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# EFFECT OF DIFFERENT ROW SPACINGS AND SEEDING DENSITIES ON THE GROWT~ AND YIELD OF GRAM *iCicer arieuhum* L.)

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Growth and grain yield response of gram *(Cicer arietinum L.)* cultivar Paidar-91 to different seeding densities (40,50,60,70 and 80 kg ha") and row spacings (30, 45 and 60 cm) were investigated under field conditions. The seed yield and growth characteristics such as plant height, number of branches plant", number of seeds pod"! and 1OOO-seedweight were influenced significantly by seeding densities. Maximum seed yield of 2299.56 kg ha" was obtained at seeding density of 70 kg ha", whereas row spacing had no significant effect on plant height, seed yield and yield components. For obtaining higher yield of gram cultivarPaidar-91, it may be sown in 30 cm apart rows using seed rate of 70 kg ha"!
Key words: growth and yield of gram, row spacing, seeding densities

## INTRODUCTION

Gram *(Cicer arietinum L.)* due to its high protein contents (20 - 26 %), is considered a good substitute of animal protein. Being a leguminous crop, it is capable of fixing atmospheric nitrogen and thereby enriches the soil in this very important element.. Therefore, the inclusion of gram in an exhaustive crop rotation is very beneficial.. It is sown on an area of 1.10 million hectares with a total production of 0.8 million tonnes of seed giving an average yield of 696 kg ha"! (FAO, 1999). Inspire of efforts made in the past to increase its production, the average seed yield of gram in Pakistan is still very low. Good yields even from the high yielding varieties cannot be achieved without the adoption of improved package of technology. Seeding densities, appropriate adjustment between the rows. judicious use of fertilizer, timely sowing and irrigation play a remarkable role in increasing the yield of crops.

The increase in seeding densities after a certain limit leads to a decreased seed yield of chickpea (Hernandez and Hill, 1983). A great variation exists in number of plants m'2 for obtaining higher yield of chickpea. Saxena (1979) found that yield was increased with increasing plant population up to 50 plants m,2 for irrigated chickpea and 23 plants m'2 for unirrigated chickpea. Miccolis and Scavo (1985) grew 8 chickpea cultivars at planting density of 10 - I1I plants m·2 and obtained the highest yield of 0.94 t ha"! with 56 plants m·2. Singh et al. (1988) planted five chickpea varieties at seeding densities of 10, 55 and 66 m'2 and the highest seed yield was given by tall varieties BG-257 and BG-268 at 66 plant m'2 due to more branches plant", pods plant" and lOaD-seed weight than other varieties. Singh and Singh (1989) planted chickpea cultivars H86-143 and H82-2 at seeding densities of 44, 55 and 66 m'2. They reported that in H82-2 seed yield was the highest at density of 44 plants m' 2, whereas in H86-143. the seed yield was the highest at a density of 55 plants m'. Hussain et al. (1998) reported that higher plant population increased the seed yield compared to a lower plant population due to more number of seeds plant", branches plant" and 1000-seed weight. whereas harvest index, seed pod"! and plant height were not influenced statistically by plant population.

Row spacing is also considered an important variable influencing yield of crops. Appropriate adjustment between the rows facilitates easy handling of crops which leads to increased potential for protein synthesis through better nutrition, more air and light penetration, resulting in higher yields. Beech and Leach (1989) grew chickpea at row spacings of 18, 36, 53 and 71 cm with plant population densities of 14, 28. 42 and 56 plants $m^{-2}$ and reported that row spacing had a little effect on above ground dry matter production and seed yield, whereas Singh and Singh (1989) obtained the highest seed yield of 1.99 t ha"! at row spacing of 45 cm. Sarwar (1998) reported that row spacings significantly influenced the number of branches plant" and number of seeds plant", whereas plant height, number of seeds pod"!, 1000-seed weight, biological yield, seed yield. straw yield and harvest index were not affected significantly by row spacings. The present study was designed to determine the optimum seeding density and distance between rows to obtain higher yield of gram cultivar "Paidar-91" ' under the environment prevailing in Faisalabad.

## MATERIALS AND METHODS

A field experiment to study the growth and yield response of chickpea to different seeding densities (40, 50, 60. 70 and 80 kg ha"!) and row spacings (30. 45 and 60 cm) was conducted at the Postgraduate Agricultural Research Station. University of Agriculture, Faisalabad. The experiment was quadruplicated in split plot design. keeping row spacing in main plots and seeding densities in subplots. measuring 3.6m x 7m.

