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YIELD PERFORMANCE OF CHICKPEA CULTIVARS AS INFLUENCED BY SOWING TIME AND SEED RATE

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ABSTRACT

Field experiments were conducted during *rabi* 2012-13 and 2013-14 at Hisar to study the yield response of four chickpea cultivars (H09-23, H08-18, C-235 and HC-1) two dates of sowing (1st fortnight of November and December) and three seed rates (40, 50 and 60 kg ha^{-1}) at Pulse Research Area of CCS Haryana Agricultural University, Hisar. The results indicated that chickpea sown on 1st fortnight of November produced better yield attributes (except100 grain weight) and yield in both the years. Number of pods per plant was recorded highest in cultivar H09-23 in 2012-13 and in cultivar H08-18 in 2013-14. Cultivar H09-23 and H08-18 produced significantly higher grain yield than other cultivars. Seed rates at 40 kg ha^{-1} produced 12.5% and 18.19 % higher number of pod per plant than with 60 kg ha^{-1} seed rate in both the year. Highest stover yield was recorded with seed rate of 60 kg ha^{-1} in 2012-13 and with 50 kg ha^{-1} seed rate in 2013-14. Grain yield of chickpea cultivars were significantly higher with 50 kg ha^{-1} seed rate in 2012-13 and with 40 kg ha^{-1} seed rate in 2013-14.

INTRODUCTION

Pulses play a significant role in diet of the Indian vegetarian people and in animal nutrition. These are not only rich source of protein but also have higher amino acid composition than cereals.Chickpea *(Cicer arietinum* L.) is the most important *rabi*pulse crop. In India, it accounts for more than one third of the area and about 50% of the production of pulses. India accounts for 65% of the world acreage and 67% production of chickpea at present. It is currently grown on about 11.5 million ha, with 96% of the area in developing countries. Chickpea production has increased during the past 30 years from 6.5 million tons (1978-1980 average) to 9.6 million tons (2007-09) because of increase in grain yields from 630 to 850 kg/ha during this period. Despite its economic and nutritive importance, the yield of chickpea is very low in India. There are many factors responsible for the low yield. The use of traditional or low yielding varieties and adoption of poor management practices are of great importance. Amongst the agronomic practices, sowing methods and proper seed rate are of great importance (Reddy *et al*., 2003).Various genotypes behave differently due to their plant architecture particularly under late sown condition because of poor plant growth. Under such situation plant population play an important role in improving the productivity of crop.Time of sowing is an important non-cash input which has been recognized as the most critical factor in influencing the yield of chickpea. Sowing of chickpea at optimum time ensures a better harmony among soil, plant and atmospheric system. Studies have shown that early winter sowing (mid-October to mid-November) is the optimum period (Saxena, 1987; Papendick *et al.,* 1988). Late sowing, after November 18 reduced yield by 28% for every 10 day interval delay (Paikaray and Misra, 1992). Keeping in view, the scanty information available on these aspects, present investigation entitled, y*ield* performance of *chickpea* cultivars as influenced by sowing time and seed ratehas been planned to be carried out.

MATERIALS AND METHODS

The study was conducted at Pulse Research Area of CCS Haryana Agricultural University, Hisar during rabi season of 2012-13 on sandy loam soils under irrigated conditions. The factorial experiment consisting of 24 treatment combinations with two sowing time (1st fortnight of November and 1st fortnight of December) and four cultivars (H09-23, H08-18, C-235 and HC-1) kept in main plots while three seed rates *viz*. 40, 50 and 60 kg ha^{-1} in split plot design with three replications. The soil of the experimental site was deep sandy loam having pH of 7.9, EC of 0.13 dS/m and low in organic carbon (0.34%), low in available N status (193.36 kg ha^{-1}), medium in available P_2O_5 (32.18 kg ha^{-1}) and high in available K_2O (249.67 kg ha^{-1}). The crop was sown with a row spacing of 30 cm as per the dates of sowings after pre sowing irrigation. Recommended dose of fertilizer ie 20 N + 40P_2O_5 Kg ha^{-1} was applied in the form of di- ammonium phosphate as basal dose at the time of sowing. The crop was irrigated as and when required so as to maintain adequate soil moisture in the root zone The crop was sprayed with monocrotophos (1.25 l/ha) at the initiation of flowering and at pod filling stage to protect the crop from pod borer attack.The crop was harvested from 8th to 15th May,

2013 and 2015.The yield and yield attributing characters were measured at the time of harvest.

RESULTS AND DISCUSSION

Effect of sowing dates

A cursory glance on the data in Table 1 indicates that sowing chickpea on 1st fortnight of November resulted in higher pods/plant and higher grains/pod as compared to delay sowing. This was due to decreased temperature in delayed sowing. Higher yield attributing parameters in early sown chickpea might be attributed to more favourable conditions for growth of root and nodules and thereby leading to vigorous vegetative growth through taller plants, more dry matter accumulation and branches per plant which might have encouraged plant in the formation of pods.

Sowing time showed pronounced effect on yield attributes and finally on the yield of chickpea. The better development of yield attributes might also be due to early growth stages in November sowing. Moreover, delayed germination due to low temperature in 1st fortnight of December sowing invariably resulted in poor crop growth. Straw yield is both the year were 50.47and 83.51% higher in November sowing as compared to later one. Sowing of chickpea on 1st fortnight of December resulted in about 24.04 and 22.48 % decrease in grain yield in 2012-13 and 2013-14, respectively. Increased stover and biological yield under early sowing might be due to higher dry matter accumulation and better yield attributing characters due to accumulation of more photosynthates in sinks. The grains pod^{-1} and 100-grain weight have been reported the source of yield. Parmar *et al*. (2015) revealed that maximum grain yield 1855 kg/ha was recorded from early sown crop on November 07, whereas minimum yield 612 kg/ha was obtained from late sown crop of chickpea. The findings confirmed the results of Prasad *et al*. (2012).

