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EFFECT OF DIFFERENT LEVELS OF PHOSPHORUS ON SEED AND OIL YIELD OF TWO GENOTYPES OF LINSEED *(Linum usitatissimum* L.)

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A field trial to investigate the effect of different levels of phosphorus i.e. 0, 30, 60 and 90 kg ha^{-1} on the growth and yield of two genotypes of linseed namely 'Chandni' and 'LS-49' was carried out at the Agronomic Research Area, University of Agriculture, Faisalabad. The number of capsules per plant, number of seeds per plant, 1000-seed weight, seed yield and oil contents were influenced significantly by the application of phosphorus. The maximum mean seed yield of 1189.73 kg ha^{-1} was obtained with the application of 90 kg P_2O_5 ha^{-1} but was at par with 60 kg P_2O_5 ha^{-1}. The ~enotypes LS-49 produced significantly higher mean seed yield (1697.48 kg ha^{-1}) than Chandni (1169.77 kg ha-).

Key words: Phosphorus, genotypes and linseed

INTRODUCTION

Linseed *(Unum usitatissimum* L.) is an important and well-known oilseed as well as fiber crop. It is popular due to its industrial importance. Its fiber is used in lenin cloth, canvas, water resistant pipes, packaging material, reinforcement of plastic and concrete, lining material for automotive industry and alternative for fiberglass. While its oil is used as a dying agent in varnish, paints, printing press, ink, high quality soap, oil colour, wood treatment, building and construction industry to some extent.

It covers an area of 7.25 thousands hectares with an annual production of 473 tonnes and average yield of 617 kg ha^{-1} in Pakistan (Govt. of Pakistan, 2000). Its oil has great importance due to its industrial value. Its seed contain 20 - 25 % protein and 30 - 40 % oil along with mineral elements like phosphorus (Hatam and Abbasi, 1994). Linseed yield in Pakistan is very low. The reasons for low yield are poor soil fertility, inadequate use of fertilizer and traditional crop management practices. Nutrient imbalance appears to be the major reason. Application of N along with adequate amount of phosphorus improved the seed yield of linseed (Nagaraja *et al.,* 1997). Singh and Verma (1998) stated that linseed showed a great response to NPK application. Whereas, Grant *et al.* (1999) stated that different cultivars of linseed differed for seed yield, straw yield and harvest index with increased phosphorus levels. Similarly, Khan *et al.* (2000) evaluated five genotypes of linseed and reported that LS-49 gave higher yield than other genotypes i.e. LS-75, LS-73, LS-29 and Chandni. The present study was therefore designed to evaluated the effect of different phosphorus levels on growth and yield of linseed cultivars under agro-climatic conditions of Faisalabad.

MATERIALS AND METHODS

A field experiment to determine the effect of different phosphorus levels viz., 0, 30, 60 and 90 kg ha^{-1} on the growth and yield of two genotypes of linseed namely 'Chandni' and 'LS-49' was carried out at the Agronomic Research Area, University of Agriculture, Faisalabad. The experiment was laid out in randomized complete block design with factorial arrangement having three replications and a net plot size of 1.8 m x 5.0 m. The crop was sown on October 31, 2000, in 30 cm apart single rows with a single row hand drill using a seed rate of 15 kg ha^{-1}. The plant to plant distance of 15 cm was maintained by thinning. Half of nitrogen @ 30 kg ha^{-1} and prescribed doses of phosphorus were applied at sowing in the form of urea and triple super phosphate, respectively. Remaining nitrogen was applied before first irrigation. Ten plants were selected at random from each plot for recording number of capsules per plant, number of seeds per capsule and 1000-seed weight, whereas, seed yield was calculated on plot basis and was converted into kg ha^{-1}. The data collected was analysed using Fisher's analysis of variance technique and least significant differences (LSD) test at 5 % probability level to compare the treatment means (Steel and Torrie, 1984).

RESULTS AND DISCUSSION

Plant population was not affected significantly by different phosphorus levels and genotypes. Non-significant results might have been due to the reason of using a uniform seed rate and maintaining plant population by thinning. These results are supported by the findings of Grant *et al.* (1999) who reported non-significant effect of varieties on plant population. However, the genotypes LS-49 produced significantly higher number of capsules plant^{-1} (128.15), number of seeds capsule^{-1} (9.71), 1000-seed weight (5.74 g), seed yield (1697.48 kg ha^{-1}) and oil contents (38.09%) than 'Chandni'. Variation in yields and yield contributing parameters can be attributed to difference in the genetic potential of the genotypes. These results are in line with Khan *et al.* (2000) and El-Sweify *et al.* (1997) who reported that different genotypes differed significantly for number of capsules plant^{-1}, number of seeds capsule^{-1} 1000-seed weight, seed yield and oil contents.

Table: Effect of different phosphorus levels and genotypes on yield, yield components and oil content of linseed.

Genotypes	Plant Population (m^{-2})	Number of capsules plant"	Number of seeds capsule"	1000-seed weight (g)	Seed yield (kg ha")	Oil content (%)
Chandni	115.58 NS	102.75b	9.07 b	5,43 b	1169.77 b	37.38 b
LS-49	118.83	128.15a	9.71 a	5,74 a	1697.48 a	38.09 a
Phosphorus levels (kg ha")						
0	115.17 NS	104.43b	8.33c	5.12c	957.71c	35.73 c
30	116.33	107.78 b	9.03 b	5.50 b	1022.91 b	36.74b
60	118.67	124.80 a	10.05a	5.81 a	1175.64a	38.92 a
90	118.67	124.77 a	10.13a	5.90a	1189.73a	39.56 a

Any two means not sharing the same letter differ significantly at 5% probability level

Various phosphorus levels substantiauy affected the number of capsules plant", number of seeds capsula", 1000-seed weight, seed yield and oil contents. All the treatments produced higher number of seeds capsule -1, 1000-seed weight, seed and oil yields than control when fertilized @ 30 kg P_2O_S ha" except number of capsules plant" which were at par with control. The maximum number of capsules plant" (124.77), number of seeds capsule-1 (10.13), 1000-seed weight (5.90 g), seed yield (1189.73 kg ha") and oil contents (39.56 %) were obtained when the crop was fertilized @ 90 kg P_2O_S ha". However these yield and yield parameters were statistically at par with treatment where phosphorus was applied @ 60 kg ha". The results revealed that increase in phosphorus rate from 60 kg ha" to 90 kg ha" did not show a significant effect on all these parameters. Whereas, minimum number of capsules plant", number of seeds capsule", 1000-seed weight, seed yield and oil contents were obtained from control. Increase in number of capsules plant", number of seeds capsule", 1000-seed weight, seed yield and oil contents with increased phosphorus level might have been due to better and balanced nutrient supply especially phosphorus. Moreover, the higher yield at higher fertilizer levels might have been due to reduced pre-mature drop of flowers and young capsules The results are in line with those of Khan *et al.* (2000), Shrivastava *et al.* (1994), Grant *et al. (1999)* and Sarode and Naphade (1993) who reported a significant effect of phosphorus application on number of capsules plant" and 1000-seed weight number of seeds capsule", seed yield and oil contents, respectively. The interaction between genotypes and phosphorus levels was found to be non-significant for all the parameters.

Based on the results obtained from this investigation it can be concluded that the genotype LS-49 should be fertilized @ 60kg P_2O_S ha" for obtaining higher seed yield and oil contents under agro-climatic conditions of Faisalabad.

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