



EFFECTS OF PLANTING METHOD ON YIELD AND YIELD ATTRIBUTING CHARACTERS IN CHICKPEA (*CICER ARIETINUM* L.)

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Abstract

The experiment was conducted to study the effect of planting method on yield and yield attributing characters in chickpea. A randomized complete block design was adopted for the experiment with three replications. Four variety viz. BAU-1, BINA Chola-4, BINA Chola-5 and BINA Chola-9 and two planting method i.e. line sowing and ridge sowing were used in the experiment. The highest seed yield (1.81 ton/ha) was obtained from BINA Chola-4 and the lowest one (1.31 ton/ha) was found in BARI Chola-9. The seed yield was higher in ridge sowing (1.57ton/ha) and the lower (1.53 ton/ha) in line sowing. The highest seed yield (1.83 ton/ha) was obtained from BINA Chola-4 with ridge sowing and the lowest (1.30 ton/ha) was obtained from BARI Chola-9 in line sowing. It is concluded that ridge sowing is better than line sowing for the yield of chickpea.

Key words: Chickpea, Planting method, Variety, Yield components and yield

Introduction

Chickpea (*Cicer arietinum* L.) is a major pulse crop in Bangladesh standing 5th position in respect of area and production among the pulse crop (BBS 2012). They are rich source of protein and they sustain productivity in cropping system through biological nitrogen fixation process. As the population of our country is increasing day by day, the demand of chickpea is also increasing. Therefore, we need to increase the production of chickpea. It is a well-recognized concept that planting method greatly affects chickpea production. Increased removal of micronutrients as a consequence of the adoption of high yielding varieties and intensive cropping resulting negative effect on yield. The ridge sowing method may give better result than line sowing method for high seed production in chickpea. The raised bed planting of chickpea provided an environment much suitable for the crop growth. Eventually the crop yield under the raised bed planting was higher than that under the flat bed planting. This is well evident from the results of the two years study. Moreover lesser amount of seed was required under the raised bed planting. Pramanik et al. (2009) in their study of raised bed planting with chickpea have also reported that raised bed planting gave higher grain yield than the flat bed planting. Khambalkar et al. (2014) in their study on the performance of bed-furrow planter in winter season of dry land crops have reported that there was an increase in yield of chickpea by 12.5% using broad bed and furrow system of planting as compared to the traditional flatbed method of sowing.

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 bacteria 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 major pulse growing countries in the world is low compared

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to cereals. As a result of ever increasing the population, availability of pulses shown sharp declined. Respective 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 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 varietal performance are of great importance (Reddy et al. 2003). Various genotypes behave differently due to their plant architecture. Under such situation plant variety play an important role in improving the productivity of crop.

Several reasons have been attributed to low productivity of which the major ones are 90 percent 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. Considering the above information the present study was taken to observe the effect of planting method on the seed yield of chickpea.

Materials and Methods

The present research work was carried out at the Agronomy Field, Department of Agronomy and Agricultural Extension, University of Rajshahi during the period from November 2016 to April 2017. The experiment was carried out in randomized complete block design three replications. Four variety viz. BAU-1, BINA Chola-4, BARI Chola-5, BARI Chola-9 and two planting method i.e. line sowing and ridge sowing were used in the experiment. The experiment was laid out in randomized complete block design with three replications. Variety was allocated in the main plot, planting method in the sub-plot. Different intercultural operations were done as and when necessary. The data on plant height (cm), number of branches/plant, total pods/plant, effective pods/plant, non-effective pods/plant, 1000 seed weight, seed yield (ton/ha), straw yield (ton/ha), and biological yield (ton/ha) were recorded. The data were analyzed statistically using the analysis of variance (ANOVA) and the mean differences among the treatments were adjudged by Duncan's Multiple Range Test with the help of MSTAT-C software.

