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STUDIES ON METHOD OF PLANTING ON SEED YIELD AND QUALITY OF CHICKPEA (*CICER ARIETINUM L.*) GENOTYPES

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Abstract

The field and laboratory were carried out during *rabi* season 2011, at the Department of Seed Science and Technology, College of Agriculture, UAS, Raichur. Significantly higher seed yield (21.41 qt ha^{-1}) of chickpea were recorded in ridges and furrow planting method (45x10 cm) over other planting methods which may results from significantly higher growth and seed attributes. Among genotypes BGD-103 was recorded significantly higher seed yield (19.89 qt ha^{-1}) and its seed yield attributes as compared to JG-11 and A-1. The planting method and genotype did not differ with respect to germination percentage but recorded significantly higher Seedling Vigour index-I (2832 and 2931) and Seedling Vigour index-II (20.1 and 21.0) respectively.

Key words: Chickpea, Planting methods, Genotypes, Seed quality.

Introduction

Pulse crops play an important role in Agriculture. Besides being rich in protein, they sustain productivity in cropping system. Their ability to use atmospheric nitrogen through biological nitrogen fixation is economically more sound and environmentally acceptable. Pulses are considered secondary to cereal crops and grown on marginal soils, as they are perceived to be low yielding and less remunerative crops. As a result, the growth rate of production of pulses in India, the major pulse growing country in the world is low compared to cereals. As a result of ever increasing the population, availability of pulses shown sharp decline. The Government is therefore forced to import pulses to meet at least a part of growing demand. Hence, there is need to increase the seed yield and quality with particular reference to chickpea.

There are many factors responsible for low yield, but among those factors use of traditional or low yielding varieties and poor adoption of management practices are considered most important. The average yield of chickpea is quite low as compared to national average. Several reasons have been attributed to low productivity, of which the major ones are 90 per cent of its area is under rainfed condition, besides it is grown as post-monsoon winter crop on conserved soil moisture. Among many reasons, less water availability during its growing period is one of the major factors for low productivity of chickpea. Several workers have reported the positive response of seed yield in chickpea to planting methods under protective irrigated condition. Chickpea seed yield can be increased by providing suitable planting methods (Agarwal *et al*., 1997). So there is need to adopt a suitable management practices like a proper planting method and to develop high yielding genotypes.

Material and Methods

The field experiments were carried out during *rabi* season 2011, at the Department of Seed Science and Technology, College of Agriculture, UAS, Raichur to study the "Effect of planting methods on seed yield and quality of chickpea (*Cicer arietinum* L.) genotypes". Raichur during *rabi* 2011-12. Raichur is situated in North Eastern Dry zone (Zone-2) of Karnataka between 16° 15' N latitude and 77° 20' E longitude with an altitude of 389 m above the Mean sea level. The soil of experimental site was medium black in nature.

There were 18 treatment combinations comprising of six planting methods in main plot P_1: Flat bed planting method (30x10 cm), P_2: Flat bed planting method (45x10 cm), P_3: Raised bed planting method (30x10 cm), P_4: Raised bed planting method (45x10 cm), P_5: Ridges and Furrow planting method (30x10 cm) and P_6: Ridges and Furrow planting method (45x10 cm) and three genotypes G_1: A-1, G_2: JG-11 and G_3: BGD-103. Treatments were replicated thrice in split-plot design. The seed plot was raised by following recommended package of practices for chickpea cultivation under irrigated condition. All the data on growth, seed and yield parameters were recorded and statistically analyzed.

Results and Discussion

Different planting methods exhibited significant influence on the growth and seed yield and quality of chickpea. Planting methods extended significant influence on growth parameters (Table. 1.). Among them total dry matter production which was increased significantly from 28.4 g $plant^{-1}$ in flat planting method 30x10 cm to 31.5 g $plant^{-1}$ raised bed planting method 45x10 cm and 32.1 g $plant^{-1}$ in ridges and furrow planting method 45x10 cm. Higher total dry

matter in this treatment is attributed to significantly higher number of branches per plant (Table. 1) which results in higher dry matter accumulation in leaf, stem and reproductive parts compared to other methods of planting. Moisture stress caused decrease in enlargement of leaves due to reduced cell enlargement and earlier cell maturation as these processes depend on turgidity of cells. Thus, this reduction in leaf size reduced photosynthetic area and subsequently the yield, might be probable reason for decreasing dry matter content in flat bed planting method. These results are also in accordance with Saikh and Mungse (1998) who observed reduction in dry matter production per plant with an increase in plant population per unit area. Different planting methods did not differed significantly with respect to number of days to 50 % flowering but ridges and furrow method of planting 45x10 cm took more days to reach 50 % flowering (46.3 days) over other planting methods (Table. 1). Among genotypes studied BGD-103 produced significantly higher dry matter production due to increased number of branches per plant.

