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Yield Performance of Chickpea Varieties Following Application of Growth Regulator

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Abstract: An experiment was conducted at the experimental field of Sher-e-Bangla Agricultural University, Dhaka-1207, Bangladesh, during the period from November, 2005 to March, 2006. Three varieties viz. BARI chola-1 (V_1), BARI chola-4 (V_2) and BARI chola-5 (V_3) were given foliar spray of water spraying (G_0) and 1500 ppm KNap as treatment variables to study the response of chickpea varieties to the application of growth regulator. Crop characters like plant height, number of branches plant^{-1}, number of pods plant^{-1} and 1000-seed weight and seed yield of each variety were significantly influenced by 1500 ppm KNap. Among the varieties, BARI chola-5 with 1500 KNap gave the maximum seed yield (1.81 t ha^{-1}) which was 36.09% more over BARI chola-1 which produced the lowest seed yield (1.33 t ha^{-1}).

Key words: Chickpea · growth regulators · knap · varieties · yield

INTRODUCTION

Chickpea (*Cicer arietinum* L.) belongs to the family Leguminosae. It is one of the important grain legume cultivated in the world. In Bangladesh, chickpea is the third major pulse crop after grasspea and lentil. Chickpea occupied 16800 ha of land producing 15600 metric ton [1]. Chickpea seeds contain essential amino acids like isoleucine, leucine, lysine, phenylalanine and valine [2]. The protein in chickpea is highly digestible (70-90%) [3].

Chickpea meets 80% of its nitrogen requirement from symbiotic nitrogen fixation and can fix up to 140 kg N ha^{-1} from air. The yield of chickpea in Bangladesh is lower than the other chickpea growing countries in the world. This mainly due to the use of traditional or low yielding varieties as well as adoption of poor management practices. A considerable variation of yield may be found with use of suitable varieties [4]. On the other hand growth regulators can improve yield status of various crops [5-7]. A very limited works have been carried out regarding the use of growth regulators on chickpea varieties in Bangladesh.

However the present research work was designed to study the effect of growth regulator on the yield components and yield of different chickpea varieties.

MATERIALS AND METHODS

The experiment was conducted at the experimental field of Sher-e-Bangla Agricultural University, Dhaka-1207, Bangladesh, during the period from November, 2005 to March, 2006. Three chickpea varieties viz. BARI chola-1 (V_1), BARI chola-4 (V_2) and BARI chola-5 (V_3) were tested against application of water spray (G_0) and 1500 ppm potassium napthelnte (KNap) (G_1). The experiment was laid out in Randomized Complete Block Design (RCBD) with 4 replications. The unit plot was 4.0 m × 2.5 m. The plots were fertilized with cowdung, nitrogen, P_2O_5 and K_2O at the rate of 5 t ha^{-1}, 30 kg ha^{-1}, 40 kg ha^{-1} and 20 kg ha^{-1} respectively as basal application. Seeds of chickpea were collected from Pulse Research Centre of BARI (Bangladesh Agricultural Research Institute). The seeds were sown in rows on November 14, 2005 maintaining row distance as 40 cm. Seeds were placed at 2-3 cm depth in each row keeping 15 cm distance between two hills. Two seeds were sown in each hill. The excess plants were thinned out keeping one plant in each hill 15 days after sowing (DAS). The young plants were irrigated by watercan to maintain soil moisture at field capacity. Two check basin irrigation were given 20 DAS and 50 DAS. The crop field was weeded twice to control weeds. 1500 ppm KNap was prepared following Fattah [8]

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and spraying was done at 40 DAS (flower initiation stage) of chickpea. The crop was harvested 110 days after sowing. Yield attributes and yield data were analyzed statistically by using MSTAT computer program. The means were compared by LSD test. The correlation and regression analysis was done by using SPSS software.

RESULTS AND DISCUSSION

Potassium napthenate, the growth regulator at 1500 ppm influenced different varieties of chickpea to produce significant variations in plant characters, yield attributes and yield (Table 1).

Effect on plant characters: The maximum plant height (37.90 cm) was observed with treatment V_2G_1 (BARI chola-4 and 1500 ppm KNap). It was statistically at per with V_3G_1 and V_1G_1. Treatment V_3G_1 gave highest number of branches plant^{-1} (24.70). The minimum value of plant height and number of branches plant^{-1} were from V_1G_0 (BARI chola-1 and water spray). Treatment V_2G_1 and V_3G_1 gave 21.86% and 102.45% more plant height and branches plant^{-1} respectively over V_1G_0. Junttila [9] reported that auxin type growth regulators has significant effect on the elongation of shoots of crop plants. Iqbal *et al*. [10] also observed similar results spraying with Gibberellic acid in chickpea. Iqbal *et al*. [10] and Eid *et al*. [11] reported that branches of pea plants increased with foliar application of growth regulators.

Effect on yield attributes and yield: The application of 1500 KNap on BARI chola-4 produced maximum number of pods per plant (33.35) and it was statistically at per with V_3G_1 and V_1G_1. It reveals that all the varieties have similar capabilities of pod production. Off these varieties BARI chola-1 produced lower pod while it was not given KNap application. The maximum production of pod was 44% greater than the lower pod production. The same concentration of KNap (1500 ppm) was found influential to produce more pods per plant as reported by Karim and Fattah [7] in chickpea and Islam *et al*. [12] in lentil. The maximum weight of 1000-seed (273.30 g) was found from the combination of BARI chola-5 and 1500 KNap application (V_3G_1) which was statistically similar with V_2G_1. The combination of BARI chola-1 and water spray (control) showed the lowest weight of 1000-seed (233.50 g).

