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Short Communications

Effect of sowing dates and plant population on chickpea (*Cicer arietinum*) genotypes

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ABSTRACT

Results of the field experiment conducted during 2007-08 at Hisar, revealed superiority of chickpea (*Cicer arietinum* L.) genotypes 'HC-1' in term of pods/plant,100-grain weight, seed and biological yields and harvest index over 'BG-372' and 'PBG-1'. Significant decline in growth and yield attributing characters and yield was recorded, when sowing was delayed from December 1 to December 20. Planting geometry of 30 × 7.5 cm yielded significantly higher than 30 × 10 cm.

Key words: Chickpea genotype, Plant population, Sowing dates, Yield

Chickpea is the third important pulse crop in the world after french bean (*Phaseolus vulgaris* L.) and field peas (*Pisum sativum* L.), with an acreage of 11.15 Mha, production of 9.2 Mt and productivity of 826 kg/ha. (FAO, 2009) It is also the premier food legume crop in India, covering about of 8.56 Mha area with a production of 7.35 Mt and productivity of 859 kg/ha (AICRPC, 2010). India is contributing highest share in area (65.3%) and production (67.2%) in the world (FAO, 2009).

Poor agronomic practice such as seed rate, date of sowing, selection of suitable genotypes, fertilizer management, *etc.* are responsible for low productivity of chickpea in India. In northern part of India, chickpea is normally sown during second fortnight of October. Some time, its sowing is delayed depending upon the withdrawal of monsoon and late harvest of preceding *kharif* crop like rice, cotton etc., which ultimately results in poor seed yield (Jettner *et al.,* 1999). Within the genetic limits, time of sowing is an important agronomic factor affecting the productivity of most of the arable crops, owing to changes in environmental conditions to which phenological stages of crops are exposed. A good genotype under modified environment of different dates of sowing and maintenance of optimum plant population may help in realizing optimum yield level. With the development of new genotypes, it becomes essential to test them at different sowing dates to exploit their full production potential. Genotypes may behave differently due to their plant architecture particularly under late sown conditions because of poor plant growth. Under such situation plant population play an important role in improving the productivity of crop (Kumar *et al.,* 2003). Hence, the present study was undertaken to study the effect of plant population and sowing dates on growth, yield attributes and yield of chickpea genotypes.

A field experiment was conducted during *rabi* season of 2007-08 at agronomy research farm of CCS Haryana Agricultural University, Hisar situated at 29°10' N latitude and 75°46' E longitude at an altitude of 215.2 M above mean sea level, to study the effect of plant population and sowing dates on growth, yield attributes and yield in different chickpea genotypes. The soil of the experimental site was sandy loam, having 0.4% organic carbon, 153.6 kg/ha available N, 24.2 kg/ha available P_2O_5, 254.9 kg/ha available K_2O, 7.7 pH and 0.46/dsm EC. The experiment was laid out in split plot design with three replication and eighteen treatments combinations of 3 dates of sowing, 3 genotypes and 2 plant populations. The main plots received three dates of sowing *viz.* December 1, December 10 and December 20 and three genotypes *viz.* 'HC-1', 'PBG-1' and 'BG-372' while 2 plant population *viz.* 30 × 10 cm and 30 × 7.5 cm were kept in sub-plots.

Seeds were sown by pora method at 30 cm spacing in well prepared seed bed with the help of hand plough. After 15 days of planting, extra plants were thinned out to generate two planting geometry of 30x10 cm and 30x7.5 cm. The sowing was done on the respective sowing dates as per treatments. Crop received 20 kg N and 40 kg P_2O_5/ha. Observations were recorded as per the established norms.

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The planting geometry of 30x7.5 cm produced significantly more number of plants per meter row length (mrl) of chickpea genotypes during both the initial and maturity stages (Table 1). December 1 sowing resulted in significantly taller plant and Leaf area index (LAI) as compared to delayed sowing, which might be due to the most congenial environment available throughout the crop period from sowing to harvest during this date of sowing. Lowest plant height and LAI recorded with delay sowing (Figure 1). Decreases in plant height and LAI is mainly due to decreased temperature in delayed sowing, which may cause the yellowing and chlorosis of leaves, (Saini *et al.,* 1996). 'PBG-1' produced significantly taller plants than 'BG-372'which was on par with 'HC-1' (Table 1). Highest LAI was recorded with genotype 'HC-1' and 'BG-372' as compared to 'PBG-1' at 60, 90 and 120 DAS. This was probably due to superior genetic make of 'HC-1' and 'BG-372' genotypes as compared to 'PBG-1' (Fig. 1).

Chickpea sown on December 1 produced maximum number of pods per plant, which were significantly higher than all other sowing dates and the lowest values were obtained in December 20 sowing. This could be attributed due to higher growth attribute, which may be responsible for better source sink relationship. The finding of Kabir *et al.* (2009) also supports these results. Maximum number of pods/plant were recorded in 'HC-1'. Number of seed per pod and 100-seed weight remained unaffected due to dates of sowing and plant population. Genotypes differed significantly with respect to 100-seed weight. The grains of 'HC-1' were found significantly bolder than all other genotypes. Seeds of 'PBG-1' were found bolder than 'BG-372'. Similar results were reported by Kumar *et al.* (2003).

Sowing on December 1 produced the highest seed (1.50 t/ha) and biomass yields (6.70 t/ha) (Table 1). December 1 sowing provides the congenial environment condition for the growth and development of the plant. The decrease in seed yield was 8.42 and 23.19% with delay in sowing to December 10 and December 20 respectively. Increase in seed yield with December 1 sown crop was associated with more growth attributes like leaf area and crop growth rate, which resulted into higher yield attributes. 'HC-1' genotype produced significantly the highest seed (1.49 t/ha) and biomass yields (6.34 t/ha) and the lowest obtained in 'PBG-1' genotype. This is possibly due to phenotypic expression of the genetic potential of the genotypes. Similar result was reported by Kumar *et al.* (2006). Narrow intra-row spacing (30 × 7.5 cm) recorded higher seed yield (1.37 t/ha) and biological yield (5.96 t/ha) than wider intra-row spacing (30 × 10 cm). Kumar and Kadian (2006) also reported similar results.

