OF SOME FLAX CULTIVARS

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ABSTRACT

Two field experiments were conducted on the Farm of A El-Gemmeiza Research Station, Gharbia Governorate, Agricultural Research Center, **Egypt**, during two successive winter seasons of 2018/2019 (1st) and 2019/2020 (2nd) to investigate the effect of three nitrogen fertilizer rates, *i.e.* 30, 50 and 70 kg N/fed and three plant densities, *i.e.* 1500, 2000 and 2500 seeds/m^2 on flax (*Linum usitatissimum* L.) yield and its components of three cultivars of flax, *i.e.* Sakha 3 (fiber flax cultivar), Giza 11 and Giza 12 (dual purpose flax cultivar). The obvious results of this investigation can be summarized as follows:

Flax cultivars were significantly differed in mean values of all flax traits under study in both seasons. Planting flax cultivar of Sakha 3 significantly produced the maximum mean values of total plant height (cm) and technical stem length (cm), upper branching zone length (cm), No. of seeds/capsule, total fiber percentage (%), fiber yield/plant (g), fiber yield/fed (kg), fiber length (cm) and fiber fineness (Nm) in both seasons. Meanwhile, the highest mean values in No. of basal branches/plant, straw yield/plant (g), straw yield/fed (kg), biological yield/fed (kg) and seed oil content (%) in both seasons which were recorded with planting flax cultivar of Giza 12. While planting flax cultivar of Giza 11 gave the maximum mean values of stem diameter (mm), No. of upper branches/plant, No. of capsules/plant, No. of seeds/plant, seed index (g), seed yield/plant (g), seed yield/fed (kg), harvest index (%), oil yield/plant (g) and oil yield/fed (kg) in both seasons.

Results revealed that increasing nitrogen fertilizer rates from 30 up to 70 kg N/fed caused significant increases in mean values of almost yield and its related traits of flax, on the other hand, mean values of fiber fineness (Nm) which significantly decreased with increasing nitrogen rates in 2018/2019 and 2019/2020 seasons.

Data revealed that growing flax at plant density with 1500 seeds/m^2 markedly gave the greatest mean values in No. of basal branches/plant, stem diameter (mm) and straw yield/plant (g), upper branching zone length (cm), No. of upper branches/plant, No. of capsules/plant, No. of seeds/plant, seed

yield/plant (g), harvest index (%), oil yield/plant (g) and fiber yield/plant (g) in both seasons. While, the maximum mean values of total plant height (cm), technical stem length (cm), straw yield/fed (kg), seed yield/fed (kg), biological yield/fed (kg), oil yield/fed (kg), total fiber percentage (%), fiber yield/fed (kg), fiber length (cm) and fiber fineness (Nm) which were obtained from planting flax at plant density of 2500 seeds/m^2 in both seasons.

All interactions between the three factors under study were significant in the most cases. Where, the maximum mean values of straw yield/fed (kg) were recorded from the first order interactions between (Giza 12 X 70 kg N/fed), (Giza 12 X 2500 seeds/m^2), (70 kg N/fed X 2500 seeds/m^2) as well as the second order interaction between (Giza 12 X 70 kg N/fed X 2500 seeds/m^2). Whereas, the maximum mean values of seed and oil yields/fed (kg) were recorded from the first order interactions between (Giza 11 X 70 kg N/fed), (Giza 11 X 2500 seeds/m^2), (70 kg N/fed X 2500 seeds/m^2) as well as the second order interaction between (Giza 11 X 70 kg N/fed X 2500 seeds/m^2). Data illustrated an increase in each of total cross section area, cortex area, fiber area, xylem area, fiber index per plant, cortex % and xylem % in all flax cultivars under study (Sakha 3, Giza 11 and Giza 12) when fertilized flax plants with 70 kg N/fed and plant density at 1500 seeds/m^2. Sakha 3 achieved highest fiber area per cross section when compared with the other two ones (Giza 11 and Giza 12), meanwhile the latter two cultivars recorded more xylem area per cross section.

From the obtained results of this study it could be concluded that planting flax cultivar of Sakha 3 under soil fertilized by 70 kg N/fed with plant density of 2500 seeds/m^2 to maximizing fiber yield/fed, while planting flax cultivar of Giza 11 with the same rates of nitrogen and plant density to maximizing seed and oil yields/fed.

Keywords: flax, cultivars, Nitrogen fertilizer, plant densities, straw, seed, oil, fiber yield and anatomical manifestations.

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