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Impact of Fertilizer on Seed Yield of Chick Pea Genotypes

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ABSTRACT

To investigate the performance of three Kabli gram (*Cicer arietinum* L.) genotypes viz. K-88194, K-90395 and N-91 under various fertilizer (NPK) regimes an experiment was carried out during 1999-00 and 2000-2001. Fertilizer levels had a significant but differential effect on the seed yield of gram genotypes. The application of fertilizer @ 35-87.50-00 kg NPK ha^{-1} gave the best results during both the years of investigation. There was a linear increase in yield response of all the three genotypes from 0-0-0 to 35-87.50-00 kg NPK ha^{-1}, it decreased there after with the increase in fertilizer dose. The differences among the varietal means were non significant during 1st year but significant during the 2nd year of study. Whereas, the application of fertilizer dose of 35-87.50-00 kg NPK ha^{-1} to gram genotype K-90395 proved to be the best under the present experimental conditions.

Key Words: Kabli Gram; *Cicer arietinum* L; Fertilizer doses; Seed yield; Genotypes

INTRODUCTION

Gram (*Cicer arietinum* L.) is an important rabi pulse crop of Pakistan. It is grown on an area of about 1047 thousand hectares with total annual production of 660.7 thousand tones giving an average seed yield of 615.0 kg ha^{-1} (Anonymous, 2000). The average gram seed yield of 439 kg ha^{-1} (Anonymous, 2001) can be enhanced only through integrated crop and soil management practices. Generally, poor fertility status of soil is a major cause of low yield in grams. Pakistani soils are deficient in nitrogen and phosphorus in general, but those of rain fed areas are also deficient in potassium (K) and other micro nutrients (Anonymous, 1998). Low organic matter (O.M.) content in the soil is one of the major causes of the deficiency of nutrients (Ahmad *et al*., 1988). It is established that N is an integral part of chlorophyll molecule and amino acids. Phosphorus is a constituent of nucleic acids, phytin and phospholipids. An adequate supply of P early in the life of a plant is important in laying down the primordia for its reproductive parts as is considered essential for seed formation (Ghaffar, 1990). Potassium is essential for N and carbohydrate metabolism, activation of various enzymes and adjustment of stomatal movement and water relations (Boyer & Stout, 1959). Due attention towards nutrient management is not paid in case of low input high risk rain fed legume crops, frequently grown in low fertility soils (Halliday, 1992).

Present studies were carried out to investigate the response of different gram genotypes to varying levels of NPK.

MATERIALS AND METHODS

The investigation was carried out at the Research Area of Agronomy Section, Ayub Agricultural Research Institute, Faisalabad, during 1999-2000 and 2000-2001. The experiment consisted of 18 treatments and three replications. A Randomized Complete Block Design with split arrangements was employed with genotypes as sub plots and fertilizer levels as main plots. Treatments comprised of three gram genotypes i.e. K-88194, K-90395 and Noor-91; and six fertilizer levels, viz: (control); 12.5-30-00; 35-87.5-0, 45-115-00 and 57.5-145-00 NPK kg ha^{-1}. Plot size was kept 2.70 x 9.0 m^2 with a row spacing of 30 cm whereas; plant to plant distance of 15 cm was maintained by thinning. The gram crop was sown with a single row hand drill using 60 kg ha^{-1} seed in the last week of October on a well prepared seed bed during both the years. All the N and P_2O_5 was applied according to the treatments at the time of seed bed preparation. Soil was tested for the availability of NPK and was found sufficient in it, whereas, soil pH was 8.3. Plant protection measures and agronomic practices were kept uniform and normal throughout the growing season. The crop was harvested in the third week of April during both the years. Data on grain yield were recorded on plot basis, which was then converted into yield ha^{-1}. The data were analysed statistically using Fisher's analysis of variance technique and the treatment means were compared using least significant difference test at 5% level of probability (Steel & Torrie, 1984).