Table. 1. Effect of planting methods and genotypes on growth parameters in chickpea

Treatments	Dry matter production (g/plant)				Number of branches per plant				Days to 50 % flowering			
	Genotypes (G)				Genotypes (G)				Genotypes (G)			
Planting methods (P)	G_1	G_2	G_3	Mean	G_1	G_2	G_3	Mean	G_1	G_2	G_3	Mean
P_1	27.8	28.7	28.8	28.4	17.1	17.5	17.8	17.5	44.2	46.4	47.4	46
P_2	28.8	29.1	29.2	29.0	17.7	17.9	18.5	18.0	44.1	46.8	47.3	46.1
P_3	29.4	30.7	31	30.3	18.3	18.2	18.5	18.3	45.3	46.6	47.5	46.5
P_4	30.5	31.8	32.4	31.5	18.5	19.4	19.6	19.3	45.2	46.6	46.5	46.1
P_5	29.8	31.2	31.8	30.9	18.8	18.8	19	18.9	45.7	46.8	46.7	46.4
P_6	31.1	32.4	33	32.1	19.4	20.1	20.5	20.0	45.4	46.5	47.1	46.3
Mean	29.6	30.6	31		18.3	18.6	18.9		45	46.6	47	
	S.Em±		CD (0.05)		S.Em±		CD (0.05)		S.Em±		CD (0.05)	
Planting methods (P)	0.18		0.59		0.11		0.38		0.17		NS	
Genotypes (G)	0.12		0.39		0.07		0.24		0.11		0.38	
G at same level of P	0.34		NS		0.35		NS		0.4		NS	
P at same or different level of G	0.33		NS		0.43		NS		0.38		NS	

NS: Non-significant

The mean number of pods per plant was highest (40.7) in ridges and furrow planting method (45x10 cm) followed by raised bed method 45x10 cm and significantly lowest (32.2) in flat bed method 30x10 cm (Table. 2). Pooniya *et al*. (2006) also recorded significantly higher pods per plant and number of seeds per plant in row spacing of 40 cm when compared to 20 cm and 30 cm row spacing. The ridges and furrow 45x10 cm method also recorded significantly higher test weight (27.1 g) followed by 26.7 g in raised bed planting method 45x10 cm and significantly lowest (25.3 g) in flat bed planting method 30x10 cm (Table. 2). Several workers reported an increase in plant growth and seed yield with different planting methods. (Jadav and Pawar, 1999, Karande *et al*., 2006). Among genotypes studied BGD-103 produced significantly higher number of pods per plant and test weight (32.9 g) over other genotypes. Similar differences in number of pods per plant and test weight of chickpea genotypes were observed by Tomer *et al*. (1988), Jadav and Pawar (1999) and Dharmaraj *et al*. (2005). The highest yield of 21.41 q ha^{-1} was obtained with ridges and furrow method 45x10 cm), followed by 20.47 q ha^{-1} under raised bed method 45x10 cm, ridges and furrow (19.45 q ha^{-1}) planting methods 30x10 cm and 16.25 q ha^{-1} in flat bed method 30x10 cm (Table. 4). These results are in accordance with experiment conducted at Rahuri (Maharashtra), where ridge and furrow system significantly increased chickpea seed yield (22.62 q ha^{-1}) over flat bed system (Saikh and Mungse, 1998). Increased seed yield in ridges and furrow 45x10 cm method (wider spacing) was due to increased performance by the individual plant and effective utilization of resources. Similar results obtained by Saikh and Mungse (1998) and Sher Singh *et al*. (2004). These results are also in accordance with the experiment conducted at Mahatma Phule Krishi Vidhyapeeth, Rahuri, where maximum seed yield of chickpea (28.7 q ha^{-1}) was obtained with ridges and furrow layouts than that of flat bed layout (Jadav and Pawar, 1999), Pramanik *et al*. (2009) and Karande *et al*. (2006). The higher seed yield in ridges and furrow planting method (45x10 cm) may results from significantly higher growth and seed yield attributes (Vinayak naik and Pujari., 2010). Among genotypes BGD-103 produced significantly higher seed yield (19.89 q ha^{-1}), followed by JG-11 (18.90 q ha^{-1}) and significantly lower yield in A-1 (17.90 q ha^{-1}) (Table 2). The higher seed yield in BGD-103 followed by JG-11 over A-1 was mainly due to significantly higher growth and yield components in these genotypes. The significant reduction in yield of A-1

was mainly due to the significant reduction in yield components like pods per plant, seed weight per plant, test weight as compared to yield components of JG-11 and BGD-103. The difference in seed yield of chickpea genotype was reported by Tomer *et al*. (1988), Paremeshwarappa and Lamani (2003) and Dharmaraj *et al*. (2005).