Performance of chickpea cultivars

Chickpea cultivars differed significantly with each other in respect of yield attributing parameters. Various cultivars did not differ significantly in respect of number of grains per pod in both the year. But, there was significant variation in number of pods per plant and 100 grain weight. Maximum number of pods was recorded in cultivar H09-23 in 2012-13 and in cultivar H08-18 in 2013-14 and least in C235 in both the year. On an average, chickpea cultivar H08-18 and H09-23 were found significantly bolder than rest two cultivars. Higher yield attributing parameters in chickpea cultivar H08-18 and

Table 1: Effect of sowing time and seed rate on yield attributes and yield of chickpea cultivars

Treatments	Pods/plant	Grains/pod	100 grain wt.(g)	Grain yield(kg ha^{-1})	Stover yield(kg ha^{-1})
Date of sowing (2012-13)					
1st fortnight of November	38.39	1.50	14.27	2063	8,947
1st fortnight of December	28.83	1.24	14.24	1567	5,946
SEm ±	0.48	0.027	0.16	36	296
CD at 5%	1.47	0.083	NS	109	898
Cultivars					
H08-18	35.01	1.39	15.83	1932	7,696
H09-23	36.68	1.35	15.66	1995	7,204
C235	29.62	1.39	12.19	1498	7,547
HC-1	33.10	1.36	13.33	1834	7,337
SEm ±	0.69	0.04	0.23	51	418
CD at 5%	2.09	NS	0.70	154	NS
Seed rates					
40 kg ha^{-1}	36.27	1.45	14.04	1832	6,997
50 kg ha^{-1}	33.00	1.47	14.42	1869	7,539
60 kg ha^{-1}	31.53	1.23	14.3	1743	7,803
SEm ±	0.58	0.03	0.17	36	128
CD at 5%	1.67	0.08	NS	105	369
Date of sowing (2013-14)					
1st fortnight of November	33.07	1.36	14.72	1988	7381
1st fortnight of December	24.41	1.16	14.44	1541	4022
SEm ±	0.27	0.03	0.11	16	55
CD at 5%	0.81	0.105	NS	49	168
Cultivars					
H08-18	31.31	1.22	16.44	1903	5830
H09-23	28.88	1.25	16.12	2072	5752
C235	26.12	1.27	12.51	1349	5357
HC-1	28.64	1.30	13.25	1734	5867
SEm ±	0.38	0.04	0.15	23	79
CD at 5%	1.15	NS	0.458	69	238
Seed rates					
40 kg ha^{-1}	31.18	1.29	14.45	1817	5335
50 kg ha^{-1}	28.66	1.28	14.66	1742	5900
60 kg ha^{-1}	26.38	1.21	14.63	1734	5870
SEm ±	0.57	0.06	0.21	34	117
CD at 5%	1.63	NS	NS	97	336

H09-23 might be attributed to the differences in their genetic makeup.

Various chickpea cultivar failed to influence the stover yield in 2012-13 which might be ascribed to the non significant differences in their number of grains per pod. But, in 2013-14 cultivars H08-18 and C235 gave higher stoveryield. Chickpea cultivar H09-23 recorded higher grain yield than others. However, this difference did not appear to the level of statistical significance with H08-18. Higher grain yield in chickpea cultivar H09-23 and H08-18 than rest two cultivars (HC-1 and C235) might be ascribed to their better vegetative growth in terms of plant height, number of pods and bolder seeds .The differences in grain yield of chickpea genotypes have also been reported by Nagarajaiah *et al*. (2005). These results are also in concurrence with those of Sharma *et al*. (1988), Dixit *et al*. (1993) and Kumar *et al*. (2003).

Effect of seed rates

Varying seed rates favourably influenced the yield parameter of chickpea (pods per plant and grains per pod) in both the years (except grains/pod in 2013-14). Seed rates of 40 kg ha^{-1}produced maximum number of pods per plant which were significantly higher than other seed rates.Seed rates at 40 kg ha^{-1} produced 12.5 and 18.19 % higher number of pod per plant than with 60 kg ha^{-1} seed rate in 2012-13 and 2013-14, respectively. Seed rates at 50 kg ha^{-1} produced maximum number of grains per pod which were significantly higher than other two seed rates in 2012-13. However, 100 grain weight of chickpea cultivars was not significantly affected by different seed rates in both the years.

Grain yield of chickpea cultivars were significantly higher with 50 kg ha^{-1} seed rate in 2012-13 and with 40 kg ha^{-1} seed rate in 2013-14 as compared to 60 kg ha^{-1} seed rates. The number of grains per pod and test weight have been reported the source of yield. This might be attributed to higher number of grains per pod and test weight in case of 40 and 50 kg ha^{-1} seed rate. Highest stover yield was recorded with seed rate of 60 kg ha^{-1} in 2012-13 and with 50 kg ha^{-1} seed rate in 2013-14. Machado *et al*. (2003) also reported that grain yield increased when the seeding rate was increased from 17 to 33 seeds m^{-2}.

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