Harvest index was recorded maximum in 20 December sowing. This may be due to better partitioning of photosynthetes between the different plant parts. Relatively less harvest index was found in December 1 sowing (Table 1). Genotypes 'BG-372' recorded higher harvest index followed by 'HC-1' and 'PBG-1'. Wider spacing of 30 × 10 cm caused improved harvest index over narrow spacing. Interaction effect of sowing dates and genotypes

Table 1. Effect of sowing dates and plant geometry on plant height, yield attributes and yield of chickpea genotypes

Treatment	Plant population/ meter row length		Plant height (cm)		Pods/ plant	Seeds/ pod	100-seed weight (g)	Seed yield (t/ha)	Biological yield (t/ha)	Harvest index (%)
	Initial (25 DAS)	At Maturity	120 DAS	At Maturity						
Sowing dates										
December 1	12.1	10.1	47.5	48.8	43.6	1.71	10.62	1.50	6.70	22.3
December 10	11.7	10.0	42.2	43.4	38.5	1.63	10.68	1.37	5.91	23.2
December 20	11.3	9.9	40.3	41.4	36.0	1.53	10.96	1.15	4.59	25.0
SEm±	0.15	0.14	0.7	1.2	0.5	0.1	0.19	0.029	0.01	0.15
CD (P=0.05)	NS	NS	2.3	3.7	2.0	NS	NS	0.11	0.41	0.42
Genotypes										
'HC-1'	11.7	10.2	43.1	44.2	41.3	1.63	11.30	1.49	6.34	23.5
'PBG-1'	11.7	10.0	45.5	46.3	37.4	1.66	10.87	1.21	5.28	23.1
'BG-372'	11.8	9.9	41.3	43.1	39.3	1.57	10.08	1.32	5.58	23.8
SEm±	0.16	0.19	0.5	0.8	0.5	0.04	0.14	0.01	0.07	0.09
CD (P=0.05)	NS	NS	1.5	2.3	1.4	NS	0.39	0.05	0.22	0.27
Plant population										
30 × 10 cm	10.1	8.2	43.1	44.4	39.3	1.65	10.81	1.30	5.51	23.8
30 × 7.5 cm	13.4	11.8	43.5	44.7	39.4	1.59	10.70	1.37	5.96	23.2
SEm±	0.13	0.15	0.4	0.6	0.4	0.03	0.11	0.01	0.06	0.07
CD (P=0.05)	0.39	0.46	NS	NS	NS	NS	NS	0.04	0.18	0.22

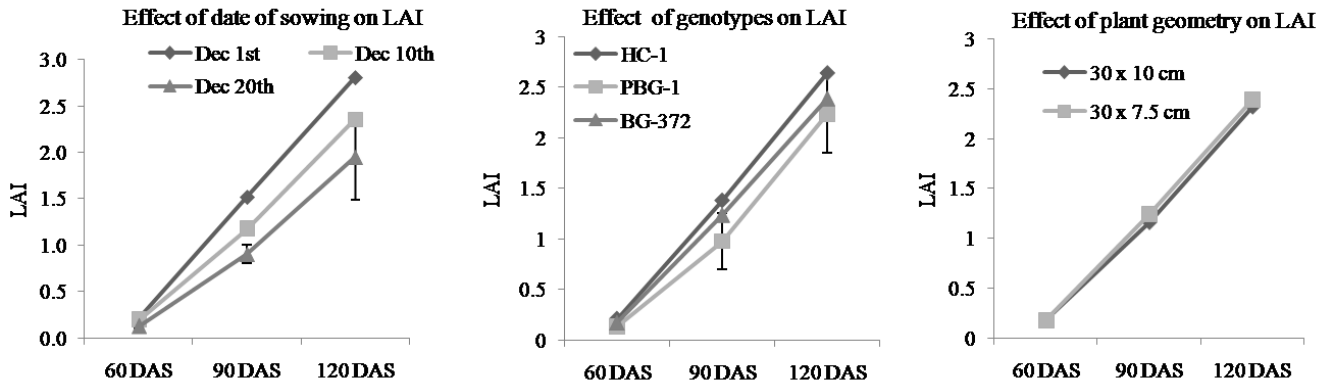

Fig. 1. Effect of plant population and sowing dates on leaf area index of chickpea genotypes. Standard error bars indicate the CD values.

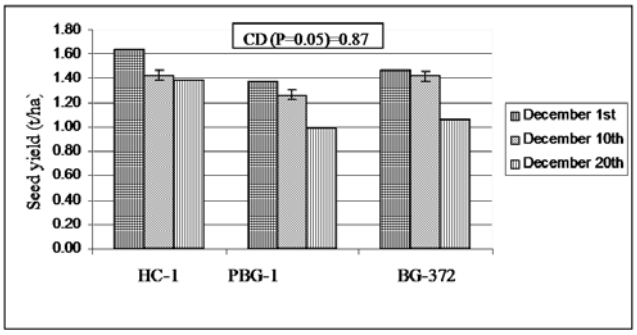

Fig. 2. Interaction effect of sowing dates and genotypes on seed yield of chickpea (t/ha). Standard error bars indicate the CD values.

was found significant on seed yield. With all the sowing dates, the genotype 'HC-1' produced significantly higher seed yield than other genotypes and minimum being with the 'PBG-1' (Figure 2).

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