Table. 2. Effect of planting methods and genotypes on seed yield and its attributes in chickpea

Treatments	Number of pods per plant				Test weight (g)				Seed yield (q/ha)			
	Genotypes (G)				Genotypes (G)				Genotypes (G)			
Planting methods (P)	G_1	G_2	G_3	Mean	G_1	G_2	G_3	Mean	G_1	G_2	G_3	Mean
P_1	31.7	32.3	32.5	32.2	20.2	23	32.3	25.3	12.4	12.8	14.3	13.1
P_2	33.4	34.3	34.6	34.1	20.6	23.2	32.6	25.5	13.0	13.4	14.0	13.5
P_3	35.2	36.8	39.4	37.1	21.5	23.6	32.6	26.0	13.5	13.7	14.4	13.9
P_4	38.3	39.6	40.4	39.4	22.1	24.7	33.3	26.7	14.6	15.1	14.9	14.8
P_5	36.3	38.5	39.5	38.1	21.7	24.2	32.9	26.3	14.2	14.5	14.7	14.5
P_6	39.3	40	42.7	40.7	22.4	25.2	33.8	27.1	14.9	15.3	16	15.4
Mean	35.7	37	38.2		21.4	24.3	32.9		13.8	14.1	14.7	
	S.Em±		CD (0.05)		S.Em±		CD (0.05)		S.Em±		CD (0.05)	
Planting methods (P)	0.33		1.06		0.35		0.12		0.06		0.20	
Genotypes (G)	0.16		0.51		0.27		0.09		0.04		0.12	
G at same level of P	0.48		NS		0.22		NS		0.09		NS	
P at same or different level of G	0.44		NS		0.22		NS		0.10		NS	

NS: Non-significant

The successful seed programmes aims at obtaining higher quantity of quality seeds. The effect of planting methods on germination percentage of chickpea seeds was non-significant.

Table.3. Effect of planting methods and genotypes on seed quality in chickpea

Treatments	Germination percentage				Seedling Vigour Index-I				Seedling Vigour Index-II			
	Genotypes (G)				Genotypes (G)				Genotypes (G)			
Planting methods (P)	G_1	G_2	G_3	Mean	G_1	G_2	G_3	Mean	G_1	G_2	G_3	Mean
P_1	91.0 (73.3)	90.0 (72.0)	91.0 (73.0)	90.6 (72.7)	2420	2445	2712	2526	16.0	18.2	20.0	18.1
P_2	91.0 (72.6)	92.0 (73.7)	92.0 (73.8)	91.6 (73.4)	2436	2528	2771	2578	16.4	19.0	20.3	18.6
P_3	92.3 (73.9)	92.0 (73.6)	93.0 (74.7)	92.4 (74.1)	2522	2593	2905	2674	17.1	19.5	20.8	19.1
P_4	92.0 (73.6)	92.3 (73.9)	94.0 (75.9)	92.7 (74.5)	2570	2655	3060	2762	17.7	19.8	21.5	19.7
P_5	91.6 (73.2)	93.0 (74.7)	93.3 (75.0)	92.6 (74.3)	2539	2650	2971	2720	17.3	19.8	21.0	19.4
P_6	92.3 (73.9)	93.3 (75.0)	94.0 (75.9)	93.2 (75.0)	2619	2708	3169	2832	18.1	20.2	22.0	20.1
Mean	91.7 (73.4)	92.1 (73.8)	92.8 (74.7)		2518	2597	2931		17.1	19.4	21.0	
	S.Em±		CD (0.05)		S.Em±		CD (0.05)		S.Em±		CD (0.05)	
Planting methods (P)	0.86		NS		23.6		67.71		0.11		0.33	
Genotypes (G)	0.6		NS		16.68		47.88		0.1		0.3	
Interaction	1.49		NS		40.88		NS		0.29		NS	

However the planting methods showed significant effect on other quality parameters (Table. 3). Significantly higher SVI-I (2832) and SVI-II (20.1) were obtained with ridges and furrow planting method 45x10 cm than other methods. Among genotypes BGD-103 recorded significantly higher values for seedling vigour index-I (2931) and seedling vigour index-II (21.0) over other treatments. The superiority of harvested seeds form ridges and furrow planting method 45x10 cm and BGD-103 genotype for seed quality parameters may be due to better development of seeds and better nutrition which is exhibited by recording higher dry matter accumulation in seeds and test weight.

Conclusion

From the present study it may concluded that for quality seed production of chickpea the ridges and furrow planting method (45x10 cm) is found better for higher quality seed yield and the among the genotypes studied BGD-103 performed better than other genotypes.

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