RESULTS AND DISCUSSION

Seed yield per unit area is a function of the combined effect of all the individual yield components, which are influenced differently by the various agronomic practices and environmental factors. The data given in Table I (1999-2000) and Table II (2000-2001) elucidated that seed yield was significantly affected by the application of fertilizer treatments. All the fertilizer doses enhanced gram seed yield significantly over control (no fertilizer) irrespective of

Table I. Seed yield of three gram genotypes (kg ha^{-1}) as affected by different fertilizer doses during 1999-00

Varieties	Fertilizer Levels						Mean
	0-0-0 kg NPK ha^{-1}	12.5-30-0 kg NPK ha^{-1}	22.5-57.5-0 kg NPK ha^{-1}	35-87.5-0 kg NPK ha^{-1}	45-115-0 kg NPK ha^{-1}	57.5-145-0 kg NPK ha^{-1}	
K-88194	1499 m	1608 k	1850 e	2422 b	1667 j	1318 r	1727
K-90395	1407 p	1424 n	2047 d	2440 a	1720 g	1370 q	1735
Noor-91	1522 l	1691 i	1702 h	2320 c	1740 f	1410 o	1731
Mean	1476 e	1574 d	1866 b	2394 a	1709 c	1366 f	N.S

LSD at alfa 0.05 for fertilizer =97.25, for varieties = N.S and for F x V = 17.82 kg ha^{-1}

Table II. Seed yield of three gram genotypes (kg ha^{-1}) as affected by different fertilizer doses during 2000-2001

Varieties	Fertilizer Levels						Mean
	0-0-0 kg NPK ha^{-1}	12.5-30-0 kg NPK ha^{-1}	22.5-57.5-0 kg NPK ha^{-1}	35-87.5-0 kg NPK ha^{-1}	45-115-0 kg NPK ha^{-1}	57.5-145-0 kg NPK ha^{-1}	
K-88194	1498 m	1563 h	1799 e	2369 b	1631 g	1289 h	1692 a
K-90395	1304 h	1386 h	2009 d	2401 a	1685 f	1324 h	1685 a
Noor-91	1441 h	1545 h	1639 g	2294 c	1669 f	1375 h	1665 b
Mean	1414 e	1498 d	1815 b	2354 a	1671 c	1329 f	

LSD at alfa 0.05 for fertilizer =83.67, for varieties = 19.85 and for F x V = 31.93 kg ha^{-1}

varieties. However, the highest grain yield of 2394 kg ha^{-1} and 2354 kg ha^{-1} was obtained during the year 1999-00 and 2000-01, respectively with the application of 35-87.5-00 NPK kg ha^{-1}. Lower and higher doses of fertilizer than 35-87.5-00 kg NPK ha^{-1} reduced gram seed yield during both the years. This indicated that 35-87.50-00 kg NPK ha^{-1} is the optimum dose of fertilizer to obtain the maximum seed yield, under Faisalabad conditions.

The current results are in line with those of Ahmed *et al* (1988), Ghaffar (1990), Kar *et al.* (1989) and Halliday (1992) who have reported differential response of chick peas to various fertilizer doses.

It is interesting to know that the average yield response of all the three gram genotypes to different levels of fertilizer was different during both the years. Table I and II revealed that average response of genotypes to fertilizer levels was non significant during 1999-2000 but it was significant in 2000-2001. This difference, however, could be attributed to the change in the field of experiment, as the crop was not sown on the same field during both the years. Halliday (1992) had reported contribution of micro nutrients to increase seed yield in different crops.

As regards interaction between gram genotypes and fertilizer treatments, all levels of fertilizer increased seed yield of all the three genotypes over control during both the years. However, a greater response was shown by the genotype, K-90395 at a fertilizer level of 35-87.5-00 kg ha^{-1} during both the years. Genotypes K-88194 and Noor-91 ranked 2nd and 3rd, respectively, at this level of fertilizer during both the years. Poor yield response of all the genotypes to other levels of fertilizer might be due to lodging at higher levels and stunted at lower levels of fertilizer. Boyer and Stout (1959), and Sarwar (1988) have reported similar results in this regard.

CONCLUSION

Chick pea genotypes K-88194 and K-90395 remained at par giving higher seed yield than Noor-91. Fertilizer dose of 35-87.8-00 NPK kg/ha proved to be the best irrespective of varieties, under Faisalabad conditions.

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