Results and Discussion

Plant height

Variety of chickpea responded significantly on plant height. BINA Chola-4 produced the tallest (58.956 cm) plant and BARI Chola-9 gave the shortest (52.601 cm) one. Similar results were also observed by Iqbal et al. (2001) and Khan et al. (2000). Plant height varied significantly due to planting method (Table 1). The tallest plant (56.60 cm) as recorded in ridge sowing method and shortest one (55.42 cm) was recorded in line sowing (Table 1). In ridge sowing method generally provide better atmospheric condition (e.g high moisture content) than line sowing. The interaction effect of variety and planting method on plant height was statistically significant (Table 2). It was observed that highest plant height (60.01 cm) was obtained in BINA Chola-4 with ridge sowing and the shortest one (52.13 cm) was recorded from BARI Chola-9 with line sowing.

Branches per plant

Branches of plant varied significantly due to varieties. The highest number of branches per plant (19.56) was obtained from BINA Chola-4 and the lowest number of branches/plant (11.19) was obtained from BARI Chola-9. This result is quite similar to Rashid et al. (1999). Branches/plant was influenced significantly by the

planting method (Table 1). The highest number of branches/plant (15.27) obtained in ridge sowing and the lowest number (13.83) was recorded from line sowing (Table 1). Ridge sowing method facilitated the crop with high depth of root, as a result nutrient uptake was high. Similar result was reported by Pramanik et al. (2009). The interaction effect of variety and planting method on branches per plant was not statistically significant. Apparently the higher number of branches/plant was obtained from BINA Chola-4 with ridge sowing and the lowest one in BARI Chola-9 variety with line sowing (Table 2).

Total pod per plant

Variety showed a significant variation in total pods/plant. The higher pods/plant (59.66) was produced by variety BINA Chola-4. The lower pods/plant (34.94) was produced by variety BARI Chola-9. Planting method was statistically significant on the number of total pods/plant. The ridge sowing method gave the higher number of pods/plant (48.63) and lower was (46.02) observed in line sowing method (Table 1). Similar results were shown by Dharmaraj et al. (2005). Total pods/plant was not significant due to the interaction of variety and planting method. The highest value (61.67) was obtained in BINA Chola-4 with ridge sowing and the lowest one (33.67) in BARI Chola-9 with line sowing (Table 2).

Table 1. Effect of variety and planting method on yield and yield components of chickpea

Treat.	Plant height (cm)	No. of branches/plant	Total pod/plant	Effective pod/plant	Non-effective pod/plant	1000 seed weight (g)	Seed yield (ton/ha)	Straw yield (ton/ha)	Biological yield (ton/ha)
Variety									
V ₁	57.20b	15.04b	48.44b	40.00b	8.44c	135.11b	1.57b	2.05b	3.63b
V ₂	58.95a	19.56a	59.66a	51.33a	8.33d	142.02a	1.81a	2.32a	4.13a
V ₃	55.30c	12.41c	45.83c	36.55c	9.22b	121.73c	1.50c	1.95c	3.45c
V ₄	52.60d	11.19d	34.94d	25.16d	9.77a	125.50d	1.31d	1.71d	3.03d
LS	0.05	0.01	0.05	0.05	0.05	0.05	0.01	0.01	0.01
CV%	3.39	6.77	7.06	5.85	16.72	11.18	2.27	2.76	2.27
Planting method									
S ₁	55.42b	13.83b	46.02b	36.79b	8.72	132.11	1.53b	1.99b	3.52b
S ₂	56.60a	15.27a	48.63a	39.89a	9.16	130.07	1.57a	2.03a	3.60a
LS	0.01	0.01	0.05	0.05	-	-	0.05	0.01	0.01
CV%	3.39	6.77	7.06	5.85	16.72	11.18	2.27	2.76	2.27

In a column figures having similar letters (S) or without letters (s) do not differ significantly as per DMRT. V₁ = BAU-1, V₂ = BINA Chola-4, V₃ = BARI Chola-5, V₄ = BARI Chola-9, S₁ = Line sowing, S₂ = Ridge sowing, LS = Level of significance, CV = Co-efficient of variation, - = Non-significant.