Highest seed yield per plant (6.94 g) and per unit area (1.81 t ha^{-1}) were observed in V_3G_1 and followed by V_2G_1.

Table 1: Plant characters, yield attributes and yield of chickpea as influenced by growth regulator

Treatment	Plant height (cm)	No. of branches plant^{-1}	No. of pods plant^{-1}	1000-seed weight (g)	Seed yield plant^{-1}(g)	Seed yield (t ha^{-1})
V_1G_0	31.10	12.20	23.15	233.50	5.13	1.33
V_1G_1	35.07	15.45	28.45	247.30	6.09	1.51
V_2G_0	33.30	15.35	25.85	246.30	5.65	1.41
V_2G_1	37.90	19.15	33.35	263.00	6.67	1.74
V_3G_0	32.28	18.15	26.60	257.80	6.26	1.52
V_3G_1	37.02	24.70	32.95	273.30	6.94	1.81
$LSD_{0.05}$	4.44	4.43	6.52	11.83	0.45	0.20
CV (%)	8.46	16.79	15.16	3.10	4.78	8.66

V_1= BARI Chola-1, V_2= BARI Chola-4, V_3= BARI Chola-5
G_0=control (Water spray), G_1= 1500 ppm KNap

Table 2: Correlation among plant height, no. of branches plant^{-1}, no. of pods plant^{-1}, 1000-seed weight and yield of chickpea

	Plant height	No. of branches plant^{-1}	No. of pods plant^{-1}	1000-seed weight	Seed yield
Plant height	1.00	0.724^{ns}	0.975**	0.770^{ns}	0.902*
No. of branches plant^{-1}		1.00	0.838*	0.978**	0.929**
No. of pods plant^{-1}			1.00	0.883*	0.973**
1000-seed weight				1.00	0.950**
Seed yield					1.00

** significant at 0.01 level * significant at 0.05 level ^{ns} Not significant

The yield status either per plant or unit area were minimum in V_1G_0. Treatment V_3G_1 increased yields by 35.28% and 36.09% over seed yields per and unit area, respectively with V_1G_0. The greater seed yield was the resultant effect of maximum production of pods plant^{-1} and 1000-seed weight. 1500 KNap was examined influenced to improve yield status of chickpea and lentil [7, 12]. Similar results were also observed by Iqbal *et al*. [10], Eid *et al*. [11], BARI [13] and Khan *et al*. [14].

Correlation and Regression analyses: From the correlation study, it was observed that all the crop characters and their associations were significant among themselves except plant height with number of branches and 1000-seed weight (Table 2). Plant height, number of branches per plant, number of pods per plant and 1000-seed weight had significantly positive correlation with seed yield of chickpea with the r values of 0.902**, 0.929**, 0.973** and 0.950**, respectively. The relationship between branches plant^{-1}, pods plant^{-1} and 1000-seed weight and seed yield were

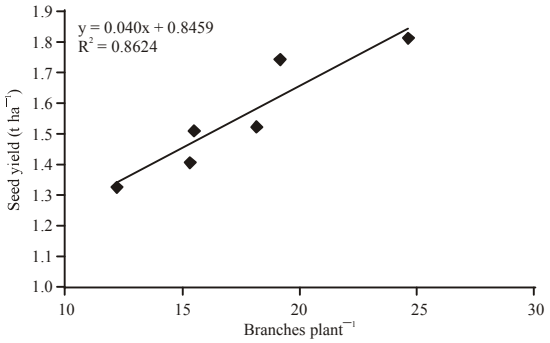

Fig. 1: Relationship between branches plant^{-1} and seed yield of chickpea

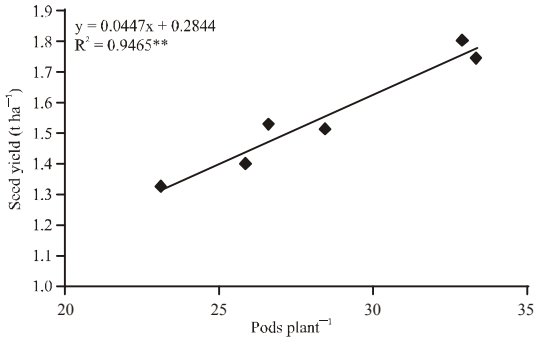

Fig. 2: Relationship between pods plant^{-1} and seed yield of chickpea

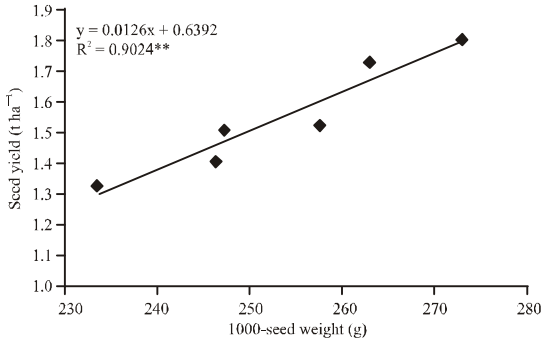

Fig. 3: Relationship between 1000-seed weight and seed yield of chickpea

found positive, linear and significant (R^2=0.86**, R^2=0.94** and R^2=0.90**, respectively) (Figs. 1, 2 and 3). Ali and Tahir [15] also observed similar trend while they studied on the correlation and regression in chickpea. Malik *et al*. [16] also observed same results in chickpea.

CONCLUSIONS

From the study, it may be concluded that application of 1500 ppm KNap had a significant influence on different varieties of chickpea through producing maximum plant characters. Among the varieties BARI chola-5 showed better performance than BARI chola-4 and BARI chola-1 in respect of seed yield production with treated with KNap 1500 at ppm.

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