The crop was sown in the month of November with a single row hand drill.. Nitrogen at the rate of 15kg haand $P_2O_5$ at the rate of 40 kg ha"! were applied at the time of sowing in the form of urea and single super phosphate respectively. All plots were harvested and threshed manually. Twenty plants from each plot were selected randomly to record plant height. number of branches plant", number of seeds plant" and number of seeds pod"!. From each plot three samples of 1ODD-seedwere taken at random and weighed to get IOOO-seed weight.. Plant height was recorded with the help of meter rod from soil level to the tip of plant.. Seed

yield from individual plot was recorded and then it was converted on hectare basis. Harvest index was calculated using the following formula:

$$\text{Harvest Index} = \frac{\text{Economic yield}}{\text{Biological yield}} \times 100$$

The data thus collected were analysed statistically using Fisher's analysis of variance technique and least significant difference (LSD) test at 5% probability was employed to test the difference among the treatment means (Steel and Torrie, 1984).

## RESULTS AND DISCUSSION

Plant Height: Plant height was influenced significantly by seeding densities (Table I). The height of the plants sown at seeding densities of 60, 70 and 80 kg ha" was statistically similar. The differences between seeding densities of 40 and 50 kg ha"' were also non-significant. . The maximum (75.34 cm) and minimum (69.73 cm) plant height was obtained at the seeding densities of 60 and 40 kg ha"' respectively. These significant differences might have been due to competition between the plants for light. These results are contradictory to those of Hussain et al. (1998) who reported non-significant effects of seeding densities on plant height.. The effect of row spacing on plant height was not significant, however, plant height decreased with increase in row spacing and it ranged from 70.92 cm to 74.78 cm at 60 cm and 30 cm spacing respectively. The increase in height with decrease in row spacing might be due to more competition among the plants for sunlight.. Sarwar (1998) had also reported non-significant effects of row spacing on plant height..

Number of Branches Plant": The data in Table I revealed that seeding densities had a significant effect on number of branches plant", The number of branches plant" decreased with increased seeding density. The plot sown at a seeding density of 40 kg ha" produced the maximum branches (4.76) and did not differ significantly from 50 kg ha", The minimum number of branches plant" (3.51) was recorded from the plots sown at the seeding densities of 80 kg ha" and it was significantly lower from all other seeding densities. The seeding densities of 60 and 70 kg ha" did not differ significantly from each other. The increased seed rates resulted in more plants per unit area and hence less number of branches plant" due to more competition for nutrients, light, water and air. Singh et al. (1988) and Hussain et al. (1998) have also reported significant effects of seeding densities on the number of branches plant", The effect of row spacing on number of branches plant" was not significant.. However, the maximum (4.35) and minimum (4.10) branches were obtained from plots sown at row spacing of 60 cm and 40 cm respectively. The results are contradictory to those of Sarwar (1998). This variation in results may be due to differences in genetic make up of the varieties, soil fertility status or environmental conditions.

Number of Seeds Pod-1: The seeding densities differed significantly regarding number of seeds pod". The number of seeds pod" decreased with increased seeding density. The plot sown at a seeding rate of 40 kg ha" did not differ significantly from those sown at seeding density of 50 k~ ha", but produced significantly more number of seeds pod' than the rest of seeding densities. The lowest number of seeds was recorded at a seed rate of 80 kg ha"' and was statistically at par' with 60 and 70 kg ha"'. These results did not agree with those of Hussain et al. (1998). The row spacing did not significantly influence the seeds pod"'. Non-significant effect of row spacing on number of seeds pod"' was also reported by Sarwar (1998).

IOOO-seed Weight: Seed weight was influenced significantly by the seeding densities. There has been a consistent decrease in the seed weight with increased seeding densities. The plots sown at a seed rate of 40 kg ha" produced the heaviest seeds but did not differ significantly from 50 and 60 kg ha' ı. The lowest seed weight was produced by 80 kg seed rate ha" but was statistically similar to 60 and 70 kg ha"'. The results conform to those of Hussain et al. (1998). All row spacings had statistically similar seed weights, being maximum (178.16 g) at 60cm spacing. Sarwar (1998) also reported non-significant effect of row spacing on IOOO-seedweight..

Seed Yield: Seeding densities significantly affected the yield. Plots sown at a seeding density of 70 kg ha" gave the highest seed yield (2299.56 kg ha'I~. The minimum seed yield was recorded using 80 kg ha' seed rate and it was statistically similar to the seeding rate of 40 kg ha": The differences between 40, 50 and 60 kg ha'lseeding densities were non-significant. . These results are in conformity with those of Sexena (1979), Miccolis and Scavo (1985), Singh et al. (1988) and Hussain et al. (1998). The effect of row spacing on the seed yield was not significant and maximum seed yield (2095.20 kg ha") was obtained from plots sown at 30 cm apart rows. These results are in accordance with those of Beech and Leach (1989) and Sarwar ( 1998).

Harvest Index (%): The seeding densities and row spacings did not affect the harvest index significantly and the values recorded ranged from 38.68% to 44.36%. Non-significant effects of seeding densities and row spacings on harvest index have also been reported by Hussain et al. (1998) and Sarwar et al. (1998).

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