Effective pods per plant

Effective pods/plant showed a significant response due to varieties (Table 1). The highest number (51.33) of effective pod/plant was obtained from BINA Chola-4. BARI Chola-9 showed the lowest number (25.16) of effective pods/plant. Karim (2004) observed similar result and reported that the number of effective pods/plant showed significant response to varieties. Number of effective pods/plant was significantly influenced by planting method (Table 1). The highest number of effective pods/plant (39.89) was recorded in ridge sowing method and the lowest one (36.79) was found in line sowing method (Table 1). This result was supported by Dutta et al. (1998). The interaction between variety and planting method on the production of effective pod/plant was not significant (Table 2). The highest effective pods/plant was obtained from the variety BINA Chola-4 with ridge sowing method and the lowest one from variety BARI Chola-9 with line sowing method.

Non effective pods per plant

Variety showed a significant effect in number of non-effective pods/plant (Table 1). The highest number of non-effective pods/plant (9.77) was produced by variety BARI Chola-9 and lowest non-effective pods/plant (8.33) was produced by variety BINA Chola-4. The number of non-effective pods/plant was not influenced significantly by planting method (Table 1). The highest number of non-effective pods/plant (9.16) was obtained from ridge sowing method and the lowest one (8.72) in line sowing method. The interaction effect of variety and planting method on the number of non-effective pods/plant was not significant (Table 2). But numerically the highest value (9.81) was obtained from variety BINA Chola-4 with ridge sowing method and the lowest value (7.88) in BARI Chola-9 with line sowing method (Table 2).

1000 seed weight

Varietal effect differed significantly in respect to 1000 seed weight (Table 1). BINA Chola-4 gave the highest 1000 seed weight (142.02 g). The lowest 1000 seed weight (125.5 g) was produced by BARI Chola-9. Thousand seed weight influenced significantly by planting method (Table 2). Table 1 indicates that the highest weight of 1000 seed (132.07 g) was produced in ridge sowing method and the lowest was recorded from (130.11 g) line sowing method. The 1000 seed weight was significantly influenced by the interaction of variety and planting method (Table 2). Table 2 represents that the BINA Chola-4 resulted highest value of 1000-seed weight (143.11 g) when it was interacted with the ridge sowing method i.e. $V_2 \times S_2$ combination and the lowest value (125.35 g) of 1000 seed weight was produced by BARI Chola-9 with line sowing.

Seed yield

All the varieties differed significantly in respect to seed yield (Table 1). The highest seed yield (1.81 ton/ha) was recorded from the variety BINA Chola-4 due to increased number of effective pods/plant. The lowest seed yield (1.31 ton/ha) was obtained from BARI Chola-9. The significant reduction in yield of BARI Chola-9 was mainly due to the significant reduction in yield components like pods/plant, seed weight/plant as compared to yield components of BINA Chola-4. Khalid et al. (2001) also observed same results in chickpea. These results are also in concurrence with those of Kumar et al. (2003).

Planting method showed a significant variation in seed yield (Table 1). Table 1 indicates that ridge sowing method gave the highest seed yield (1.57 ton/ha). The lowest grain yield (1.53 ton/ha) was obtained from line sowing method. This result is similar to Dutta et al. (1998). The raised bed planting of chickpea provided an environment much suitable for the crop growth. Joshi and Shrivastava (2017) in their study on modification and performance evaluation of tractor drawn raised bed seed drill under vertisol have reported that the average yield of chickpea by raised bed sowing was 1211.3 kg/ha as compared to that viz. 1127.83

kg/ha under conventional practice. Thus here also the raised bed sowing outperformed the conventional of sowing of chickpea. The interaction effect between variety and planting method on seed yield was statistically non-significant (Table 2). The highest yield was recorded from BINA Chola-4 when it was interacted with ridge sowing method and the lowest seed yield was obtained from BARI Chola-9 with line sowing method.

Straw yield

The effect of variety on straw yield was statistically significant (Table 1). BINA Chola-4 produced the highest straw yield (2.32 ton/ha). The lowest straw yield (1.71ton/ha) was produced by BARI Chola-9. Planting method showed a significance variation in straw yield (Table 1). The ridge sowing method gave the highest straw yield (2.03) and the lowest was observed in line sowing method (1.99).The interaction effect between variety and planting method on straw yield was not significant (Table 2). Numerically the highest result was obtained from variety BINA Chola-4 when it was interacted with ridge sowing method.

Biological yield

The effect of variety on biological yield was statistically significant (Table 1). BINA Chola-4 produced the highest biological yield (4.137 ton/ha). BARI Chola-9 produced the lowest biological yield (3.03 ton/ha). Planting method showed a significant variation in biological yield. Table 1 represents that the ridge sowing method gave the highest biological yield (3.60 ton/ha) and the lowest was observed in line sowing method (3.52 ton/ha). This result is similar to Dharmaraj et al. (2005).The interaction effect of variety and planting method on biological yield was statistically significant (Table 2). Data indicates that the highest biological yield was recorded (4.18t ton/ha) in V₂S₂ (BINA Chola-4 with ridge sowing method) and the lowest value was observed in V₄S₁ (BARI Chola-9 with line sowing).

Table 2. Interaction effect of variety and planting method on yield and yield components of chickpea

Interaction (V × Pm)	Plant height (cm)	No. of branches/plant	Total pod/plant	Effective pod/plant	Non-effective pod/plant	1000 seed weight (g)	Seed yield (ton/ha)	Straw yield (ton/ha)	Biological yield (ton/ha)
V ₁ S ₁	56.80d	14.57	46.44d	38.11	8.33	133.61d	1.55	2.03	3.58d
V ₁ S ₂	57.61cd	15.50	49.33cd	41.88	8.55	136.60cd	1.59	2.07	3.67cd
V ₂ S ₁	57.89b	18.75	57.66b	49.77	7.88	140.87b	1.78	2.30	4.08b
V ₂ S ₂	60.01a	20.38	61.66a	52.88	8.77	143.11a	1.83	2.33	4.18a
V ₃ S ₁	54.87ef	11.68	46.33ef	35.00	9.11	114.84ef	1.52	1.97	3.49ef
V ₃ S ₂	55.73de	13.13	47.33de	38.11	9.33	114.84de	1.52	1.97	3.49de
V ₄ S ₁	52.13gh	10.32	33.66gh	24.22	9.55	125.35gh	1.30	1.70	3.00gh
V ₄ S ₂	53.07fg	12.06	36.22fg	26.23	9.81	125.65fg	1.32	1.73	3.07fg
LS	0.05	NS	0.05	NS	NS	0.05	NS	NS	0.05
CV%	3.39	6.77	7.06	5.85	16.72	11.18	2.27	2.76	2.27

In a column figures having similar letters (S) or without letters (s) do not differ significantly as per DMRT.

Conclusion

All the yield components and yield varied significantly among the varieties. The highest seed yield (1.81 ton/ha) was obtained from BINA-4 and lowest (1.31 ton/ha) was found from BARI-9 variety. The seed yield was higher in ridge sowing (1.57 ton/ha) and the lowest one (1.53 ton/ha) in line sowing method. From the interaction effect between variety and planting method the highest seed yield (1.83 ton/ha) was obtained from BINA Chola-4 with ridge sowing and lowest (1.30 ton/ha) was found from BARI Chola-9 with line sowing method. It was observed planting has a significant effect on yield of chickpea. It may be concluded that ridge sowing is better than line sowing for maximum yield of chickpea.

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